TASCAM

TEAC Professional Division

34B

4-Track Recorder/Reproducer

OPERATION/MAINTENANCE

5700050900

The guarantee of performance that we provide for the 34B must have several restrictions. We say that the recorder will perform properly only if it is adjusted properly and the guarantee is that such adjustment is possible. However, we cannot guarantee your skill in adjustment or your technical comprehension of this manual. Therefore, Basic Daily Setup is not covered by the Warranty. If your attempts at internal adjustments such as rebias and record EQ trim are unsuccessful, we must make a service charge to correct your mistakes.

Recording is an art as well as a science. A successful recording is often judged primarily on the quality of sound as art, and we obviously cannot guarantee that. A company that makes paint and brushes for artists cannot say that the paintings made with their products will be well received critically. The art is the province of the artist. TASCAM can make no guarantee that the 34B *by itself* will assure the quality of the recordings you make.

Your skill as a technician and your abilities as an artist will be significant factors in the results you achieve.

CAUTION RISK OF ELECTRIC SHOCK DO NOT OPEN	CAUTION: TO REDUCE THE RISK OF ELECTRIC SHOCK, DO NOT REMOVE COVER (OR BACK). NO USER-SERVICEABLE PARTS INSIDE. REFER SERVICING TO QUALIFIED SERVICE PERSONNEL.
	The lightning flash with arrowhead symbol within an equilateral triangle, is intended to alert the user to the presence of uninsulated "dangerous voltage" within the product's enclosure, that may be of sufficient magnitude to constitute a risk of electric shock to persons.
	The exclamation point within an equilateral triangle is intended to alert the user of the presence of important operating and maintenance (servicing) instructions in the literature accompanying the appliance.

WARNING: TO PREVENT FIRE OR SHOCK HAZARD, DO NOT EXPOSE THIS APPLIANCE TO RAIN OR MOISTURE.

This recorder/reproducer has a serial number located on the rear panel. Please record the model number and serial number and retain them for your records.

Model Number _____

Serial Number _____

TABLE OF CONTENTS

❶ Reel Tables
Support either 7" reels or hub adaptors when 10-1/2" reels are used. Use the same size and kind of reels. See page 10 for details.

❷ NAB Hub Adaptors
These can be installed to allow use of 10-1/2" reels. Rotate adaptor ring CW to fully tighten.

❸ Digital Counter
A four digit green fluorescent counter which provides a numerical index relative to tape position.

❹ RESET Button
Press this button to obtain "0000" when determing the record start position (ZERO RETURN position).

❺ ZERO RETURN Button
When depressed, counter 0000 may be considered a one position "autolocator" allowing rewind (◂◂) to find one spot (0000) on the tape without the use of the cue lever. You won't need an audible cue to find this location, and accidents to the tape or damage to the monitor system tweeters will be avoided. This auto stop function is only possible in rewind (◂◂), and the transport will not stop at 0000, if you are using (▸▸) fast forward.

1. If the rewind time is short, the transport will stop at 999, not precisely on the "mark".
2. If the rewind time is long (half a reel of tape) the transport will cycle between (▸▸) and (◂◂) several times and finally come to rest at counter 999.

Tape slippage will lower the accuracy of the "stop" point. So, always check by listening before re-recording. You may not be exactly "on-cue". Take care.

CAUTION:
Once the ZERO RETURN operations are completed, make sure to reset this button to (⊔ OFF).

❻ Impedance Roller
Sometimes refered to as a "flutter filter", which insures even tape travel across the heads and low wow and flutter performance.

❼ Tension Arm
Maintains even tape tension and compensates for slight irregularities in the supply reel.

❽ POWER Switch
When depressed (⎓ ON), the digital counter and VU meters light. Press again (⊔ OFF) to turn off.

❾ REEL Switch
When large diameter 10-1/2" reels are used greater back tension is required for correct operation. 7" reels require less back tension. This switch sets the correct amount of back tension; set it to suit the size of reel you are using on the supply side.

❿ SPEED Switch
LOW (⎓) selects a tape speed of 7-1/2 ips and HIGH (⊔) selects a tape speed of 15 ips.

⓫ EDIT Switch
Depress to activate, depress again to release.

CAUTION:
Edit mode may only be activated safely from STOP. When this button is depressed, the takeup reel motor is released from transport logic control. If the recorder is in either fast forward or rewind, and the EDIT button is depressed, only the STOP and PLAY buttons will function. Fast motion in either direction will not be accepted as a command after STOP until the EDIT button is released. This protective restiriction must be included in the logic or the transport may spill tape uncontrollably.

When EDIT is depressed, pressing PLAY (▸) activates the capstan motor and the pinch roller solenoid regardless of the position of the takeup tension shutoff arm. The takeup reel will not move, and the tape will "spill". This will allow you to listen to the playback of an unwanted section without winding that part of the tape on to the takeup reel. When you hear that the section that you wish to remove (edit out) has completely "spilled", or "dumped", a splice can be made, the desired parts can be joined together, and the unwanted length of tape discarded. As you can see, the "safety features" such as brakes and tape tension detection must be bypassed in order to provide these edit capabilities, so take care.

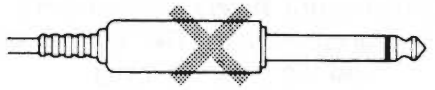
⑫ PITCH CONTrol
PULL ON to engage a ±12 % variation of the tape speed in the recording or reproducing modes.
Pull out and turn to the left (-) to decrease the speed of the tape transport; turn to the right (+) to increase the transport speed.
Push in to disengage.
NOTE:
Since this pitch control is active in record as well as reproduce, it is wise to check and make sure that it is disengaged (pushed in) when not wanted.

⑬ CUE Lever
This control will defeat the fast motion tape lifters. The more pressure you apply, the closer the tape will come to the heads. This will allow the reproduce signal to be heard in fast motion for cueing. Use only enough pressure to hear the signal. Too much signal will damage the electronics, and if your monitor system is turned up, high frequency playback signal will damage your loudspeakers so be sure the cue lever is not engaged (locked) when in fast motion. The latch position is provided only for hand winding the tape to find an edit point. Push down on the lever to release.
CAUTION:
Use of the cue lever in fast forward or rewind will greatly accelerate head wear.

⑭ PHONES SELECT Switches
Select which of track(s) will feed the headphone amplifier. The source, Input or Tape, is determined by the position of the FUNCTION SELECT and OUTPUT SELECT Switches.

⑮ PHONES Level Control
Controls the level of the mix selected by the PHONES SELECT Switches.

⑯ PHONES Jack
This 1/4" phone jack is where you connect your stereo headphones. The signal at this point is the same as the signal at the OUTPUT (Line Out) jacks. This output is designed for 8 ohm stereo headphones.
CAUTION:
MONO (2 WIRE) HEADPHONES WILL CAUSE CIRCUIT FAILURE. If your headphones have this connector, don't use them


(1/4" phone 2-connector)


(1/4" phone 3-connector)

Your headphone connector must 3 sections to be safe. While accidents do happen, and protection circuit have been built in, use of mono/2 wire headphones will eventually cause circuit failure (2 to 3 minutes).
Using the 2 wire connector shorts out the amplifier driving the headphones, which will cause it to burn out.

⑰ INPUT Level Control
Adjusts the record level of the track. The "CAL" position provides a nominal setting to be used for set-up, calibration and with a mixer when levels must be consistant and repeatable. For more information on calibrating the Recording System see page 16.

⑱ OUTPUT Level Control
Adjust the playback level of the track. In the SYNC and REPROduce modes the playback signal is available at the rear panel OUTPUT jacks, the VU meters and the PHONES SELECT Switches. The "CAL" position function is the same as the INPUT Level CAL.

⑲ VU Meters
The INPUT and OUTPUT Volume level controls will affect the meter level.

⑳ INPUT SELECT MIC/LINE Switches
In the out position (LED off) the line input is selected. Depressing this switch (in) selects Mic input and lights the corresponding LED.

㉑ FUNCTION SELECT Switches and LEDs
These four switches determine whether a track will enter record mode when RECORD and PLAY are pressed. An LED indicates each track's record status ("Record Safe", "Record Ready", or "Record" mode):
LED off: Record Safe Mode, no recording can take place.

LED blinks: Record Ready Mode, recording will occur when "Record" is engaged and the tape is moving.

LED on: Record or Record/Pause.
Record, the tape is moving and recording is taking place.
Record/Pause, recording will begin when play is selected.

㉒ OUTPUT SELECT Buttons

Select which of three possible sources to feed the OUTPUT jacks (rear panel), VU meter circuits and PHONES SELECT Switches. The LED's above the buttons show selection.

INPUT — Meter reads line input to recorder, input signal appears at OUTPUT jacks, and PHONES SELECT Switches. Tape signal will not be heard.

SYNC — Used for all normal operations, recording, sync/reproduce and reproduce. Meter reads input or sync/reproduce head (#2) play output depending on setting of FUNCTION SELECT Switches.

REPROduce — Selects the reproduce head (#3). Meter now reads tape playback. Does not prevent recording on head #2. Used in set-up to check performance and record/play monitoring of tape.

OUTPUT SELECT		FUNCTION SELECT		OUTPUT and VU METERS
Switch	LED	Switch	LED	
Input	on	out	off	Input/Source
		in	blinks	
Sync	on	out	off	Tape
		in	blinks	Input/Source
Repro	on	out	off	Tape
		in	blinks	

㉓ Transport Controls

This group of buttons control the mechanical action of the transport, and the in/out switching of the record circuit. The RC-71 remote control unit (see rear panel for the connection point) will duplicate this control group. When the remote is connected, both sets of controls will be active at the same time.

(▶) Play Button

1. When depressed alone, the tape will advance at the speed selected by the SPEED switch and the PITCH CONTrol.
2. When depressed along with the RECORD button, any or all tracks that have their FUNCTION SELECT buttons IN (record ready) will begin recording immediately.
3. This transport has a motion sensing circuit that allows the selection of PLAY directly from either fast forward or rewind. Press PLAY when fast winding and the transport will slow, come briefly to STOP and then enter PLAY by itself.

(▶▶) Fast Forward Button

(◀◀) Rewind Button

Rewind time is 90 seconds for a 10-1/2" reel, 1-1/2 mil tape.

STOP Button

RECORD Button

Depressing this button by itself will have no effect. To begin recording, several conditions must first be met.

1. One or more FUNCTION SELECT buttons must be IN (record ready).
2. To enable the record logic, the PLAY button must be depressed simultaneously with the RECORD button. If the transport is in PLAY, press BOTH buttons together and the unit will go into record mode.
3. The PAUSE button can hold the record logic in an active condition. If PAUSE is active, recording can start with a one button PLAY command.

㉔ RECORD Status Indicator

The red LED blinks when the deck is in Record Ready mode and lights up in the Record mode.

㉕ PAUSE Status Indicator

The green LED lights only when PAUSE and RECORD have been simultaneously pressed.

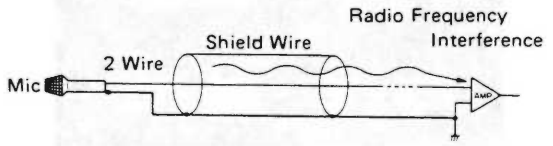
㉖ Shut Off Arm

The shut off arm will drop power to the capstan and reel motors if the tape breaks. It's a good idea to allow it to drop when you take a break in the middle of a session. Doing this will stop the constant rotation of the capstan, and will lengthen the life of the capstan motor bearings. It is not necessary to unthread the tape. Just allow it to become slack so that the shut off arm can drop.

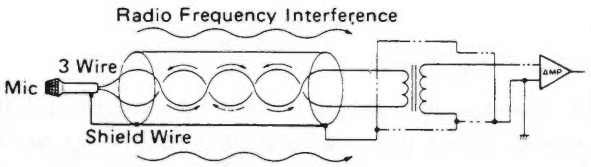
㉗ MICrophone Input

1/4" phone jack accepts unbalanced signals from any type of microphone having any impedance from 150 ohms to 10,000 ohms. If you are using balanced professional mics, use #109B adaptor to connect it to the MIC IN jack.

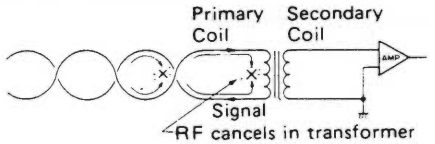
Why use a transformer if it is not absolutely necessary? There may be a good reason, and it applies primarily to mics used with cable runs exceeding 10 feet. The low power signal that mics (and some instrument pickups) generate must frequently be protected and isolated from other low power signals. Radio, power line hum, buzz, crackles and switching noise when motors start up (do you have an air conditioner on your AC line or maybe an old fridge?) — all these unwanted signals must be kept out of the very high gain amplifiers that are needed to raise the mic signal to a working level. The balanced or three-wire mic circuit and input isolation transformer are the only sure way to deal with the problem. Here's how it works:



Any signal will pass to amplifier, no rejection.



Audio signals from mic have opposite polarity. Buzz, hum, and RFI have common polarity.



Signals with opposite polarity in the primary coil will generate current in the secondary coil. Signals with common polarity will cancel out in the primary coil and will not pass to the secondary coil. No signal in the secondary coil means no signal in the amplifier. You leave the "interference" behind and get only the mic signal.

㉘ MIC ATTenuator

The two position switch selects either a 0 dB or a -20 dB attenuator. This 20 dB attenuator (pad) is used to reduce the level of extremely "hot" mic signals.

㉙ LINE IN Jacks

Nominal input level is -10 dB (0.3 V). Input impedance is 50 k ohms (unbalanced).

㉚ OUTPUT (Line Out) Jacks

Nominal output level is -10 dB (0.3 V). Minimum load impedance is 10 k ohms (unbalanced).

㉛ DBX UNIT CONTROL SIGNAL Connector

This allows connection of the DX-4D NOISE REDUCTION SYSTEM and supplies control signal to the dbx system to permit simultaneous encode/decode dbx operation. Because of this "dual process", no switching is required when you change function from recording to playback. The fact that there are separate sections for each function will also allow "off-the-tape" monitoring when dbx is used.

㉜ REMOTE Connector

Allows connection of the optional RC-71 Remote Control Unit.

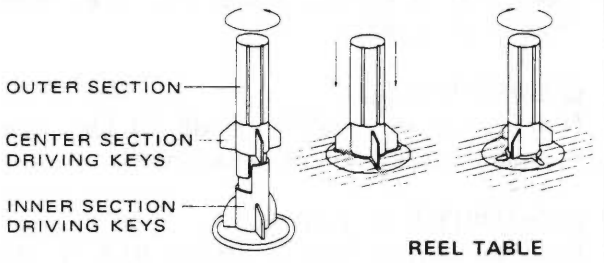
㉝ PUNCH IN/OUT REMOTE Connector (RC-30P)

Allows connection of the optional RC-30P TASCAM PUNCH IN/OUT REMOTE PEDAL.

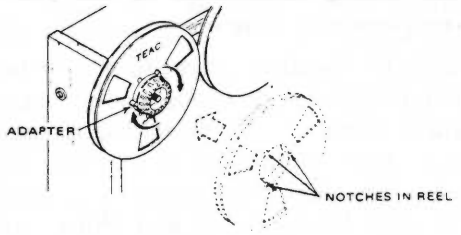
BASIC INFORMATION

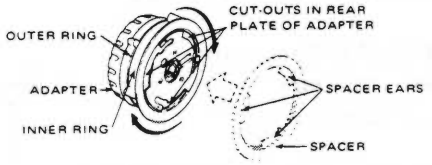
Reel Installation

Small Hub Reels



Large Hub Reels

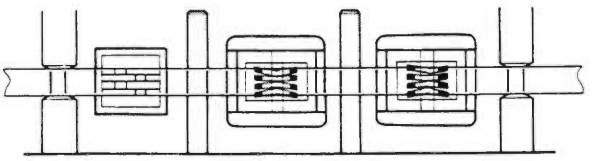




NOTE:

A metal spacer is mounted on the back of the reel adaptors and it must be in place when NAB standard 10-1/2" metal reels are used.

Head Configuration



①ERASE HEAD ②RECORD/ SYNC HEAD ③REPRO HEAD

Threading the Tape

Lift the head access cover and release the sync head shield to gain access for threading.

NOTE:

If you use a reel of tape that has been stored "tailed out" (See "Editing and Tape Storage"), it must be placed on the right reel table and rewound to the left.

Erasing the Tape

A previously recorded tape is automatically erased when you make a new recording on it. For the best-quality recordings and for convenience, we recommend the TEAC E-2A bulk eraser. This will erase your tapes cleanly in one pass for the best signal-to-noise ratio. Another way to erase is to record with the input controls set to the minimum levels.

Editing and Tape Storage

Never use ordinary adhesive tape for this vital procedure. Use only the special tape made exclusively for tape editing.

Monitor with the CUE lever. When you have located the precise point to make the cut, stop the tape and mark the back of the tape with a Chinacraft type pencil at the center of the reproduce head, and then use the EDIT switch. With the EDIT switch and (▶) button depressed, the tape will begin unthreading itself (dumping) because the take up reel will not be moving to take up the slack. The use of non-magnetic tools is highly recommended. A good quality machine-milled tape-editing block will help ensure good edits.

Tape should be stored in a cool, dry place well away from the influence of magnetic fields. Print-through (the unwanted transfer of magnetic signals from one part of the tape to an adjacent part of the tape, causing "echos") may be reduced by winding (NOT fast winding) the tape onto the take up reel at normal playing speed for storage. When the tape is played again, it is first rewound at a high speed onto the supply reel. This is called storing the tape "tails out" and is a common practice in many studios. A helpful idea is to use white leader tape at the beginning and red leader tape at the tail end. The analogy with vehicle head and tail lights is then an easy way to remember which end is which.

CLEANING

IMPORTANT:

Do not overlook the importance of cleaning. Insufficient cleaning is the number one cause of the degradation of performance levels.

The first thing you will need for service is definitely the least expensive — Cleaning fluids and swabs. The whole outfit, 2 fluids and all the cotton swabs you'll need for months cost less than one roll of high quality tape. We can't stress the importance of cleaning too much. **Clean up before every session. Clean up after every session. Clean up every time you take a break in the middle of a session (we're serious).** How come? Well there are two good reasons we can think of right off the top:

1. Any dirt or oxide buildup on the heads will force the tape away from the gaps that record and playback. This will drastically affect the response. Even so small a layer of dirt as one thousandth of an inch will cause big trouble. All the money you have paid for high performance will be wiped out by a bit of oxide. Wipe it off with head cleaner and get back to normal.
2. Tape and tape oxide act very much the same as fine sandpaper. The combination will grind down the tape path in time. If you don't clean off this abrasive on a regular basis, the wear will be much more rapid and, what's worse, it will become irregular. Even wear on heads can be compensated for by electronic adjustments for a time, but uneven wear can produce notches on heads and guides that will cause the tape to "skew" and skip around from one path to another, making adjustment impossible. This ragged pathway chews up the tape, thus dropping more abrasive, thus causing more uneven wear and so — a vicious spiral that can't be stopped once it gets a good start. The only solution will then be to replace not only the heads, but all the tape guides as well. Being conscientious about cleaning the tape path on the 34B will more than double the service life of the head assembly.

DEGAUSSING (DEMAGNETIZING) IMPORTANT:

1. **Do not overlook the importance of degaussing. Magnetism in the tape can significantly degrade performance. In extreme cases, the heads may not respond to signals at all.**
2. **Turn off the deck before degaussing.**
3. **Do not turn the degausser (E-3) off or on while it is in close proximity to the tape path.**
4. **Keep all recorded tape a safe distance from the degausser.**

A little stray magnetism goes a long way. A long way towards making trouble for your tapes. It only takes a small amount (0.2 gauss) to cause trouble on the record head and playing 10 rolls of tape will put about that much charge on the heads and other ferrous parts of the tape path. A little more than that (0.7 gauss) will start to erase high frequency signal on previously recorded tapes. Demagnetize the whole tape path, including the tips of the tension arms every six fully played 10-1/2" reels. This is a fair "rule of thumb" even though it may be a bit hard to keep track of. Fast motion isn't as significant to the heads, so we don't give an hourly reference. It's the record/play time that counts.

Degaussing is always done with the recorder turned off. If you try it with the electronics on, the 60 cycle current pulses produced by the degausser will look just like 60 Hz audio to the heads, at about 10,000 VU and will seriously damage the electronics and/or the meters. Turn off the machine, turn on the degausser at least 3 feet away from the recorder. Move slowly in to the tape path. Move the degausser slowly up and down in close proximity to all ferrous parts and, slowly move away to at least 3 feet before turning off.

It's a good idea to concentrate when you are degaussing. Don't try to hold a conversation or think of anything else but the job you are doing. If the degausser is turned off or on by accident while it is near the heads, you may put a permanent charge on them that no amount of careful degaussing will remove – head replacement time again, we're sorry to say. Make sure you are wide awake for this procedure.

A clean and properly demagnetized tape recorder will maintain its performance without any other attention for quite some time. Even if it does drift as a recorder, it won't ruin previously recorded material, and getting it back in good shape will not be too difficult.

ENTERING "RECORD"

OUTPUT SELECT BUTTONS: The signal presented at the output terminals is controlled by the OUTPUT SELECT buttons.

INPUT will typically be used for source calibrations during system interface and set-up procedures. When this button is depressed, the input signals are sent directly to the output terminals.

REPRO will present the reproduce head signal to the output jacks for those situations where it is desirable to monitor the printed signal on the tape for reference during the recording.

SYNC will be used for most operations: recording, overdubbing (sync), and reproduce. The monitoring status is then determined by the FUNCTION SELECT buttons.

FUNCTION SELECT Buttons. When the OUTPUT SELECT is in either the INPUT or REPRO position, the FUNCTION SELECT buttons have the single purpose of determining the record status. OUT is safe. IN is ready-to-record.

When the OUTPUT SELECT is in the SYNC position, the FUNCTION SELECT buttons serve two purposes: (1) they determine the record status – OUT is safe, IN is ready-to-record and (2) they determine the monitoring status – OUT is sync/tape reproduce; IN is source.

There are 3 ways to enter record:

1. RECORD/PLAY

With the OUTPUT SELECT in the SYNC position, depress the FUNCTION SELECT Switches for those tracks on which you wish to record. The LEDs will indicate ready-to-record on those particular tracks. Enter record with the TRANSPORT CONTROLS – depress RECORD (red LED lights) and PAUSE (green LED lights) together. Then push (▶) and the selected FUNCTION SELECT LEDs will remain lit until released.

	FUNCTION SELECT		TRANSPORT CONTROLS		OUTPUT
	Switch	LED	RECORD/PLAY	LED	
Safe	out	off	–	off	Tape
Ready	in	blinks	–	off	Input/Source
Record	in	on	engaged	on	Input/Source

2. FUNCTION SELECT

This method should be used when it is necessary to hear a previously recorded signal up to the "punch-in" point. If the FUNCTION SELECT Switches are OUT (safe) the tape signal will appear at the output and the PHONES SELECT Switches. If the FUNCTION SELECT Switches are IN (record ready), only new INPUT signal can be auditioned and listening to the tape to find a "Cue" point for the punch-in will not be possible. When you must listen to the tape, preload the record logic and the FUNCTION SELECT Switches to begin the recording.

First set the FUNCTION SELECT Switch in the out position and enter record with the RECORD and (▶) buttons. Now the record LED will blink, indicating ready-to-record, and you are monitoring sync/tape reproduce. At the appropriate time, depress the FUNCTION SELECT Switch(es) for the tracks you wish to punch-in, and you enter record while simultaneously switching the monitor to source. The record status indicator will now stay on instead of blinking.

Now, imagine two different occasions where it is desirable to punch-in a correction on a given track, instead of recording the entire part all over again.

	FUNCTION SELECT		TRANSPORT CONTROLS		OUTPUT
	Switch	LED	RECORD/PLAY	LED	
Safe	out	off	–	off	Tape
Ready	out	off	engaged	blinks	Tape
Record	in	on	engaged	on	Input/Source

EXAMPLE 1:
If the correction needs to be made at the BEGINNING – say a hesitant start that is slightly out of sync with the cue/downbeat – then there is no need to monitor reproduce (sync) since the bad start will only serve to confuse the talent.
So the punch-in is straightforward enough: enter the record mode on the appropriate track with the corresponding FUNCTION SELECT Switch. Press the record and (▶) button when the cue/slate occurs – at the beginning of the tune – then enter stop at a convenient, appropriate time, after the punch-in is completed.

EXAMPLE 2:
In this situation, suppose an error has been made near the end – or in the middle – the example 1 is still valid. Now the talent will likely need to hear his performance up to that point so that the punch-in does not represent a different style or feel, and therefore, is consistent with the rest of the performance. In this case, enter record ready by pressing the record and play buttons simultaneously. The record mode will be activated when a FUNCTION SELECT Switch is depressed.
When the FUNCTION SELECT is in the out position, the talent will be monitoring reproduce (sync) and probably play along with the previous performance until the time comes to punch-in the correction. When that moment occurs, simply press the appropriate FUNCTION SELECT Switch for the corresponding track that is ready to be recorded. Two things then happen. First, you instantly enter the record mode on that track, and the new part will replace the previous one, in sync of course. Second, the monitor is automatically switched from tape (out position) – sync reproduce – to source (in position) – so the talent can hear his new part as it is being added. The logic remains consistent.

3. PUNCH IN/OUT OPERATION WITH THE RC-30P REMOTE PEDAL.
An accessory pedal is available that will allow you to start recording with a foot switch. This is extremely useful to the talent who must make a "right" punch-in that requires both hands "on the instrument" at the exact moment of the "punch". The foot switch will NOT start the transport, you must do that, but it WILL start and stop recording. Here's How.
Connect the TASCAM PUNCH IN/OUT REMOTE PEDAL to the rear of the 34B. Now, even with both of your hands occupied, PUNCH OUT can still be performed by using the remote pedal. While in sync reproduce, pressing the pedal with your foot initiates punch-in of the channels for which record function has been selected. Punch-out is done by simply pressing the pedal again.

BASIC CONNECTION AND HOOK-UP

Connection of the 34B is actually fairly straightforward. Integrating a multitrack recorder with the studio mixer, various patch bays or other effects devices can be confusing, and while there is no absolute correct answer, here are some guidelines.

The connection of a four track recorder to a console remains somewhat consistent. Every console has primary line (buss) outputs and these are going to connect to the line inputs of the multitrack recorder. This will enable the input channels of the console to be assigned (grouped on the busses) to the recorder for basic tracking. Of course, mixdown is also an essential function and this is where confusion sometimes appears. Initially it is easy to use the line inputs of each mixer channel for tape playback (return). TASCAM has provided separate tape return inputs on many of our mixer designs, which greatly enhances flexibility by leaving the standard console line level inputs available for recording inputs.

A COMMENT ON PATCHING

Most people tend to look for permanent connections in order to reduce complex patching logic to something that can be dealt with "under pressure." It is true that the logic of the control functions on the top panel takes some time to become familiar with, but multi-channel production has many mixing requirements. A permanent patch will severely restrict flexibility. If you can learn to examine the system with re-patching in mind, you can achieve significant improvements in system performance. For this reason, we suggest that you plan on access to the back panel of the mixer. Don't set up your system in such a way that you "hide all that mess" and have no access to the back panel. Leave yourself room to get at all the connectors. You will need all the options you can get.

After you have made several patches you may find that the top panel labels are no longer correct, and so we strongly suggest that you take the time to re-label each control to correspond to the new function that your re-patch is controlling. Drafting tape labels applied to each control or group will prevent accidents from happening because you have tried to operate the mixer "normally."

It is also wise to label both ends of every cable. When repatching away from "normal", a label will save endless tracing and re-tracing of the wiring.

In all patching and connecting of two-wire single ended circuits, some basic rules are worth mentioning:

Keep your cable runs SHORT! – as short as possible.

Installing a patch bay behind the engineer's chair will require at least 20 foot cable runs out and back and is not recommended. Mounting the patch bay on the left or right side of your mixer will allow much shorter runs. Incidentally short runs cost less so you will save money as well.

Try to develop the ability to look at your equipment with an eye toward a specific solution for the problem at hand. Layout your equipment to match your work style and facilities. Ultimately you will grow to know your equipment better, discover new uses, and most likely become a better engineer as you learn.

BASIC HOOKUP AND CALIBRATION OF THE RECORDING SYSTEM

Calibrating the 34B is simply the process of matching its output to the rest of the equipment. In this example, we will assume you are using a 4 buss mixer. The method we use here can be used with virtually any type or combination of equipment you are likely to encounter.

The first step is to connect the outputs of the console to the LINE INputs of the recorder. The recorder LINE OUTPUTs should be connected to the tape return or line inputs of the console. If you are using a console with an operating level of +4 dBm with XLR connectors, TASCAM has a solution in the form of the LA-40. Please refer to page 24 for more information on this device.

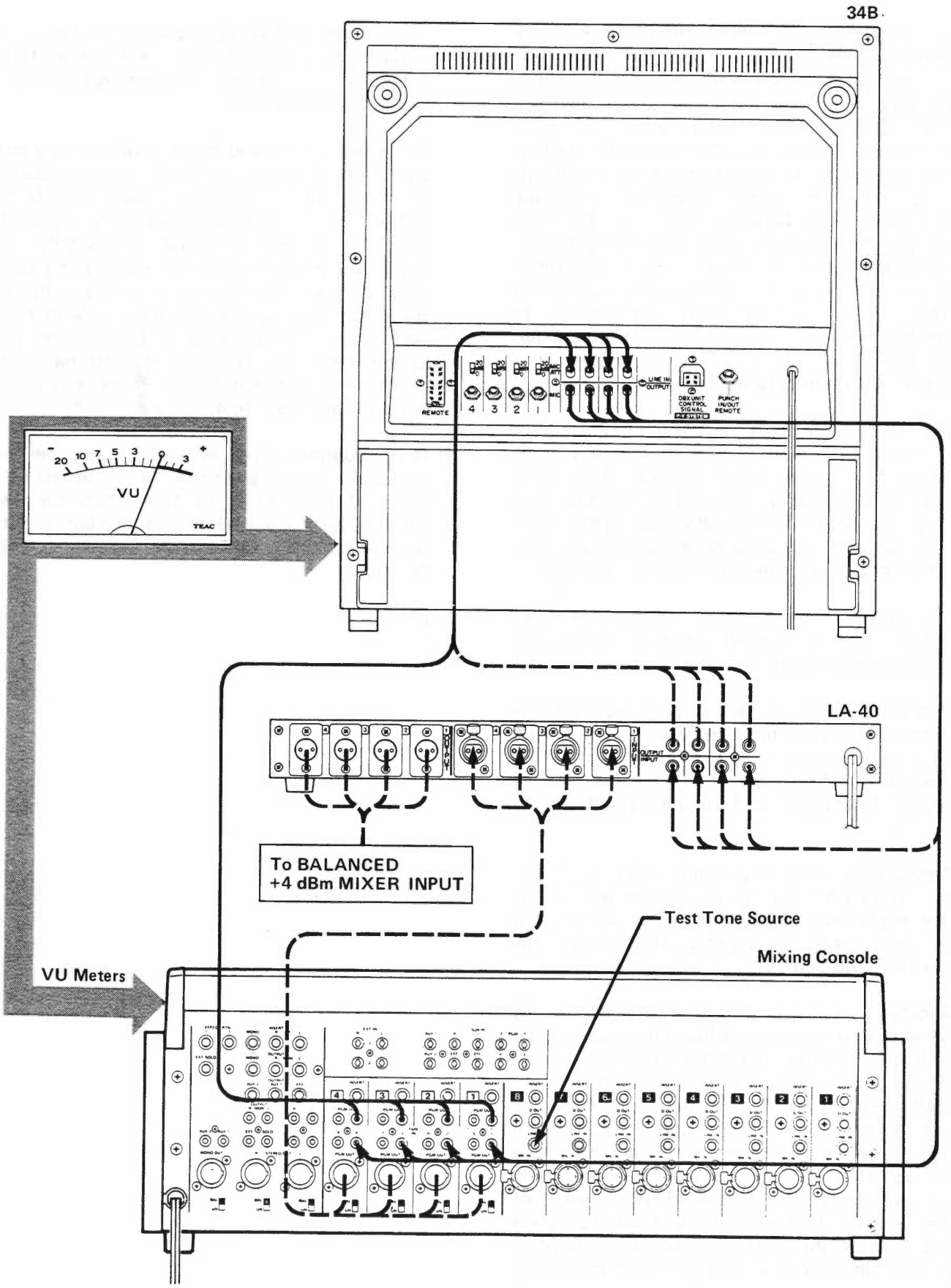
The basic procedure is very simple if you have a tone generator of some kind (TEAC TO-122A).

1) Set the Test Tone Oscillator to 1,000 Hz (1 kHz) and plug it into an input on your mixer.
2) Set the pan to 12 o'clock and bypass or defeat the EQ, assign the output busses.
3) Raise the channel fader to the nominal level and raise the buss faders to indicate 0 VU on the console's meters.
4) Set the 34B INPUT SELECT switches to LINE. Set the INPUT controls on the recorder to 0 VU on the recorder meters (this should be approximately on the "CAL" position). Zero the tape counter.
5) Place the deck in Record and record the 0 VU tone for a minute or two. While the tape is rolling, depress the REPROduce switch to switch to reproduce. Set the OUTPUT control to 0 VU.
6) Engage the zero return. Rewind the tape (it will stop at approximately "0000"). Disconnect the original tone source and set your console to the tape return or line inputs. Play the tape; this will provide a constant tone source and the faders should again be near the nominal position for an indicated "0 VU" on the console meter.

NOTE: If you own a playback reference tape, this method can be altered slightly by starting with the recorder in playback. The test tape can be used as your tone source to establish nominal console fader positions. The procedure is as follows:

1) Play the tape.
2) Set the OUTPUT controls on the 34B to 0 VU. This should be approximately "CAL" on the output dial scale.
3) Switch the mixer to tape or line input on the channels connected to the recorder.
4) Set your mixer input faders and buss faders to 0 VU on the console meters.
5) Switch the tape recorder to INPUT.
6) Adjust recorder INPUT controls to 0 VU on recorder's meters. This should be approximately the "CAL" position.

Note: Please do not engage record mode during this procedure or you will erase your expensive reference tape.


34B
VU
TEAC
REMOTE
LINE IN/ OUTPUT
DBX UNIT CONTROL SIGNAL
PUNCH IN/OUT REMOTE
LA-40
To BALANCED
+4 dBm MIXER INPUT
Test Tone Source
Mixing Console
VU Meters

WHAT IS SIMUL-SYNC?

On a tape recorder the Record and Playback heads are some distance apart. If you record something, the actual replay occurs a second or so later when the tape reaches the Playback head. Under normal circumstances this isn't a problem but if you wanted to record something and make a second recording in sync with the first, you'd find it impossible. This is because the point on the tape that you would be listening to and the point where the recording was taking place would not be the same and therefore create a time lag. By building a combined Record and Playback head, it's possible to monitor and record at exactly the same point on the tape, hence the term Simultaneous Synchronization or Simul-Sync.

The solution is to record new material while monitoring previous recordings at the same point. This is what simul-sync does. The record head is temporarily switched to function as a playback device. (You cannot do both simultaneously on the same track. Simul-sync provides a choice of either recording or playback).

With an understanding of how Simul-Sync functions, come a number of new techniques, advantages and some operating hints.

It is now no longer necessary to record everything at the same time. Recording can be done on a convenient schedule and with much more flexibility. This means that isolation can be better. Talent can perform individually in the studio.

Additionally since maybe only one mic is "live" at a given time, an investment can be made in one really high quality mic, that can be used on each track, to significantly upgrade the overall sound quality.

Another technique that becomes available is known as ping-pong or collapsing tracks in order to further expand the capabilities of your equipment. Simply put, to collapse tracks record both tracks 1 and 2, then play them back and mix them together which is then re-recorded on track 4. Additional parts could also be added through the mixer at that line, so you can end up with many parts combined onto track 4 of the recorder. This method does require planning and forethought on the part of the operator of course, since once all the parts are combined, they cannot be individually adjusted, altered, or redone in any way without repeating everything. (The use of a track chart in planning the production is of great value.)

Some basic rules and notes apply to ping-pong operation. It is quite common to hear crosstalk in simul-sync or ping-pong use. This is not critical for this crosstalk does not print on the tape, it is present in the electronics only. It is also good practice to avoid a ping-pong to an adjacent track, for this requires actual adjacent tracks on the Record (simul-sync) head to be performing the functions of Record and Play at the same time. It is far better to maintain a guard track between the playback and record channels (ie: 1 & 2 to 4, not 2 & 3 to 4).

If a situation arises where this becomes unavoidable, it is of great help to record the basic track at high levels so that when they are combined, the playback can be very low and still provide adequate signal to be recorded in combination.

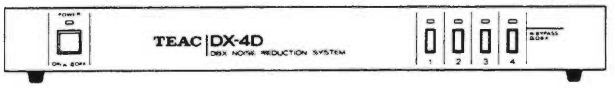
MONITOR METHODS

When used with a mixer the multitrack recorder becomes a powerful tool for production and recording. Together, they form the foundation on which you will build your work or presentation. With this consideration in mind, it is valuable to consider a procedure that is a very valuable method to save time and improve efficiency. We at TASCAM strongly recommend a monitoring system whereby playback through tape electronics is employed on a regular basis.

Monitoring is among the most important facilities a mixer can provide. TASCAM has expended great effort to develop affordable mixer designs with comprehensive monitoring facilities. In fact, the monitor functions are really a separate sub-mixer included within the mainframe. TASCAM mixers typically provide full independent monitor facilities equivalent to the number of tape returns. Other manufactures of PA type mixers depend on the input channels for monitoring.

Establishing your monitor mix from the recorder tape returns (playback as normal procedure solves the problem of "where is the signal coming from?" It is no longer important to remember which console input is assigned to track 4, just listen to track 4 and you hear what's on tape. With this method, any line level signal becomes a track feed, even if you can't monitor it "on the way out," because you will be monitoring the return, not the send. This method will also immediately show up any glitch in the recording system, tape dropouts or other problem so you know whether you have a good "take" and don't discover it later when the talent has left for the day. Another advantage of this method is that no console changes are required to provide a playback for the talent or producer to audition. Since you are already listening to "playback," just rewind and play the tape. This is a great timesaver.

CONNECTION AND OPERATION OF THE DX-4D



The 4 channel DX-4D dbx Noise Reduction unit has been designed to be used with the 34B and other TASCAM 4 and 8 channel reproducers. The DX-4D is a dual process design, capable of simultaneous encode and decode of 4 channels of audio. The function of each channel is automatically controlled so that non-encoded signals are always available at the outputs of the DX-4D.

The DX-4D, as with all other TASCAM dbx units, will only function when connected to a TASCAM unit. They have been designed to operate as a system and function automatically. Once they have been connected they become an integral part of the 34B. There is no need for record or reproduce calibration or level adjustments for the unit. There will however need to be some adjustments in your recording technique. After you have connected the DX-4D to your 34B you will find that the meters will read at a lower level with the dbx engaged than without it. This is because the meters are displaying the encoded signal level (after compression), and looking at reduced levels on the meters may take some getting used to. DO NOT attempt to adjust the input and output levels of the 34B to reflect 0 VU with the dbx engaged as this elevated level will induce decoding errors.

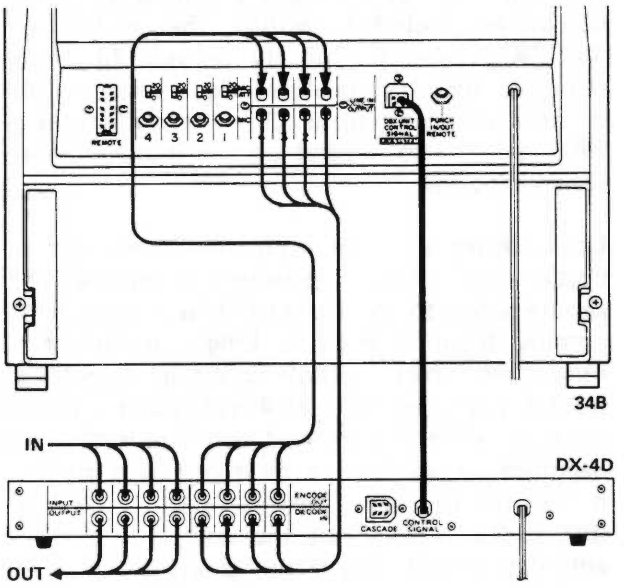
Always calibrate your mixer and 34B with the dbx in the bypass position. This will insure optimum performance of the system. Following these environmental guide lines will also help to insure quality performance of your system.

* Avoid temperatures beyond the range of 5°C to 30°C (40°F to 87°F).
* Avoid using AC power inputs that fluctuate greatly.
* Avoid areas where there is extermely high humidity.
* If the surface of the unit gets dirty, wipe with a soft cloth or use a diluted neutral cleaning liquid. Clean off thoroughly. Do not use thinner, benzine or alcohol as they may damage the surface of the unit.

HOOK UP

Connecting the DX-4D to the 34B is very straight forward.

1. Connect the Control Signal cable of the DX-4D to the DBX UNIT CONTROL SIGNAL jack on the 34B.
2. Using 4 cables connect the ENCODE OUT jacks to the 34B LINE INput jacks.
3. Using 4 cables connect the 34B OUTPUT jacks to the DX-4D DECODE IN jacks.
4. Connect your mixer buss (group) outputs to the DX-4D INPUTs.
5. Connect the OUTPUTs of the DX-4D to the Line-In or Tape-In connectors of your mixer.



POWER Switch

When depressed (⏍ ON), the LED above lights. Press again (⊓ OFF) to turn off.

DBX/BYPASS Switches

These switches allow you to control the function of each channel.

DBX – (⊓) position: the LED is on and the dbx circuits are engaged.

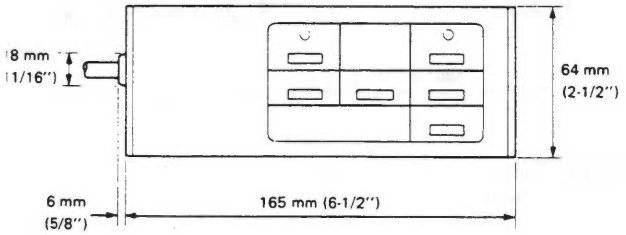
BYPASS – (⏍) position: the LED is off and the dbx circuits are disengaged, not in the audio path.

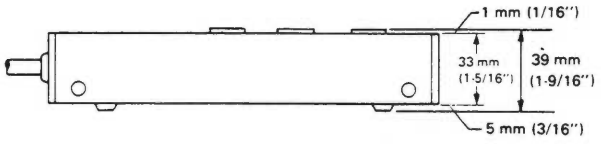
Note: Use the BYPASS position when you are playing back tapes which have not been recorded with dbx or when you are recording and working with individual tracks containing time code or control code information.

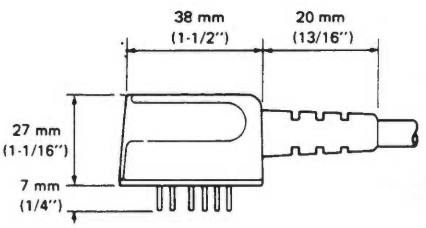
ACCESSORY INFORMATION

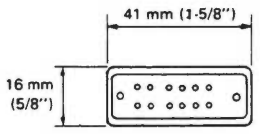
RC-71 Remote Control Unit

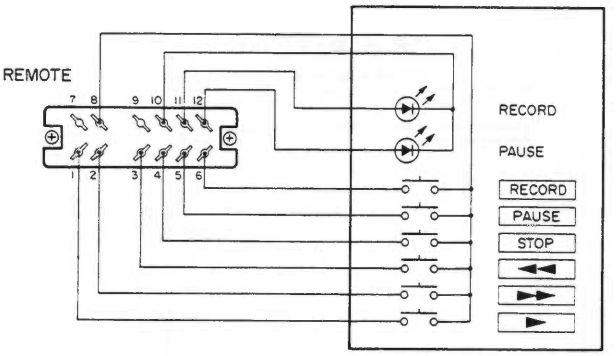
The RC-71 is designed for remote control of the transport functions.







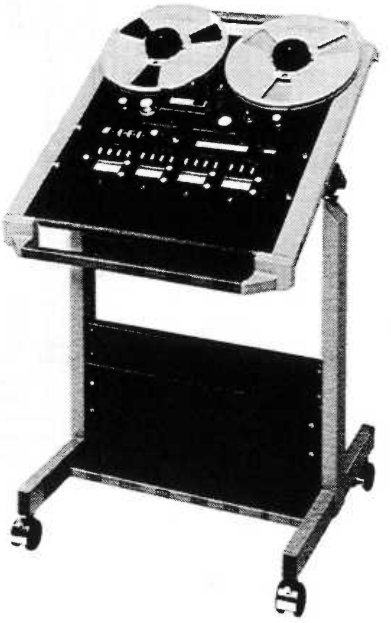


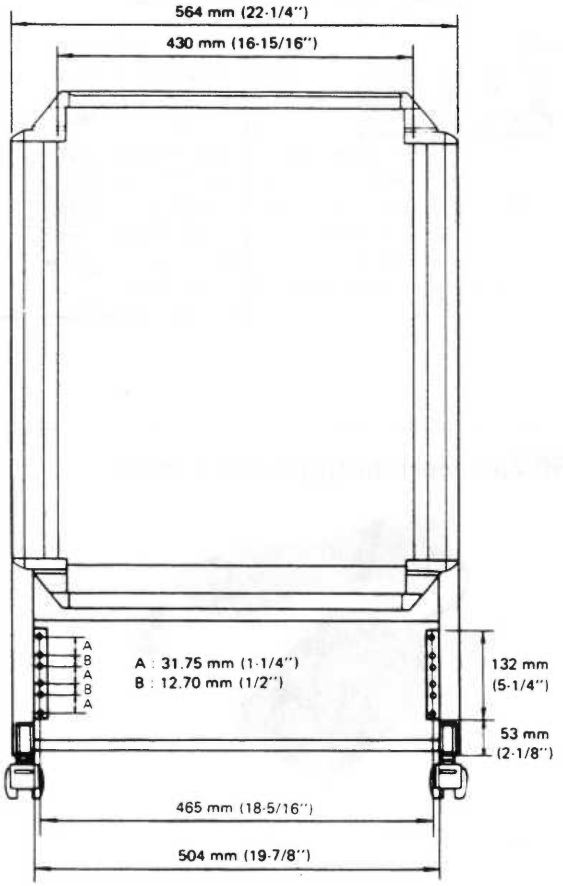


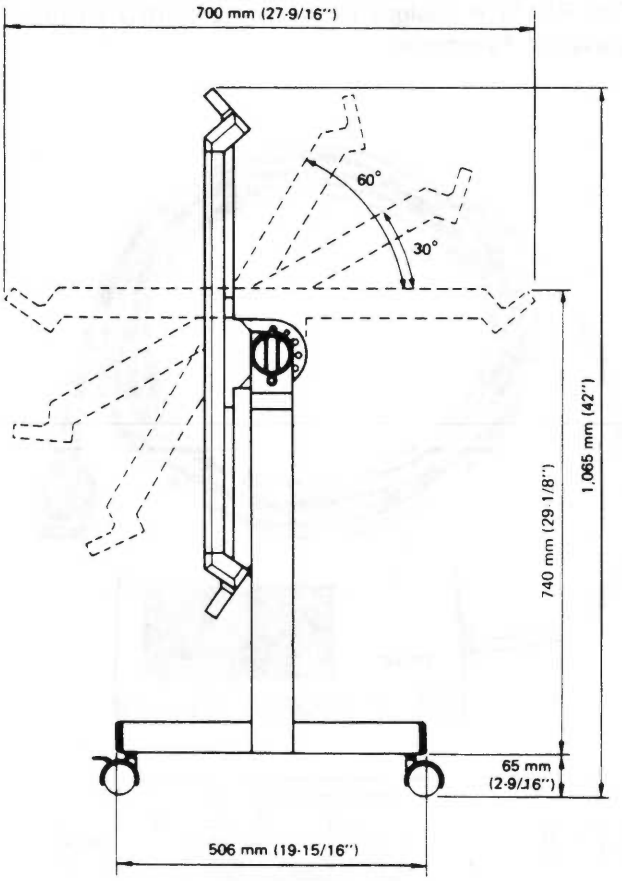
RC-30P Punch In/Out Remote Pedal

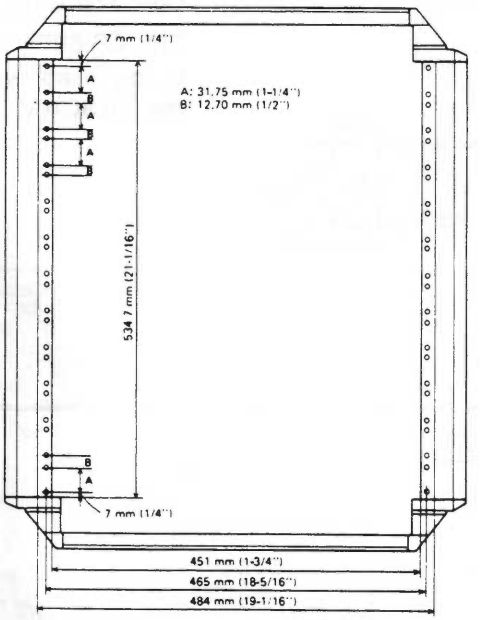
CS-607B Console Rack (EIA 19-inch)

The CS-607B is a standard 19-inch console rack to be used with the RM-300 for mounting of the TASCAM 34B.



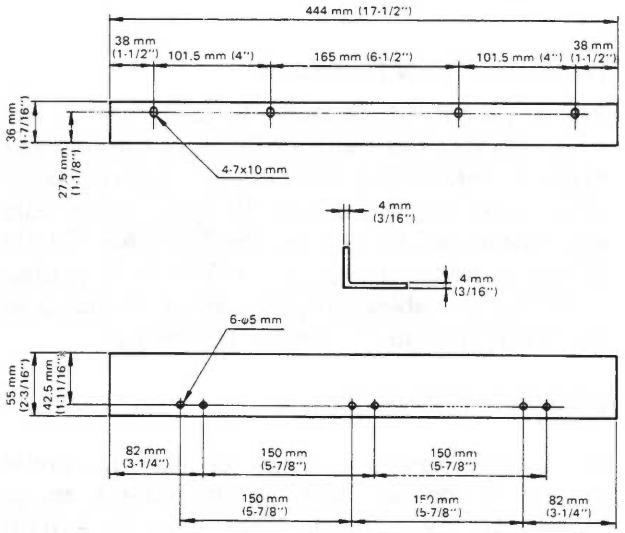

564 mm (22·1/4")
430 mm (16·15/16")
A
B
A
B
A
A : 31.75 mm (1·1/4")
B : 12.70 mm (1/2")
132 mm
(5·1/4")
53 mm
(2·1/8")
465 mm (18·5/16")
504 mm (19·7/8")


700 mm (27·9/16")
60°
30°
740 mm (29 1/8")
1,065 mm (42")
65 mm
(2·9/16")
506 mm (19·15/16")


7 mm (1/4")
A
B
A
B
A
B
A: 31.75 mm (1·1/4")
B: 12.70 mm (1/2")
534.7 mm (21·1/16")
B
A
7 mm (1/4")
451 mm (1·3/4")
465 mm (18·5/16")
484 mm (19·1/16")

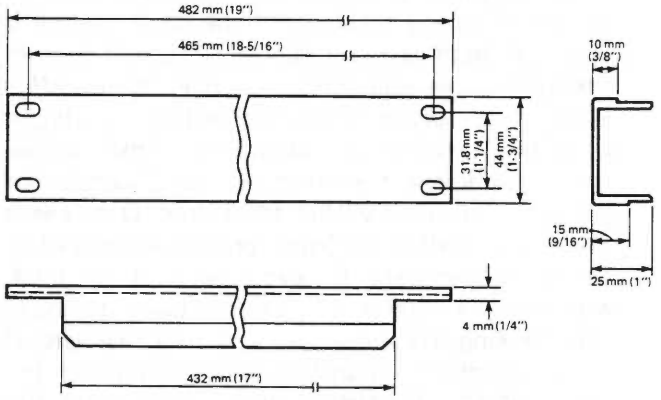
RM-300 Rack Mount Angle (EIA 19-inch)

The RM-300 is a rack mount angle kit for the TASCAM 34B recorder/reproducer to enable mounting in the CS-607B, or an equivalent 19-inch rack.



T-0804 Blank Panel (EIA 19-inch)

The T-0804 is designed to cover up the unavoidable blank spaces on the TASCAM CS-607B, or equivalent EIA standard 19-inch rack.



TO-122A Test Tone Oscillator

Checks input/output balance or other electric characteristics of the system chain. This unit is also useful for tape deck maintenance work.

*Output pin jack
*Output level -10 dB, -40 dB (0 dB/1 V)
*Selectable frequencies 40 Hz, 400 Hz, 1 kHz, 4 kHz, 10 kHz, 15 kHz

E-3 Head Demagnetizer

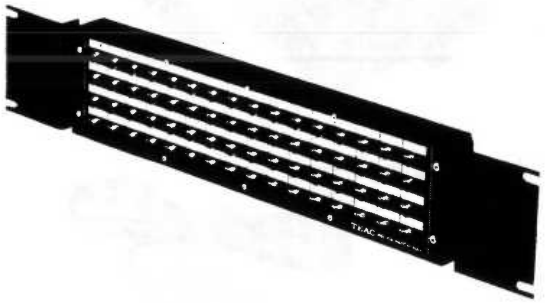
E-2A Bulk Eraser

RE-1004 Reel (10-1/2", 1/4" tape)
RE-712 Reel (7", 1/4" tape)

LA-40 Low Impedance Adaptor

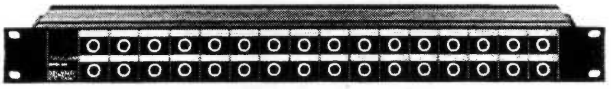
The LA-40 is a 4-channel low impedance adaptor which makes it possible to connect 600 Ω balanced +4 dBm/-20 dBm XLR type connectors or 3-conductor 1/4" phone jacks to -10 dBV RCA pin jacks, or vice versa.

PB-64 Patch Bay



A tangle of cables is one of the growing vexations of any audio system. With all of the inputs and outputs plugged into the rear panel, jumper cables plugged into the front make any hookup you need neatly.

PB-32 Patch Bay



The PB-32 patch bay is today's simplest and most effective way to deal with the ever-increasing tangle of wires necessary for the recording and signal processing you want to do. Instead of leaning over, walking around, or turning consoles, racks, recorders and other equipment, you can bring all those confusing cable ends to one single spot in your rack, or next to your mixer, and get them under control. You can label inputs and outputs on the PB-32, and wan't have to guess anymore at what you might be plugging in. A few cords can save endless hours of searching around on the floor behind your console and, as the whole process of patching is made simpler, you'll probably find more flexibility in your recording setup.

The PB-32 comes in four versions. The PB-32P is equipped with 1/4" phone jacks only, the PB-32R with RCA jacks only, the PB-32H with 1/4" phone jacks on one side and RCA jacks on the other, and the PB-32W with 1/4" phone jacks for 6 channels and RCA jacks for the remaining 10 channels.

Professional Low Loss Cable

There are vast differences in cable design and performance, and those differences can make or break an otherwise excellent sound system. When you're investing in the kind of high quality audio equipment represented by the TASCAM Studio Series, it makes sense to use TASCAM professional audio cables. Anyone who's switched to them will tell you they're worth every cent.

LOW CAPACITANCE

Our cables feature very low capacitance under 15 picofarads per foot, so they don't act as high-frequency roll-off filters as do typical cables of 100 or 300 pF/foot. In addition, our cables use an ultra-high density bare-copper braided shield (99 % coverage), so electrostatic noise (buzz or hum) and RFI (CB or broadcast signals) are kept out of your program.

Low capacitance is important, and so is consistent capacitance; that is, you want the electrical coupling of center conductor-to-shield to remain the same throughout the cable, even if it is sharply bent, crushed, flexed, or tugged. Should the local cable capacitance change, noise and/or signal losses often result. We utilize the unique dielectric known as Datalene. This special insulation keeps the stranded signal conductor perfectly centered within the shield. Datalene is about as flexible as foam core dielectrics but far more resistant to extreme heat or cold, and it has a "memory", so it retains its shape after flexing. Datalene also acts as a mechanical shock absorber, guarding against external impacts which, in other cables, might sever the center conductors and cause intermittent contact.

When we join the connector to the cable, we insert the cable's stranded center conductor all the way into the pin and then fill the pin with solder. The braid is wrapped and soldered a full 120° around the shell, not tacked at one spot, so you get maximum shielding and strength.

VOLTAGE CONVERSION

This deck is adjusted to operate on the electric voltage specified on the power cord and packing carton.

Note: This voltage conversion is not possible on model sold in the U.S.A. and Canada, UK, Australia or Europe.

For general export units, if it is necessary to change the voltage requirements of this deck to match your area, use the following procedures.

Always disconnect Power Line Cord before making these changes.

1. Disconnect the power cord of the deck from the source.
2. Remove the bonnet panel and locate the voltage selector on the side of the deck.
   Refer to "2-2 Removing the Panels of the Deck" on page 63.
3. To increase the selected voltage, turn the slotted center post clockwise using a screw-driver or another suitable tool.
4. To decrease the selected voltage, turn the slotted center post counter-clockwise.
5. The numerals that appear in the cut-out window of the voltage selector indicate the selected voltage.
6. If the desired voltage numerals do not appear in the cut-out window as you turn the slotted center post, your deck must be taken to an authorized TEAC Service Facility for voltage conversion.

NOTE FOR U.K. CUSTOMERS

U.K. Customers Only:

Due to the variety of plugs being used in the U.K., this unit is sold without an AC plug. Please request your dealer to install the correct plug to match the mains power outlet where you unit will be used as per these instructions.

IMPORTANT

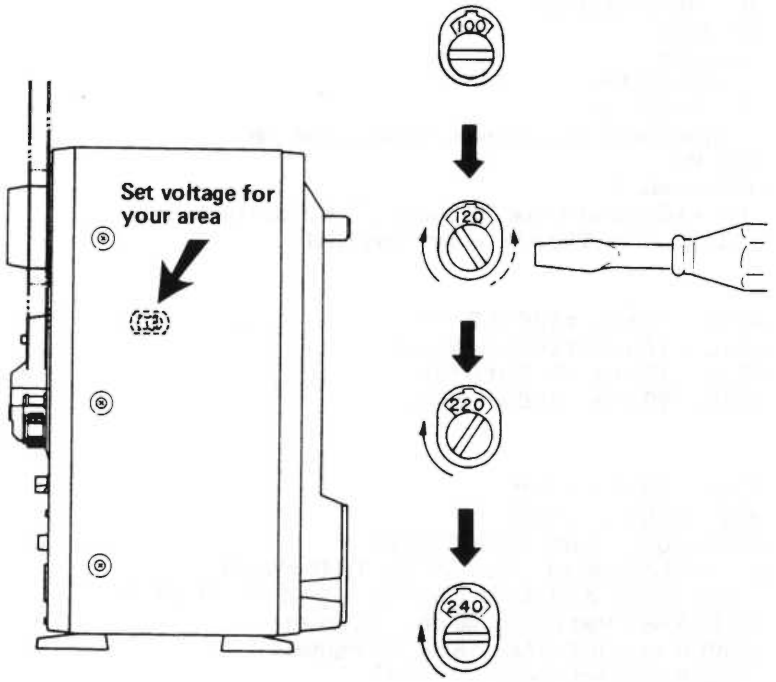
The wires in this mains lead are coloured in accordance with the following code:

BLUE:	**NEUTRAL**
BROWN:	**LIVE**

As the colours of the wires in the mains lead of this apparatus may not correspond with the coloured markings identifying the terminals of you plug, proceed as follows.

The wire which is coloured BLUE must be connected to the terminal which is marked with the letter N or coloured BLACK. The wire which is coloured BROWN must be connected to the terminal which is marked with the letter L or coloured RED.

This product is manufactured to comply with the radio interference of EEC directive "82/499/EEC."



SPECIFICATIONS OF THE 34B

MECHANICAL	
Tape:	1/4 inch, 1-1/2 mil, low noise, high output tape
Track Format:	4-track, 4-channel, track width, 0.036 inch (0.91 mm)
Reel Size:	10-1/2" NAB (large) Hub maximum
Tape Speeds:	15 inches per second (38 cm/sec), 7-1/2 inches per second (19 cm/sec); Variable, ±12 % relative to 15 ips/7-1/2 ips
Speed Accuracy:[1]	±0.8 % deviation
Wow and Flutter:[1]	
15 ips	±0.06 % peak (DIN/IEC/ANSI weighted)
	±0.1 % peak (DIN/IEC/ANSI unweighted)
	0.05 % RMS (JIS/NAB weighted)
	0.07 % RMS (JIS/NAB unweighted)
7-1/2 ips	±0.09 % peak (DIN/IEC/ANSI weighted)
	±0.12 % peak (DIN/IEC/ANSI unweighted)
	0.07 % RMS (JIS/NAB weighted)
	0.09 % RMS (JIS/NAB unweighted)
Fast Wind Time:	90 seconds for 10-1/2" reel 2,400 feet
Start Time:	Less than 0.8 sec. To reach standard Wow and Flutter
Capstan Motor:	FG (frequency generator) DC servo motor
Reel Motors:	Slotless DC motors x 2
Head Configurations:	3 heads; erase, record/sync and reproduce
Tape Cue:	Manual
Dimensions:	(W) 16-3/16" x (H) 18-3/16" x (D) 10-1/8" (410 x 461 x 256 mm)
Weight:	49 lbs (22 kg), net
ELECTRICAL	
Line Input:	
Input impedance:	50k ohms, unbalanced
Maximum source impedance:	2.5k ohms
Nominal input level:	-10 dBV (0.3 V)
Maximum input level:	+18 dBV (8.0 V)
Nominal input source impedance	1k ohms
Mic Input:	
Source impedance:	10k ohms or less
Input impedance:	10k ohms, unbalanced
Nominal input level:	-60 dBV (1 mV)
Maximum input level:	-3 dBV (700 mV), with mic ATT (20 dB) engaged.
Line Output:	
Output impedance:	1k ohms, unbalanced
Minimum load impedance:	10k ohms
Nominal load impedance:	50k ohms
Nominal output level:	-10 dBV (0.3 V)
Maximum output level:	+18 dBV (8.0 V)
Headphone output:	100 mW maximum at 8 ohms stereo headphones
Bias Frequency:	150 kHz
Equalization:	NAB standard
	3180 + 50 μsec at 15 ips (38 cm/sec), 7-1/2 ips (19-cm/sec)
Record Level Calibration:	0 VU reference; 250 nWb/m tape flux level
Frequency Response:	
Overall:[3]	
15 ips	40 Hz – 22 kHz, ±3 dB at 0 VU
	40 Hz – 22 kHz, ±3 dB at -10 VU
7-1/2 ips	40 Hz – 16 kHz, ±3 dB at 0 VU
	40 Hz – 20 kHz, ±3 dB at -10 VU
Playback (both Sync and Reproduce heads):[2]	
15 ips	40 Hz – 22 kHz, ±3 dB
7-1/2 ips	40 Hz – 20 kHz, ±3 dB
Total Harmonic Distortion (THD):[3]	0.8 % at 0 VU, 1,000 Hz, 250 nWb/m
	3 % at 13 dB above 0 VU, 1,000 Hz, 1,116 nWb/m
Signal-to-Noise Ratio:[3]	At a reference of 1 kHz, at 13 dB above 0 VU, 1,116 nWb/m
15 ips	68 dB A weighted (NAB), 60 dB unweighted
7-1/2 ips	66 dB A weighted (NAB), 58 dB unweighted
	92 dB A weighted (NAB), with dbx*
	82 dB unweighted, with dbx

Adjacent Channel Crosstalk (Overall):[3]	Better than 50 dB down at 1,000 Hz, 0 VU
Erasure:[3]	Better than 65 dB at 1 kHz, +10 VU reference
Headroom:	Recording Amplifier – Better than 25 dB above 0VU at 1 kHz
Connectors:	
Line inputs and outputs:	RCA jack
Remote control:	Multi-Pin jack
Punch in/out remote:	Phone jack (Tip-Sleeve)
dbx unit:	Multi-Pin jack
Power Requirement:	100/120/220/240 V AC, 50/60 Hz, 73 W (General Export Model) 120 V AC, 60 Hz, 73 W (USA/Canada Model) 220 V AC, 50 Hz, 73 W (Europe Model) 240 V AC, 50 Hz, 73 W (UK/AUS Model)

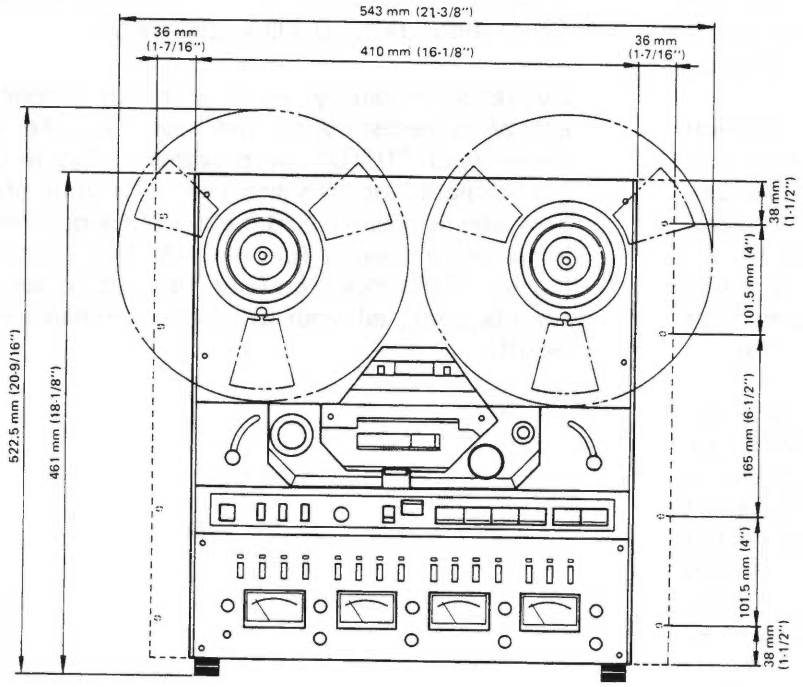
In these specifications, 0 dBV is referenced to 1.0 Volt. Actual voltage levels also are given in parenthesis.
To calculate the 0 dB = 0.775 Volt reference level (i.e., 0 dBm in a 600-ohm circuit) add 2.2 dB to the listed dB value; i.e., -10 dB re: 1 V = -7.8 dB re: 0.775 V.

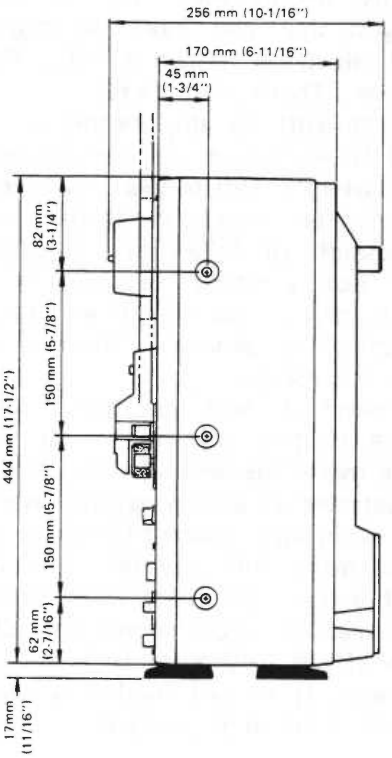
1) Specifications were determined using TEAC Test Tape YTT-2004/YTT-2003.
2) Specifications were determined using TEAC Test Tape YTT-1004/YTT-1003.
3) Specifications were determined using AMPEX #456 Tape.

Changes in specifications and features may be made without notice obligation.
*dbx is a trademarks of dbx Inc.

Options for:

Mounting (EIA Standard 19-inch rack):	CS-607B Console Rack, RM-300 Rack Mount Angle and T-0804 Blank Panel (normally 2 panels used)
Remote control:	Full transport function available with RC-71
Punch in/out remote control:	Punch in/out function available with RC-30P





THEORY OF OPERATION—MAINTENANCE

If you are new to high quality sound recording equipment, you should become aware of the fact that high quality sound requires high quality maintenance.

Recording studios that rent time by the hour are very fussy about maintaining their equipment. Tape recorders and other electronic gear in the studio are checked out before every session. And, if necessary, adjusted to "spec" by an "in house" service technician. He is usually prepared to correct any problem from a minor shift in circuit performance to major breakdown in a motor. He has a full stock of spare parts and all the test equipment he needs.

Now that you are running your own "studio" you will have to make some decisions about maintaining it, and your 34B. You will have to become your own "in house" service technician. Well, what about the test gear and the spare parts? A stock of spare parts and a super deluxe electronic test bench can easily cost many times the price of the recorder. Fortunately, the most frequently needed adjustments use the least expensive equipment, and the very costly devices are only needed for major parts replacements such as drive and rewind motors or head assemblies. Replacing parts cannot be considered "daily maintenance" by any means, so we suggest that you leave the major mechanical and electrical repair to the Dealer Service Center. That's what it's for.

Adjustments to the motors — back tension and brake torque are not required often and can safely be left to dealer service. The adjustments for wow and flutter require several thousands of dollars of test gear to perform. It's not practical to consider doing these adjustments yourself unless you have fifty machines to service. Then it might pay to buy the test gear.

In order to help you make plans about the more routine adjustments to your 34B, we have made this section of the manual as easy to understand as technology will allow. It's a short course in tape recorder theory as well as a list of adjustments and will help you to understand that is going on inside when you record. Read the manual, decide what test equipment you can afford (although it is not violently expensive, it is not free) and determine what service you can do yourself.

TEST EQUIPMENT/MATERIALS

To make electronic adjustments, you need test gear, so let's go over what's necessary.

1) Alignment Tapes

You need one for each speed that the recorder operates at. For the 34B the specs are:

Reference fluxivity: 250 nWb/m
Equalization standard: NAB
15 ips (38 cm/sec) 3180 μs + 50 μs
7-1/2 ips (19 cm/sec)
3180 μs + 50 μs

These test tapes are made by several companies, but there are many different tape specs. Be sure you have the right one.

Lets's talk about each spec separately.

STL3 or MRL21J205 = Tape speed 15 ips
STL22 or MRL21T204 = Tape speed 7.5 ips
Reference fluxivity: 250 nWb/m
Equalization: NAB; time constant 3180 + 50 μsec.
— or —
TEAC YTT-1004 = Tape speed 15 ips
TEAC YTT-1003 = Tape speed 7.5 ips
All specs are identical with STL or MRL tapes except for the reference fluxivity which is 185 nWb/m, and thus, its reproduce output level will be 3 dB lower compared with 250 nWb/m fluxivity. Calibration level under "Reproduce Calibration" refers 0 VU as 250 nWb/m.

Reference Fluxivity — How much magnetic energy is necessary on the tape to make the meter read "0 VU" in playback? This is the "benchmark" or standard you tune your playback electronics to. 250 nano Webers per meter is the correct value for the 34B. If a lower or higher "Reference Fluxivity" is used to set up the playback, all your other measurements will be off.

NAB Equalization — Here we have a lot to talk about. The process of magnetic recording is far from "flat." Every circuit in a tape recorder will alter the level of signal with respect to its frequency — some deliberately, some unavoidably. The deliberate errors are used to overcome the unavoidable problems. Here is a selection of frequency response graphs at various points in the recording process:

1. The input signal starts this way in the beginning (FLAT).

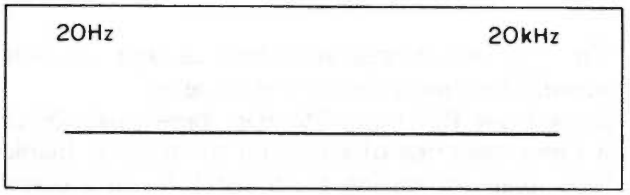


Fig. 5

2. EQ to overcome head loss at high frequency and bass anomalies (NAB)
   Deliberate error

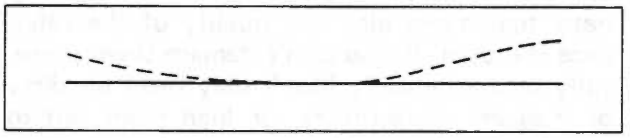


Fig. 6

3. Record Head Response
   (6 dB per octave rise until gap in head approaches wavelength)
   Unavoidable error
   Small wavelengths (high frequencies) are partially erased as fast as they are recorded.

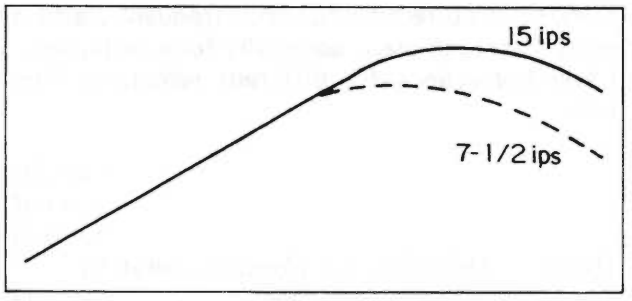


Fig. 7

We will assume something is recorded, but it's not flat on the tape either. Now we'll play it back.

4. Playback Head Response
   (6 dB per octave rise again, same as record head).
   Unavoidable error,
   Small wavelengths are not picked up by gap.

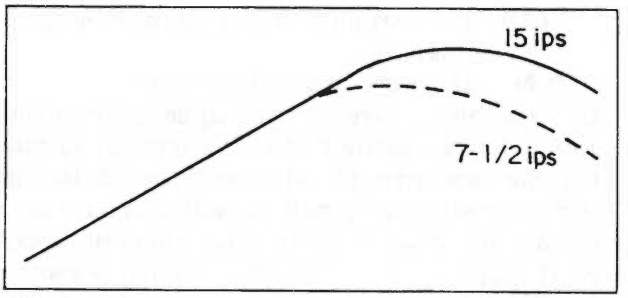


Fig. 8

5. Playback EQ
   Now we must overcome the characteristic response of heads.
   Big deliberate error
   Helps lower tape hiss as well as restoring proper levels to high frequencies.

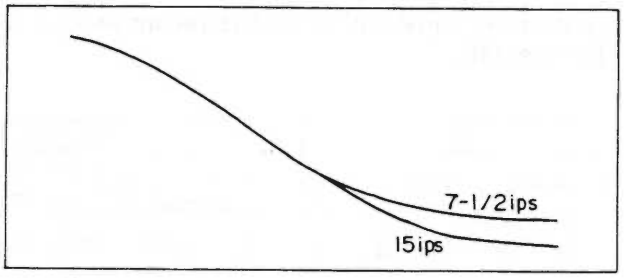


Fig. 9

6. The result of all this equalization is this (hopefully).

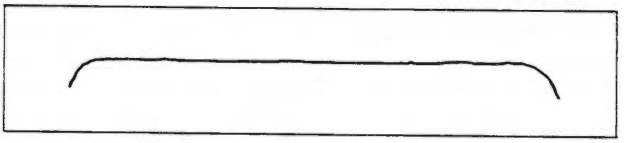


Fig. 10

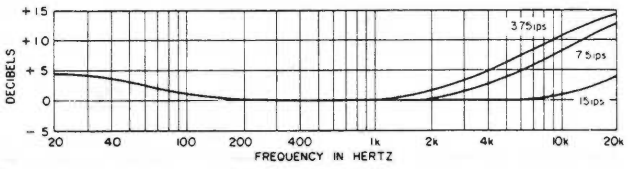
The idea is to use the electronics that are adjustable to cope with the problems that are caused by the nature of the magnetic recording process. We can't change the basic laws of magnetic physics, so we change the record and playback equalization. Now comes the sticky part. How much EQ do we use in each stage? If every manufacturer of tape recorders used their own standard, their idea of what was best, there would be no playback compatibility. Tapes made on one recorder would not playback properly on another of different make. The standards for

record and playback equalization are established by societies of scientists, engineers and users in the profession. They are:

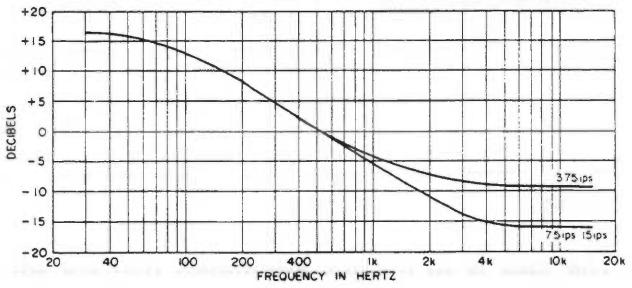
NAB National Association of Broadcasters
IEC International Electrotechnical Commission
CCIR International Radio Consultive Commission
DIN Deutsche Industrie Normen

Unfortunately, they don't all agree. Each organization has a slightly different approach to solving the problems of tape recording. Scientists and engineers are human, as well, and have been known to disagree, sometimes violently about what ways are best. Advances in the manufacture of tape, improvements in head design, and the lowering of electronic circuit costs have made bizarre solutions quickly change into practical realities. The optimums have shifted and will probably continue to do so. Standards are set by man, not cast in stone.

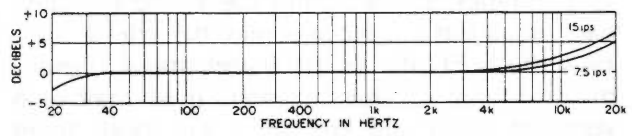
But while the scientists are boxing in the conference room, we would like to be recording, so TASCAM has selected the NAB for record/reproduce equalization as the recommendation for the 34B.



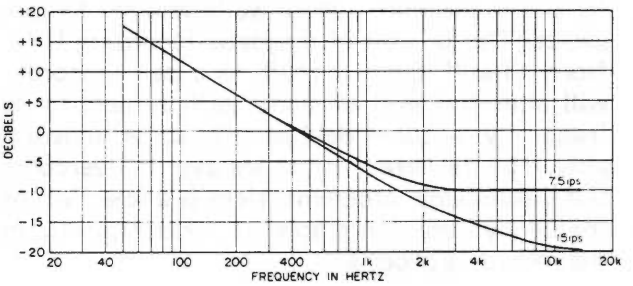
Typical recording (pre-equalization) for 1/4-inch tape recorders using NAB characteristics.



Typical post-equalization for 1/4-inch tape recorders using NAB characteristics.



Typical pre-equalization characteristics for 1/4-inch tape recorders running at 7.5 and 15 ips using the CCIR (DIN) standard.



Typical post-equalization curves for 1/4-inch recorders using CCIR characteristics, at 7.5 and 15 ips.

You will need a separate reference tape for each speed. The curves are not the same.

Since these Reference Standard tapes cost about 3 times the price of a big roll of the best blank tape, plan on storing them carefully in a place that will not encounter any magnetic fields that might damage them – away from loudspeakers, guitar pickup, tape recorder and record player motors, power amplifiers (magnetic field surges in big transformers when amps are turned on and off can be very powerful) or anything magnetic that might alter the quality of the reference standard. If you don't damage them physically or magnetically (don't play them on dirty or magnetized recorders, or loan them out to the careless) they will last for several years.

If it is not possible to obtain a tape that has both the NAB EQ and a fluxivity of 250 nWb/m, select the NAB EQ as the preferred single standard. A different reference fluxivity requires only that you make a level correction once. Just use a different mark on the meter instead of "zero." A different EQ curve requires a different amount of correction for each frequency and is much harder to use – especially for a beginner.

Level corrections for different reference fluxivity:

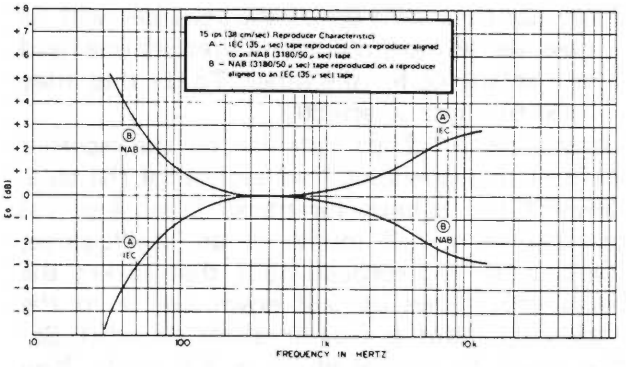
		Use this instead of "0" VU
15 ips	185 nWb/m – (Ampex operating level)	-3 VU
	200 nWb/m – (STL, MRL)	-2 VU
7-1/2 ips	185 nWb/m operating sweep frequencies	-3 VU
		-13 VU
	200 nWb/m operating sweep frequencies	-2 VU
		-12 VU

Below are tabulated some commonly encoutered flux levels along with their dB differences, and their differences in dB from 185 nWb/m.

	Flux Level nWb/m	Flux Level Difference in dB	Difference from 185 nWb/m in dB
	150		1.82
		0.56	
	160		1.26
		0.53	
	170		0.73
		0.50	
	180		0.24
		0.24	
Ampex operating level	185		0.00
		0.23	
	190		0.23
		0.45	
	200		0.68
		0.42	
	210		1.10
		0.40	
	220		1.51
		0.39	
	230		1.89
		0.37	
	240		2.26
		0.35	
	250		2.62
		0.34	
	260		2.96
3 dB above Ampex operating level		0.04	
	261.32		3.00
		0.28	
	270		3.28
		0.32	
	280		3.60
		0.30	
	290		3.90
		0.29	
	300		4.20
		0.28	
	310		4.48
		0.28	
DIN Standard	320		4.76
		0.27	
	330		5.03
		0.26	
	340		5.29
		0.25	
	350		5.54
		0.24	
	360		5.78
6 dB above Ampex operating level		0.22	
	369.12		6.00
		0.02	
	370		6.02
		0.23	
	380		6.25
		0.23	
	390		6.48
		0.22	
	400		6.70

Note:
Add 0.7 dB for European Measurement Method using Magnetometer.

IEC Correction Chart (illus.)



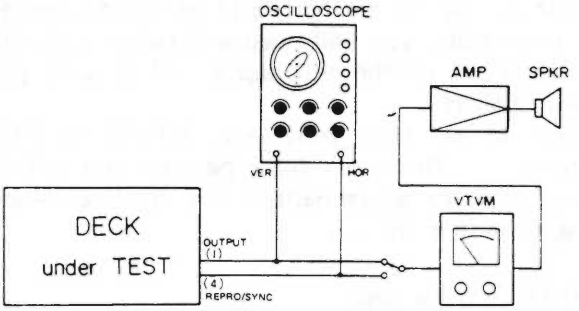
If you must use IEC EQ tapes, these readings are correct. IEC has less boost in playback, the tape will read progressively higher as frequencies rise when played on a NAB adjusted recorder. At 250 nWb/m reference read these numbers to set IEC EQ.

30 50 100 400 1K 3K 5K 7K 10K 15K
-5.4 -3.0 -0.6 0 +0.2 +1.2 +2.3 +2.6 +2.7 +2.9 +3.0 +3.0 dB

See "Test Tapes for the 34B" on page 28.

Since the low frequency EQ on the 34B is fixed, the differences are academic. On to the next piece of test equipment.

2) VTVM or FET Multimeter



Head Alignment Fine Adjustment Set-up and Test Connections (REPRODUCE)

Use a VTVM or FET multimeter with an input impedance of at least 1 megohm that can read levels down to –70 (full scale) you can think of this as a very accurate VU meter of very wide range. Meters with lower input impedances will draw power from the circuits to be measured and will affect the readings. Meters that have adequate input impedance but do not read below –40 (0.01 V) can be used for reference levels and frequency response measurements, but will not be capable of making signal-to-noise, erase efficiency or bias circuit measurements where the output of the circuit being adjusted is expected to be very low. Meter MUST have wide, flat frequency response (minimum = 10 Hz – 1 MHz).

This tool is not cheap and is just as important as the test tapes. Without a good reference meter, you can do very little in the way of accurate adjustment. Spend as much as you can here. It's worth it. Next. . . .

3) Signal Generator or Oscillator

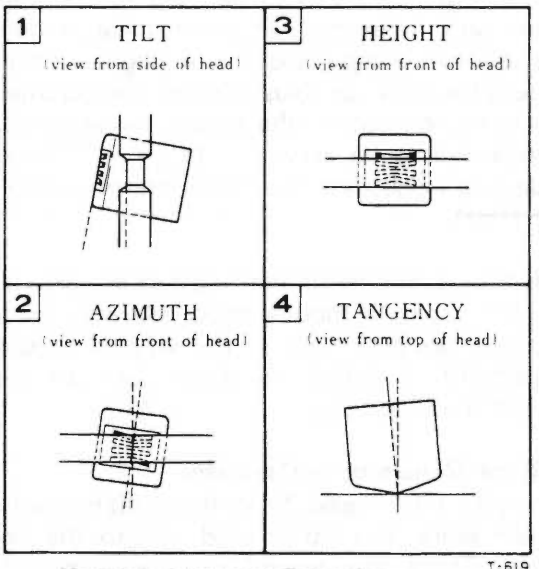
Here you get a break. A simple oscillator will do all the work and won't send you to the poor house. There are several on the market for

around $100. The local electronic surplus store can be a good source for test equipment that can be re-calibrated by the manufacturer for a reasonable cost. If you get one with a meter on it, you won't have to calibrate its output with the big meter as often. This device is very useful in a studio for troubleshooting a good investment. It should have at least the following frequencies.

40 Hz — 100 Hz — 400 Hz — 1 kHz — 4 kHz — 10 kHz — 15 kHz — 18 kHz

Sine wave is all that is required, at a distortion of no more than 0.5 %. Most modern units do better than this easily. This unit is the workhorse on the equipment list. Whether you are reading the big meter (FET) or the meters on the recorder, you will need a signal to read, this instrument or the test tapes will provide you with signals.
Test tapes, tone generator, VTVM or FET meter . . . This is the basic package and will do almost every adjustment in the sequence – except the first one . . .

4) The Oscilloscope
Even a simple one is not cheap. Fortunately, a simple one is all you need. You can spend $6,000 and more for the big ones, but for this purpose $100 – $200 will be more than enough. It must have a "vertical" and a "horizontal" amplifier and an X–Y mode. That's all you use to do the one adjustment you need it for. Assuming that the motors are not in need of attention (that's for Dealer Service), Azimuth, or head alignment is the number one step in maintenance . . . . so let's begin.



Head Mis-Alignment Example

The gaps in the heads that do the erasing, recording, and playing back must be precisely perpendicular to the tape. PRECISELY. Even a tiny error in alignment will make problems for the recorder. If the heads are not in alignment, both with the tape, and with respect to each other, tones recorded on one head will not play properly on the other. In the table below, the error is shown with the loss in dB. The amount of tilt is given in the fractions of a single degree called minutes, 60 minutes to a degree. As you can see, it only takes 1/4 degree to cause big trouble.

1-Mil Wavelength		½-Mil Wavelength		¼-Mil Wavelength	
Loss in dB	Azimuth Error in Minutes	Loss in dB	Azimuth Error in Minutes	Loss in dB	Azimuth Error in Minutes
0.5 dB	14.86	0.5 dB	7.43	0.5 dB	3.71
1.0 dB	20.90	1.0 dB	10.45	1.0 dB	5.22
2.0 dB	29.21	2.0 dB	14.60	2.0 dB	7.30
3.0 dB		3.0 dB	17.67	3.0 dB	8.83
4.0 dB		4.0 dB	20.16	4.0 dB	10.08
5.0 dB		5.0 dB	22.16	5.0 dB	11.13
6.0 dB		6.0 dB	24.08	6.0 dB	12.04
7.0 dB		7.0 dB	25.68	7.0 dB	12.84
8.0 dB		8.0 dB	27.09	8.0 dB	13.54
9.0 dB		9.0 dB	28.36	9.0 dB	14.18
10.0 dB		10.0 dB	29.50	10.0 dB	14.75

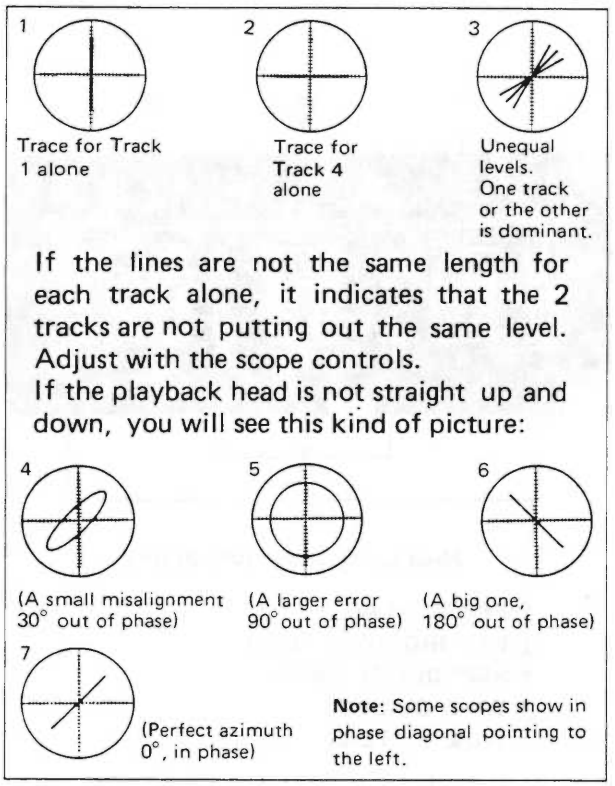
Loss due to azimuth misalignment for 43-mil quartertrack. (Courtesy, Ampex Corp. Test Tape Laboratory)

Since the 34B can use a single head (head #2 in the stack) to perform all functions (recording, sync play and playback) it won't hurt the recorder to use the "whizbang studio alignment" procedure, which is to do nothing about alignment at all. You won't notice anything wrong with the sound you make, but there are drawbacks.

1. Your tapes won't play properly on any other recorder (whizbang standards are unique).
2. No accurate tune-up of the recorder will be possible, as most test procedures use one head as a reference for the other. To do this, they must be aligned perfectly.

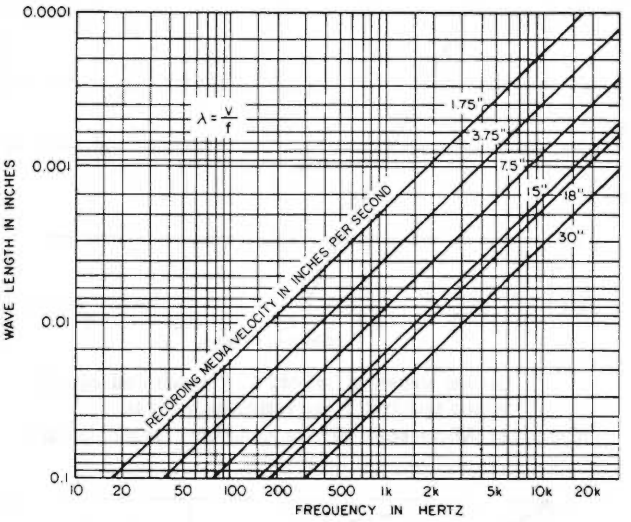
Thread the 7-1/2 ips test tape on the recorder and find the operating level section of the tape. Connect the outputs for tracks 1 and 4 of the recorder to the 2 inputs of an oscilloscope, track 1 to the vertical input that makes the beam draw lines up and down and 4 to the horizontal input (draws lines left to right). Set the scope to the "Vector" or XY mode. You will have to consult the instruction book

for the scope to determine how to do this. We don't know what brand of test gear you have. Play the tone, and this is what you should see:



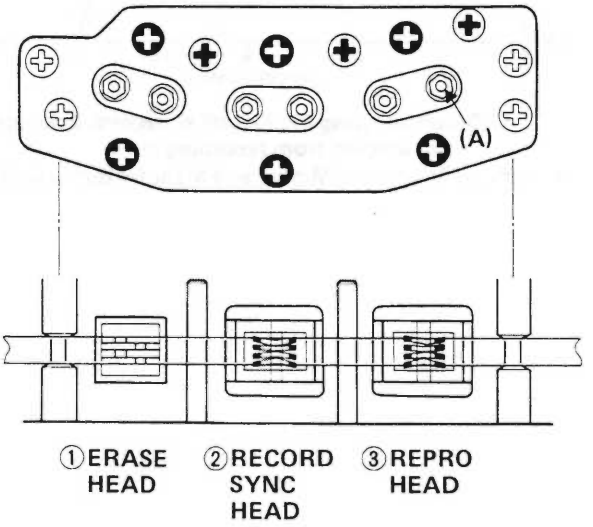
Phase Shift

How much distance error is involved depends on the frequency or pitch of the tone and the speed of the tape. One "cycle" per second at 15 ips would be hard to misalign. To get scope picture No. 6, you would have to separate the gaps in the playback head by 7-1/2 inches, but one cycle per second is not audio. How about 1,000 cycles per second of tape travel? At 15 ips, the separation or tilt in the head for scope picture No. 6 becomes 0.0075 inch. And at 15,000 Hz at 15 ips it's 0.0005 inch. Not much tilt will produce a big error. Slower tape speeds mean even smaller spacings and good azimuth becomes even more important. The proper method of adjustment is to look first at a long wave, say 1000 cycles, and make a coarse adjustment. Then work up in frequency, adjusting shorter and shorter wavelengths smaller and smaller amounts. If you start adjusting with 10 kHz or 15 kHz, you can make a big mistake. Here's why. . . . Since the very short wavelengths are very close together on the tape, it is possible to get a good "picture" on the scope by adjusting one full cycle off. If you work up to 15K, checking and adjusting as you go, you will avoid this mistake.

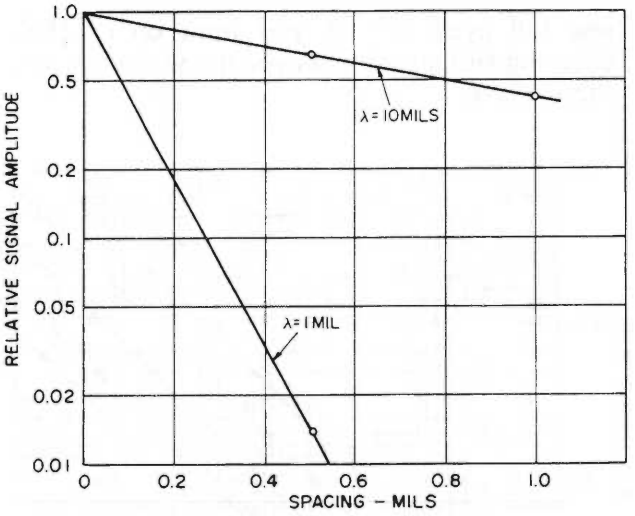


Velocity of recording media versus recorded wavelength in inches for a given frequency.

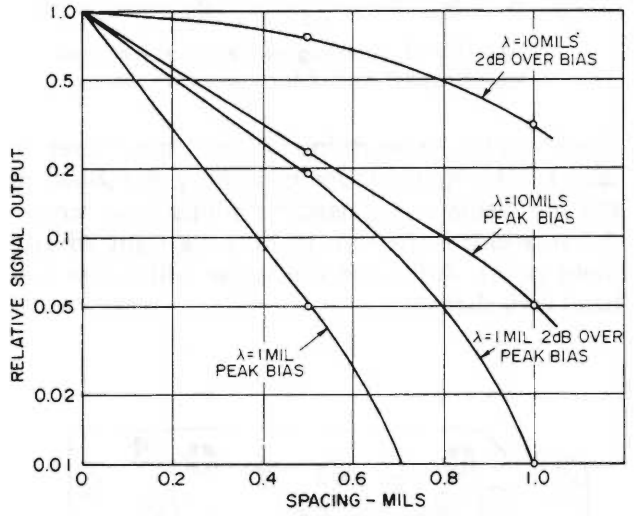
Once you have everything set up — the reference tape is playing, the scope is running and showing the x-y display, you need a Phillips head screwdriver and this diagram to find the right adjustment point. Adjusting the screw will rotate the head very slightly.



Head Adjustment Screws and Alignment



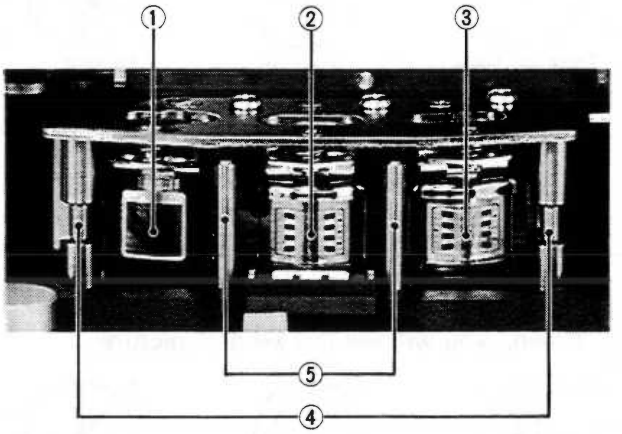
Curves showing fall-off of reproduced signals versus spacing from reproducer head.
(Courtesy, Minnesota Mining and Manufacturing Co.)



Curves showing the fall-off of recorded signals versus spacing from recording head.
(Courtesy, Minnesota Mining and Manufacturing Co.)

Head Location and Adjustment

Head block illustration showing all parts, tape path, and all adjustment screws for guides and head adjustments. Larger screws are for azimuth adjustment.



Head Location and Adjustment

① ERASE HEAD
② RECORD/SYNC HEAD
③ REPRODUCE HEAD
④ TAPE GUIDES
⑤ TAPE LIFTERS

The next step is to play all the signals from the lowest frequency to the highest on the 7-1/2 ips alignment tape – one play for each head position (2–3), and DO NOTHING. Just have a look. It's not a good idea to turn knobs just to "see what happens." Just because an adjustment can be made doesn't mean it's necessary. The recorder is very solid and is well adjusted at the factory, so in all test and maintenance procedures, check first, then if something is not right, adjust. Taking your time will save endless grief A new machine is very likely to be "on the money" when you get it and if you keep it clean and degaussed will drift away from top shape very slowly. It's not necessary to plan on a major overhaul when it comes out of the box.

DAILY SETUP

It's obvious that this entire procedure is not something that can be completed quickly. You don't begin a "major" ten minutes before the musicians arrive. It is not likely to be necessary every day, but what is reasonable? Most good engineers make several quick tests. If nothing is amiss, they start setting up the rest of the session with confidence. If there is a problem, they go further. Here is what they do.

1. Clean and degauss. Obvious first step.
2. After the recorder has been on for 10 minutes and is nicely warmed up, they check the reproduce response with the test tape. A little trim? OK, no problem.
3. They then set up the signal generator and record several frequencies, say 100 Hz, 4k, 10k. Looks good? Then we can begin.
4. A very fussy engineer will take a look at the bias adjust to make sure everything is OK there as well, before he looks at the record EQ.

These several quick checks will usually uncover any serious troubles, and the idea is to work backwards up the chain of adjustments if anything shows an error. "Reproduce" is the first step in a major overhaul, and Record EQ is the last. If everything works OK, you can assume all is well. If you get something funny as a reading, you will have to track it down, but these tests will usually give you some idea of where the problem lies. Work backwards through the recorder (that's forward through the adjustments, by the way, they run from back to front in the procedure, don't get confused) until you uncover the problem. You always clean and degauss, and you should always check the reproduce response with the test tape. Again, reproduce, bias, record check, no problems, OK, go, and good luck with your tapes.

Speaking of tape, the 34B has been designed to use 1.5 mil tape, the use of 1 mil tape is not recommended, we strongly suggest that you buy good quality tape and stick to one kind. White box tape is cheap for a reason. It doesn't perform as well as the "good stuff", and will be hard to tune up to, and may even damage your recorder. Excessive shedding of oxide, uneven slitting and other defects too numerous to mention will make all your efforts go for very little. Tape is important, use the best.

GENERAL ADVICE ON MAINTENANCE

Don't attempt to adjust a stone cold machine. Turn it on and let it warm up for 30 minutes.

Don't adjust the "traps" with a metal screw driver or tool. The metal tip will affect the value of the part and will give false readings. Use a plastic T.V. adjustment tool, or cut a strip of rigid plastic to size. (Credit cards will work, if you have an old one you don't need.)

Suspect any large change in adjustment that happens all at once.

Stop and think, if you turn a pot and get no change in reading, have you adjusted the wrong control?

Remove the alignment tape from the heads when switching power "on" or "off." A switching transient on a badly adjusted recorder can "print" on the tape.

Tape and electronic "hiss" should be smooth sounding. If, when recording, you detect popping, or sputtering noises, degauss the heads. If this doesn't change the sound, plan on a record bias trap adjustment.

If the oscilloscope picture is not stable when using the alignment tape (the trace opens and shuts like a mouth) suspect the holdback torque adjustment. When recording and playing test tones, suspect the tape slitting as well as the motor adjusts. If the reference tape doesn't do this, but the recording tape does, it's definitely not the recorder. It is the tape that is at fault.

At the end of a session, take the time to slow wind (play) the roll off the machine and store it "tails out." This is the best way.

Don't plan on recording over a splice. Any steady tone such as singing, or violins that you attempt to print over a cut in the tape may show a dropout, or momentary interruption. Even the best splice in the world is thicker than normal. The splicing tape adds quite a lot, and makes the tape "bump" when it goes by the head. This is especially important if you are using DBX. The dropout will be made much more noticeable by the action of the DBX.

It is a good idea to pad your master tapes by winding some blank tape on both ends, and adding leader tape.

Put a test tone (1 kHz) on each tape for reference level checks. Then it's easier to set up machines and mixers when recording sessions occur on different dates or different machines.

Keep a TRACK SHEET. Write down what happened during the session and what went on to the tape. You might list such things as mic placement; complete/incomplete takes; brand of tape used; speeds; noise reduction; comments (for example: a producer might have liked a particular bass part more than others, so you can save it and use it during overdubbing and mix-down).

Have the tools of the trade handy – leader tape, razor blades, splicing tape, masking tape, grease pencils, etc.

There's another old saying around studio circles: If it's not labeled, use it. So it's a very good idea to label all tape boxes and reels. And pack a track sheet in every box.

When you're not working on a tape, it's safest to put it in its box; don't leave it on the machine where an accident could wipe out weeks of work.

MAINTENANCE

INSTRUCTIONS FOR SERVICE PERSONNEL

BEFORE RETURNING APPLIANCE TO THE CUSTOMER, MAKE LEAKAGE-CURRENT OR RESISTANCE MEASUREMENTS TO DETERMINE THAT EXPOSED PARTS ARE ACCEPTABLY INSULATED FROM THE SUPPLY CIRCUIT.

NOTES

- ★ All resistors are 1/4 watts, 5 %, unless marked otherwise. Resistor values are in ohms (k=1,000-ohms, M=1,000,000 ohms).
- ★ All capacitor values are in microfarads (p=pico-farads).
- ★ ⚠ Parts marked with this sign are safety critical components. They must always be replaced with indentical components – refer to the TEAC Parts List and ensure exact replacement.
- ★ 0 dB is referenced to 1 V in this manual unless otherwise specified.
- ★ PC boards shown viewed from foil side.
- ★ Because of the improvements made to the recent production models, some parts of the circuit diagram may no longer conform to the actual circuitry.

1. CIRCUIT DESCRIPTION

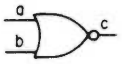
Signal flow and functions of the various control circuits of the tape deck are explained in detail in this section. These should be of help in analyzing any trouble which may occur and in correcting the malfunctioning circuit.

1-1. LOGIC USED IN THE TAPE DECK

(a) 2 INPUT NAND GATE

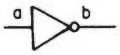
a	b	c
H	H	L
H	L	H
L	H	H
L	L	H

(b) 2 INPUT NOR GATE



a	b	c
L	L	H
H	H	L
L	H	L
H	L	L

(c) INVERTER



a	b
L	H
H	L

Note: H level = 3.4 V ~ 5 V
L level = 0 V ~ 0.6 V

1-2. SYSTEM CONTROL IC

1-2-1. Pin Assignments and Their Functions

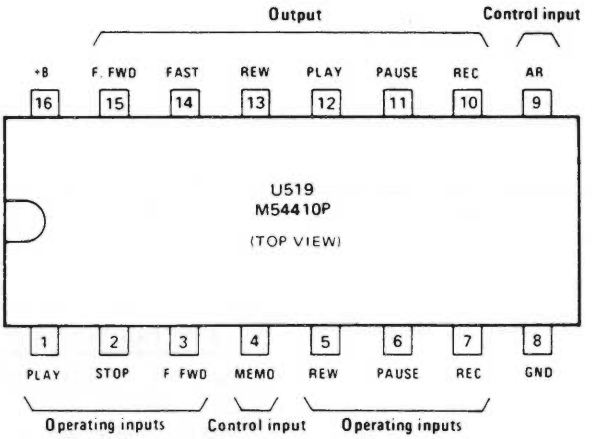


Fig. 1-1. Pin Assignments

	Pin No.	Pin name	Function	
Operation inputs	1	PLAY	Reproduce start signal input terminal.	Signal level: L
	2	STOP	Stop signal input terminal	Signal level: L
	3	F.FWD	Fast-forward signal input terminal.	Signal level: L
	5	REW	Rewind signal input terminal.	Signal level: L
	6	PAUSE	Pause signal input terminal.	Signal level: L
	7	REC	Record signal input terminal.	Signal level: L
Control inputs	4	MEMO	Memory input terminal (resets rewind mode when at L level)	
	9	AR	Record inhibit signal input terminal (L level: record inhibited, H level: record enabled)	
Outputs power	10	REC	H-level signal output terminal during record/reproduce or record/pause mode	
	11	PAUSE	H-level signal output terminal during pause mode	
	12	PLAY	H-level signal output terminal during reproduce mode.	
	13	REW	H-level signal output terminal during rewind mode.	
	14	FAST	H-level signal output terminal during rewind or fast-forward mode.	
	15	F.FWD	H-level signal output terminal during fast-forward mode.	
Power	8	GND	Ground terminal.	
	16	+B	Power supply terminal (standard: +5 V +/-10%, absolute maximum: +7.0 V)	

1-2-2. Block Diagram

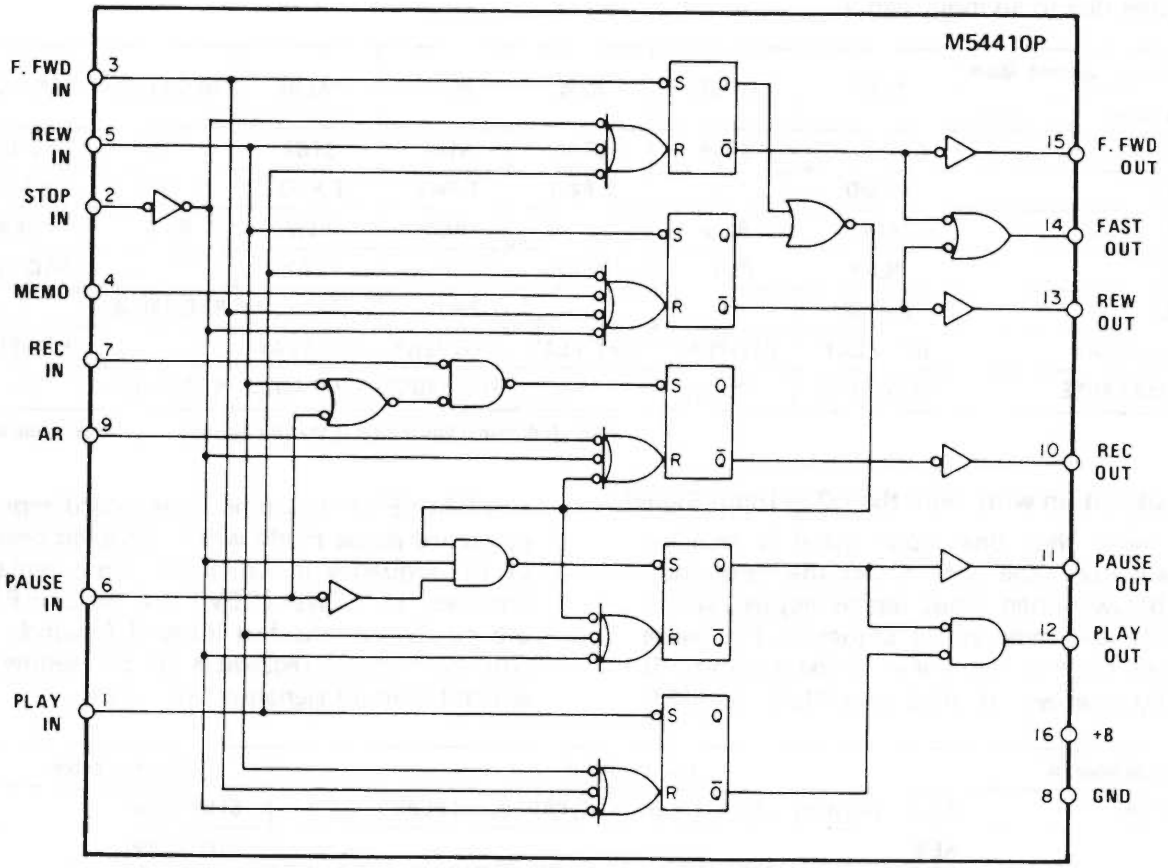


Fig. 1-2. Block Diagram

1-2-3. Input Signals and Resulting Modes

Output signal / Input signal	REC	PAUSE	PLAY	REW	FAST	F. FWD	Operating mode
PLAY	L	L	H	L	L	L	PLAY mode
STOP	L	L	L	L	L	L	STOP mode
F.FWD	L	L	L	L	H	H	F.FWD mode
REW	L	L	L	H	H	L	REW mode
PAUSE	L	H	L	L	L	L	PAUSE mode
REC and PLAY	H	L	H	L	L	L	REC/PLAY mode
REC and PAUSE	H	H	L	L	L	L	REC/PAUSE mode

Notes 1. The mode is set at the decaying edge of the input signal waveform.
2. The output retains the current mode until an input signal indicating a different mode is received.
3. Output REC remains at L as long as input AR is L.
4. Output REW remains at L as long as input MEMO is L.

1-2-4. Mode Transition

The table below summarizes transition from one to another due to an input signal.

Current Mode / Input signal	STOP	F.FWD	REW	PLAY	PAUSE	REC/PLAY	REC/PAUSE
STOP		STOP	STOP	STOP	STOP	STOP	STOP
F.FWD	F.FWD		F.FWD	F.FWD	F.FWD	F.FWD	F.FWD
REW	REW	REW		REW	REW	REW	REW
PLAY	PLAY	PLAY	PLAY		PLAY		REC/PLAY
PAUSE	PAUSE			PAUSE		REC/PAUSE	
REC and PLAY	REC/PLAY	REC/PLAY	REC/PLAY	REC/PLAY	REC/PLAY		REC/PLAY
REC and PAUSE	REC/PAUSE			REC/PAUSE	REC/PAUSE	REC/PAUSE	

Note. A diagonal line indicates that the current mode remains unchanged.

1-2-5. Operation with more than One Input Signal

When more than one input signal is received simultaneously, the deck enters the mode indicated below. When input signals applied simultaneously are removed in sequence, the mode indicated by the last signal to be removed is normally enabled. If REC and PLAY or REC and PAUSE are combined, the record/reproduce or record/pause mode will be enabled regardless of the sequence in which the input signals are removed. If F.FWD (REW) and REC or PAUSE are combined, the fast-forward (rewind) mode will be enabled regardless of the sequence in which the input signals are removed.

Input signal A	Input signal B	Resulting mode
STOP	Any combination of F.FWD, REW, REC, PAUSE, and PLAY	STOP mode
F.FWD	REW	STOP mode
	REC and/or PAUSE	F.FWD mode
	PLAY	STOP mode
REW	REC and/or PAUSE	REW mode
	PLAY	STOP mode
REC	PAUSE	REC/PAUSE mode
	PLAY	REC/PLAY mode
	PAUSE and PLAY	REC/PAUSE mode
PAUSE	PLAY	REC/PLAY mode

1-2-6. Input/Output Levels

Input/output levels and voltages are given below.

Item	Minimum	Standard	Maximum	Absolute maximum
Maximum supply voltage	–	–	–	7.0 V
Maximum input voltage	–	–	–	5.5 V
Recommended supply voltage	4.5 V	5.0 V	5.5 V	–
H-level input voltage	2.0 V	–	–	–
L-level, input voltage	–	–	0.8 V	–
Open-input voltage	3.2 V	–	–	–
H-level output voltage	2.9 V	–	–	–
L-level output voltage	–	–	0.4 V	–

1-2-7. Initial Reset Circuit

See Fig. 1-3.

The initial reset circuit generates a signal which puts the deck in the stop mode as soon as the power is turned on, preventing incorrect operation during the time the DC supply voltage is unstable.

When power is turned on, current from the IC U519 charges the noise suppression capacitors (C502 ~ C507). It takes only about 20 msec to charge C502 ~ C507 because of their low capacity. When the capacitors are fully charged, the PLAY, PAUSE, F.F, REW, and REC input terminals become HIGH. However, it takes approximately 100 msec for the STOP input terminal to rise to HIGH because of the large capacity of C507. Since STOP takes longer to become HIGH than the other input terminals, a flip-flop is set in U519 when power is turned on and the deck enters the stop mode.

Unless C507 is fully charged and the STOP input terminal is HIGH, U519 does not switch from the stop mode to any other mode even if operation signals are input.

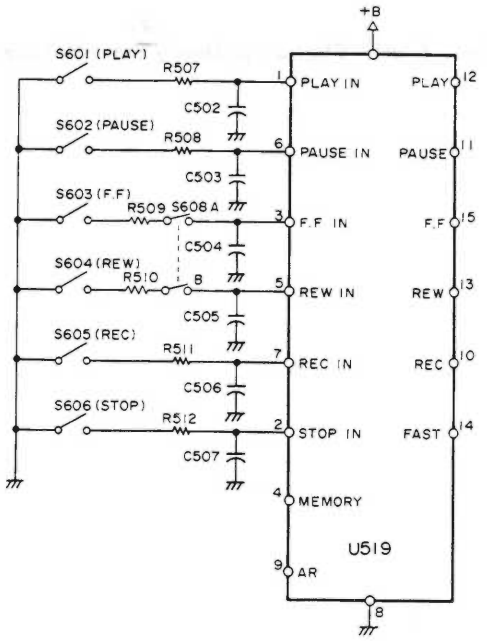


Fig. 1-3. System Control IC Input Circuit

1-3. POWER SHUT-OFF CIRCUIT

See Fig. 1-4.

A photo interruptor type shut-off switch is interlocked with the right tension arm.

1. When the tension arm deviates from its normal position, the light beam falling on the photo transistor is interrupted and the photo transistor output voltage drops, turning off Q512 and Q513. When Q512 is cut off, Q853 is also turned off and no power is supplied to terminal 6 of capstan motor assembly, and the capstan motor is deenergized.
2. When Q513 goes off, base bias current flows to the base of Q514 through R552 and R553 and Q514 goes on. Since the collector of Q514 is connected to the STOP mode switch, the tape deck is set to the STOP mode. Thus, the entire system stops when the tension arm is not set in its specified position due to tape slackness or other trouble.

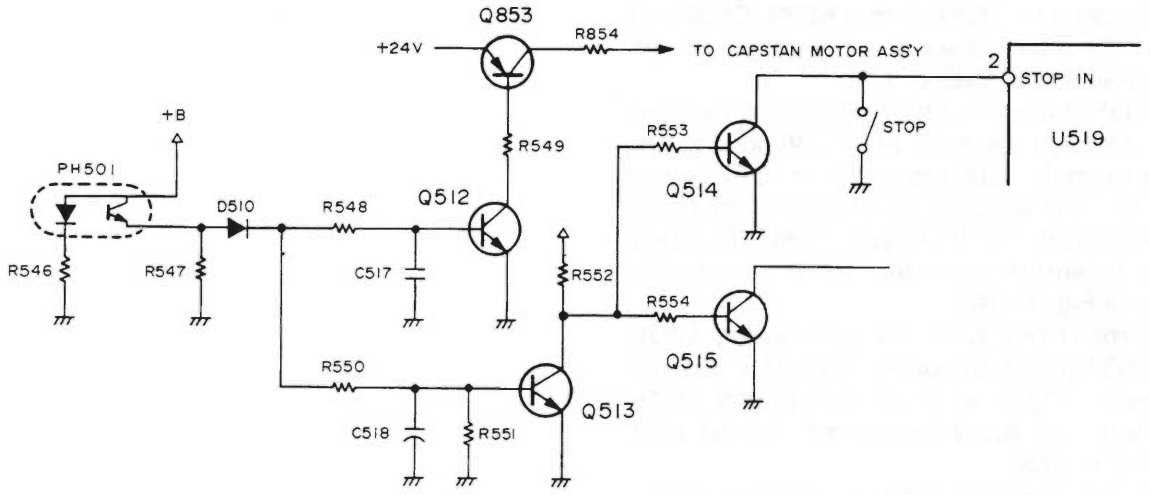


Fig. 1-4. Power Shut-Off Circuit

3. When the tension arm is in its normal position, the photo transistor receives the light beam and outputs a high level voltage to make Q512 and Q513 conduct.
4. When Q512 goes on, the Q853 base bias circuit is grounded and Q853 supplies current to the capstan motor.
5. When Q513 goes on, Q514 and Q515 are turned off, disconnecting Q514 from the stop mode switch and Q515 from the speed sensing circuit.

1-4. CAPSTAN AND BRAKE SOLENOID DRIVE CIRCUIT

The tape deck uses two solenoids; their drive circuits are shown in Fig. 1-5 (B).

1) Capstan solenoid
   This solenoid operates in the PLAY mode to activate the pinch roller. The solenoid goes off in the PAUSE mode.
2) Brake solenoid
   In the PLAY, F.F, and REW modes, this solenoid operates to release the reel motor brakes. The solenoid goes off in the PAUSE, STOP, F.F., and REWIND mode.

These solenoids operate as described below:

1. When the deck is in the STOP mode and the PLAY button is pressed, pin 12 of U519 goes HIGH.
2. When pin 12 goes HIGH, Q538 goes on and current flows to the base of Q539 and Q539 goes on.
3. When Q539 goes on, the ground side of the capstan solenoid coil is connected to the ground.
4. When pin 12 of U519 goes HIGH, Q540 goes on, followed by Q542 so that R638, C532 and the brake solenoid are grounded through the collector-emitter path of Q542.
5. When Q542 goes on, charging current flows to C532 through route (1) and Q536 goes on for approximately 200 msec. Then Q537 also goes on and supplies the capstan and brake solenoids with +24 V. A large solenoid current flows to ensure activation of the solenoids. Refer to Fig. 1-5(A)
6. When the charge current stops flowing, Q536 and Q537 go off, disconnecting +24 V supply. However, +12 V is supplied through D519 and solenoid activation is maintained with minimal voltage.
7. Thus, the solenoid voltage applied during activation is reduced for holding, maximizing the activation force to ensure positive action but minimizing heating of the solenoid during holding.

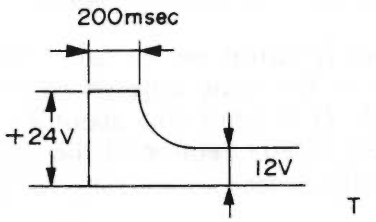


Fig. 1-5 (A). Flashing & Steady State Voltage

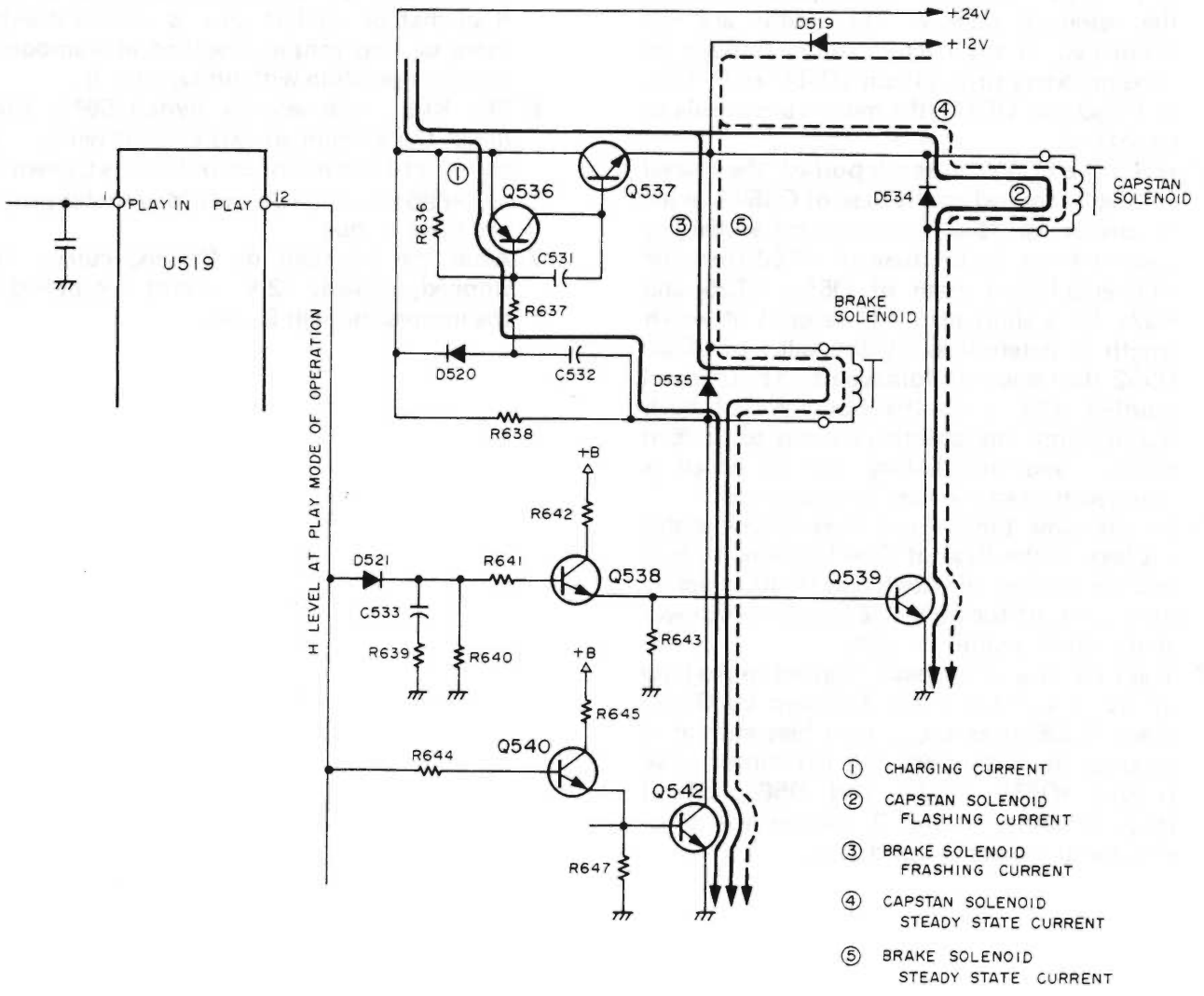


Fig. 1-5 (B). Solenoid Drive Circuit

1-5. REEL MOTOR DRIVE CIRCUIT

Reproduce (Record) Operation

See Fig. 1-6.

1. Before the PLAY button has been pushed, Q547 is cut off, and Q548, Q549 go on causing a 20 V line voltage to be applied to the hot sides of both reel motors through the collector-emitter paths of Q549 and D525. Since the opposite sides of the motor are not connected to the circuit ground through its corresponding drive circuit (Q556 and Q557, or Q560 and Q561), the motors are unable to be rotated.
2. When the PLAY button is pushed, the H level voltage is applied to the base of Q550 making it conductive. Q551 goes on and a charging current flows to the base of Q552 from the emitter-collector path of Q551, C535 and R671 for a short period (1 second) of which length is determined by the value of C535. Q552 then goes on, followed by Q553 which supplies +24 V to the hot sides of both motors until the charging current to C535 is stopped and the flashing current which is required to start the motors is provided.
3. At the same time, the H level voltage is also applied to the base of Q547 making it conductive, turning off Q548 and Q549, which in turn, cuts off the 20 V line voltage which was applied to the motor circuit.
4. Then the H level voltage is applied to the base of Q554 to turn it on, followed by Q555. When Q555 goes on, a base bias current is supplied to both right and left motor drive circuits (Q556, Q557, and Q560, Q561) through routes 1 and 2 causing the drive circuits to initiate motor driving.
5. Meanwhile, the H level voltage is differentiated by C536 and the resultant short impulse turns Q558 and Q559 on. Since the right reel motor is connected to the Q559 collector at time of PLAY start, it is driven with a higher current than that of the left, so it is able to develop more take-up torque, resulting in a smoother starting operation without tape slack.
6. The REEL size selector switch S611 determines the amount of bias current which is to be fed to both motor drive circuits by switching R680 and R698 on and off to enable proper reel drive torque.
7. After the transient or flashing current has stopped, a steady 12 V current is supplied to the motors through D524.

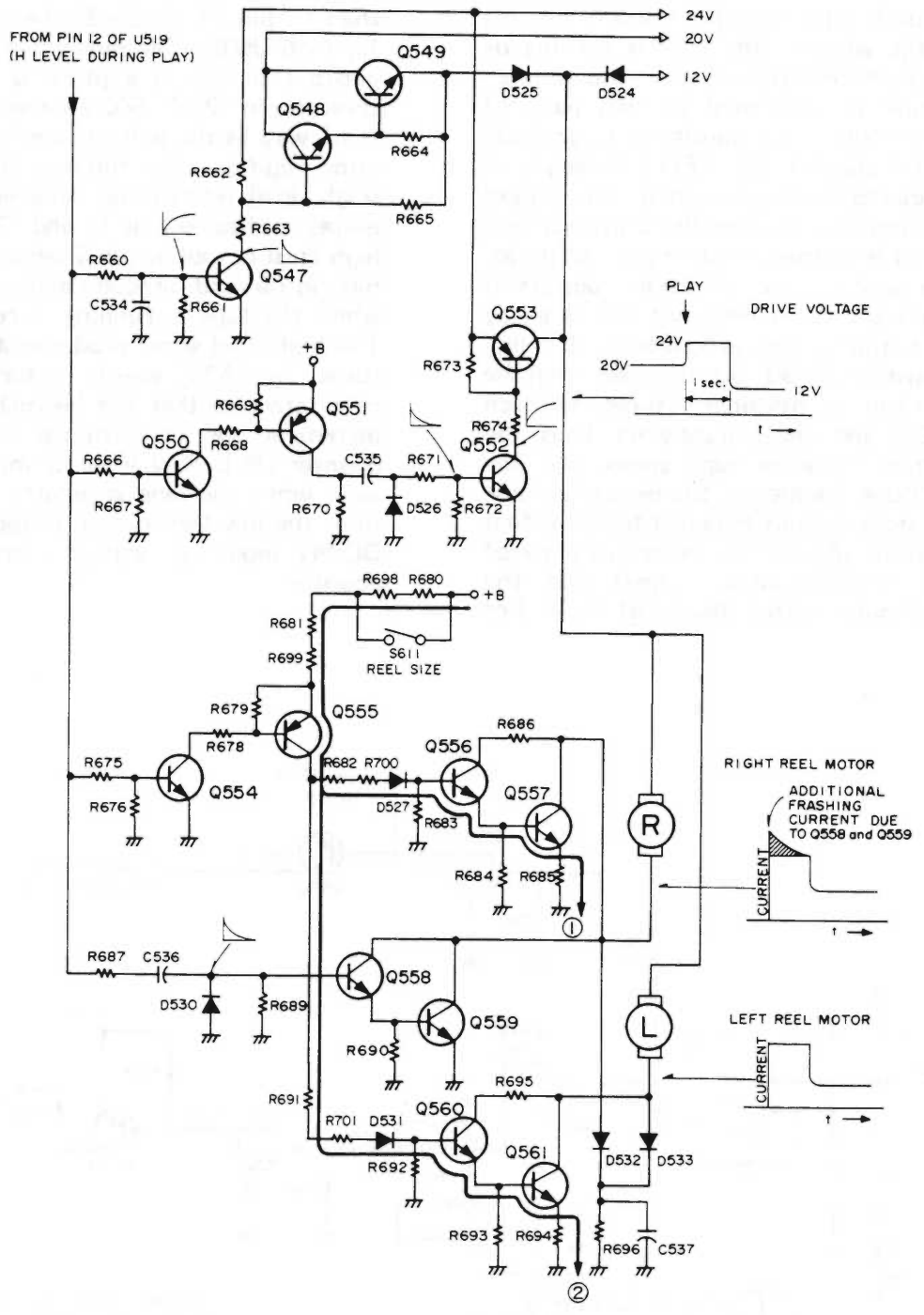


Fig. 1-6 Reel Motor Drive Circuit

1-6. TAPE DIRECTION SENSING AND COUNTER CLOCK GENERATION CIRCUIT

See Fig. 1-7.

This tape deck employs photo-sensing circuits which detect whether the tape is running or stationary and the direction in which it is running. This function is performed by two pairs of photo-interruptors, each consisting of an LED and a photo transistor. The LED and the photo transistor are respectively mounted on the upper and lower sides of a rotating disc which has four openings and is coupled to the right reel motor shaft. The second pair of photo-couplers is mounted in a similar manner, but in such a way that both output pulses produced by the two photo transistors are 90° out of phase when the disc rotates and the openings pass between each pair of LEDs and photo transistors. Thus, the pulses output represent tape speed, and the higher the pulse frequency, the higher the tape speed. The pulse output obtained from the first photo-transistor (PH502) is applied to pin 2 of U517 (an amplifier/wave shaper) and the wave-shaped pulse output developed at pin 1 of U517 is further applied to the base of Q531, then to pin 11 of U505 (the clock terminal of flip-flop U505). The pulse output by the second photo transistor is applied to pin 6 of U517, then to pin 12 of U505 after wave-shaped in the same way as the pulse applied to pin 11 of the same flip-flop. The flip-flop checks the phase (high, low) relationship between the two input pulses applied to pins 11 and 12 and produces a high level output at pin 9 when the tape is running in forward direction and a low level output when the tape is running in reverse direction. The high level signal produced at pin 9 of U505 turns on Q533, which in turn makes Q534 conductive so that the instruction required to increment the tape counter is issued to the counter UP/DOWN input terminal. In a similar way, when the tape is running in reverse direction, the low level output is applied to the UP/DOWN input terminal to decrement the tape counter.

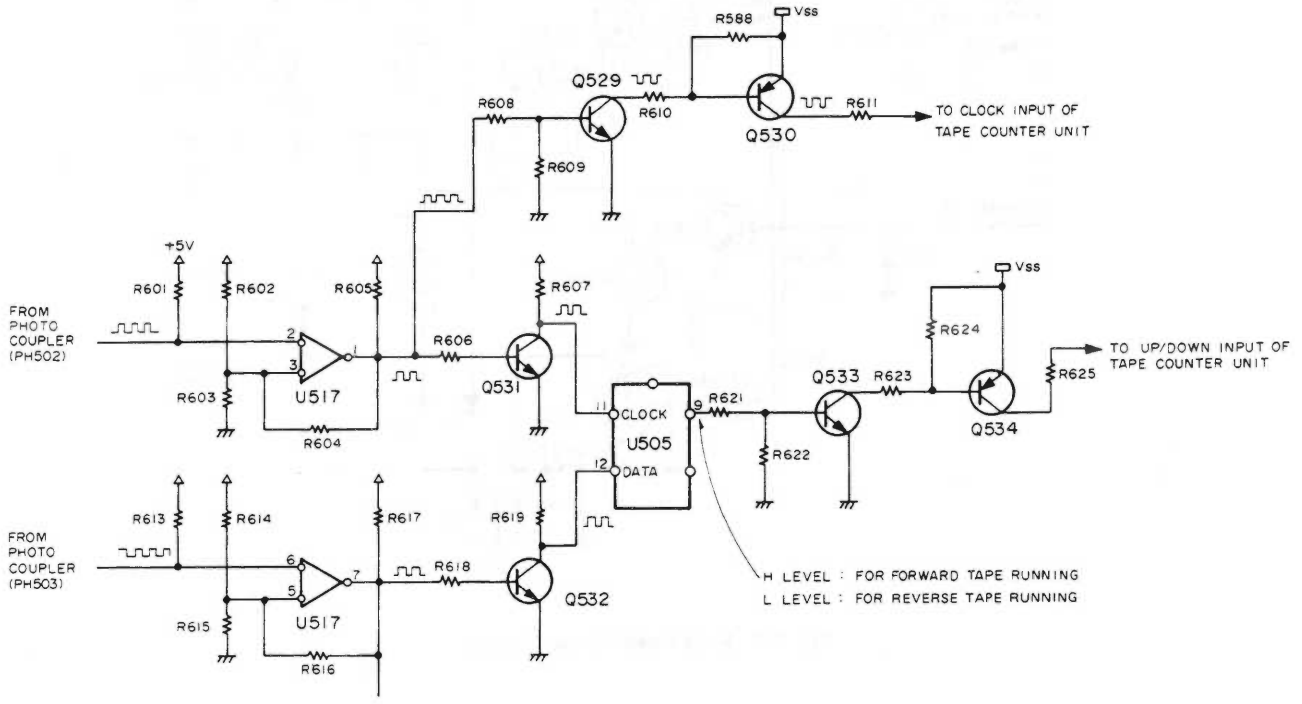


Fig. 1-7. Tape Direction Sensing and Tape Counter Clock Generation Circuit

1-7. COUNTER CLOCK PULSE

See Fig. 1-7.

The wave-shaped pulse output developed at pin 1 of U517 is also applied to the base of Q529 to turn Q529 on or off, along with Q530. The pulse output thus obtained at the Q530 collector is applied to the clock input terminal of the electronic tape counter as a clock pulse.

1-8. MOTION SENSING CIRCUIT

See Fig. 1-8.

1. The wave-shaped pulse output from pin 7 of U517 to represent the tape speed is differentiated by C526, then applied to the base of Q528 to turn it on and off at a frequency corresponding to the tape speed at that time. Thus, C524 is repeatedly charged and discharged. However, C524 does not charge when Q528 goes on and off repeatedly at high speed or when the tape is running at high speed, and pin 6 of U516 (comparator) goes HIGH so that pin 7 of U516 goes HIGH. On the other hand, pin 7 goes LOW when tape is running at low speed. (Pin 7 may develop HIGH and LOW output in alternation when the tape runs at a threshold speed.)
2. Since the voltage developed at pin 7 of U516 is applied to the base of Q521 through R580 and D512, Q521 goes on at high tape speeds and off at low speed. Consequently, pin 1 of U516 also outputs H at high speed and L at low speed as long as Q520 is off.
3. The two signals obtained at pins 7 and 1 of U516 are used as motion control signals, as described later.
4. The motion sensing circuit does not operate in the PLAY and PAUSE modes because pin 12 (PLAY OUT) and pin 11 (PAUSE) of U519 are connected to D513 and D514, respectively, and Q526 is forced to go on when the PLAY or PAUSE button is pushed.

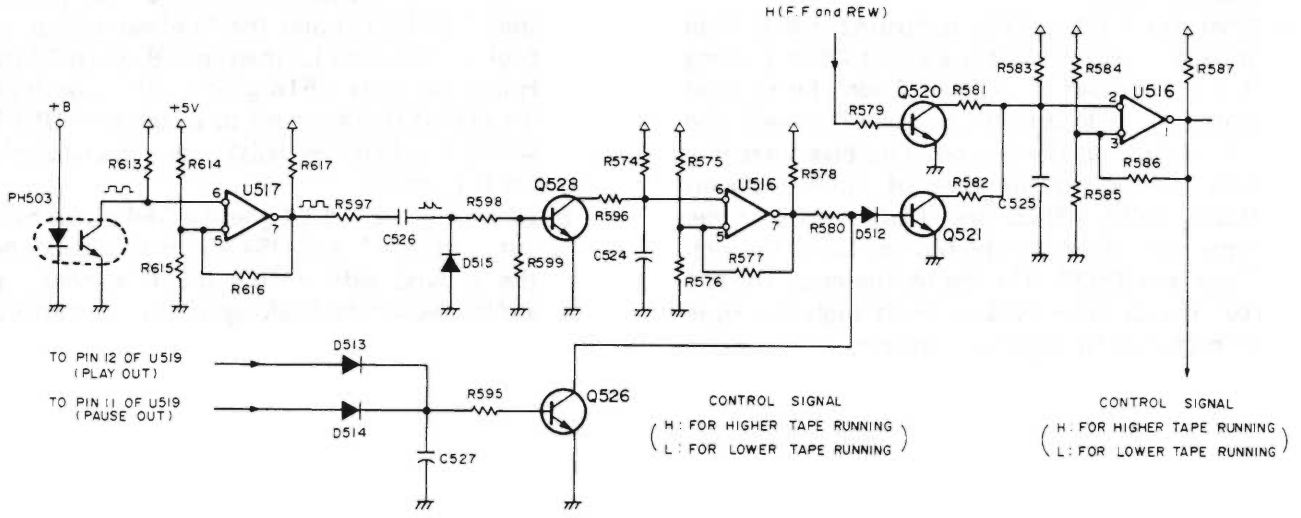


Fig. 1-8. Motion Sensing Circuit

1-9. F.F. AND REW OPERATION

See Fig. 1-9

1. As previously mentioned, both pin 3 and pin 6 of U514 develops an H level voltage during the F.F. and REW operations.
2. Q547 goes off during F.F. and REW operations, and Q548, Q549 go on supplying 20 V line voltage to the hot sides of both reel motors.
3. When the F.F. button is pushed, the H level voltage developed through pin 3 of U514 is applied to the base of Q543, turning it on, which in turn, makes Q544 go on. When Q544 goes on, 5 V is applied to the base of Q556 and Q557 through route 1 to enable the energizing of the right reel motor through its own drive circuit (Q556 and Q557).
4. At the same time, the base of Q560 and Q561 are also biased through route 2 to enable the energizing of the left reel motor through its drive circuit (Q560 and Q561).
5. As shown in the schematic diagram, the overall resistance of bias route 1 is lower than that of route 2, signifying that the right reel motor drive circuit is able to supply more current to the right motor. Consequently, the right reel motor rotates with higher torque than that of the left reel motor. The left reel motor is only driven to develop proper back tension torque.
6. When the REW button is pushed, the H level voltage is applied to the base of Q545 turning it on, followed by Q546. Then the manner which the bias current is applied above in the F.F. operation is reversed. The bias current is now applied to the base of Q556 through R659, R658, R656 and D522 while at the same time is fed to the base of Q560 through R657 and D523. This being the case, the left reel motor now rotates with higher torque than that of the right reel motor.

1-10. ELECTRICAL BRAKE SYSTEM

See Fig. 1-9

The electrical braking system functions when a fast operation mode is changed to any other mode and continues to function until the tape speed drops to a predetermined speed and the motion sensing circuit develops an L level signal. The case in which the mode is changed from REW to STOP is described below.

1. When the STOP button is depressed in the REW mode of operation, pin 13 of U519 goes LOW, then pin 12 of U513 goes LOW to make pins 11, 5 and 10 of U513 and pin 4 of U514 go HIGH. When pin 4 of U514 goes HIGH, pin 6 of U514 goes LOW and Q545 and Q546 are turned off.
2. While the logic state at pin 6 of U513 is set to HIGH by the H level output from the motion sensing circuit during REW mode of operation, pin 8 of U513 (and thus, pin 2 of U514) goes LOW when the STOP button is depressed. Then pin 3 of U514 goes H.
3. Thus, the mode of operation is temporarily changed from REW to F.F and electrical braking is applied to the reel motors to reduce tape speed rapidly.
4. When tape speed has been considerably reduced by applying the electrical brake to the reel motors, the motion sensing circuit outputs an L level signal to the reset terminal (pin 1 of U513) and the flip-flop output (pin 6 of U513) goes L; then, pin 8 of U513 goes H and pin 3 of U514 goes L. Thus, both pins 3 and 6 of U514 are set to L (pin 6 of U514 is set to L when the REW mode is changed to the F.F mode).
5. When pin 3 of U514 goes L, Q541 base bias is cut, and Q541 and Q542 go off to disconnect the ground side of the brake solenoid and apply mechanical braking to the reel motors.

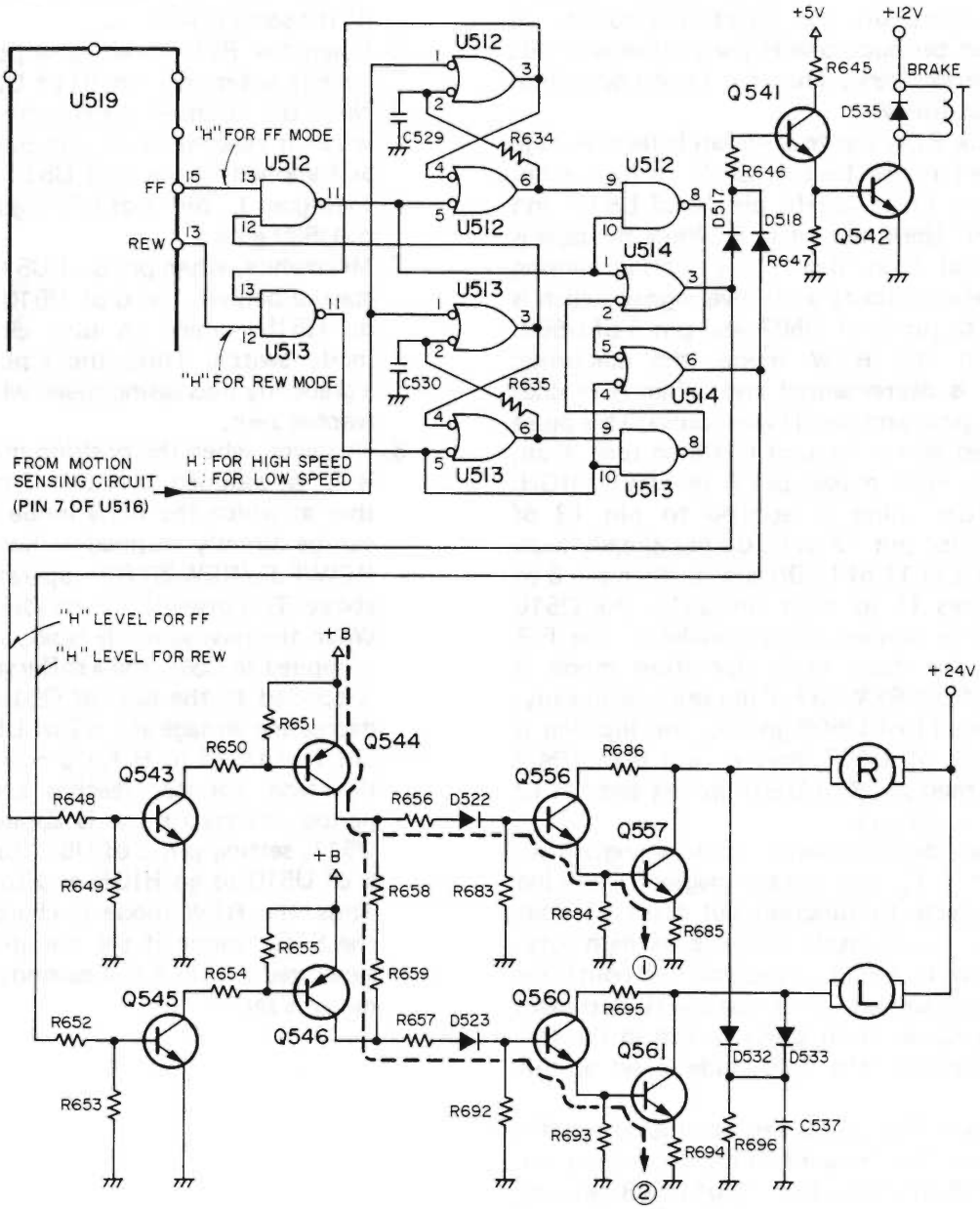


Fig. 1-9. FF and REW Mode Operation Control Circuits

1-11. COUNTER ZERO RETURN

See Fig. 1-10.

If ZERO RETURN switch S609 is set to ON, the tape stops automatically when the electronic counter reading reaches zero during the REW mode of operation. The electronic counter is designed to produce one H level pulse when its reading reaches zero. The zero return operation functions as follows:

1. When the REW mode is set, an H level voltage is applied to the base of Q508 to turn it on. Thus, pin 11 of U510, pin 10 of U510, and pin 12 of U506 are set to H. While the tape is running at high speed, the motion sensing circuit also outputs an H level signal, which is applied to pin 5 of U507 and pin 5 of U509. While in the REW mode, the electronic counter is decremented and, when it reaches zero, it generates one H level pulse. This pulse is applied to the base of Q506 to turn it on, which in turn makes pin 6 of U506 HIGH; this HIGH pulse is applied to pin 13 of U506. Since pin 12 of U506 has already been set to H, pin 11 of U506 goes L, then pin 8 of U506 goes H to turn on Q516. As Q516 collector is connected in parallel to the F.F button, the tape deck operation mode is changed from REW to F.F mode electronically.
2. When pin 11 of U506 goes L, the flip-flop is set, pin 3 of U507 goes H, pin 6 of U507 goes L, then pin 8 of U507 goes H and pin 12 of U507 is set to H.
3. When tape deck operation mode changes from REW to F.F, the electro-magnetic braking system starts to function but the tape does not stop immediately because of high rotational inertia and the tape counter continues to be decremented. When the inertia decreases the tape stops, then starts to run in the forward direction (the F.F mode is set at this time).
4. When the F.F mode is set, an H level signal is applied to the base of Q507 to turn it on, then pin 3 of U508 (pin 12 of U508) goes H. Now the tape counter is being incremented and, when the reading reaches zero, the counter outputs one H level pulse. This pulse is applied to pin 13 of U508 to make pin 11 of U508 go L. Pin 8 of U508 then goes H to set pin 13 of U507 to H. As pin 12 of U507 has already been set to H, pin 11 of U507 goes L and pin 6 of U508 goes H, turning Q517 on or changing the tape deck operation mode from F.F to REW.
5. On the other hand, when pin 11 of U507 goes L the flip-flop consisting of two U509 units is set and pin 3 of U509 is set to H and pin 6 of the same is set to L.
6. When the REW mode is set, pin 11 of U510 goes H again and pin 10 of U510 is set to H. Now the counter is being decremented and, when it reaches zero, one pulse is generated and applied to pin 9 of U510. Pin 8 of U510 then goes L, pin 3 of U510 goes H, and pin 8 of U509 goes L.
7. Meanwhile, when pin 3 of U511 is set to L (as started below), pin 6 of U510 goes H to turn on Q518, which in turn closes the STOP mode switch. Thus, the tape is stopped at a gradually decreasing speed when the counter reaches zero.
8. However, when the position in which the tape is to be stopped is within 3 or 4 seconds of that at which the REW mode is set, the tape can be directly stopped without repeating the REW/F.F./REW/STOP operation described above. This operation is conducted as follows: When the rewind mode is set, an H level signal is applied to C521 and a differentiated impulse is applied to the base of Q519 to turn it on, decreasing voltage at pin 2 of U515 and setting pin 1 of U515 to H for 3 ~ 4 seconds. When the tape counter reaches zero within this period, its zero pulse is applied to pin 2 of U511, setting pin 3 of U511 to L, causing pin 6 of U510 to go HIGH and to turn Q518 on. Thus, the REW mode is changed directly to the STOP mode if the counter zero pulse is generated within 3 ~ 4 seconds after the REW mode is set.

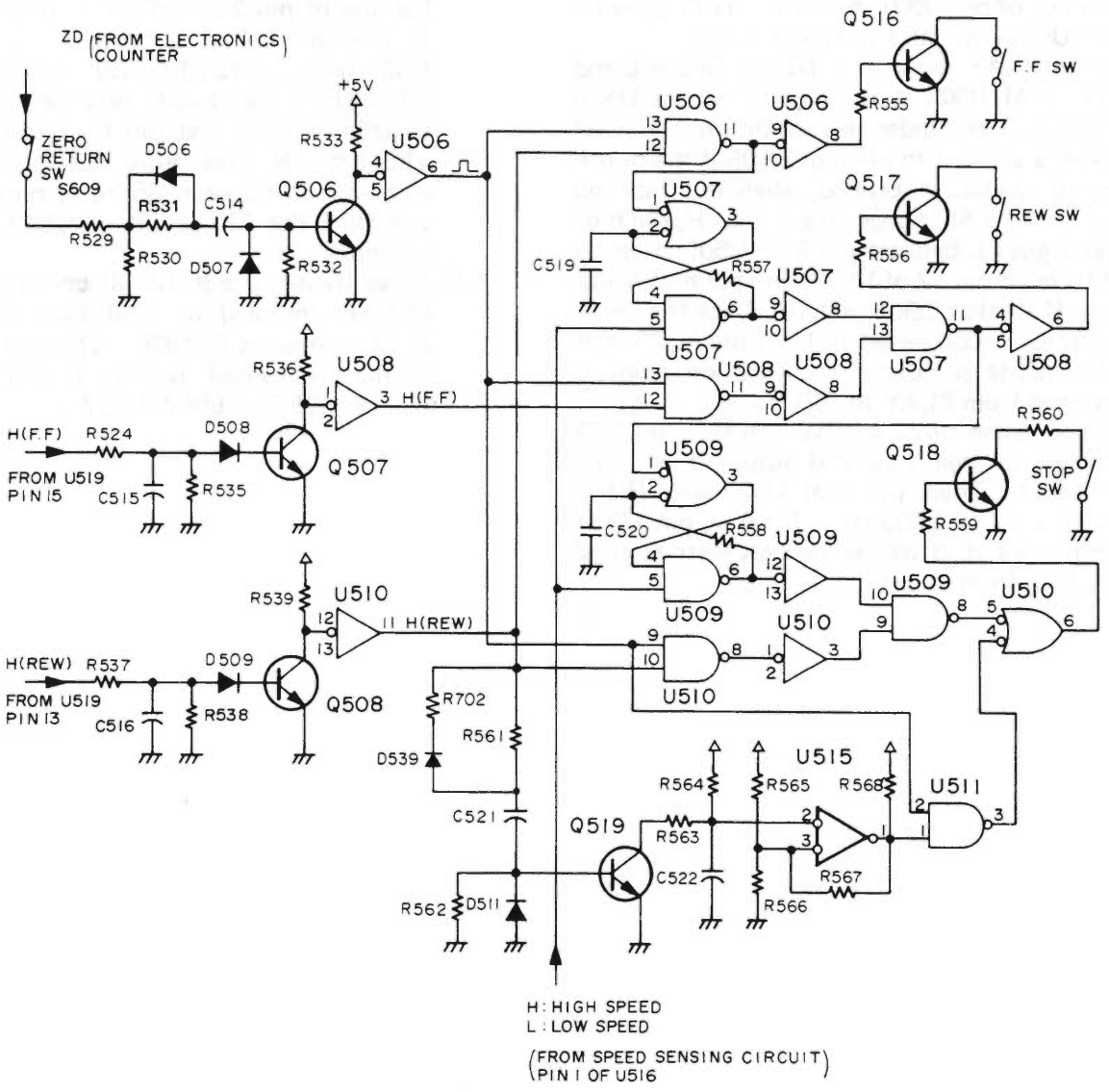


Fig. 1-10. Counter Zero Return Control Circuit

1-12. PUNCH IN/OUT CONTROL CIRCUIT

See Fig. 1-11

1. The PUNCH IN/OUT switching pulse circuit consists of Q901, Q902, U506 and a momentary switch. When the punch in/out switch is pushed once, Q901 goes off, Q902 goes on and U506 generates an H level pulse.
2. In the PLAY mode, pin 1/2 of U502 is L and pin 12 of U502 is H, so pin 2 of the U505 flip-flop is H. Under this condition, a H level pulse is applied to pin 3 of U505 if the punch in/out switch is pushed, then the flip-flop output (pin 5) changes from L to H, pin 6 of U502 goes L because pin 5 of U502 is set to H through pin 12 of U519, and pin 8 of U502 goes H so that Q504 goes on. Since the Q504 collector is connected to both the PLAY and REC mode switches, the operation mode is changed from PLAY to REC/PLAY.
3. At the same time, another flip-flop in U503 changes its logic state and outputs L at pin 6 of U503 . Then, pin 8 of U503 goes H and sets pin 13 of U503 to H. Further, pin 1/2 of U502 goes H, changing the logic state at pin 2 of U505 from H to L.
4. When the PUNCH IN/OUT switch is pushed once more, a positive pulse is applied to pin 3 of U505 which changes output from H to L because of pin 2 of U505 is at this time set to L. Then pin 1/2 of U504 goes L and pin 3 of U504 (and pin 12 of U503) goes H. Since pin 13 of U503 has already been set to H, pin 11 of U503 goes L and pin 6 of U504 goes H. Thus, the H level pulse obtained is finally applied to the base of Q505, turning it on and operating the AR circuit of U519 to inhibit recording.
5. Three diodes (D536-D538) connected to the CLEAR terminal of U505 are inserted to avoid erroneous PUNCH IN operation which would be caused during operation mode switching (F.F, REW & STOP).

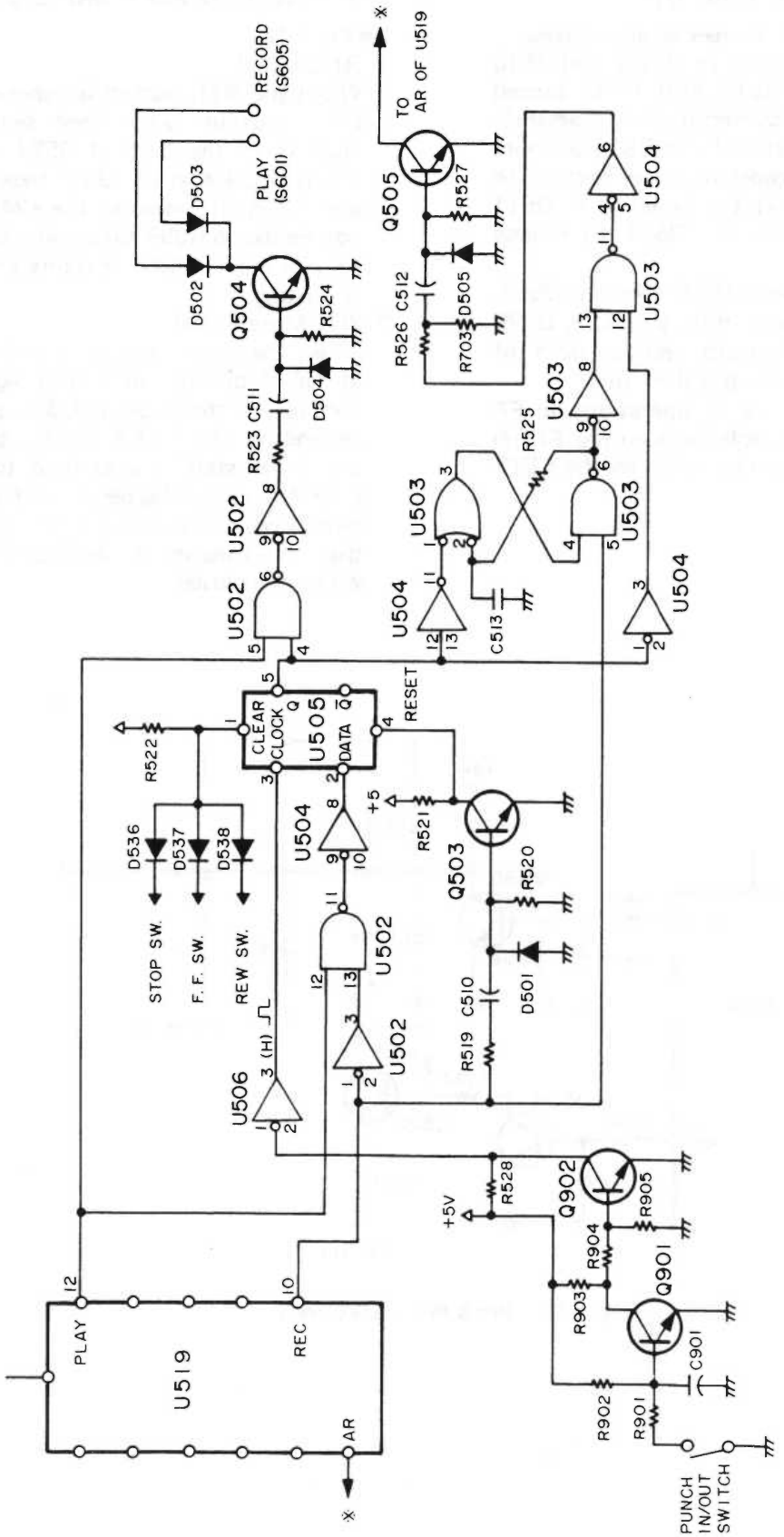


Fig. 1-11. Punch In/Out Control Circuit

1-13. EDIT CONTROL CIRCUIT

See control section of the inserted circuit diagrams.

1. When the EDIT switch is on, Q509 and Q510 go on, followed by Q512. With Q512 turned on, the Q813 base bias circuit on PCB assembly power supply is closed and Q813 supplies DC power to the capstan motor circuit to actuate the motor. At the same time, Q511 also goes on to turn off Q514 to release the STOP mode.
2. At the same time, when Q509 goes on, Q556, and Q558 are grounded through D528, D529 and through the collector-emitter path of Q509, to stop the take-up reel motor.
3. During the EDIT mode of operation, no FF or REW mode is available because the FF IN and REW IN circuits are opened by the EDIT switch being set on.

1-14. REC AND PLAY MUTE SIGNALS

See Fig. 1-12.

1. REC signal
   When the REC button is depressed, pin 10 of U519 outputs an H level signal, which is applied to the base of Q524 to turn it on. When Q524 goes on, Q525 base current flows and Q525 also goes on. The +24 V line is then connected to R594 for use as a control voltage to actuate amplifier circuits associated with recording.
2. Play Mute Signal
   When the PLAY button is depressed, pin 12 of U519 outputs an H level signal, which is applied to the base of Q535 to turn it on, grounding the PLAY MUTE terminal. This low level state is also used to control the amplifier circuit (as described later). The CUE switch connected in parallel with Q535 serves the same function as the PLAY MUTE signal when it is closed.

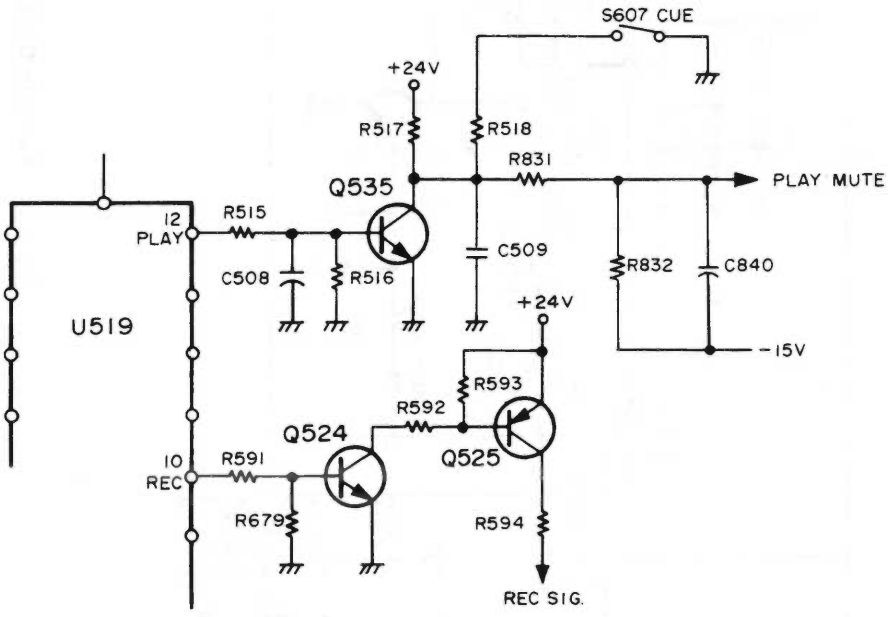


Fig. 1-12. Rec & Play Mute Circuit

1-15. DISPLAY CIRCUIT

See Fig. 1-13.

A. RECORD LED

1. The comparator of U515 with pins 5, 6, and 7 constitutes a square wave oscillator and outputs a pulse signal at pin 7. When the REC button is depressed, pin 9 of U511 is set to H and the pulse output is obtained at pin 8 of U511. The pulse signal is then fed to gate pin 5 of Q501. Meanwhile, as the REC button is on, pin 1 of U501 is set to H.
2. If one or more of the four record function switches are switched on, a L level signal is applied to R511 as the REC MODE signal, causing pin 11 of U511 (pin 2 of U501) to go H. Then, pin 3 of U501 (pin 4 of U501) goes L, setting pin 6 of U501 to H and turning Q501 on. Thus, the REC LED (D601) lights.
3. Next, assume that none of the four record function switches are on; an H level signal is then applied to pins 12/13 of U511 through R511 so that pin 11 of U511 (pin 2 of 501) goes L. Since pin 1 of U501 is set to H, pin 3 of U501 (pin 4 of U501) goes H and the output gate (pin 6 of U501) opens. Then, the pulse signal applied to pin 5 of U501 is output from pin 6 of U501, turning Q501 on and off and making the REC LED flash to indicate that the tape deck is in the REC mode but that no recording channel is designated.

B. PAUSE LED

When the REC and the PAUSE buttons are on, pins 12 and 13 of U501 are set to H and an L level signal is output at pin 11 of U501. Then, pin 8 of U501 goes H, turning on Q502 and lighting PAUSE LED D602.

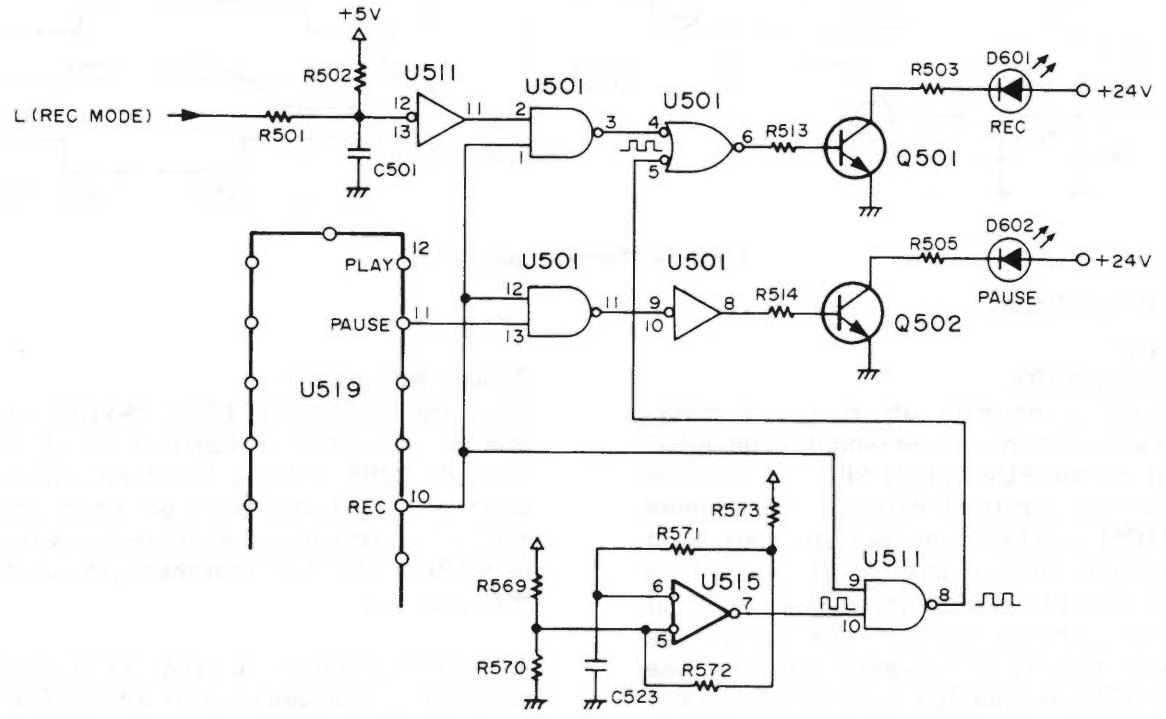


Fig. 1-13. Display Circuit

1-16. AMPLIFIER CIRCUIT DESCRIPTION

1-16-1. Power Muting Circuit

See Fig. 1-14.

K-102 is a muting relay which protects the output line from impulse noise occuring when the power switch is turned on or off. When power supply starts, +6 V (VU meter lamp power) rises rapidly, charging C802 through R801. When the voltage across C802 reaches about 1.2 V, Q801 goes on and K102 operates to connect the OUTPUT terminal to the output circuit of the OUTPUT amplifier. It takes about 3 seconds for K102 to go on after power supply starts. The power lines of the deck's amplifier reach a steady state during this time. Thus, the audio output line is protected from transient noise.

When the power is turned off, the +6 V applied to the VU meter lamp falls rapidly, and C802 quickly discharges through D805 and the meter lamp; Q801 and K102 go off immediately before the amplifier power line voltage falls. Thus, the output line is also protected from transient noise.

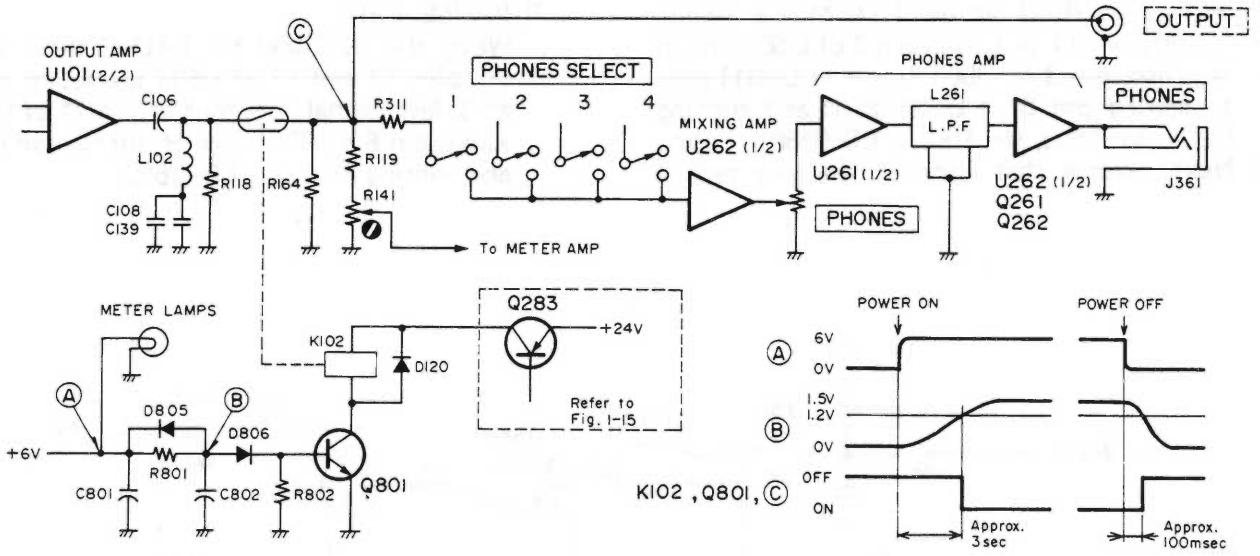


Fig. 1-14 Power Muting Circuit

1-16-2. Relay Circuit

See Fig. 1-15

1. Rec Relay K103

Relay K103 is normally off, during all modes except record (even while in record mode, K103 is off if all the FUNCTION SELECT switches are in the "up" position). When any one or more FUNCTION SELECT switches are pressed on (for example, that of channel 1), a +24 V is supplied to Q123 emitter through D125. If, at this moment, the transport is in the record mode and therefore a +6 V is supplied to Q254 base through R252, turning Q254 on, then Q123 also turns on. When Q123 turns on, the +24 V is supplied to Q120 base through D117, R220 and R201, turning Q120 on. This energizes K103. When K103 is energized, contact switch k103a connects the sync head to the output of U102 REC AMP, and at the same time, contact switch k103b disconnects the REC AMP from ground and, instead, grounds out the erase head.

2. Sync Relay K101

When the OUTPUT SELECT "SYNC" switch is pressed, a +24 V is supplied to Q282 base through R285, turning Q282 on. When Q282 turns on, Q281 also turns on, energizing relay K101. The contact of K101 switches the input of REPRO EQ AMP from the reproduce head to the sync head.

As a result, unless rec relay K103 is not energized (i.e, transport not in RECORD or none of FUNCTION SELECT switches is depressed), signals picked up by the sync head are fed into the REPRO EQ AMP.

3. Muting Relay K102

If, for example, the OUTPUT SELECT "INPUT" switch is pressed on, a +24 V supply charges C284 through R249, and only when the voltage

across C284 reaches about 7.4 V, Q284 base current flows through D288 and D284, turning Q284 on. When Q284 turns on, Q283 also turns on and K102 is energized to connect the output of the OUTPUT AMP to the OUTPUT jack and other output circuits. Thus, since K102 does not go on but with a delay, "click noise" is inhibited from being fed into the output circuits.

When, subsequently, either the OUTPUT SELECT "SYNC" or "REPRO" switch is pressed on, the "INPUT" switching supply is cut off and charge stored in C284 is quickly released through D287, R293 and the "INPUT" contact, turning Q284 off. When Q284 turns off, Q283 and K102 also turn off and the output of OUTPUT AMP is disconnected from the output circuits.

Refer to Fig. 1-16 for operational timing of the sync relay K101 and the muting relay K102.

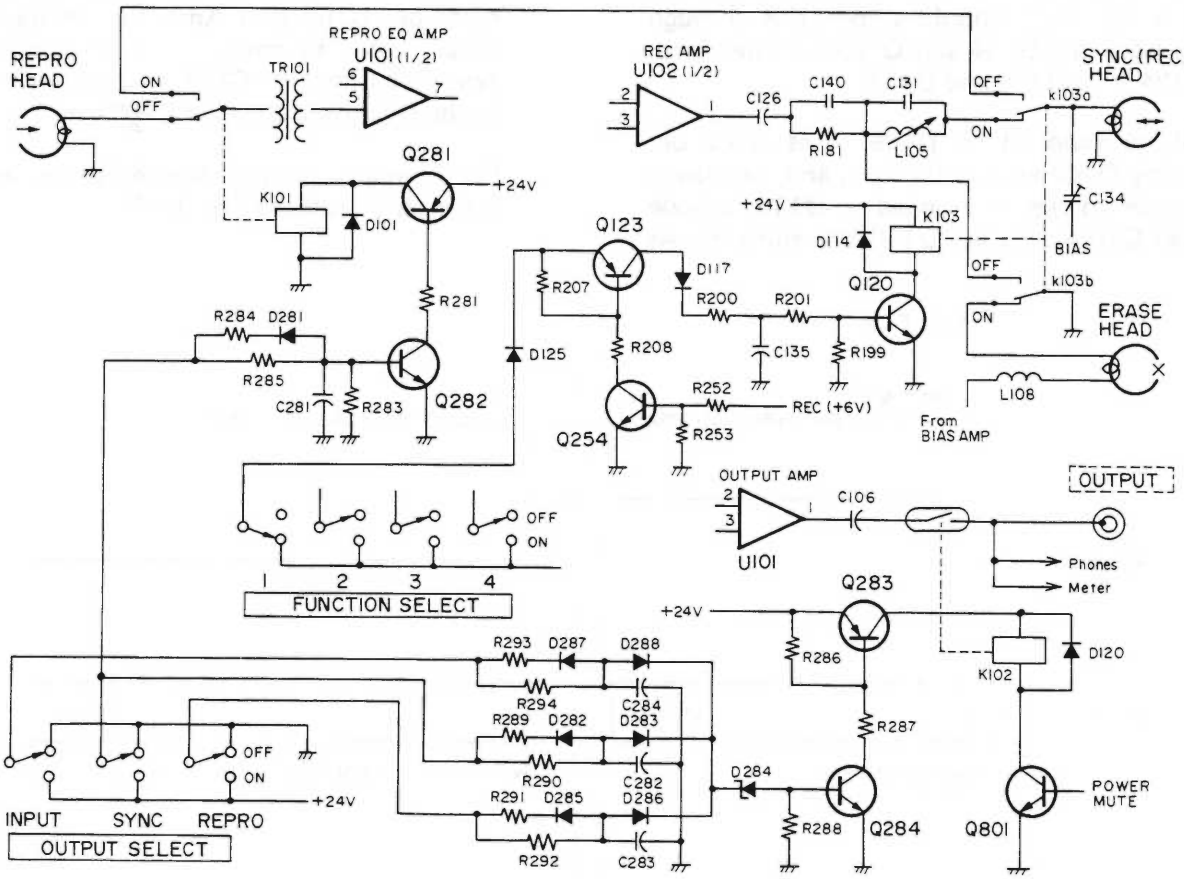


Fig. 1-15 Relay Circuit

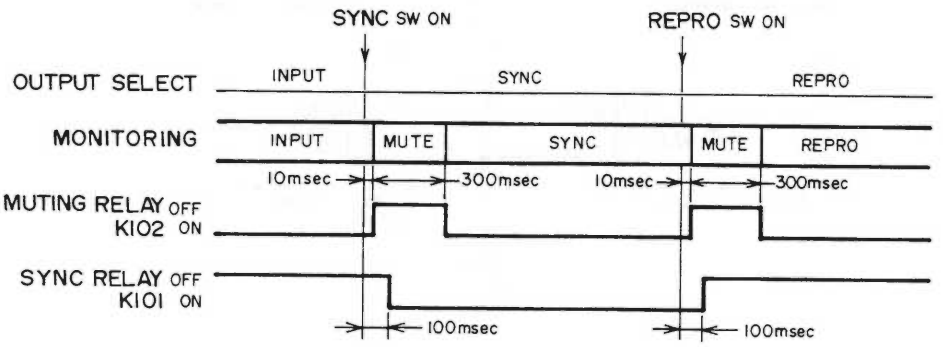


Fig. 1-16 Sync and Rec Relay Timing Chart

1-16-3. Bias and Record Control Circuit

See Fig. 1-18.

With the transport in RECORD, REC SIG is applied to Q252 and Q254 bases, and therefore, Q252 and Q251 turn on. When any one (or more) FUNCTION SELECT switch (for example, that of channel 1) is pressed on, swtich F1c switches to ON, making D301 Function LED light. On the other hand, a +24 V is supplied to D109 and D125 through switch F1a. Because REC SIG is fed to Q254 base as said above, when a +24 V is supplied to Q123 through D125, both the Q254 and Q123 turn on, sending a +24 V to D115 and D117.

1) Voltage supplied to D109 turns Q108 on, causing Q109 also to turn on, and, because a positive voltage is supplied to D110 cathode when Q109 turns on, Q110 also turns on. As a result, source signals (LINE IN or MIC) are fed to the monitor section through the output volume control.

2) Voltage supplied to D117 turns Q120 on, energizing rec relay K103.

3) Voltage supplied to D115 turns Q118 on, causing Q119 also to turn on. When Q119 turns on, U103 Bias Amplifier enters operational status to apply a record bias to the sync head through C134, and an erase signal to the erase head through L108.

   For timing of the rec relay switching and the bias output, refer to Fig. 1-17.

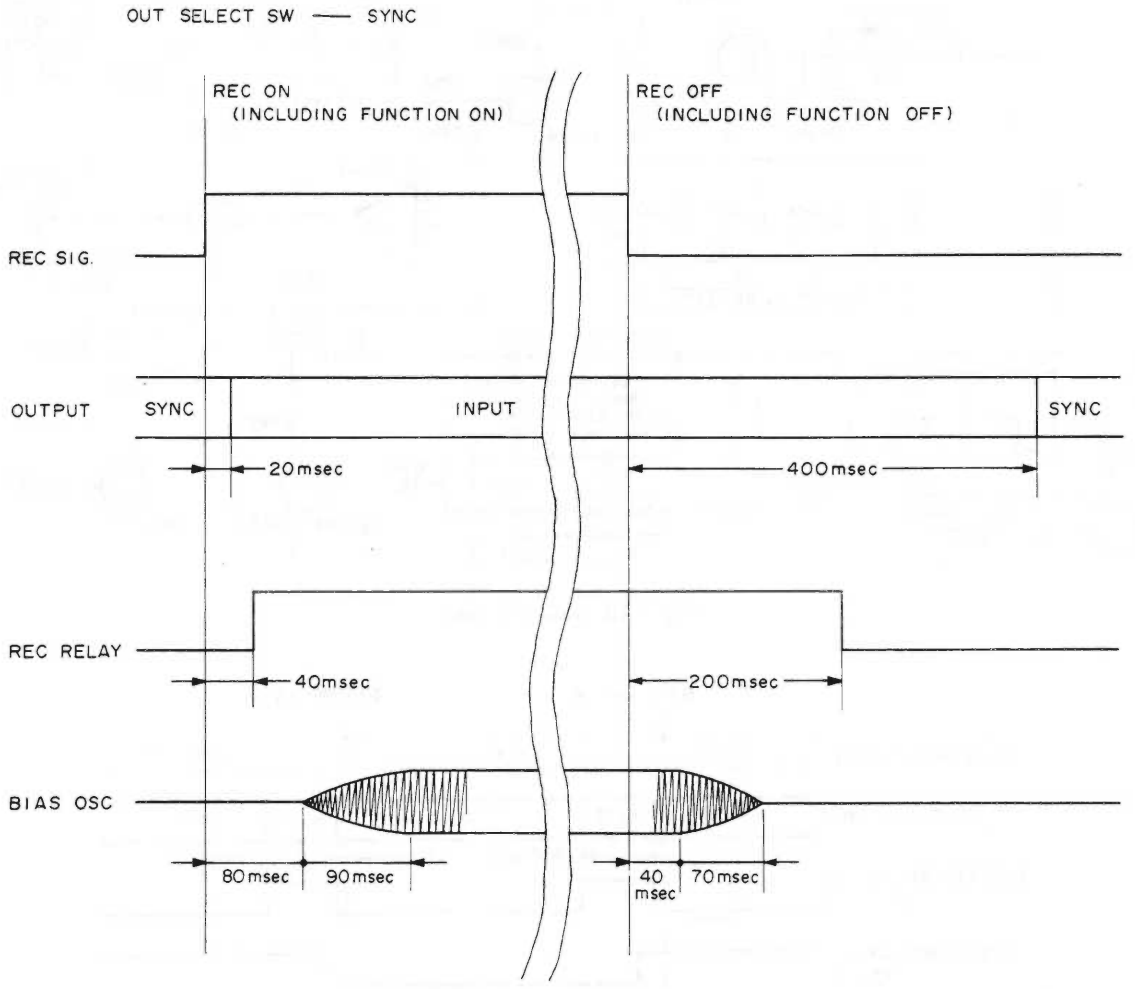


Fig. 1-17 Rec Relay and Bias Timing Chart

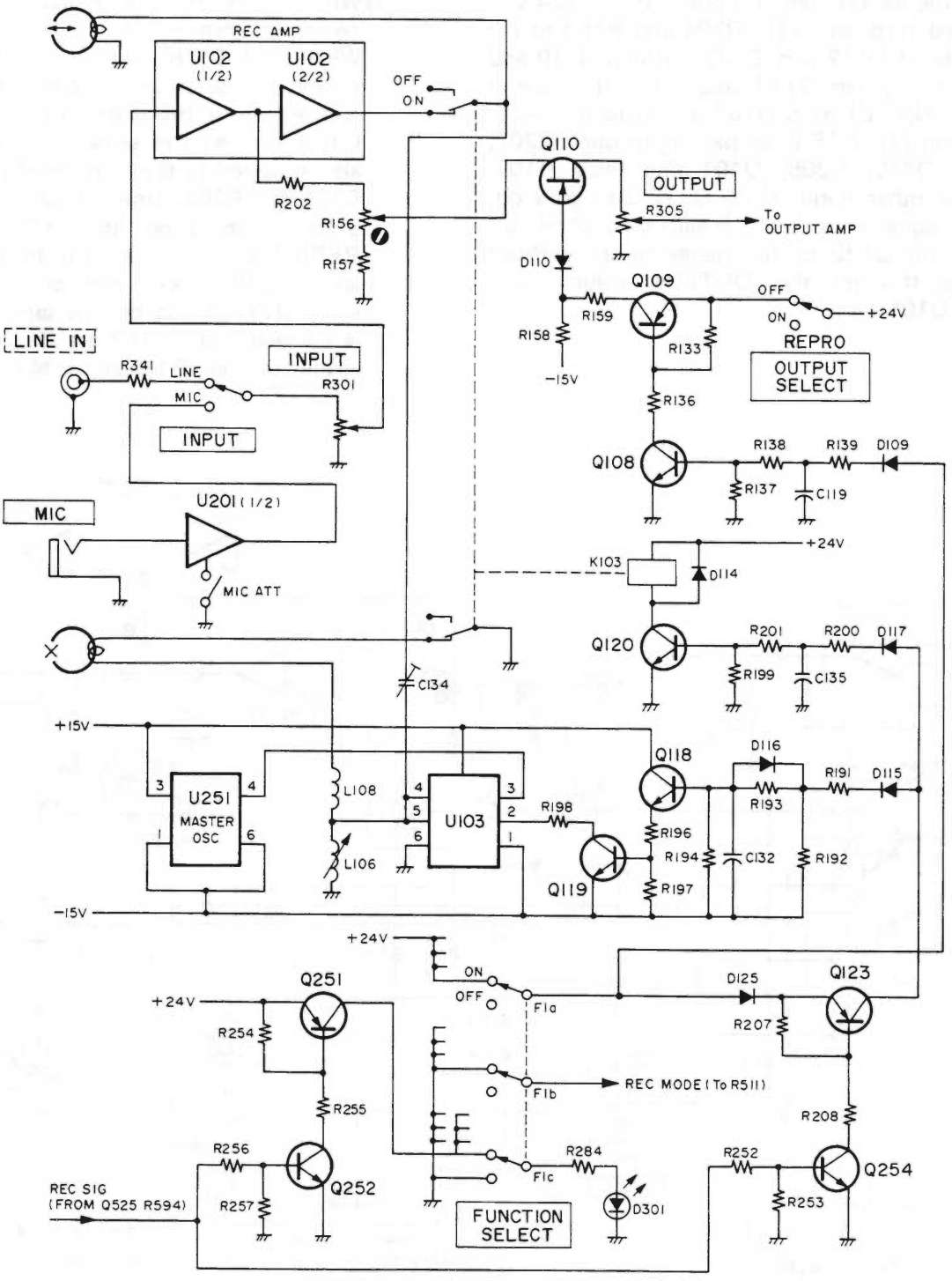


Fig. 1-18 Bias and Record Control Circuit

1-16-4. Monitor Circuit

See Fig. 1-19.

1. OUTPUT SELECT "INPUT"

When the INPUT switch is pressed on, a +24 V is supplied through D118, R204 and R159 to the cathode of D112 and D122, turning Q110 and Q122 on. When Q110 goes on, source signal (LINE IN/MIC) from U102 is sent to the OUTPUT and PHONES jacks passing through R202, R156, Q110, R305, U101 and relay K102. On the other hand, since Q122 also goes on, source signal from U102 is sent through R140, R203 and Q122 to the meter circuit without passing through the OUTPUT volume amplifier U101.

2. OUTPUT SELECT "SYNC"

1) When none of the FUNCTION SELECT switches is depressed:
When the SYNC switch is pressed on, a +24 V is supplied through R321, R135 and R132 to the cathode of D107, turning Q106 on. At the same time, the +24 V is also supplied to the cathode of D124 through D123 and R206, turning Q121 on.
Since Q106 is on, the SYNC signal from REPRO EQ AMP is sent to the OUTPUT and PHONES jacks, and, on the other hand, since Q121 is also on, the same SYNC signal is derived after K102 and fed to the meter circuit through R119 and R141.

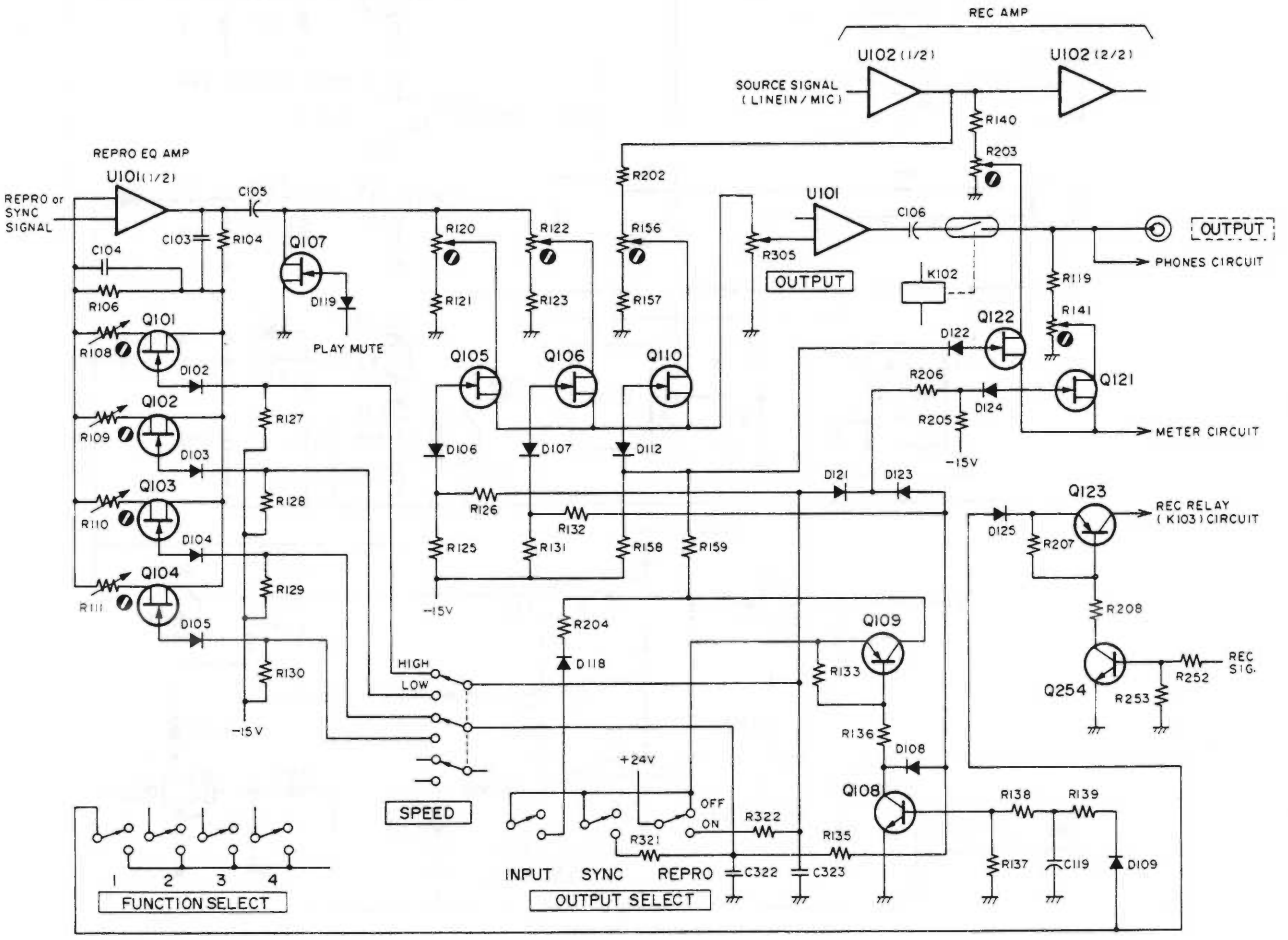


Fig. 1-19 Monitor Circuit

2) When any one or more FUNCTION SELECT switches is depressed:
When the FUNCTION SELECT switch(es) are pressed on, a +24 V is supplied to Q108 through D109, R139 and R138, turning Q108 on; and, therefore Q109 also turns on.
While Q108 is on, even if the SYNC switch is pressed, the switching supply is grounded out through R321, R135, D108 and Q108, inhibiting Q106 and Q121 from turning on.
On the other hand, since Q109 goes on and therefore a +24 V is supplied through the REPRO switch, Q109 and R159 to D112 and D122, Q110 and Q122 turn on as in the case when the OUTPUT SELECT "INPUT" switch is pressed on.

3. **OUTPUT SELECT "REPRO"**
When the REPRO switch is pressed on, a +24 V is supplied to D106 through R322 and R126, and to D124 through R322, D121 and R206, turning Q105 and Q121 on.
When Q105 turns on, the REPRO signal is sent to the OUTPUT and PHONES jacks, while the same signal is also sent to the meter circuit since Q121 is on.

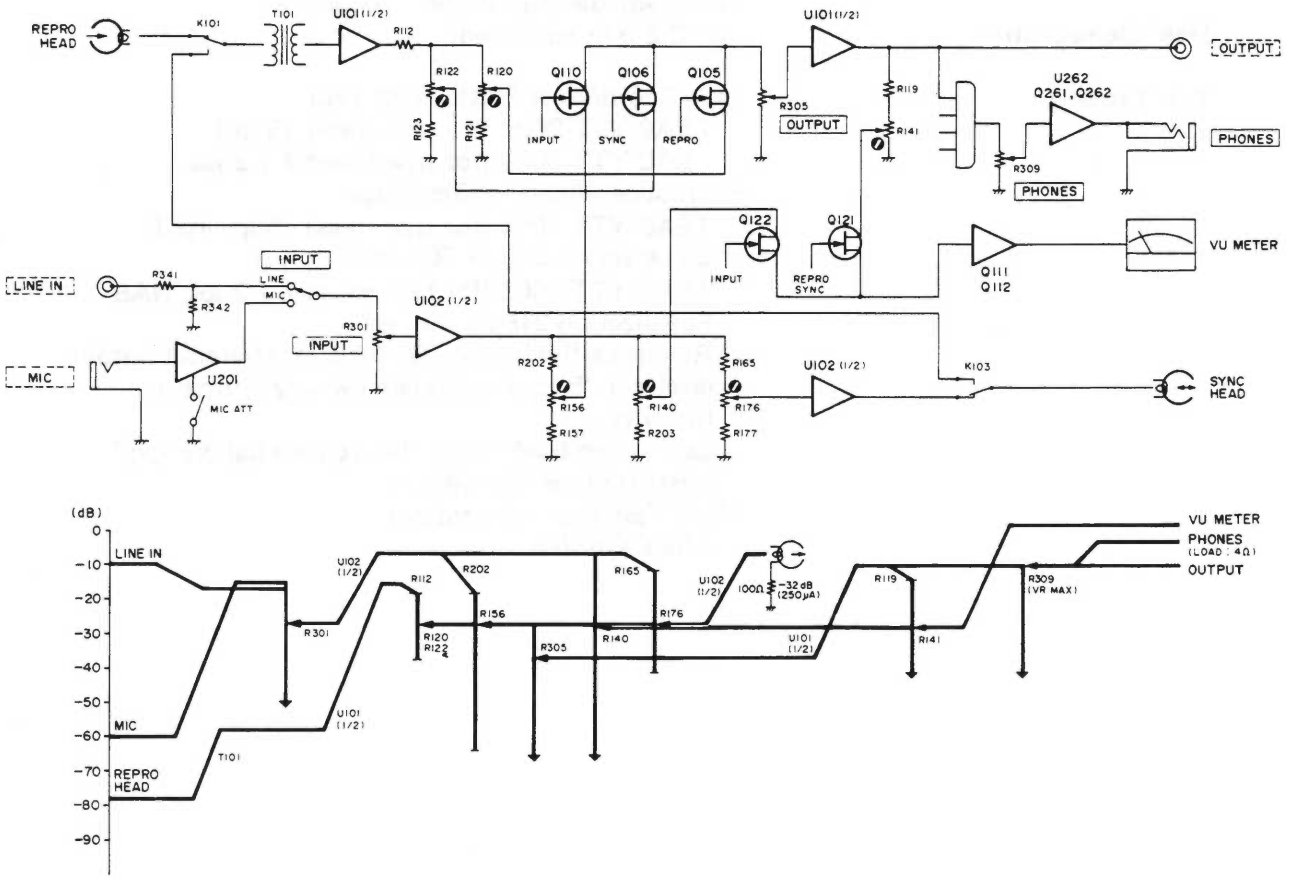


Fig. 1-20 Block and Level Diagram

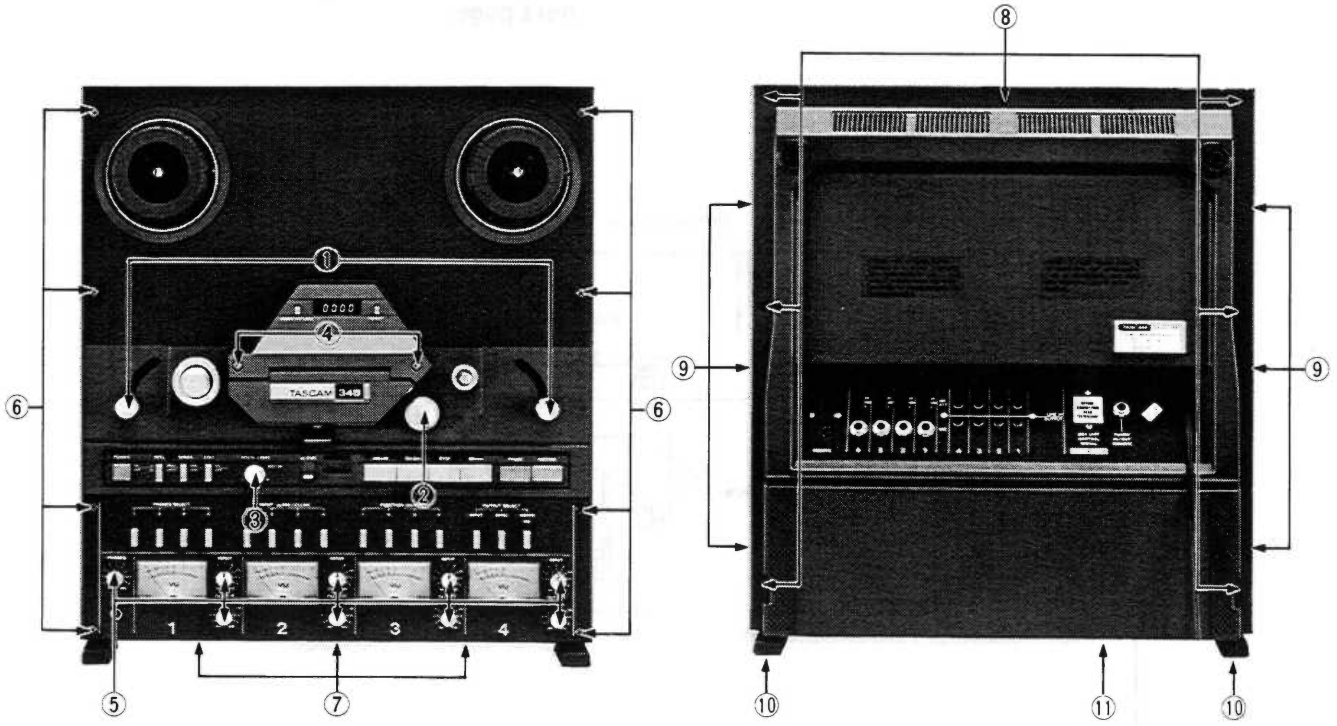
2. CHECKS AND ADJUSTMENTS

2-1. ESSENTIAL TEST EQUIPMENT REQUIRED

Wow & Flutter Meter	Meguro Denpa Sokki K.K., Model MK-668C (JAPAN), or Mincom Division, 3M Co., Model 8155 (U.S.A)
Audio Oscillator	Hewlett Packard, Model 204C or equivalent
Digital Frequency Counter	Range: 0Hz ~ 1 MHz; sensitivity; 0.1 Vrms; imp.: > 1 MΩ, < 25 pF
Band-Pass-Filter	TEAC M-206A or 1 kHz narrow band pass type
AF Level Meter	Range; -80 dB ~+40 dB; imp.: > 1 MΩ, < 25 pF (example—HP 400GL)
Distortion Meter	General purpose (400 Hz, 1 kHz)
Oscilloscope	General purpose
Attenuator	General purpose
Tools	Tape tension gauge: TENTELO Model T-2-H20-1 (preferred) or Tension analyzer Spring scale: 0 ~8 lbs (0 ~ 4 kg) 0 ~2.2 lbs (0 ~ 1 kg) Hex head Allen wrenches, Plastic alignment tool
Cleaning Fluid:	TEAC TZ-261 or equivalent TEAC Spindle Oil TZ-255 or equivalent
Head Demagnetizer	TEAC E-3 or equivalent
Test Tapes	Tape Speed/Wow-Flutter Test Tape TEAC YTT-2004 (for tape speed 15 ips) TEAC YTT-2003 (for tape speed 7-1/2 ips) Reproduce Alignment Test Tape TEAC YTT-1004 (for tape speed 15 ips, NAB Equalization 3180 + 50 μsec.) TEAC YTT-2003 (for tape speed 7-1/2 ips, NAB Equalization 3180 + 50 μsec.) Reference fluxivity is 185 nWb/m; reference output level is 3 dB lower compared with 250 nWb/m fluxivity. Calibration level under "Reproduce Calibration" refers 0 VU as 250 nWb/m. Blank Test Tape (Recording) AMPEX #456

2-2. REMOVING THE PANELS OF THE DECK

1. Dress Panels
   1) Remove the left and right tension arm tape guides ① by turning the tape guide caps counterclockwise.
   2) Turn the pinch roller cap ② counterclockwise to remove the pinch roller.
   3) Remove the pitch control knob ③ with a 1.5 mm hex-head wrench and loosen to remove the nut directly behind it.
   4) Remove the housing by loosening the two hex screws ④ with a 3 mm hex-head wrench.
   5) Remove the phones, input and output knobs ⑤ with a 1.5 mm hex-head wrench.
   6) Remove the eight hex screws ⑥ from both sides with a 2.5 mm hex-head wrench, and then remove the three screws ⑦ holding the dress panel. Remove the dress panel by pulling out in the direction of the bottom cover. To completely remove, disconnect the connector coupling the transport control assembly to the main assembly.
2. Rear Panel
   Remove the seven ⑧ holding screws from the rear panel.
3. Bonnet Panel
   1) After removing the rear panel, go on to removing the bonnet panel.
   2) Remove the six screws ⑨ (both sides) holding the bonnet panel.
4. Bottom Panel
   1) Remove the eight screws ⑩ from the feet attached to the bottom panel.
   2) Remove the screw ⑪ holding the bottom panel.



2-3. CAPSTAN THRUST CLEARANCE

1. There must be a clearance of 0.05 to 0.15 mm between the capstan shaft and the thrust plate. Check to see that the clearance is within this range. If not, loosen the two screws on the flywheel, adjust the clearance, and retighten the screws.

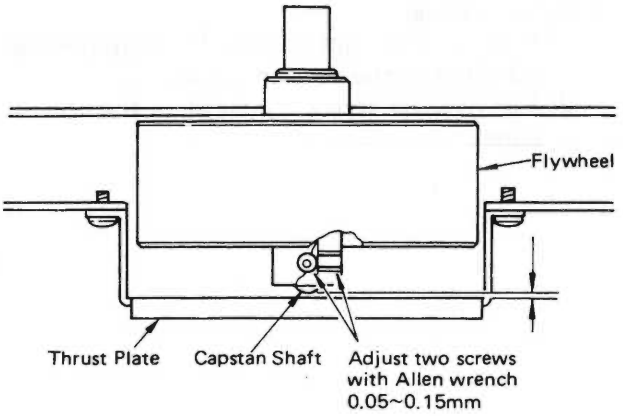


Fig. 2-1.

2-4. BRAKE MECHANISM

Note: Be sure that the power is turned off prior to making any adjustments to the brakes.

1. Screw (A) for the left brake (as viewed from the front) must be adjusted so that there is a clearance (a) of 1 mm between lever (C) and lever (E). Screw (A) for the right brake must then be adjusted so that lever (B) is parallel to lever (C). See Fig. 2-2.
2. When there is contact at (a), position the solenoid housing so that the gap at (f) (the distance between the plunger and solenoid washer) is 3 mm.

2-5. BRAKE TORQUE

Note: Before making any brake adjustments or measurements, make sure the power is off.

1. Mount an empty 7" reel onto either reel table and attach a spring scale to the reel with a string. See Fig. 2-3.
2. Smoothly pull the scale away from the reel under test and note the torque value when the reading on the scale is steady. The proper torque values are given in the chart on the next page.

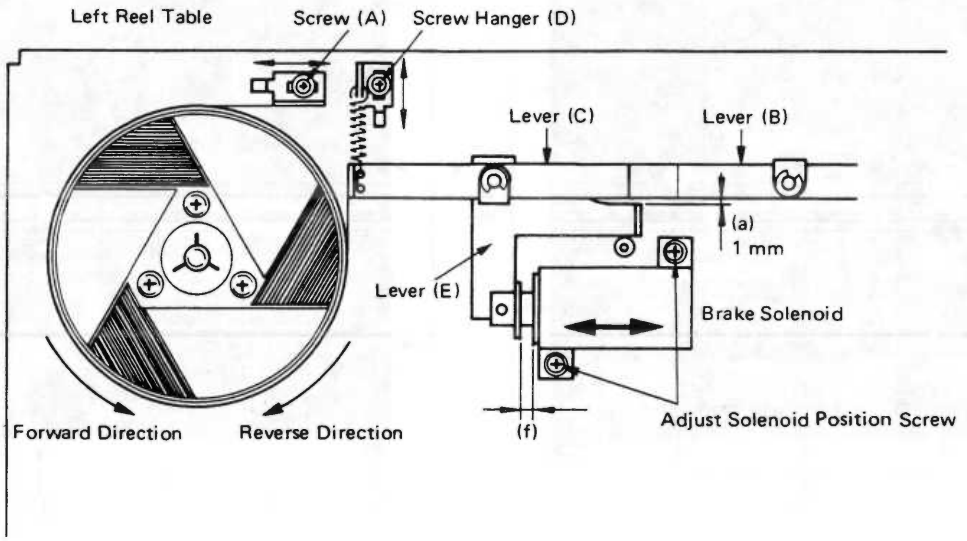


Fig. 2-2.

3. Follow steps 1 and 2 for each measuring condition; i.e., (A) through (D) in Fig. 2-3.
4. If the forward-direction torque is not correct, change the hooking position of the spring hanger (reference (D) in Fig. 2-2) for the corresponding brake requiring adjustment. If, after the forward-direction torque has been properly adjusted, the reverse-direction torque is not correct, or the forward-direction torque is still not correct, replace the brake felt pad with a new one after cleaning the inner side of the brake band with a cleaning alcohol, and also check that the brake mechanism is properly aligned as explained in Section 2-4, "Brake Mechanism". If necessary, replace the entire reel table.

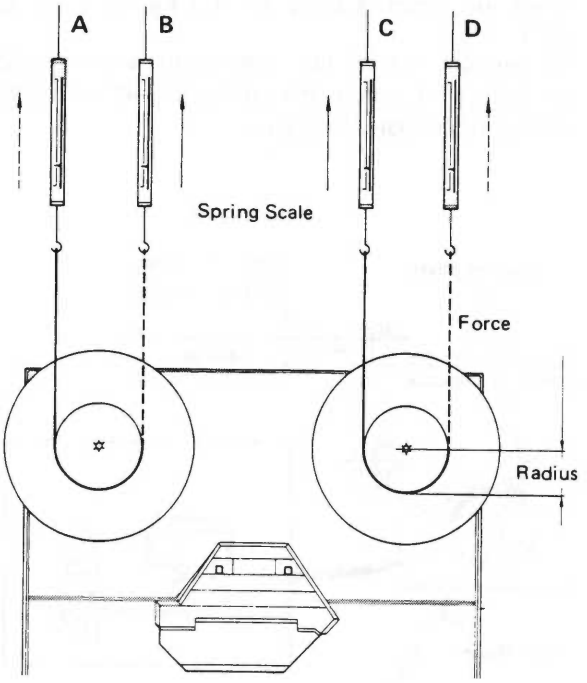


Fig. 2-3.

Forward direction (B) (C)	1700 – 2100 g-cm (23.6 – 29.2 oz-inch)
Reverse direction (A) (D)(Reference values)	650 – 800 g-cm (9.0 – 11.1 oz-inch)
Left/Right deviation	200 g-cm (2.78 oz-inch)

Torque calculating formulas:
1. Torque (in g-cm or oz-inch)
   = Force or Weight (in g or oz) x Radius (in cm or inch)
2. Conversion of g-cm to oz-inch:
   g-cm x 0.0139 = oz-inch

2-6. REEL MOTOR TORQUE

Note: *For torque calculation, refer to the said formulas.
*There is no specially-provided adjustment for take-up torque, so if correction is needed, repair or replace the defective part and/or circuit.

2-6-1 Take-up Torque

1. Hold the right tension arm up with a rubber band.
2. Mount an empty 7" reel onto the take-up (right) reel table, and attach a spring scale to the reel with a string.
3. Place the deck in the reproduce mode.
4. Allow the rotation of the reel to slowly pull the scale toward the reel.
5. Hold the spring scale with enough force to allow steady reading. See Fig. 2-4.
6. The calculated value should be approx:

REEL SW	TAKE-UP TENSION
LARGE	550 to 650 g-cm (7.64 to 9.03 oz-in)
SMALL	300 to 400 g-cm (4.17 to 5.55 oz-in)

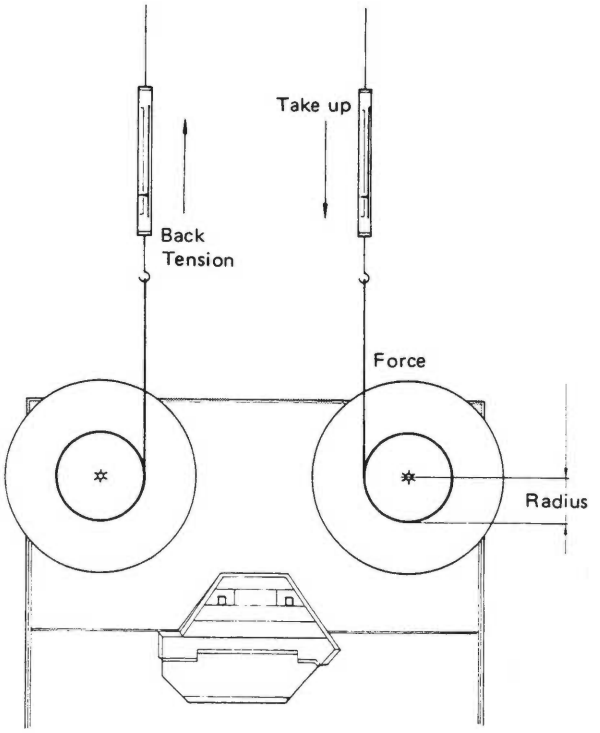


Fig. 2-4.

2-6-2 Back Tension

1. Hold the right tension arm up with a rubber band.
2. Mount an empty 7" reel onto the supply (left) reel table, and attach a spring scale to the reel with a string.
3. Place the deck in the reproduce mode.
4. Using a steady, smooth motion, pull against the motor torque to draw the scale away from the reel.
5. After making sure that the reel motion is smooth (the string should not be rubbing against the reel flanges), note the value indicated on the scale. See Fig. 2-4.
6. The calculated value should be approx:

REEL SW	BACK TENSION
LARGE	350 to 400 g-cm (4.86 to 5.55 oz-in)
SMALL	200 to 250 g-cm (2.78 to 3.47 oz-in)

2-7. PINCH ROLLER PRESSURE

Note: Pinch roller pressure is supplied by the pinch roller spring arm and it is most important that the solenoid plunger be fully bottomed before taking pressure measurement.

1. Hold the right tension arm up with a rubber band, string, etc.
2. Place the deck in the reproduce mode without threading the tape.
3. Attach a spring scale to the pinch roller as shown in Fig. 2-5.
4. Pull the pinch roller away from the capstan shaft (on a plane intersecting the center of the capstan shaft and the pinch roller) until the capstan shaft and the pinch roller are separated.
5. Ease pressure on the scale until the pinch roller just begins to turn. The scale should then be read 1.5 kg to 1.7 kg (3.3 lbs to 3.74 lbs).
   If you get a reading other than what should be indicated, make the necessary adjustments through the adjust screws.

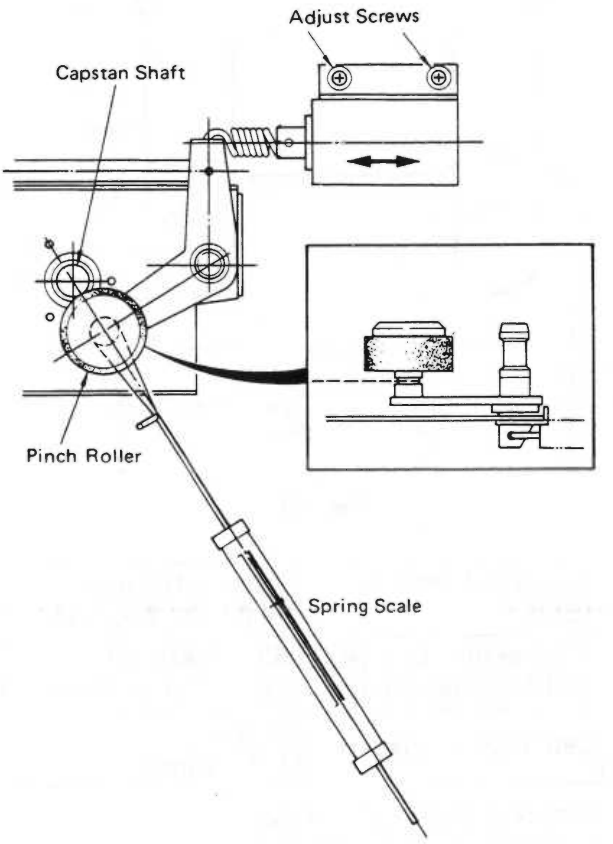


Fig. 2-5.

2-8. REEL TABLE HEIGHT ADJUSTMENT

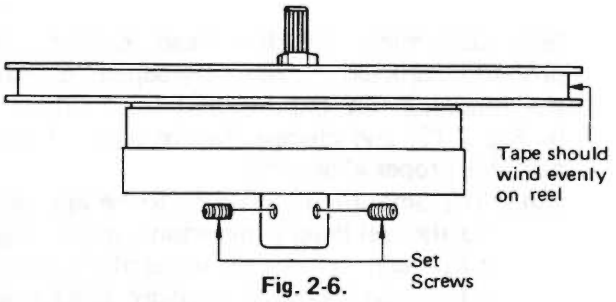


Fig. 2-6.

Reel height adjustment is required only if a motor has been replaced or if tape rubs excessively against the reel flanges.

Adjustment is accomplished by loosening the reel set screws and moving the reel table on the motor shaft as shown in Fig. 2-6.

Remove the bonnet panel on the left or right of the unit for access to the set screws (2) in the reel motor shaft. Reel table should be adjusted using standard NAB 7" reels. With a tape loaded on the machine, position the reel table height for smooth tape travel. Be sure to tighten the set screws after each adjustment is made.

2-9. TAPE SPEED

Tape speed is measured by using flutter test tape, which contain a highly accurate, continuous 3 kHz tone.

Test Tape: TEAC YTT-2004 (for tape speed 15 ips)
TEAC YTT-2003 (for tape speed 7-1/2 ips)

1. Connect a digital frequency counter to either OUTPUT.
2. The indicated frequency should be 3 kHz, ±0.8 % for all speeds.
3. Play the middle of the test tape at high speed 15 ips (38 cm/sec) and adjust the HIGH speed trimmer resistor until the frequency counter indicates a reading of 3000 Hz. Use the LOW speed trimmer resistor for low speed adjustment 7-1/2 ips (19 cm/sec). See Fig. 2-7. (CAUTION: Use an insulated screwdriver to prevent shorting.)
4. Playing the tape at both the beginning and the end, check that the tape speed does not vary any more than the limits prescribed in the specifications, so that there is never a total deviation of more than ±0.8 Hz from the 3000 Hz test tone.
5. If tape speed is greatly offset from the specification, check pinch roller pressure and takeup tension for correct values, and see that the tape path is clean.

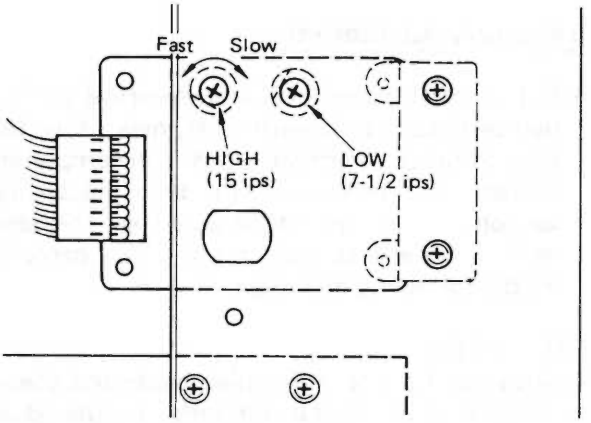


Fig. 2-7.

2-10. WOW AND FLUTTER CHECK (Reproduce Method)

1. Connect a Wow-and-Flutter Meter to the deck as shown in Fig. 2-8.
   These meters will measure the ANSI peak value or the NAB rms value depending on the switch selection on the meter.
2. Playback the appropriate wow-and-flutter test tape.
3. If the peak or rms weighted value is to be read, set the Wow-and-Flutter Meter for the "Weighted" readings and also make sure that the meter is properly calibrated.
4. As the measured results may vary with respect to the location on the tape at which the measurement is taken, at least two locations – at the beginning and near the end of the tape – should be checked. There may also be slight differences in absolute values measured according to the brand of the meter being used.

Values should be as shown:

Tape speed	DIN/IEC/ANSI (peak value)		NAB (rms value)	
	Weighted	Unweighted	Weighted	Unweighted
HIGH	±0.06 %	±0.09 %	0.05 %	0.07 %
LOW	±0.09 %	±0.12 %	0.07 %	0.09 %

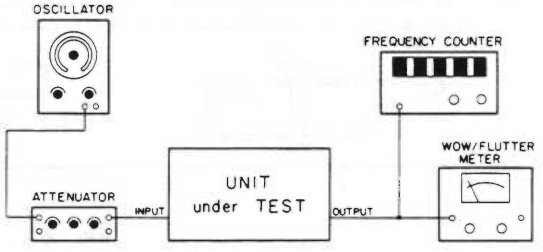


Fig. 2-8.

2-11. RECORD/REPRODUCE AMPLIFIER CHECKS AND ADJUSTMENTS

Preliminary Adjustments

A. Before proceeding with any electrical performance checks or adjustments, make sure the tape transport mechanism has been completely aligned as mentioned in the preceeding section, or at least make sure that the tape path and head contact are aligned correctly by the following methods:

TAPE PATH

1. Advance the tape in the play mode and check to see that the tape is not curled on the edges of the tape guide poles which are located on either side of the head assembly.
2. If curling at the left tape guide is evident, adjust the height of the guide by inserting a shim of appropriate thickness (ϕ5 x ϕ8 x 0.5t or 0.25t) into "a" of the left tension arm. The same procedures should be followed for the right tension arm height adjustment. See Fig. 2-9.

HEAD CONTACT

1. Load a prerecorded tape with a constant level tone and reproduce at high speed 15 ips (38 cm/sec).
2. While observing the VU meter, temporarily increase back tension to the left reel by lightly applying pressure by hand. If sufficient contact pressure is applied to the head while the tape is running, no change will be noticed on the meter when back tension is increased. However, if insufficient pressure is applied to the head, the deflection needle will show increased deflection due to contact pressure caused by the back tension. This method will help determine whether head contact is properly adjusted or not. To adjust, loosen the retaining nut (A) for that head (Shown in Fig. 2-12) and change the direction of the head for proper alignment.

Note: The amount of pressure to be applied to the reel is very important; too strong of pressure lowers the speed of the tape, while too light of pressure does not ensure contact. However, by practicing a few times, you will be able to judge approximate pressure to be applied.

HEAD AZIMUTH ADJUSTMENT

1. Connect the OUTPUT jack for channel 1 of the deck to the vertical input terminals of an oscilloscope.
2. Connect the OUTPUT jack for channel 4 of the deck to the horizontal input terminals for the oscilloscope.
3. Connect an AF level meter and a 50k ohm load to the OUTPUT jack(s) as shown in Fig. 2-10.

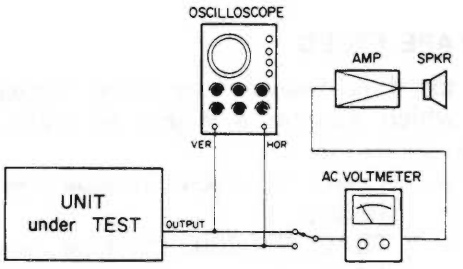


Fig. 2-10. Head Azimuth Test Set-Up

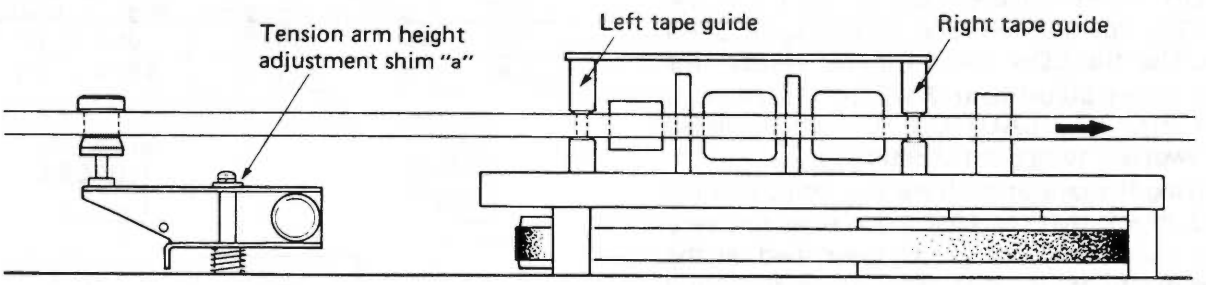


Fig. 2-9. Tape Path Adjustment

4. Switch OUTPUT SELECT to REPRO.
5. Load the reproduce alignment test tape to reproduce at high speed 7-1/2 ips (19 cm/sec). Then, a scope display reading showing phase relations between both channels will be obtained as shown in Fig. 2-11.
6. Adjust the REPRO head azimuth screw until the scope display shows less than 90 degree at 10 kHz out of phase with the AF level meter showing approximately maximum value for both channels.
7. Switch OUTPUT SELECT to SYNC, and adjust the RECORD SYNC head azimuth screw the same way.

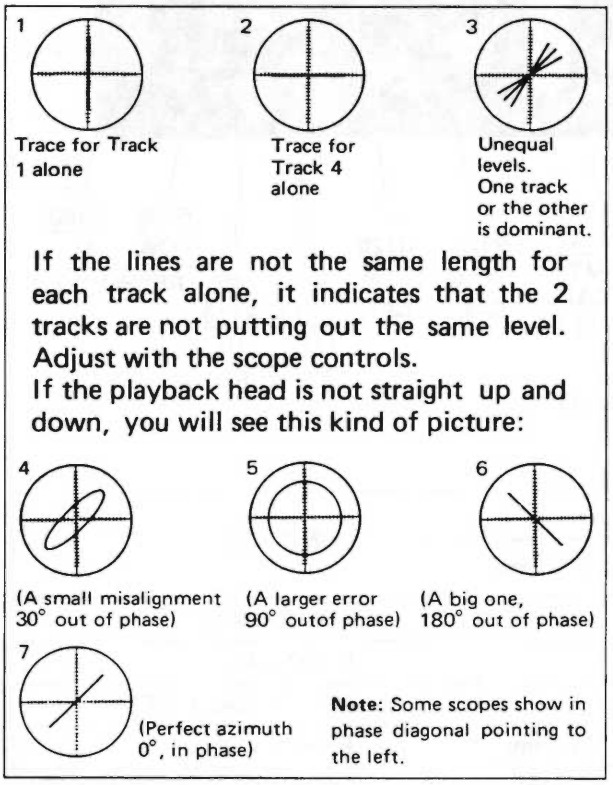
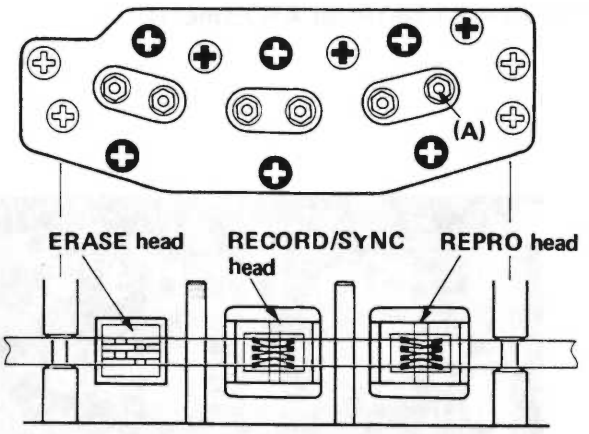


Fig. 2-11 Phase Shift



⊕ AZIMUTH ADJ. SCREWS
⊕ HEIGHT AND TILT ADJ. SCREWS
◎ TANGENCY ADJ. NUTS (A)

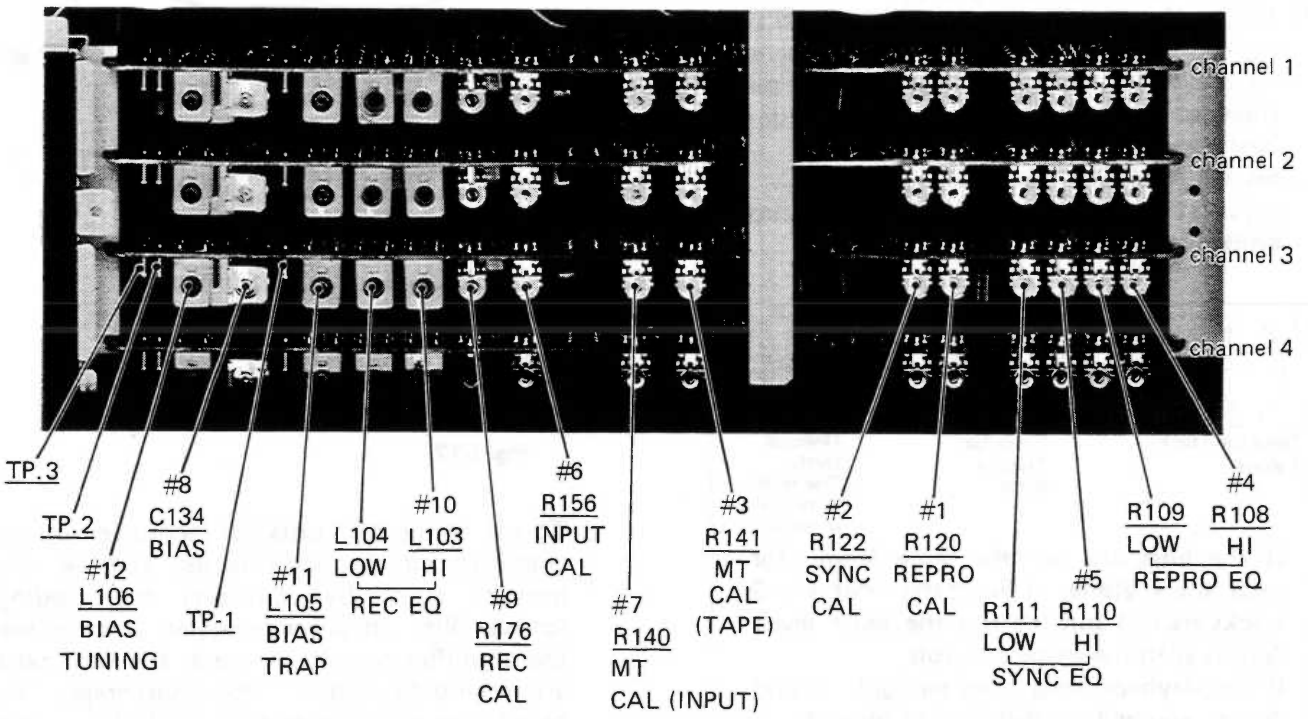
Fig. 2-12

B. To get at the trim pots for record/reproduce amplifier circuit adjustments, remove the bottom cover by removing the holding screws. With the cover removed, you will see the amplifier boards to which the trim pots are mounted as shown in the photograph. The boards are identical and are exclusively used for their respective channels. See page 63.
Record/reproduce amplifier checks and adjustments are given for only one of the channels but they should be applied for all other channels as well.
Before beginning any adjustments, thoroughly demagnetize and clean the heads, tape guide, etc.

C. Line Output Load Impedance of the Deck: This deck has been preadjusted and set for a 50k ohm load, when switched from this adjustment, for example, to a 10k ohm load, the output level results in a 0.5 dB reduction. When connecting less than a 50k ohm load, readjust the deck to match the applied load.

D. Be sure the power is turned off before you attempt to remove or replace the record/reproduce amplifier PCB.

Location of Electrical Adjustments:



TRIM POT NUMBER	REFERENCE NUMBER				FUNCTION
	Tape Speed 15 ips		Tape Speed 7-1/2 ips		
#1	R120	2k ohms	–		REPRO CAL
2	R122	2k ohms	–		SYNC CAL
3	R141	50k ohms	–		METER CAL (TAPE)
4	R108	10k ohms	R109	10k ohms	REPRO EQ
5	R110	20k ohms	R111	20k ohms	SYNC EQ
6	R156	2k ohms	–		INPUT LEVEL
7	R140	100k ohms	–		METER CAL (INPUT)
8	C134	100p Max.	–		BIAS LEVEL
9	R176	20k ohms	–		REC LEVEL
10	L103	1.4 mH	L104	2.4 mH	REC EQ
11	L105	3 mH	–		RECORD BIAS TRAP
12	L106	1.3 mH			BIAS TUNING

2-11-1 Input Level Calibration

1. Connect the test equipment as shown in Fig. 2-13.
2. Apply a 400 Hz, -10 dB (0.3 V) test signal to the INPUT jack on rear panel and switch OUTPUT SELECT to INPUT, and INPUT SELECT to LINE.
3. Set the INPUT and OUTPUT controls to "CAL" position.
4. Make sure the AF level meter reads -10 dB (0.3 V) output. If it doesn't, adjust the R156 trim pot until the -10 dB indication on the level meter is obtained.

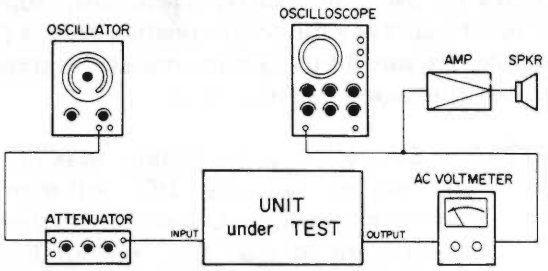


Fig. 2-13. Input Level Calibration

2-11-2 Meter Calibration (Input)

1. The meter is designed to indicate 0 VU when the reproduce amplifier produces -10 dB output into a 50k ohm load.
2. Therefore, make sure that the meter indicates 0 VU after completion of the above 2-11-1 (2-4) or after setting the input level to read -10 dB output. If the meter does not indicate 0 VU, adjust R140 to obtain the 0 VU indication.

2-11-3 MIC IN Level Check

1. Switch INPUT SELECT to MIC.
2. Apply a 400 Hz, -60 dB (1 mV) signal to the MIC IN jack on the rear panel.
3. Confirm that the level meter indicate -11 dB to -5 dB.
4. Switch MIC ATT to 20 position. The level meter should indicate -31 dB to -25 dB.

2-11-4 PHONES Level Check

1. Connect an oscilloscope across a 4-ohm load resistor to the PHONES jack and set the PHONES control to max. and the INPUT SELECT switch to LINE.
2. Adjust the input signal and measure the PHONES output level just before the waveform begins to clip. Max. output level: More than -4 dB (100 mW)

2-11-5 Reproduce Level Calibration

1. Connect the AF level meter, (oscilloscope), and a 50k ohm load to the OUTPUT jack on the rear panel.
2. Switch OUTPUT SELECT to REPRO and set the OUTPUT controls to "CAL" position.
3. Load the reproduce alignment test tape (Reference Fluxivity: 250 nWb/m) for low speed 7-1/2 ips (19 cm/sec.) and reproduce at low speed. Observe the AF level meter, it should indiate -10 dB, if not, adjust the R120 trim pot to obtain the -10 dB output indication.
4. Switch OUTPUT SELECT to SYNC and reproduce the same tape. Check the AF level meter, it should read -10 dB. If not adjust the R122 trim pot.

2-11-6 Meter Calibration (Tape)

1. The meter is designed to indicate 0 VU when the reproduce amplifier produces -10 dB output into a 50k ohm load.
2. Therefore, make sure that the meter indicates 0 VU after completion of the above 2-11-3 (2-4) or after setting the input level to read -10 dB output. If the meter does not indicate 0 VU, adjust R141 to obtain the 0 VU indication.

2-11-7 Reproduce Frequency Response

1. Connect the AF level meter, (oscilloscope), and a 50k ohm load to the OUTPUT jack.
2. Load the reproduce alignment test tape on to the tape deck.
3. Switch the OUTPUT SELECT to REPRO.
4. Reproduce the test tape and take a reading of the output levels at the specified frequencies shown in Fig. 2-14. They should be within the limit shown below. If not, adjust the REPRO EQ R108 for high speed and R109 for low speed.
   Test Tape: YTT-1004 (High Speed 15 ips, 38 cm/sec.)
   YTT-1003 (Low Speed 7-1/2 ips, 19 cm/sec.)

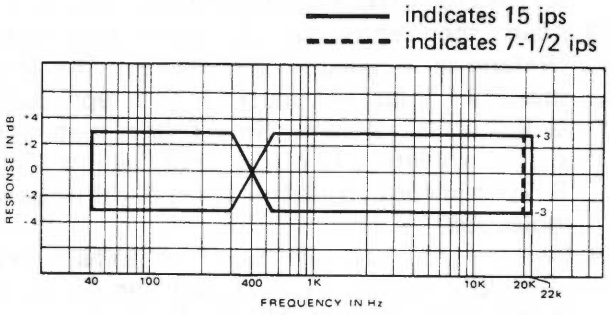


Fig. 2-14. Reproduce Frequency Response

5. Switch OUTPUT SELECT to SYNC.
6. Reproduce the same tape and also read the output levels the same way to learn whether the frequency response is within the above specified limit. If the frequency response is not within the specified limit, adjust the R110 for high speed and R111 for low speed.
7. If the specifed frequency response cannot be obtained with the trim pot(s) adjusted;
   * Check and compare the measurements of the other channels. If they stand up to spec, correct or replace the off spec channel record/reproduce amplifier PCB.
   * If all channels are off spec, check power line, incorrect head adjustment, or whether heads should be cleaned.
   * Demagnetize the heads.
   * Finally, if all else fails, replace the heads.

2-11-8 Bias Tuning and Bias Trap Adjustments

These adjustments have been made at the factory and realignment will not be necessary except for the following circumstances:

* When the SYNC head, ERASE head and/or Bias amplifier is replaced.
* When the MASTER BIAS unit is replaced.

Use the following procedures to adjust.

A. BIAS TUNING

1. Place all channel FUNCTION switches to ON and set the tape deck into the REC PAUSE mode.
2. Connect a DC volt-meter between TP(2) and TP(3) by using an insulate screwdriver, adjust L106 to obtain a minimum reading on the DC meter. Be sure to use a non-conductive screwdriver (i.e. wood, plastic, etc.).

CAUTION: Do not try to obtain maximum reading on the DC volt-meter, which would occasion an extreme amount of Bias Amp output load.

B. BIAS TRAP

1. Connect an "AC" level meter between TP(1) and ground.
2. Place all the FUNCTION switches to ON and set the deck into the REC PAUSE mode.
3. Adjust L105 to obtain a minimum reading on the level meter.

2-11-9 Recording Bias Adjustment

This adjustment is made while you are recording a tone on the type of tape you'll be using for the session. It will be different for each brand of tape. Before proceeding with this adjustment, make sure that the tape path and head contact have been adjusted correctly as mentioned earlier and that no tape curling is noticed.

1. Connect an AF oscillator, oscilloscope, AF level meter (adjusted to 1 V range) and a 50k ohm load to the tape deck as shown in Fig. 2-13.
2. Adjust the AF oscillator to apply a 7 kHz, -20 dB (0.1 V) signal to the INPUT jack on rear panel.
3. Switch OUTPUT SELECT to REPRO and set all FUNCTION switches to ON.
4. Begin recording. Now adjustments can be made while recording a 7 kHz tone.
5. Begin adjustment by turning the trimmer (C134) completely counterclockwise. Next, loosen and turn the trimmer clockwise and the AF level meter will rise to give peak reading. Slowly continue the clockwise rotation until the reading on the level meter drops 4 — 5 dB.

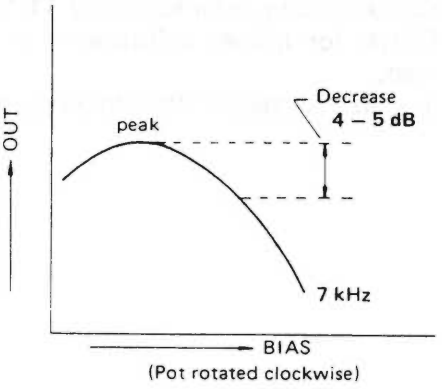


Fig. 2-15. Bias Level Adjustment

2-11-10 Recording Level Adjustment

Recording level adjustments should be done only after the reproduce level and recording bias have been properly set as specified above.

1. Connect the AF oscillator, oscilloscope, AF level meter, and a 50k ohm load to the tape deck as shown in Fig. 2-13.
2. Apply a 400 Hz, -10 dB (0.3 V) signal to the INPUT Jack.
3. Switch OUTPUT SELECT to REPRO and record the 400 Hz input signal at high speed on the specified recording test tape.
4. Check the AF level meter, it should indicate -10 dB (0.3 V). If not, adjust the R176 trim pot to obtain the -10 dB indication. At this time, make sure that the VU meter mounted on the front panel indicates 0 VU.
5. Switch OUTPUT SELECT to SYNC and record the 400 Hz input signal for a brief period of time. Then rewind the tape just recorded and reproduce it. Make sure that both the AF level meter and the VU meter indicate -10 dB and 0 VU, respectively.
6. If it's impossible to obtain a VU meter reading of 0 VU in steps 4 and 5 above, check to see whether the reproduce meter is set properly as described under 2-11-4. "Meter Calibration".

2-11-11 Frequency Response (OVERALL)

After completion of the Recording Level Check and Adjustment, proceed to the Overall Frequency Response Check.

1. Connect the test equipment to the tape deck as shown in Fig. 2-13 and load a blank test tape onto the tape deck.
2. Apply a -10 dB test signal to the INPUT jack on the rear panel.
3. Switch OUTPUT SELECT to REPRO, record and reproduce an input signal of 400 Hz, -10 dB (0.3 V) at 15 ips (38 cm/sec.), then change the frequency and check that the output is still within specification.

   If not, adjust REC EQ coils L103 using a frequency higher than 22 kHz.

4. For a tape speed of 7-1/2 ips (19 cm/sec.), record and reproduce an input signal of 400 Hz, -20 dB (0.1 V), then change the frequency and check that the output is still within specification.
   If not, adjust REC EQ coils L104 using a frequency higher than 20 kHz.
   Blank test tape: AMPEX #456
5. Switch OUTPUT SELECT to SYNC and record the test signals the same as above. When the recording is finished, rewind the tape just recorded and reproduce it. Measure the reproduced output levels at the proper test frequencies, and make sure that the frequency response is within the specified limit shown.
6. If the specifed frequency response cannot be obtained with the trim pot(s) adjust, readjust the Bias Level Setting within its specified range by refering to 2-11-9 "Recording Bias Adjustment". If the bias level is readjusted, the recording level adjustment will be upset, so repeat the recording level adjustment again as described in 2-11-10 "Recording Level Adjustment".

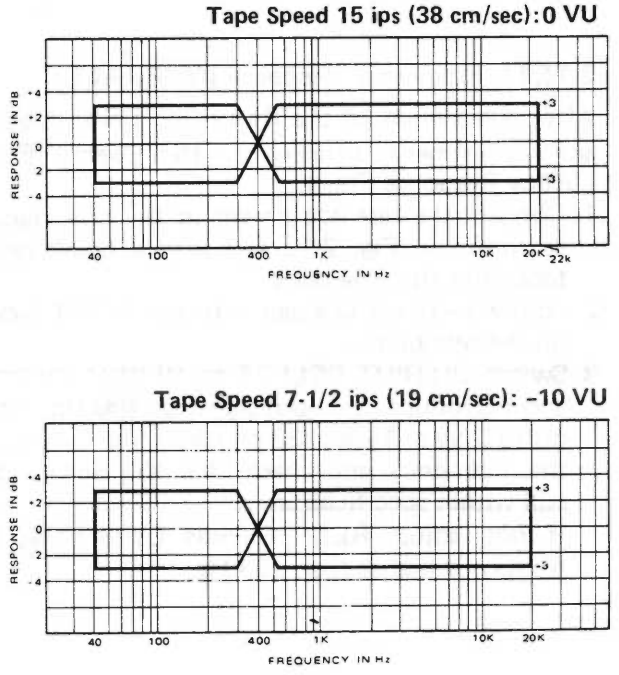


Fig. 2-16 Overall Frequency Response

2-11-12 Signal-to-Noise Ratio (OVERALL)

Prior to measurement, demagnetize all heads and tape guides.

1. Connect test equipment as shown in Fig. 2-13.
2. Apply a 400 Hz -10 dB (0.3 V = 0 VU) input signal to the INPUT jack on the rear panel.
3. Switch OUTPUT SELECT to REPRO and record a short length of the input signal at high speed, or low speed, then, while still in the recording mode, unplug the AF oscillator connected to the INPUT jack, and make another length of no-signal recording.
4. Rewind the recording made in step 3 (above) to the beginning and reproduce.
5. While making sure the reproduce output of the previously recorded 400 Hz 0 VU signal is -10 dB, raise the sensitivity of the AF level meter and measure the level of the no-signal portion of the tape.
6. With -10 dB (0 VU) as the reference level, the SN (signal-to-noise) ratio, as measured by the AF level meter, should be better than 50 dB at high speed or low speed.
7. If it is off spec,
   * Check and compare the measurement of the other channels. If they stand up to spec, correct or replace the off spec channel record/reproduce amplifier PCB.
   * Demagnetize the heads.
   * Check erasure, refer to item 2-11-13.
   * Check for proper adjustment of the bias trap.
   * Try another tape of the same type number.

2-11-13 Erase Ratio

1. Connect test equipment to the tape deck as shown in Fig. 2-17.
2. Use a 1 kHz bandpass filter to check the erasing ratio.
3. Switch OUTPUT SELECT to REPRO and record at high speed a short length of the 1 kHz, 0 dB (1 V) signal and unplug the AF oscillator connected to the INPUT jack on rear panel.
4. Rewind the tape to the beginning of the recorded section.
5. Record a no-signal portion over the recording of the 1 kHz signal.
6. Measure the difference between the 1 kHz signal level and the no-signal portion. The difference should be at least 65 dB.
7. If the level difference is below this specification, check erase head output voltage for 60 – 70 V using an AC volt-meter.

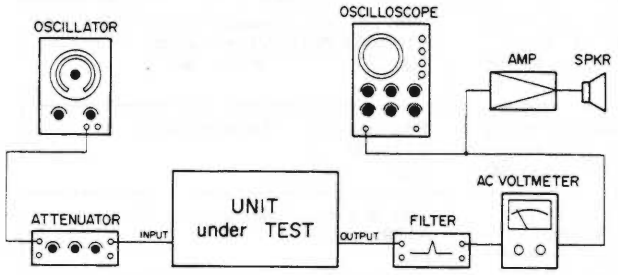


Fig. 2-17. Erase Ratio Test Set-Up

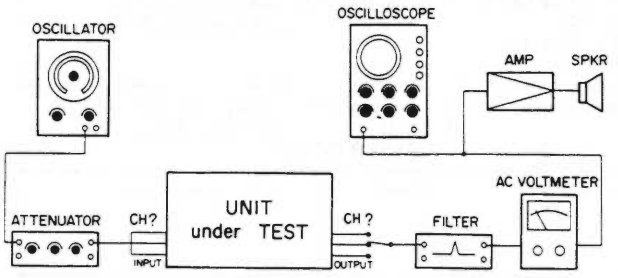


Fig. 2-18. Crosstalk Measurement Set-Up

2-11-14 Adjacent Channel Crosstalk

1. Connect test equipment as shown in Fig. 2-18.
2. While performing "no signal" recordings on one of the channels, apply a 1 kHz -10 dB (0.3 V) test signal to the adjacent channel.
3. Rewind the tape to the beginning of the recording.
4. Reproduce the tape with SYNC (OUTPUT SELECT) button depressed, after which, measure the output of the "no signal" recorded channel.
5. Measure the output of the adjacent channel. The difference should be 50 dB or greater.

2-11-12 Distortion

1. Connect test equipment as shown in Fig. 2-19.
2. Switch OUTPUT SELECT to REPRO.

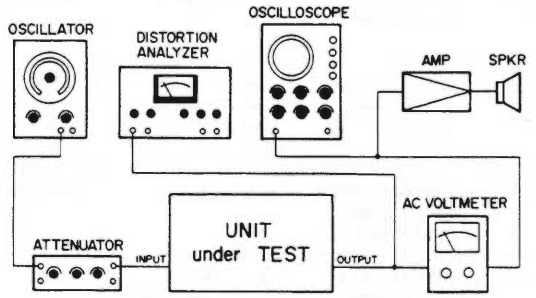


Fig. 2-19. Distortion Measurement Set-Up

3. Apply a 1 kHz, -10 dB (0.3 V) test signal to the INPUT jack and reproduce at high speed. Measure distortion of the reproduced output with a distortion analizer connected to the OUTPUT jack.
4. Stop the recording and switch OUTPUT SELECT to SYNC.
5. Rewind the tape to its beginning and reproduce. Measure the distortion of the sections, which were recorded with the input signal levels of -10 dB.
6. The distortion measured should be less than 0.8 %.
7. If the distortion is off spec;
   * Check and compare the measurements of the other channels. If they are off spec, correct or replace the off spec channel record/reproduce amplifier PCB.
   * Check bias level setting and readjust if necessary.
   * Demagnetize the heads.
   * Replace the heads.

SERVICE CHART

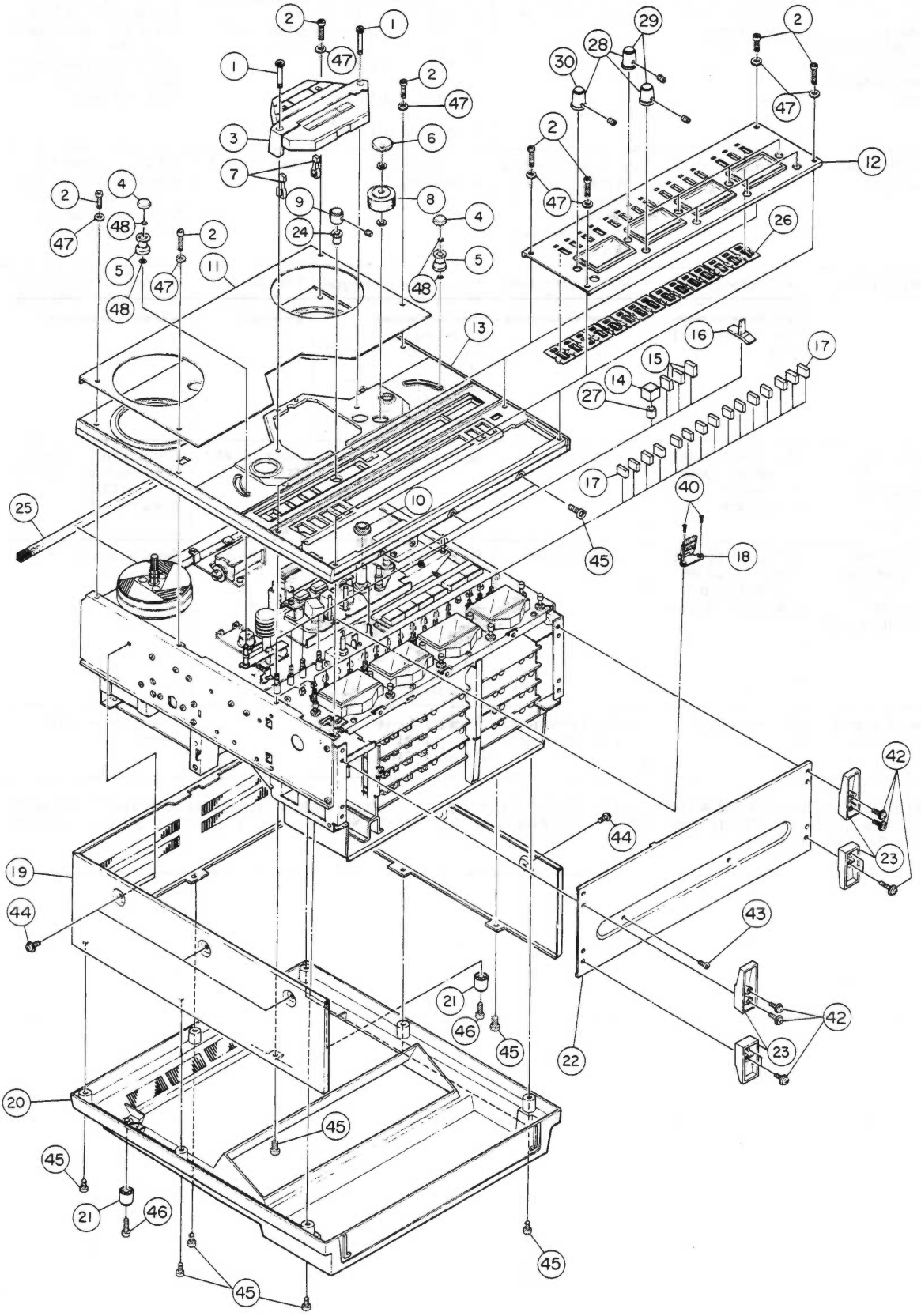
AD-JUST STEP	WHAT IS IT CALLED	SIGNAL SOURCE AND AMOUNT	WHAT TEST GEAR TO USE	WHAT IS THE RE-CORDER DOING?	POINT TO ADJUST	WHAT READING TO ADJUST FOR
1	Reproduce Head Alignment	TEAC YTT-1003 Playback Align-ment Test Tape (7-1/2 ips)	VTVM and Oscil-loscope with verti-cal and horizontal inputs connected to OUTPUT tracks 1 and 4.	Playback at 7-1/2 ips speed. OUTPUT SELECT at REPRO.	Repro head #3 azimuth adjust-ing screw.	Adjust for maximum output and for output of tracks 1 and 4 less than 90° out of phase. (at 10 kHz)
2	Record/Sync Head Alignment	Same as above	Same as above	Playback at 7-1/2 ips speed. OUTPUT SELECT at SYNC	Record/sync head #2 azimuth adjusting screw	Same as above (at 10 kHz)
3*	Reproduce Level (head #3)	TEAC YTT-1003 Playback Align-ment Test Tape (7-1/2 ips) Play 400 Hz	VTVM connected to OUTPUT jack	Playback at 7-1/2 ips speed. OUTPUT SELECT at REPRO OUTPUT cont. to "CAL"	Trim pot #1 R120 (REPRO CAL)	-13 dB (0.22 V) on VTVM
4*	Sync Reproduce Level (head #2)	TEAC YTT-1003 Playback Align-ment Test Tape. Play 400 Hz re-ference level signal	Same as above	Playback tape at 7-1/2 ips. OUTPUT SELECT at SYNC	Trim pot #2 R122 (SYNC CAL)	-13 dB (0.22 V) on VTVM
5*	Meter Adjust-ment (Tape)	Same as above	VU Meter	Same as above	Trim pot #3 R141 (METER CAL)	Adjust to read -3 VU on VU meters
6*	REPRO EQ at 15 ips speed (head #3)	TEAC YTT-1004 Playback Align-ment Test tape (15 ips) Play 20 kHz	VTVM connected to OUTPUT ter-minal or VU Meters	Playback at 15 ips speed. OUTPUT SELECT at REPRO	Trim pot #4 R108 (REPRO EQ)	Adjust to read -13 VU on VU meters or -23 dB on VTVM
7*	Sync Reproduce EQ at 15 ips speed (head #2)	Same as above	Same as above	Playback at 15 ips speed. OUTPUT SELECT at SYNC	Trim pot #5 R110 (SYNC EQ)	Same as above
8*	REPRO EQ at 7-1/2 ips speed (head #3)	Test Tape Play 16 kHz signal on the tape.	Same as above	Playback at 7-1/2 ips. OUTPUT SELECT at REPRO	Trim pot #4 R109 (REPRO EQ)	Same as above
9*	Sync Reproduce EQ at 7-1/2 ips speed (head #2)	Same as above	Same as above	Playback at 7-1/2 ips. OUTPUT SELECT at SYNC	Trim pot #5 R111 (SYNC EQ)	Same as above
10*	LINE INPUT Level	400 Hz signal at -10 dB from oscili-lator connected to INPUT jack	Same as above	Stop mode. OUTPUT SELECT at INPUT. INPUT cont. to "CAL"	Trim pot #6 R156 (INPUT LEVEL)	Adjust to read 0 VU on VU meters or -10 dB on VTVM
11*	Meter Adjust-ment (Input)	Same as above	Same as above	Same as above	Trim pot #7 R140 (METER CAL)	Adjust to read 0 VU on VU meters
12*	MIC Input Level	400 Hz signal at -60 dB from oscil-lator connected to INPUT jack	Same as above	Same as above	Check	-11 dB to -5 dB
13*	PHONES Level	400 Hz signal at -10 dB from oscil-lator connected to INPUT jack	Same as above	Same as above PHONES cont. Max	Adjust input signal level	Max. output is more than -4 dB (100 mW) with 4 ohm load

AD-JUST STEP	WHAT IS IT CALLED	SIGNAL SOURCE AND AMOUNT	WHAT TEST GEAR TO USE	WHAT IS THE RE-CORDER DOINT?	POINT TO ADJUST	WHAT READING TO ADJUST FOR
14*	Bias Level Adjustment. Refer to MAINTENANCE section for more precise adjustment.	7.5 kHz, -20 dB oscillator signal connected to INPUT jack.	VTVM connected to OUTPUT jack.	Record signal on type of tape that will be used for actual recording. FUNCTION SELECT at ON OUTPUT SELECT at REPRO Tape speed at 15 ips	Trim capacitor #8 C134 (BIAS LEVEL)	While recording adjust trim pot until VTVM indication rises to peak value, then turn pot further clockwise until signal drops off by 4 — 5 dB (over-bias)
15*	Bias Trap Adjustment	No input signal	VTVM connected to Bias Trap test point TP-1, negative lead to ground, positive lead to test point.	Record mode, no input signal	Inductor #11 L105	Adjust Inductor for minimum output at Bias Trap test point TP-1. See page 70 for test point location.
16*	Record Level	400 Hz signal at -10 dB (0 VU on VU meters) connected to INPUT jack	VTVM connected to OUTPUT jack or use VU meters	Record signal on type of tape that will be used for actual recording. FUNCTION SELECT at ON OUTPUT SELECT at REPRO. Tape speed at 15 ips	Trim pot #9 R176 (REC LEVEL)	Set for -10 dB (0.3 V) at OUTPUT jacks or 0 VU on VU meters
17*	Record/Reproduce Frequency Response at 15 ips speed.	40 Hz to 22 kHz signal at -10 dB connected to Input jack	Same as above	Same as above	Inductor #10 L103	Check that frequency response matches limits given in Chart See page 72.
*	Record/Reproduce Frequency Responce at 7-1/2 ips speed.	40 Hz to 16 kHz signal at -20 dB connected to Input terminals	Same as above	Record signal on type of tape that will be used for actual recording. FUNCTION SELECT at ON OUTPUT SELECT at REPRO Tape speed at 7-1/2 ips	Inductor #10 L104	Same as above
19*	Overall Signal-to-Noise Ratio	No input signal	VTVM connected to OUTPUT jacks	Same as above Tape speed at 15 ips or 7-1/2 ips		Check for 50 dB or better

REPEAT STEP MARKED WITH AN ASTERISK FOR EACH CHANNEL. THE ADJUSTMENT NUMBERS ARE THE SAME BUT THE CIRCUIT BOARD LOCATION, INPUT/OUTPUT TERMINAL NUMBERS, VU METERS, ETC., WILL BE DIFFERENT DEPENDING ON THE CHANNEL.

3. EXPLODED VIEWS AND PARTS LIST

EXPLODED VIEW – 1



EXPLODED VIEW–2

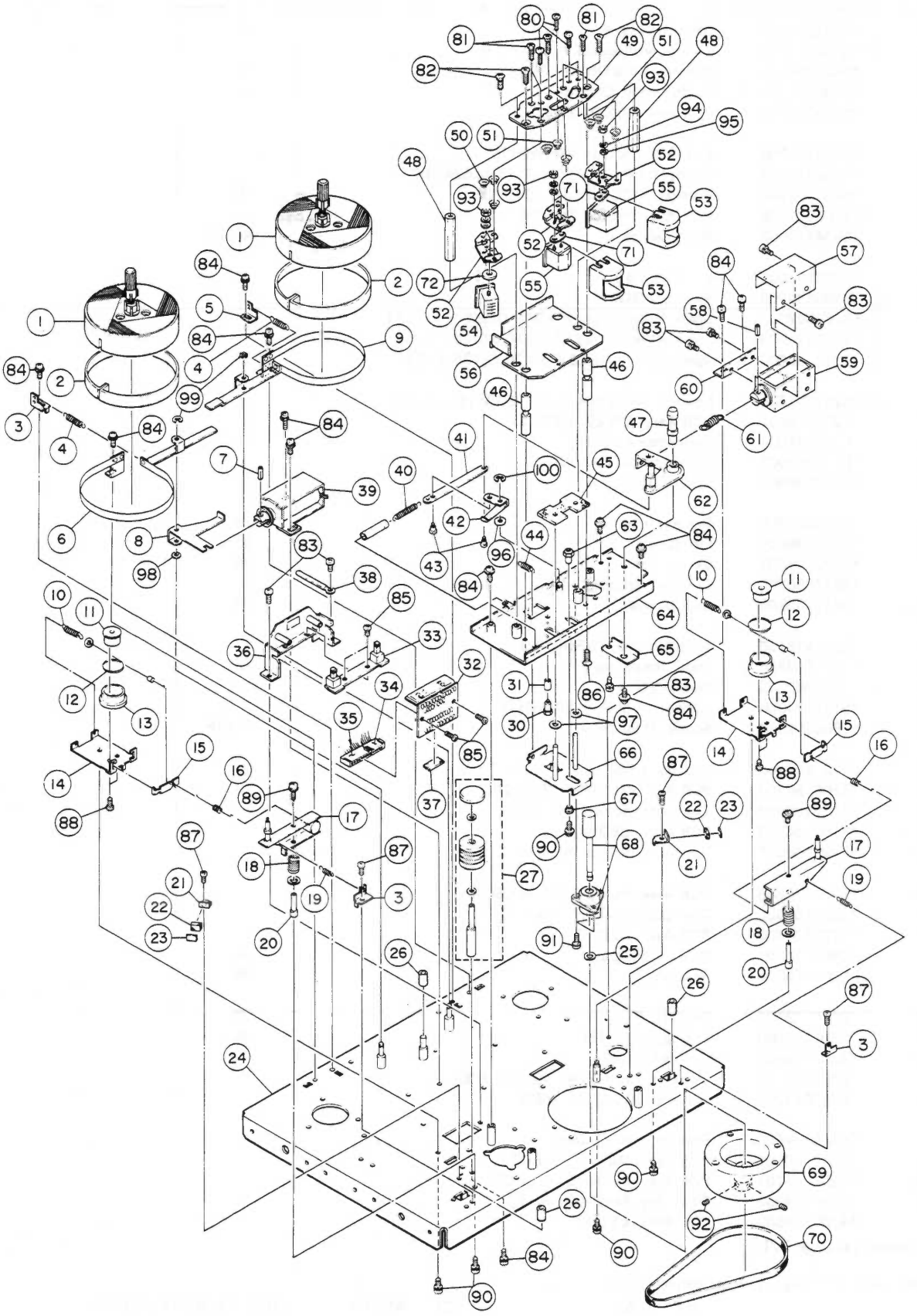
REF. NO.	PARTS NO.	DESCRIPTION	COMMON MODELS	REMARKS
2 - 1	*5800293901	Chassis, Side; R	38	
2 - 2	⚠ *5131007001	Switch, Voltage Selector [GE]		
2 - 3	*5800308100	Bracket, CONTROL PCB	34	
2 - 4	*5800287000	Button Assy, Control	38	
2 - 5	*5200073600	PCB Assy, OPERATION		
2 - 6	*5122172000	Connector Socket, 10P (WHT)		
2 - 7	*5336114000	Connector Plug 10P (WHT), Plug 524-10P		
2 - 8	*5800288700	Bracket, PITCH CONTROL PCB	38	
2 - 9	*5168938000	PCB Assy, PITCH CONTROL PCB		
2 - 10	*5534713000	Rod, Switch; C	X-10R	
2 - 11	*5786360500	Pin, Snap; ϕ5		
2 - 12	⚠ 5300030900	Switch, POWER		
2 - 13	⚠ *5052907000	Spark Killer, 0.01 μF + 300 Ω/300 V [J, GE]		
	⚠ *5052910000	Spark Killer, 0.033 μF + 120 Ω/125 V [U]		
	⚠ *5292002600	Spark Killer, 0.033 μF + 120 Ω/125 V [C]		
	⚠ *5267702500	Spark Killer, 0.0047 μF + 250 V [E, UK, A]		
2 - 14	5200074501	PCB Assy, SPEED SWITCH		
2 - 15	*5122261000	Connector Plug, 4P		
2 - 16	*5122262000	Connector Socket, 4P		
2 - 17	*5800069901	Chassis, Control		
2 - 18	*5800298800	Bracket, Cue	38	
2 - 19	*5800298600	Pin, Guide	38	
2 - 20	*5800298700	Lever, Cue	38	
2 - 21	*5534850000	Cushion, Stopper		
2 - 22	*5800303800	Spring, Cue	38	
2 - 23	5301456100	Switch Micro; SS-5GL13-3		
2 - 24	*5800299200	Plate, Insulating	38	
2 - 25	5296007000	Meter, VU		
2 - 26	*5122170000	Connector Socket, 8P (WHT)		
2 - 27	*5800002600	Screw, Shoulder; F	X-10R	
2 - 28	*5800555400	Chassis, Ampl.		
2 - 29	*5200164000	PCB Assy, OUTPUT SELECT		
2 - 30	*5122166000	Connector Socket, 4P (WHT)		
2 - 31	*5200164300	PCB Assy, LED; A		
2 - 32	*5122168000	Connector Socket, 6P (WHT)		
2 - 33	*5200075500	PCB Assy, FUNCTION SELECT; C		
2 - 34	*5122167000	Connector Socket, 5P (WHT)		
2 - 35	*5200164400	PCB Assy, LED; B		
2 - 36	*5800293801	Chassis, Side; L	38	
2 - 37	*5800289200	Bracket, L	38	
2 - 38	*5800289300	Bracket, R	38	
2 - 39	*5800289800	Spring, Earth; (B)	38	
2 - 40	*5800554400	Cushion, Meter		
2 - 41	5282014100	Volume, 100 kΩ (A); R301 ~ R308		
2 - 42	5282014200	Volume, 50 kΩ (A); R309		
2 - 43	*5800554501	Bracket, Phones Jack		
2 - 44	*5200163900	PCB Assy, INPUT SELECT		
2 - 45	*5200164101	PCB Assy, PHONES SELECT		
2 - 46	*5200164200	PCB Assy, PHONES JACK		
2 - 47	*5200164500	PCB Assy, LED; C		

(Continued on page 87)

Parts marked with * require longer delivery time.

[U]: U.S.A. [C]: CANADA [GE]: GENERAL EXPORT
[A]: AUSTRALIA [E]: EUROPE [UK]: U.K.
[L]: LIMITED AREA [J]: JAPAN

EXPLODED VIEW – 3

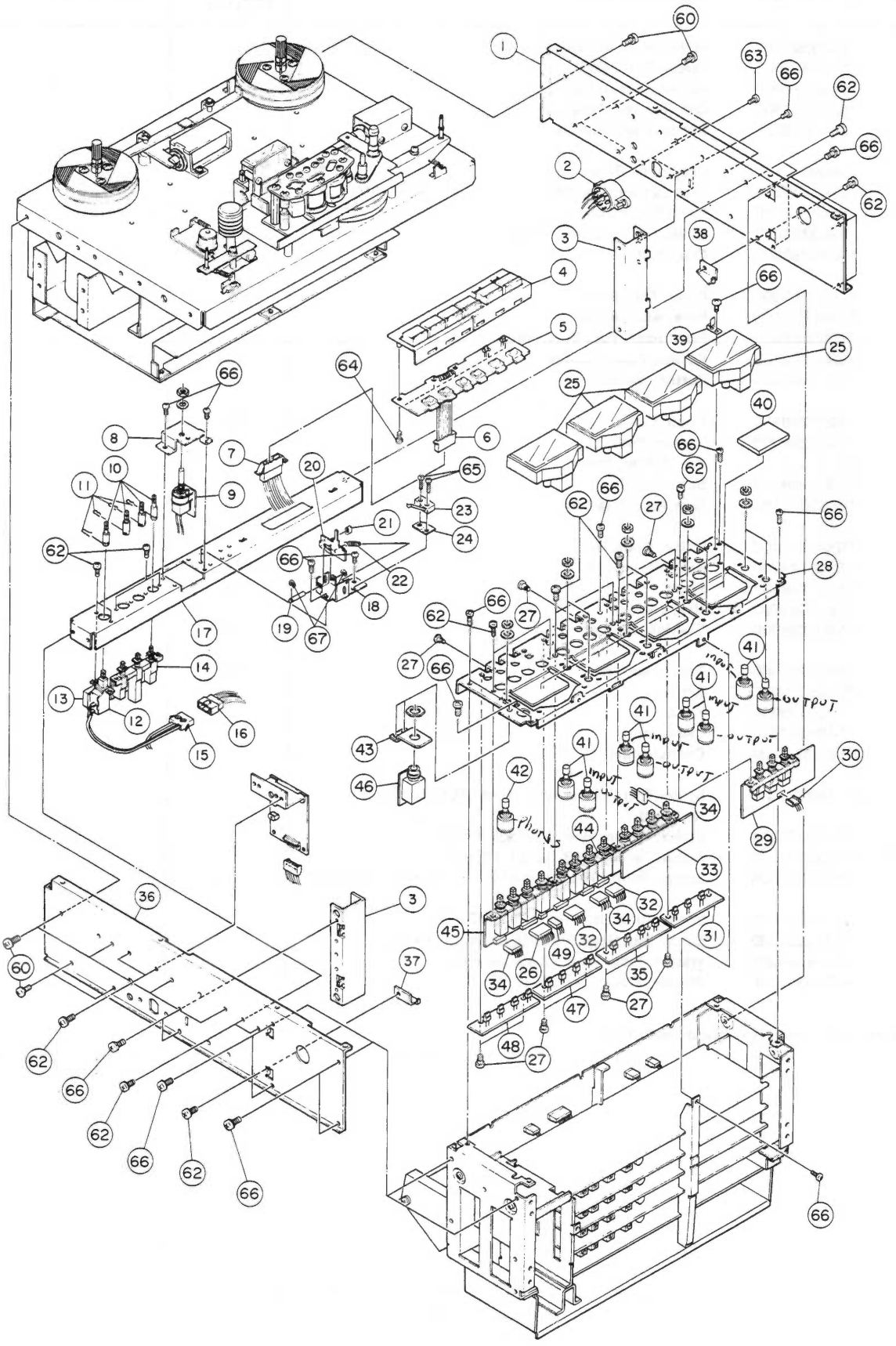


EXPLODED VIEW–1

REF. NO.	PARTS NO.	DESCRIPTION	COMMON MODELS	REMARKS
1 - 1	5800307001	Screw, Head Housing		
1 - 2	5800306901	Screw, Top Panel		
1 - 3	*5800555800	Housing Assy, Head; (7)		
1 - 4	5800311900	Cap, Tension Roller		
1 - 5	5504843000	Roller Assy, Tension		
1 - 6	5800312100	Cap, Pinch Roller	32	
1 - 7	5800302300	Push Button, Counter	38	
1 - 8 →	5800352900	Pinch Roller (1/4")	32	
1 - 9	5800288000	Knob, Pitch Control, (PH)	38	
1 - 10	*5800288600	Cap, Dust	38	
1 - 11	*5800293000	Panel, Transport	38	
1 - 12	*5800555100	Panel Assy, Ampl		
1 - 13	*5800555900	Panel Assy, Top, Dress; (4B)		
1 - 14	5800173100	Button, Power Switch	133	
1 - 15	5800288200	Button, Switch	38	
1 - 16	5800288100	Knob, Cue	38	
1 - 17	5800288300	Button, Push	38	
1 - 18	*5800301201	Shield Assy, Front	38	
1 - 19	*5800308900	Bonnet; (A)	34	
1 - 20	*5640032100	Case Assy, Rear; (4)	34	
1 - 21	*5800307100	Collar, Foot; (A)		
1 - 22	*5800348200	Bottom Assy; (A)	34	
1 - 23	*5800288502	Foot	38	
1 - 24	*5800067700	Nut, Lock		
1 - 25	*5800289500	Cushion, Bonnet	38	
1 - 26	*5800287400	Escutcheon; BL	38	
1 - 27	*5785605035	Spacer		
1 - 28	5800679900	Knob		
1 - 29	5800680000	Cap (Ivory)		
1 - 30	5800680100	Cap (Orange)		
1 - 40	*5780222004	Screw, Flat Countersunk Head (BLK Ni); M2 x 4		
1 - 41		Not used		
1 - 42	*5783073014	Screw, Washer Head S Tite; M3 x 14		
1 - 43	*5780123006	Screw, Pan Head (BLK Ni); M3 x 6		
1 - 44	*5783084008	Screw, Round Washer Head C Tite (BLK Ni); M4 x 8		
1 - 45	*5780023006	Screw, Bind Head (BLK Ni); M3 x 6		
1 - 46	*5783554030	Screw, Pan Head B Tite (BLK Ni); M4 x 30		
1 - 47	*5785224300	Washer, Fiber (BLK) ϕ4 x ϕ8 x t1		
1 - 48	*5785303100	Washer, Flat ϕ3 x ϕ6 x t0.25		

Parts marked with * require longer delivery time.

EXPLODED VIEW – 2



Exploded View–3

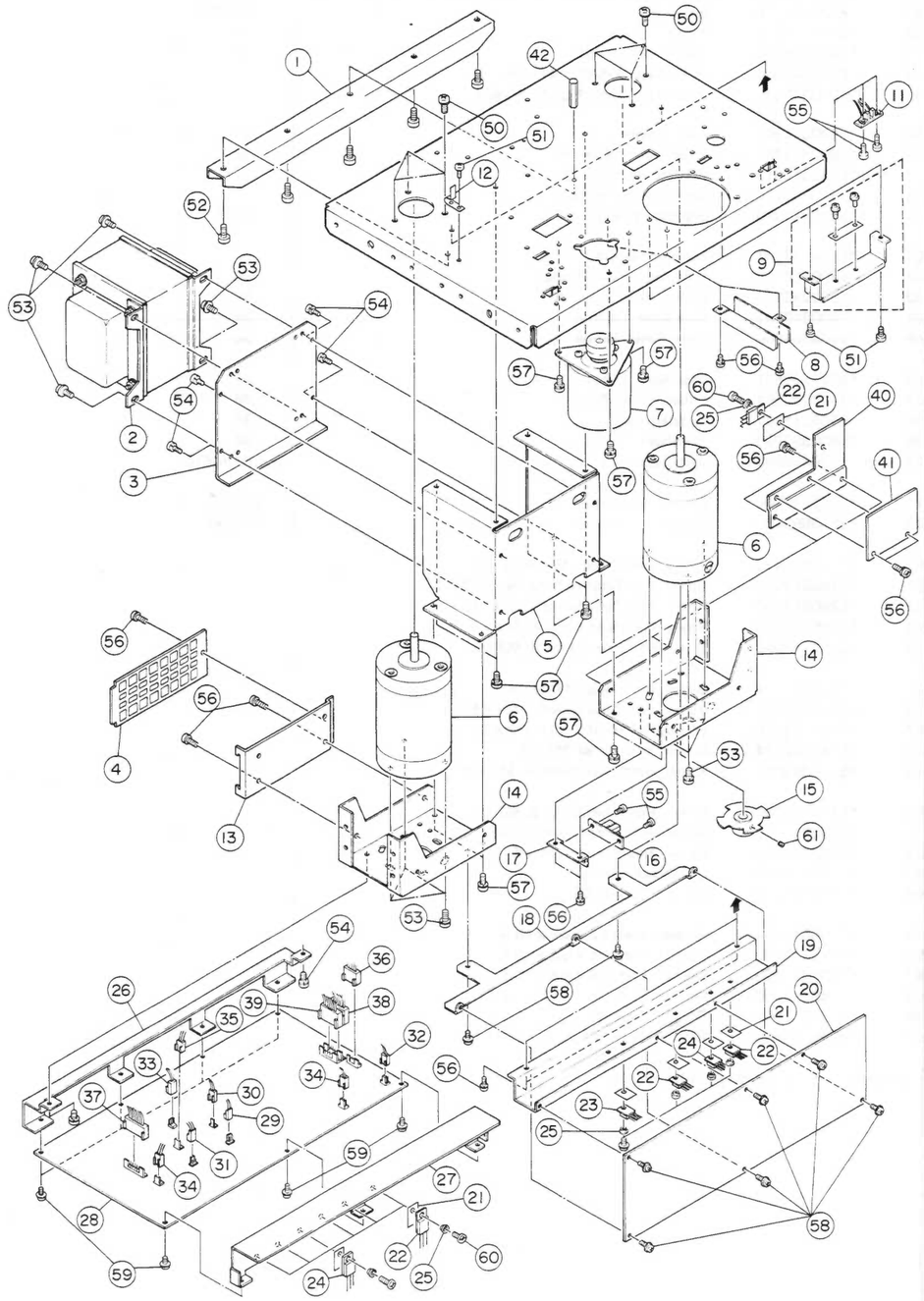
REF. NO.	PARTS NO.	DESCRIPTION	COMMON MODELS	REMARKS
3 - 1	5800311401	Table Assy, Reel	34	
3 - 2	5800295700	Felt, Brake	38	
3 - 3	*5555929000	Hook, Spring; (L)		
3 - 4	*5800301700	Spring, Brake; (B)	38	
3 - 5	*5800295801	Hook, Spring; (R)	38	
3 - 6	*5800295201	Band Assy, Brake; (L)	38	
3 - 7	*5786303012	Pin, Spring ϕ3 x 12		
3 - 8	*5800299000	Lever, Brake Actuating	38	
3 - 9	*5800295301	Band Assy, Brake; (R)	38	
3 - 10	*5800301800	Spring, Damper	38	
3 - 11	*5800305600	Shaft, Damper	38	
3 - 12	*5800301000	String Assy, Damper	38	
3 - 13	*5800301100	Drum, Damper	38	
3 - 14	*5800300800	Base, Damper	38	
3 - 15	*5800300900	Arm, Damper	38	
3 - 16	*5800302000	Spring	38	
3 - 17	5504842002	Arm Sub Assy, Tension		
3 - 18	*5524289000	Spring, Bias		
3 - 19	*5524106000	Spring, Hook Plate	A-6700	
3 - 20	*5800299101	Shaft, Tension Arm	38	
3 - 21	*5555930000	Stopper, Arm		
3 - 22	*5800298400	Damper	38	
3 - 23	*5800298500	Plate, Damper	38	
3 - 24	*5800300300	Chassis Assy, Main	38	
3 - 25	*5012390000	Stopper, Oil		
3 - 26	*5534850000	Cushion, Stopper		
3 - 27	5800312001	Roller Assy, 1/4 inch		
3 - 28		Not used		
3 - 29		Not used		
3 - 30	*5800290401	Stopper, Lifter	38	
3 - 31	*5800316000	Cushion, Stopper	38	
3 - 32	5312000100	Counter, FL4028-06		
3 - 33	*5200074000	PCB Assy, COUNTER		
3 - 34	*5122170000	Connector Socket, 8P (WHT)		
3 - 35	*5122172000	Connector Socket, 10P (WHT)		
3 - 36	*5800294900	Base Assy, Counter	38	
3 - 37	*5555570000	Cushion, Counter; (B)		
3 - 38	*5581038000	Clamper, Cord		
3 - 39	5313001501	Solenoid, Brake		
3 - 40	*5524288000	Spring, Return		
3 - 41	*5555926000	Arm, Joint; B		
3 - 42	*5555925000	Arm, Joint; A		
3 - 43	5581056000	Screw, Shoulder; A	A-304	
3 - 44	*5800301900	Spring, Lifter	38	
3 - 45	*5800303602	Cover, Lifter	38	
3 - 46	5545181000	Guide, Tape		
3 - 47	5800310900	Post, Guide; 1/4 inch	34	
3 - 48	*5800311000	Post, Head Base	34	
3 - 49	*5800311100	Base, Head	34	
3 - 50	5022050000	Spring, B		

Parts marked with * require longer delivery time.

REF. NO.	PARTS NO.	DESCRIPTION	COMMON MODELS	REMARKS
3 - 51	5520182000	Spring, D	A-5300	
3 - 52	*5800311200	Bracket, Head	34	
3 - 53	*5800329200	Shield Case, Head	34	
3 - 54	5569240000	Head Assy, ERASE; 4T-4ch		
3 - 55	5378301400	Head Assy, REC/PLAY; 4T-4ch		
3 - 56	*5800311300	Base, Lower	34	
3 - 57	*5800317700	Shield Plate, Solenoid	38	
3 - 58	*5786303012	Pin, Spring; ϕ3 x 12		
3 - 59	5313001600	Solenoid, Pinch Roller		
3 - 60	*5800171000	Bracket, Solenoid	X-3R	
3 - 61	*5524286001	Spring, Pressure		
3 - 62	*5800310700	Arm Assy, Pinch Roller	34	
3 - 63	*5800290200	Collar, Head Base; (A)	38	
3 - 64	*5800310501	Base Assy, Capstan	34	
3 - 65	*5800302700	Plate, Pinch Roller	38	
3 - 66	*5800290601	Base Assy, Lifter	38	
3 - 67	*5800290501	Collar, Lifter Base	38	
3 - 68	5800311501	Capstan Assy	34	
3 - 69	*5800397200	Flywheel	38	
3 - 70	5534468000	Belt, Capstan	A-6100MKII	
3 - 71	*5013439000	Spacer, REC Head	A-2300	
3 - 72	*5013659100	Spacer, Erase Head	A-1340	
3 - 80	*5780013010	Screw, Bind Head (Ni); M3 x 10		
3 - 81	*5780213008	Screw, Flat Countersunk (Ni); M3 x 8		
3 - 82	*5780213006	Screw, Flat Countersunk (Ni); M3 x 6		
3 - 83	*5780133006	Screw, Pan Head Sems A; M3 x 6		
3 - 84	*5780143008	Screw, Pan Head Sems B; M3 x 8		
3 - 85	*5780002604	Screw, Bind Head; M2.6 x 4		
3 - 86	*5780203008	Screw, Flat Countersunk; M3 x 8		
3 - 87	*5783003006	Screw, Pan Head S Tite; M3 x 6		
3 - 88	*5780002004	Screw, Bind Head; M2 x 4		
3 - 89	*5780053006	Screw, Bind Head Sems F; M3 x 6		
3 - 90	*5780143006	Screw, Pan Head Sems B; M3 x 6		
3 - 91	*5780053010	Screw, Bind Head Sems F; M3 x 10		
3 - 92	*5782004006	Screw, Hex Socket; M4 x 6		
3 - 93	*5781812000	Nut, Hexagon; M2		
3 - 94	*5785102000	Washer, Spring; ϕ2		
3 - 95	*5785012000	Washer, Flat; ϕ2 x ϕ6 x t0.4		
3 - 96	*5785315000	Washer, Flat; ϕ5 x ϕ8 x t0.5		
3 - 97	*5785024600	Washer, Flat; ϕ4 x ϕ8 x t0.5		
3 - 98	*5785318000	Washer, Flat; ϕ8 x ϕ12 x t0.5		
3 - 99	*5786011500	Ring, E Type; ϕ3		
3 - 100	*5786004000	Ring, E Type; ϕ4		

Parts marked with * require longer delivery time.

EXPLODED VIEW – 4



Exploded View–4

REF. NO.	PARTS NO.	DESCRIPTION	COMMON MODELS	REMARKS
4 - 1	*5800300200	Angle, Main Chassis	38	
4 - 2	⚠ 5320015101	Transformer, Power [J]		
	⚠ ✱5320015200	Transformer, Power [U, C]		
	⚠ 5320015301	Transformer, Power [GE]		
	⚠ 5320015401	Transformer, Power [E]		
	⚠ 5320015500	Transformer, Power [A, UK]		
4 - 3	*5800311700	Bracket, Transformer; (A)	34	
4 - 4	*5200078510	PCB Assy, FUSE [J, U, C, GE]		
	*5200078520	PCB Assy, FUSE [E, UK, A]		
4 - 5	*5800311600	Bracket, Transformer; (A)	34	
4 - 6	5370002802	DC Motor, Reel; (1/4" inch)	32	
4 - 7	5370002900	DC Motor, Capstan	38	
4 - 8	*5800299700	Holder, Cord	38	
4 - 9	*5504834000	Angle Assy, Thrust		
4 - 10		Not used		
4 - 11	*5200073800	PCB Assy, SHUT OFF		
4 - 12	*5800289600	Spring, Earth; (A)	38	
4 - 13	*5800311800	Bracket, FUSE PCB	34	
4 - 14	*5800300000	Holder, Motor	38	
4 - 15	*5800299400	Encoder Assy	38	
4 - 16	*5200073900	PCB Assy, SENSOR		
4 - 17	*5800299300	Bracket, SENSOR PCB	38	
4 - 18	*5800303400	Bracket, POWER SUPPLY	38	
4 - 19	*5800303500	Heatsink		
4 - 20	*5200074303	PCB Assy, POWER SUPPLY		
4 - 21	5033291000	Plate, Insulating		
4 - 22	5145087000	Transistor, 2SD-313E		
4 - 23	5220405100	IC, μPC-78M05H		
4 - 24	5145129000	Transistor, 2SB-507E		
4 - 25	*5033295000	Tube, Insulating	38	
4 - 26	*5800294100	Bracket, CONTROL PCB	38	
4 - 27	*5800293500	Heatsink		
4 - 28	*5200074205	PCB Assy, CONTROL		
4 - 29	*5122280000	Connector Socket, 2P (RED)		
4 - 30	*5122164000	Connector Socket, 2P (WHT)		
4 - 31	*5336109200	Connector Socket, 2P (YEL)		
4 - 32	*5122165000	Connector Socket, 3P (WHT)		
4 - 33	*5336109300	Connector Socket, 3P (YEL)		
4 - 34	*5122166000	Connector Socket, 4P (WHT)		
4 - 35	*5122300000	Connector Socket, 4P (RED)		
4 - 36	*5122169000	Connector Socket, 6P (WHT)		
4 - 37	*5122170000	Connector Socket, 7P (WHT)		
4 - 38	*5122880000	Connector Socket, 10P (RED)		
4 - 39	*5122172000	Connector Socket, 10P (WHT)		
4 - 40	*5800369000	Bracket, Power Supply Sub		
4 - 41	*5200086000	PCB Assy, POWER SUPPLY SUB		
4 - 42	*5800404900	Shaft, Top Panel		

Parts marked with * require longer delivery time.

[U]: U.S.A. [C]: CANADA [GE]: GENERAL EXPORT
[A]: AUSTRALIA [E]: EUROPE [UK]: U.K.
[L]: LIMITED AREA [J]: JAPAN

REF. NO.	PARTS NO.	DESCRIPTION	COMMON MODELS	REMARKS
4 - 50	*5780134008	Screw, Pan Head Sems A; M4 x 8		
4 - 51	*5783003006	Screw, Pan Head S Tite; M3 x 6		
4 - 52	*5783003008	Screw, Pan Head S Tite; M3 x 8		
4 - 53	*5780144008	Screw, Pan Head Sems B; M4 x 8		
4 - 54	*5780134006	Screw, Pan Head Sems A; M4 x 6		
4 - 55	*5780003006	Screw, Bind Head; M3 x 6		
4 - 56	*5780133006	Screw, Pan Head Sems A; M3 x 6		
4 - 57	*5730134008	Screw, Pan Head Sems A; M4 x 8		
4 - 58	*5780053006	Screw, Bind Head Sems F; M3 x 6		
4 - 59	*5783073006	Screw, Washer Head S Tite; M3 x 6		
4 - 60	*5780003008	Screw, Bind Head; M3 x 8		
4 - 61	*5782003006	Screw, Hex Socket; M3 x 6		

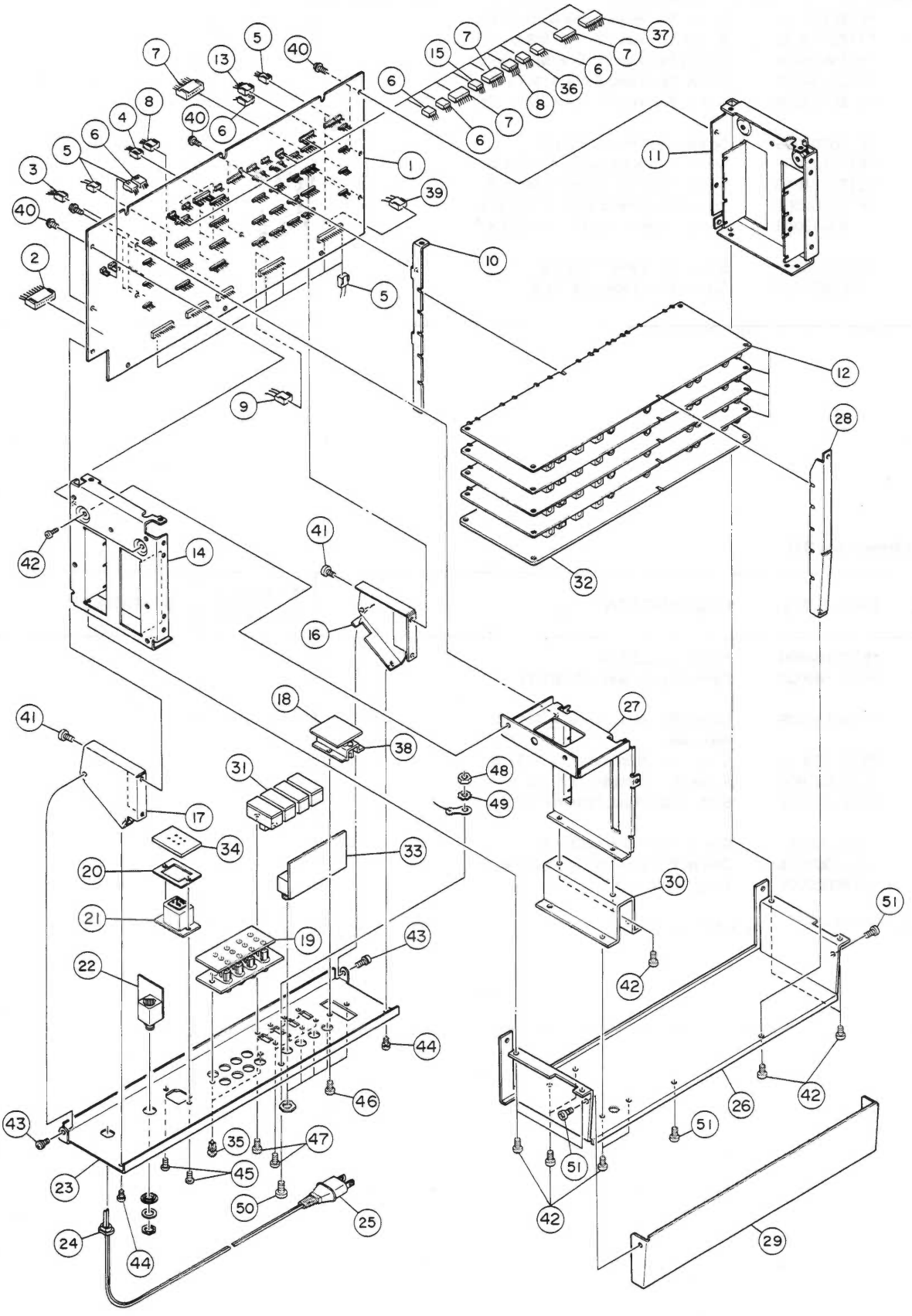
Parts marked with * require longer delivery time.

(Continued from page 81)

REF. NO.	PARTS NO.	DESCRIPTION	COMMON MODELS	REMARKS
2 - 48	*5200164600	PCB Assy, LED; D		
2 - 49	*5122165000	Connector Socket, 3P (WHT)		
2 - 60	*5780134008	Screw, Pan Head Sems A; M4 x 8		
2 - 61		Not used		
2 - 62	*5780133006	Screw, Pan Head Sems A; M3 x 6		
2 - 63	*5780002606	Screw, Bind Head; M2.6 x 6		
2 - 64	*5781012508	Screw, Pan Head Tapping; M2.5 x 8		
2 - 65	*5780002010	Screw, Bind Head; M2 x 10		
2 - 66	*5783003006	Screw, Pan Head S Tite; M3 x 6		
2 - 67	*5786002000	Ring, E type ϕ2		

Parts marked with * require longer delivery time.

EXPLODED VIEW – 5



Exploded View–5

REF. NO.	PARTS NO.	DESCRIPTION	COMMON MODELS	REMARKS
5 - 1	*5200163700	PCB Assy, MOTHER		
5 - 2	*5122173000	Connector Socket, 11P (WHT)		
5 - 3	*5122221000	Connector Socket, 2P (BLK)		
5 - 4	*5122280000	Connector Socket, 2P (RED)		
5 - 5	*5122164000	Connector Socket, 2P (WHT)		
5 - 6	*5122166000	Connector Socket, 4P (WHT)		
5 - 7	*5122170000	Connector Socket, 8P (WHT)		
5 - 8	*5122167000	Connector Socket, 5P (WHT)		
5 - 9	*5122165000	Connector Socket, 3P (WHT)		
5 - 10	*5800555000	Bracket, PCB		
5 - 11	*5800293202	Frame, Ampl.; FR	38	
5 - 12	*5200074840	PCB Assy, REC/PLAY		
5 - 13	*5122282000	Connector Socket, 4P (RED)		
5 - 14	*5800293102	Frame, Ampl.; FL	38	
5 - 15	*5122223000	Connector Socket, 4P (BLK)		
5 - 16	*5800289000	Bracket, MOTHER PCB; R	38	
5 - 17	*5800288900	Bracket, MOTHER PCB; L	38	
5 - 18	*5200073700	PCB Assy, REMOTE		
5 - 19	*5200164700	PCB Assy, IN/OUT		
5 - 20	*5555700000	Nut, Plate	X-10R	
5 - 21	*5200100000	PCB Assy, CONNECTOR		
5 - 22	*5200077700	PCB Assy, PUNCH IN/OUT		
5 - 23	*5800555200	Panel, Rear		
5 - 24	⚠ *5534660000	Strain Relief, AC Power Cord [All except C, UK]		
	⚠ *5317001700	Strain Relief, AC Power Cord [C, UK]		
5 - 25	⚠ *5127246000	Cord, AC Power [J]		
	⚠ *5350011100	Cord, AC Power [U, GE]		
	⚠ *5350008200	Cord, AC Power [E]		
	⚠ *5128095000	Cord, AC Power [UK]		
	⚠ *5350011000	Cord, AC Power [C]		
	⚠ *5350008400	Cord, AC Power [A]		
5 - 26	*5800555600	Chassis, Rear		
5 - 27	*5800309001	Holder, PCB	34	
5 - 28	*5800554900	Bracket, PCB		
5 - 29	*5800555500	Plate, Shield		
5 - 30	*5800554600	Holder, Sub		
5 - 31	6051604000	Switch, Slide; S301 ~ S304		
5 - 32	*5200163800	PCB Assy, MONITOR AMPL.		
5 - 33	*5200165200	PCB Assy, MIC IN		
5 - 34	*5200100000	PCB Assy, Connector		
5 - 35	*5534878000	Rivet, Push		
5 - 36	*5122282000	Connector Socket, 4P (RED)		
5 - 37	*5122172000	Connector Socket, 10P (WHT)		
5 - 38	*5554099100	Bracket, Connector		
5 - 39	*5122281000	Connector Socket, 3P (RED)		
5 - 40	*5783073006	Screw, Washer Head S Tite; M3 x 6		
5 - 41	*5783003008	Screw, Pan Head S Tite; M3 x 8		
5 - 42	*5783003006	Screw, Pan Head S Tite; M3 x 6		
5 - 43	*5780133008	Screw, Pan Head Sems A; M3 x 8		
5 - 44	*5783593006	Screw, Pan Head C Tite; M3 x 6		

Parts marked with * require longer delivery time.

[U]: U.S.A. [C]: CANADA [GE]: GENERAL EXPORT
[A]: AUSTRALIA [E]: EUROPE [UK]: U.K.
[L]: LIMITED AREA [J]: JAPAN

REF. NO.	PARTS NO.	DESCRIPTION	COMMON MODELS	REMARKS
5 - 45	*5780013008	Screw, Bind Head (Ni); M3 x 8		
5 - 46	*5780013006	Screw, Bind Head (Ni); M3 x 6		
5 - 47	*5780012606	Screw, Bind Head (Ni); M2.6 x 6		
5 - 48	*5781813000	Nut, Hexagon; M3		
5 - 49	*5785123000	Washer, Lock; ϕ3		
5 - 50	*5780013006	Screw, Bind Head (Ni); M3 x 6		
5 - 51	*5780133006	Screw, Pan Head Sems A; M3 x 6		

Parts marked with * require longer delivery time.

Included Accessories

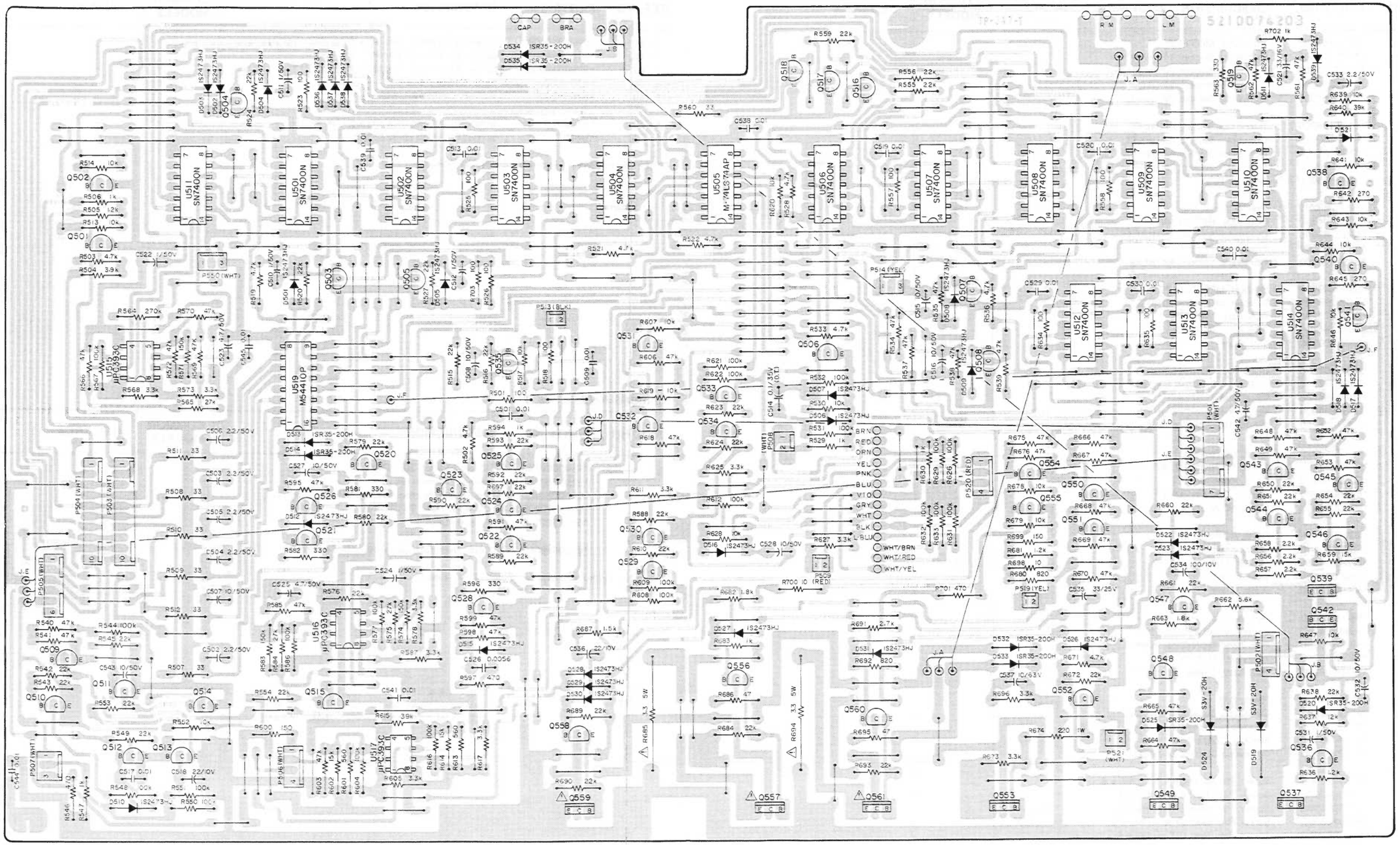
REF. NO.	PARTS NO.	DESCRIPTION	COMMON MODELS	REMARKS
	*5740002700	10 inches Reel (RE-1004)		
	*5700050800	Owner's Manual [J]		
	*5700050900	Operation/Maintenance Manual [All except J]		
	*5744023200	Clamper, Reel; B (TZ-613)		
	*5032301100	Rubber, Cushion		
	*5350008500	Cord, In-Output Connection [All except U]		

Parts marked with * require longer delivery time.

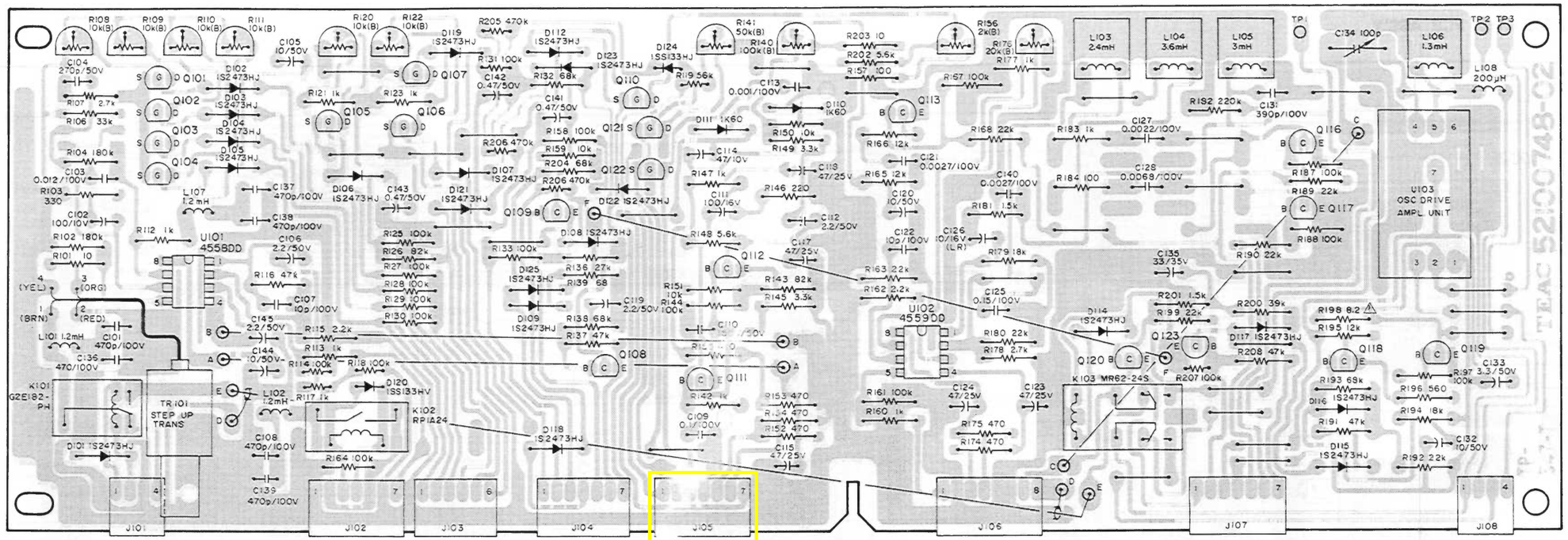
[U]: U.S.A. [C]: CANADA [GE]: GENERAL EXPORT
[A]: AUSTRALIA [E]: EUROPE [UK]: U.K.
[L]: LIMITED AREA [J]: JAPAN

4. PC BOARDS AND PARTS LIST

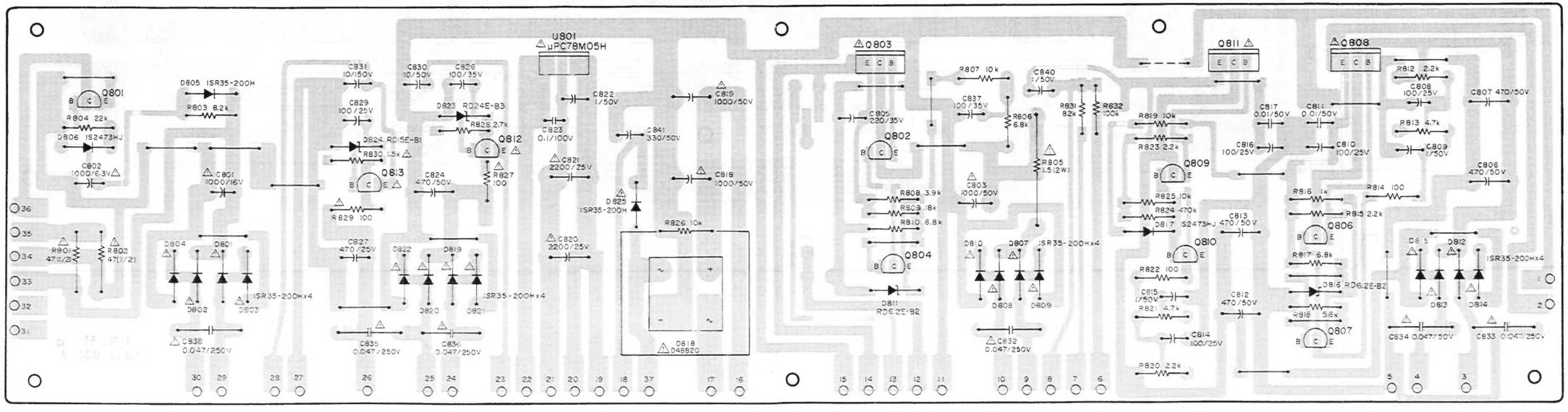
1. CONTROL PCB ASS'Y



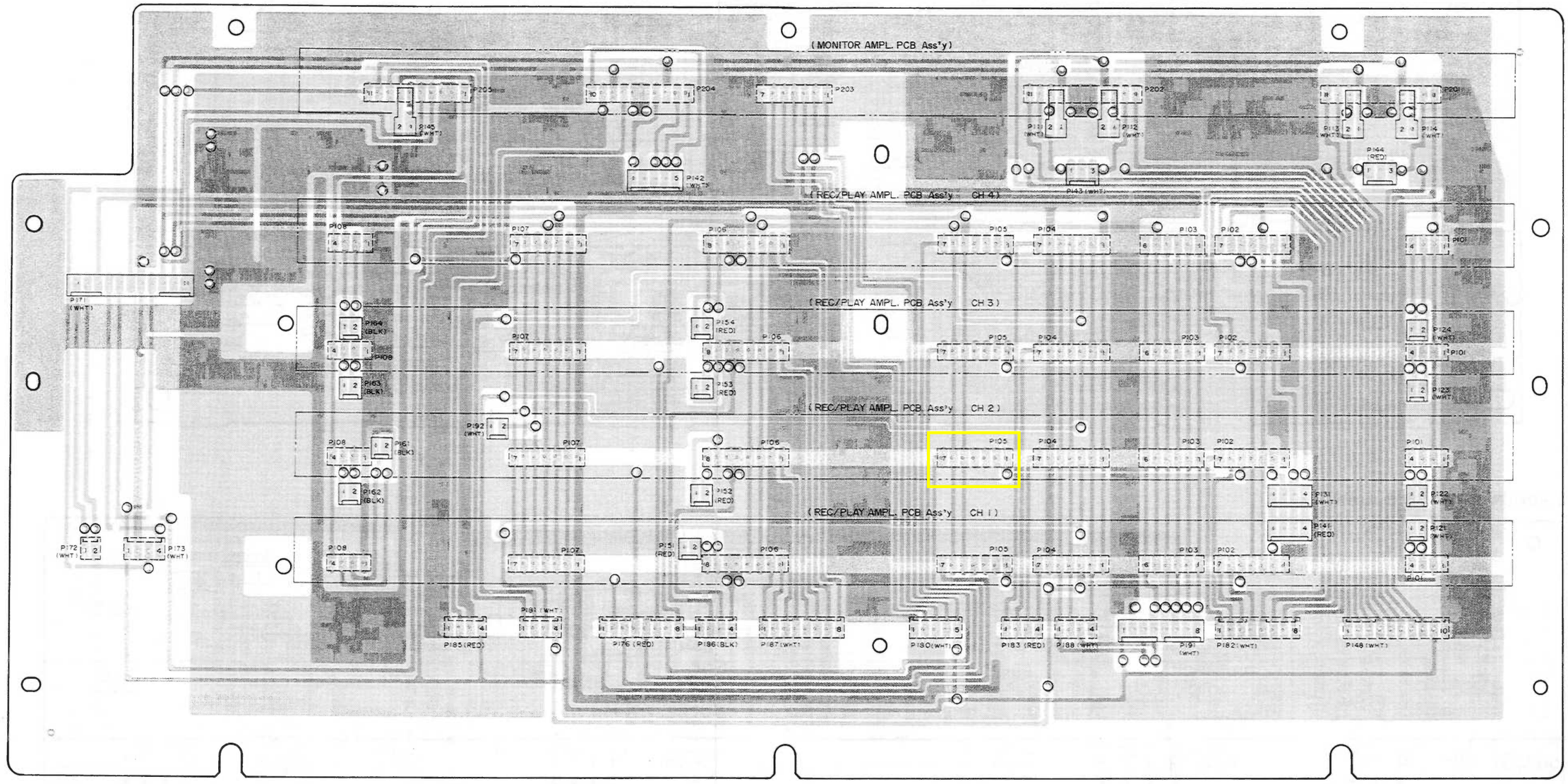
2. REC/PLAY AMPL. PCB ASS'Y



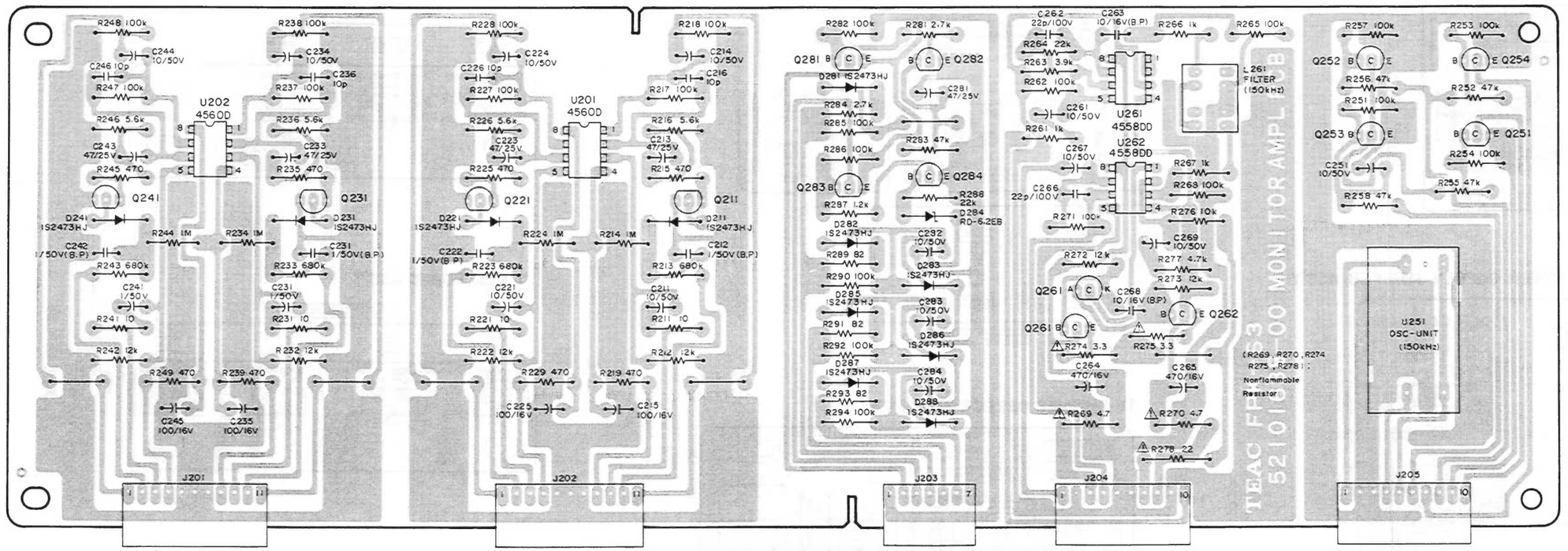
3. POWER SUPPLY PCB ASS'Y



4. MOTHER PCB ASS'Y

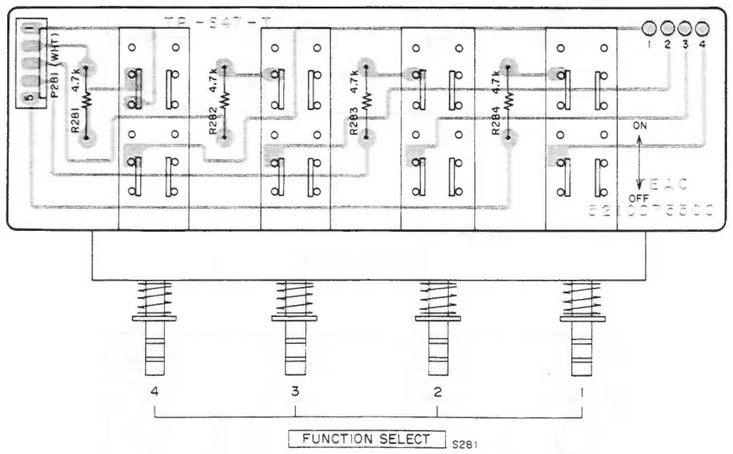


5. MONITOR AMPL. PCB ASS'Y

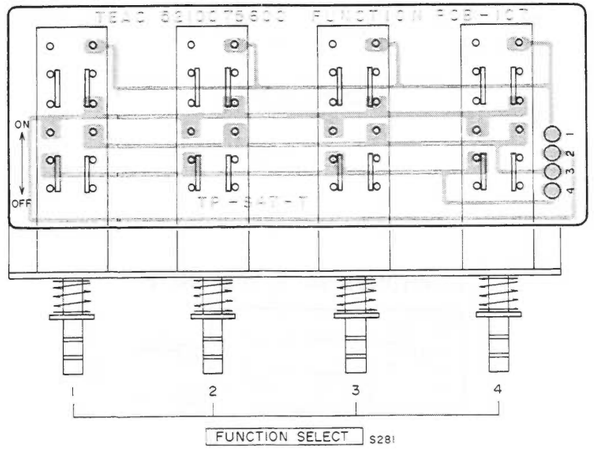


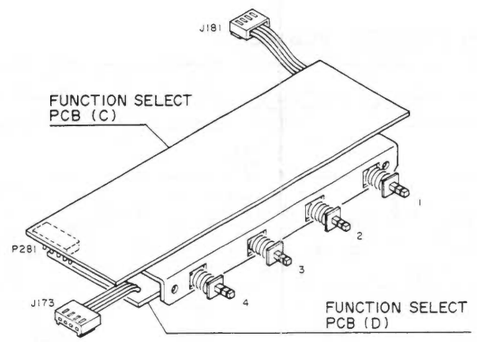
6. FUNCTION SELECT PCB C ASS'Y

FUNCTION SELECT PCB C

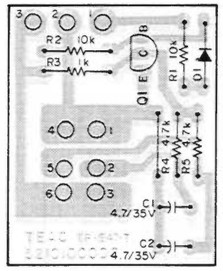


FUNCTION SELECT PCB D

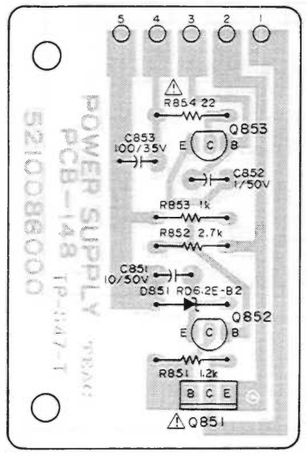




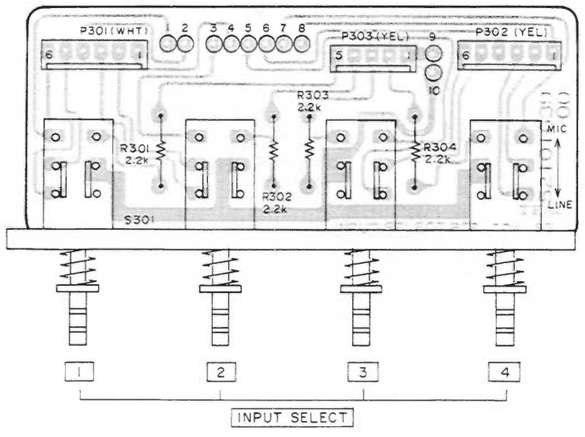
7. CONNECTOR PCB ASS'Y



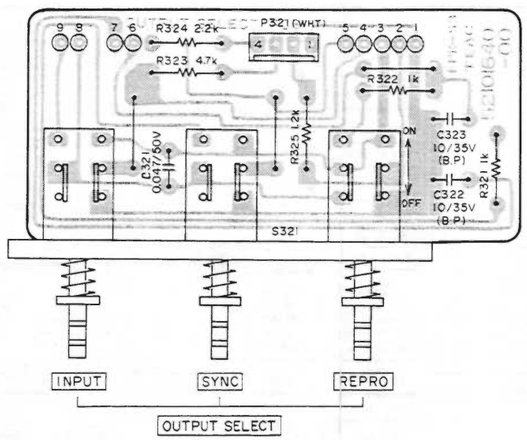
8. POWER SUPPLY SUB PCB ASS'Y



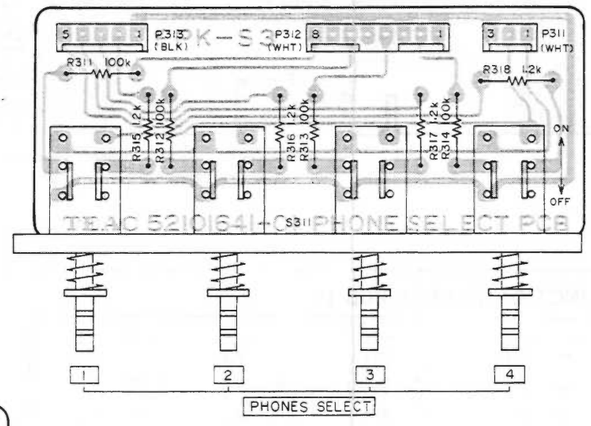
9. INPUT SELECT PCB ASS'Y



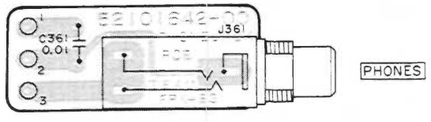
10. OUTPUT SELECT PCB ASS'Y



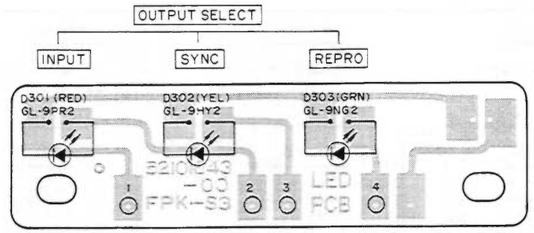
11. PHONES SELECT PCB ASS'Y



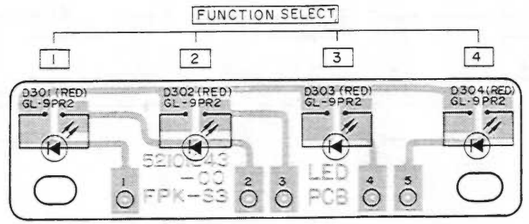
12. PHONES JACK PCB ASS'Y



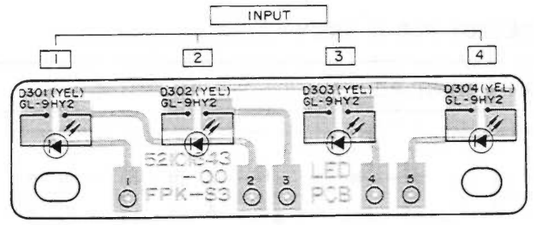
13. LED PCB A ASS'Y



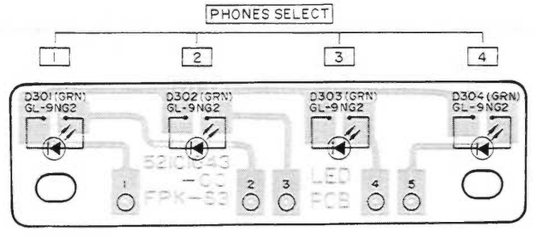
14. LED PCB B ASS'Y



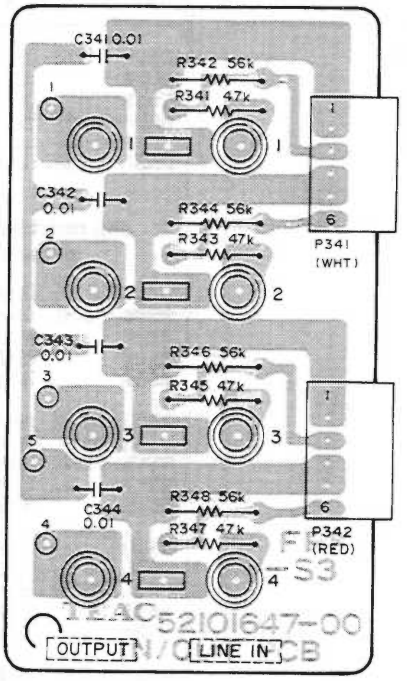
15. LED PCB C ASS'Y



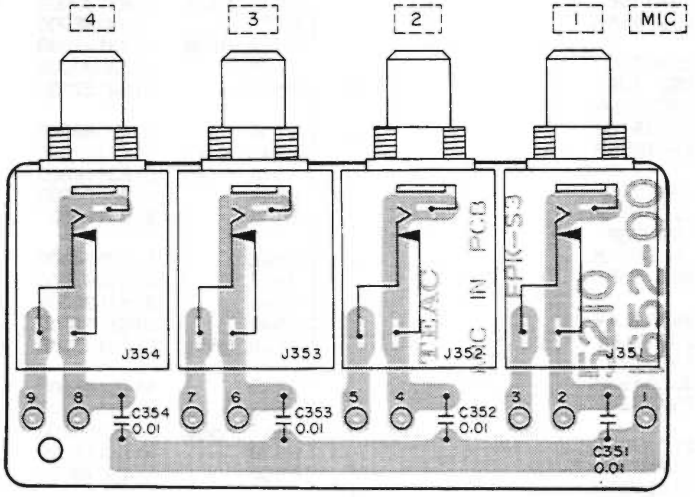
16. LED PCB D ASS'Y



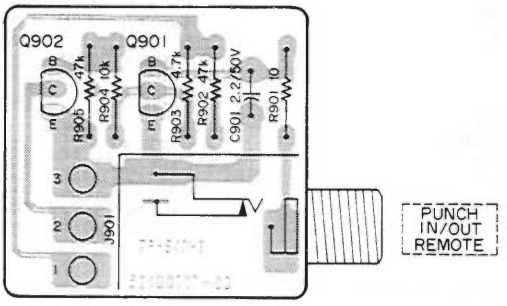
17. IN/OUT PCB ASS'Y



18. MIC IN PCB ASS'Y



19. PUNCH IN/OUT PCB ASS'Y



CONTROL PCB Ass'y

REF. NO.	PARTS NO.	DESCRIPTION
	*5200074205	PCB Ass'y, Control
	*5210074203	PCB, Control
	IC's	
U501~U504	5042712000	SN7400N
U505	5220036100	M74LS74AP
U506~U514	5042712000	SN7400N
U515~U517	5220012500	μPC393C
U519	5147047000	M54410P
	TRANSISTORS	
Q501~Q506	5230776520	2SC1685R
Q507	5145178000	2SC1684S
Q508	5230776520	2SC1685R
Q509	5145178000	2SC1684S
Q510	5042553000	2SA733P
Q511	5145178000	2SC1684S
Q512	5145091000	2SC945AK
Q513	5230776520	2SC1685R
Q514	5145178000	2SC1684S
Q515~Q523	5230776520	2SC1685R
Q524	5145091000	2SC945AK
Q525	5042553000	2SA733P
Q526	5230776520	2SC1685R
Q528	5230776520	2SC1685R
Q529	5145091000	2SC945AK
Q530	5042553000	2SA733P
Q531, Q532	5230776520	2SC1685R
Q533	5145091000	2SC945AK
Q534	5042553000	2SA733P
Q535	5145091000	2SC945AK
Q536	5145043000	2SA720Q
Q537	5145087000	2SD313E
Q538	5230776520	2SC1685R
Q539	5231755400	2SD794Q
Q540, Q541	5230776520	2SC1685R
Q542	5231755400	2SD794Q
Q543	5145091000	2SC945AK
Q544	5042553000	2SA733P
Q545	5145091000	2SC945AK
Q546	5042553000	2SA733P
Q547	5145091000	2SC945AK
Q548	5042625000	2SC1318S
Q549	5145087000	2SD313E
Q550	5145091000	2SC945AK
Q551	5042553000	2SA733P
Q552	5042625000	2SC1318S
Q553	5145129000	2SB507E
Q554	5145091000	2SC945AK
Q555	5042553000	2SA733P
Q556	5042625000	2SC1318S
Q557	⚠5145087000	2SD313E
Q558	5042625000	2SC1318S
Q559	⚠5145087000	2SD313E
Q560	5042625000	2SC1318S
Q561	⚠5145087000	2SD313E
	DIODES	
D501~D512	5143118000	1S2473HJ
D513, D514	5224014500	1SR35-200HJ
D515~D518	5143118000	1S2473HJ
D519	5224014700	S3V20H
D520	5224014500	1SR35-200HJ
D521~D523	5143118000	1S2473HJ
D524	5224014700	S3V20H
D525	5224014500	1SR35-200HJ
D526~D531	5143118000	1S2473HJ
D532~D535	5224014500	1SR35-200HJ
D536~D539	5143118000	1S2473HJ
	RESISTORS	
	All resistors are rated ±5 % tolerance, 1/4 W and of carbon type unless otherwise noted.	
R501	5183058000	100 Ω
R502, R503	5183098000	4.7 kΩ
R504	5183096000	3.9 kΩ
R505	5183084000	1.2 kΩ
R506	5183082000	1.0 kΩ
R507~R512	5183046000	33 Ω
R513, R514	5183106000	10 kΩ
R515, R516	5183114000	22 kΩ
R517	5183106000	10 kΩ
R518	5183058000	100 Ω
R519	5183098000	4.7 kΩ
R520	5183114000	22 kΩ
R521, R522	5183098000	4.7 kΩ
R523	5183058000	100 Ω
R524	5183114000	22 kΩ
R525, R526	5183058000	100 Ω
R527	5183114000	22 kΩ
R528	5183098000	4.7 kΩ
R529	5183082000	1.0 kΩ
R530	5183106000	10 kΩ
R531, R532	5183130000	100 kΩ
R533	5183098000	4.7 kΩ
R534, R535	5183122000	47 kΩ
R536	5183098000	4.7 kΩ
R537, R538	5183122000	47 kΩ
R539	5183098000	4.7 kΩ
R540, R541	5183122000	47 kΩ
R542, R543	5183114000	22 kΩ
R544	5183130000	100 kΩ
R545	5183114000	22 kΩ
R546	5183074000	470 Ω
R547	5183082000	1.0 kΩ
R548	5183130000	100 kΩ
R549	5183114000	22 kΩ
R550, R551	5183130000	100 kΩ
R552	5183106000	10 kΩ
R553~R556	5183114000	22 kΩ
R557, R558	5183058000	100 Ω
R559	5183114000	22 kΩ
R560	5183046000	33 Ω
R561, R562	5183122000	47 kΩ
R563	5183070000	330 Ω
R564	5183140000	270 kΩ
R565	5183116000	27 kΩ
R566	5183122000	47 kΩ
R567	5183130000	100 kΩ
R568	5183094000	3.3 kΩ
R569, R570	5183122000	47 kΩ
R571	5183134000	150 kΩ
R572	5183122000	47 kΩ
R573	5183094000	3.3 kΩ
R574	5183134000	150 kΩ
R575	5183116000	27 kΩ
R576	5183114000	22 kΩ
R577	5183130000	100 kΩ

Parts marked with * require longer delivery time.

REF. NO.	PARTS NO.	DESCRIPTION
R578	5183094000	3.3 kΩ
R579, R580	5183114000	22 kΩ
R581, R582	5183070000	330 Ω
R583	5183134000	150 kΩ
R584	5183116000	27 kΩ
R585	5183122000	47 kΩ
R586	5183130000	100 kΩ
R587	5183094000	3.3 kΩ
R588~R590	5183114000	22 kΩ
R591	5183122000	47 kΩ
R592, R593	5183114000	22 kΩ
R594	5183082000	1.0 kΩ
R595	5183122000	47 kΩ
R596	5183070000	330 Ω
R597	5183074000	470 Ω
R598, R599	5183122000	47 kΩ
R600	5183062000	150 Ω
R601	5183076000	560 Ω
R602	5183110000	15 kΩ
R603	5183122000	47 kΩ
R604	5183130000	100 kΩ
R605	5183094000	3.3 kΩ
R606	5183122000	47 kΩ
R607	5183106000	10 kΩ
R608, R609	5183130000	100 kΩ
R610	5183114000	22 kΩ
R611	5183094000	3.3 kΩ
R612	5183130000	100 kΩ
R613	5183076000	560 Ω
R614	5183110000	15 kΩ
R615	5183120000	39 kΩ
R616	5183130000	100 kΩ
R617	5183094000	3.3 kΩ
R618	5183122000	47 kΩ
R619, R620	5183106000	10 kΩ
R621, R622	5183130000	100 kΩ
R623, R624	5183114000	22 kΩ
R625	5183094000	3.3 kΩ
R626	5183130000	100 kΩ
R627	5183094000	3.3 kΩ
R628	5183106000	10 kΩ
R629	5183130000	100 kΩ
R630	5183082000	1.0 kΩ
R631~R633	5183130000	100 kΩ
R634, R635	5183058000	100 Ω
R636	5183084000	1.2 kΩ
R637	5183108000	12 kΩ
R638	5183114000	22 kΩ
R639	5183106000	10 kΩ
R640	5183120000	39 kΩ
R641	5183106000	10 kΩ
R642	5183068000	270 Ω
R643, R644	5183106000	10 kΩ
R645	5183068000	270 Ω
R646, R647	5183106000	10 kΩ
R648, R649	5183122000	47 kΩ
R650, R651	5183114000	22 kΩ
R652, R653	5183122000	47 kΩ
R654, R655	5183114000	22 kΩ
R656~R658	5183090000	2.2 kΩ
R659	5183110000	15 kΩ
R660, R661	5183114000	22 kΩ
R662	5183100000	5.6 kΩ
R663	5183088000	1.8 kΩ
R664~R670	5183122000	47 kΩ

REF. NO.	PARTS NO.	DESCRIPTION
R671	5183098000	4.7 kΩ
R672	5183114000	22 kΩ
R673	5183094000	3.3 kΩ
R674	⚠5184763000	220 Ω 1 W Nonflammable
R675	5183122000	47 kΩ
R676	5183122000	47 kΩ
R678, R679	5183106000	10 kΩ
R680	5183080000	820 Ω
R681	5183084000	1.2 kΩ
R682	5183088000	1.8 kΩ
R683	5183082000	1.0 kΩ
R684	5183114000	22 kΩ
R685	⚠5184410000	3.3 Ω Cement 5 W 10 %
R686	5183050000	47 Ω
R687	5183086000	1.5 kΩ
R689, R690	5183114000	22 kΩ
R691	5183092000	2.7 kΩ
R692	5183080000	820 Ω
R693	5183114000	22 kΩ
R694	⚠5184410000	3.3 Ω Cement 5 W 10 %
R695	5183050000	47 Ω
R696	5183094000	3.3 kΩ
R697	5183114000	22 kΩ
R698	5183034000	10 Ω
R699	5183062000	150 Ω
R700	5183034000	10 Ω
R701	5183074000	470 Ω
R702	5183082000	1 kΩ
R703	5183058000	100 Ω

CAPACITORS

C501	5054204000	Ceramic	0.01 μF	50 V	±10%
C502~C506	5260161150	Elec.	2.2 μF	50 V	
C507, C508	5260162850	Elec.	10 μF	50 V	
C509	5054204000	Ceramic	0.01 μF	50 V	±10%
C510~C512	5260160750	Elec.	1 μF	50 V	
C513	5054204000	Ceramic	0.01 μF	50 V	±10%
C514	5054664100	Dip. Tant.	0.1 μF	35 V	±20%
C515, C516	5260162850	Elec.	10 μF	50 V	
C517	5054204000	Ceramic	0.01 μF	50 V	±10%
C518	5260163252	Elec.	22 μF	10 V	
C519, C520	5054204000	Ceramic	0.01 μF	50 V	±10%
C521	5260222800	Elec. (LL)	33 μF	16 V	
C522	5260160750	Elec.	1 μF	50 V	
C523	5260162150	Elec.	4.7 μF	50 V	
C524	5260160750	Elec.	1 μF	50 V	
C525	5260162150	Elec.	4.7 μF	50 V	
C526	5170370000	Mylar	0.0056 μF	100 V	
C527, C528	5260162850	Elec	10 μF	50 V	
C529, C530	5054204000	Ceramic	0.01 μF	50 V	±10%
C531	5260160750	Elec.	1 μF	50 V	
C532	5260162850	Elec.	10 μF	50 V	
C533	5260161150	Elec	2.2 μF	50 V	
C534	5172933000	Elec.	100 μF	10 V	
C535	5260164452	Elec.	33 μF	25 V	
C536	5260163252	Elec.	22 μF	10 V	
C537	5172904000	Elec.	10 μF	63 V	
C538~C541	5054204000	Ceramic	0.01μF	50 V	±10%
C542	5260162150	Elec.	4.7 μF	50 V	
C543	5260162850	Elec.	10 μF	50 V	
C544, C545	5054204000	Ceramic	0.01 μF	50 V	

REF. NO.	PARTS NO.	DESCRIPTION
	CONNECTOR PLUGS	
P501	5122131000	7P (WHT)
P502	5122128000	4P (WHT)
P503, P504	5122134000	10P (WHT)
P505	5122130000	6P (WHT)
P506	5122128000	4P (WHT)
P507	5122127000	3P (WHT)
P508	5122126000	2P (WHT)
P509	5122299000	2P (RED)
P513	5122183000	2P (BLK)
P514	5336107300	3P (YEL)
P519	5336107200	2P (YEL)
P520	5122301000	4P (RED)
P521	5122126000	2P (WHT)
P550	5122127000	3P (WHT)
	MISCELLANEOUS	
	5800293501	Heat Sink
	5800294100	Bracket, Control PCB
	5033291000	Plate, Insulating
	5033295000	Tube, Insulating
J515	5122172000	Connector Socket, 10P (WHT)
J516	5122170000	Connector Socket, 8P (WHT)

REC/PLAY AMPL. PCB Ass'y

REF. NO.	PARTS NO.	DESCRIPTION
	*5200074840	PCB Ass'y, REC/PLAY Ampl.
	*5210074802	PCB REC/PLAY Ampl.
	IC's	
U101	5147028000	NJM4558DD
U102	5147064000	NJM4559DD
U103	5292201600	BIAS Ampl. Module
	TRANSISTORS	
Q101~Q107	5145103000	FET, 2SK68AM
Q108	5230776520	2SC1685R
Q109	5042553000	2SA733P
Q110	5145103000	FET, 2SK68AM
Q111	5230776520	2SC1685R
Q112	5042553000	2SA733P
Q113	5230776520	2SC1685R
Q116~Q118	5230776520	2SC1685R
Q119	5042625000	2SC1318S
Q120	5230776520	2SC1685R
Q121, Q122	5145103000	FET, 2SK68AM
Q123	5145150000	2SA1015GR
	DIODES	
D101~D109	5143118000	1S2473HJ
D110, D111	5224015400	1K60
D112	5143118000	1S2473HJ
D114~D119	5143118000	1S2473HJ
D120	5224015000	1SS133HV
D121~D123	5143118000	1S2473HJ
D124	5224015000	1SS133HV
D125	5143118000	1S2473HJ
	CARBON RESISTORS	
	All resistors are rated ±5 % tolerance and 1/4 W	
R101	5183034000	10 Ω
R102	5183136000	180 kΩ
R103	5183070000	330 Ω
R104	5183136000	180 kΩ
R106	5183118000	33 kΩ
R107	5183092000	2.7 kΩ
R112, R113	5183082000	1.0 kΩ
R114	5240033020	100 kΩ
R115	5183090000	2.2 kΩ
R116	5183012200	47 kΩ
R117	5240028220	1.0 kΩ
R118	5240033020	100 kΩ
R119	5240032420	56 kΩ
R121	5183082000	1.0 kΩ
R123	5183082000	1.0 kΩ
R125	5183130000	100 kΩ
R126	5183128000	82 kΩ
R127~R130	5183130000	100 kΩ
R131	5240033020	100 kΩ
R132	5183126000	68 kΩ
R133	5183130000	100 kΩ
R135	5240031220	18 kΩ
R136	5183116000	27 kΩ
R137	5183122000	47 kΩ
R138	5183126000	68 kΩ
R139	5183054000	68 Ω
R142	5183082000	1.0 kΩ
R143	5183128000	82 kΩ
R144	5183130000	100 kΩ
R145	5183094000	3.3 kΩ

Parts marked with * require longer delivery time.

REF. NO.	PARTS NO.	DESCRIPTION			
R146	5183066000	220 Ω			
R147	5183082000	1.0 kΩ			
R148	5183100000	5.6 kΩ			
R149	5183094000	3.3 kΩ			
R150, R151	5183106000	10 kΩ			
R152~R155	5183074000	470 Ω			
R157	5183058000	100 Ω			
R158	5183130000	100 kΩ			
R159	5183106000	10 kΩ			
R160	5183082000	1 kΩ			
R161	5183130000	100 kΩ			
R162	5183090000	2.2 kΩ			
R163	5183114000	22 kΩ			
R164	5183130000	100 kΩ			
R165	5183108000	12 kΩ			
R166	5183108000	12 kΩ			
R167	5183130000	100 kΩ			
R168	5183114000	22 kΩ			
R174, R175	5183074000	470 Ω			
R177	5183082000	1 kΩ			
R178	5183092000	2.7 kΩ			
R179	5183112000	18 kΩ			
R180	5183114000	22 kΩ			
R181	5183086000	1.5 kΩ			
R182	5183138000	220 kΩ			
R183	5183082000	1.0 kΩ			
R184	5183058000	100 Ω			
R187, R188	5183130000	100 kΩ			
R189, R190	5183114000	22 kΩ			
R191	5183122000	47 kΩ			
R192	5183114000	22 kΩ			
R193	5183126000	68 kΩ			
R194	5183112000	18 kΩ			
R195	5183108000	12 kΩ			
R196	5183076000	560 Ω			
R197	5183130000	100 kΩ			
R198	⚠5184223000	8.2 Ω	Nonflammable		
R199	5183114000	22 kΩ			
R200	5183120000	39 kΩ			
R201	5183086000	1.5 kΩ			
R202	5183100000	5.6 kΩ			
R203	5183034000	10 Ω			
R205, R206	5240034620	470 kΩ			
R207	5240033020	100 kΩ			
R208	5183122000	47 kΩ			
CAPACITORS					
C101	5263107020	Polyst.	470 pF	100 V	5%
C102	5260165952	Elec.	100 μF	10 V	
C103	5171858000	Mylar	0.012 μF	100 V	5%
C104	5172217000	Ceramic	270 pF	50 V	10%
C105	5260162850	Elec.	10 μF	50 V	
C106	5260101150	Elec.	2.2 μF	50 V	
C107	5172200000	Ceramic	10 pF	100 V	10%
C108	5263107020	Polyst.	470 pF	100 V	5%
C109	5171878000	Mylar	0.1 μF	100 V	5%
C110	5172214000	Ceramic	150 pF	50 V	10%
C111	5260166052	Elec.	100 μF	16 V	
C112	5260161150	Elec.	2.2 μF	50 V	
C113	5170352000	Mylar	0.001 μF	100 V	5%
C114	5260165052	Elec.	47 μF	10 V	
C115~C118	5260165252	Elec.	47 μF	25 V	

REF. NO.	PARTS NO.	DESCRIPTION			
C119	5260161150	Elec	2.2 μF	50 V	
C120	5260162850	Elec.	10 μF	50 V	
C121	5170362000	Mylar	0.0027 μF	100 V	5%
C122	5172300000	Ceramic	10 pF	50 V	
C123, C124	5260165252	Elec.	47 μF	25 V	
C125	5170453000	Mylar	0.15 μF	100 V	5%
C126	5171590000	Elec.	10 μF	16 V	
C127	5170409000	Mylar	0.0022 μF	100 V	5%
C128	5170372000	Mylar	0.0068 μF	100 V	5%
C131	5263106820	Polyst.	390 μF	100 V	5%
C132	5260162850	Elec.	10 μF	50 V	
C133	5260161550	Elec.	3.3 μF	50 V	
C134	5267205800	TRIMMER-M-2P100PF			
C135	5260164452	Elec.	33 μF	35 V	
C136~C139	5263107020	Polyst.	470 μF	100 V	5%
C140	5170362000	Mylar	0.0027 μF	100 V	5%
C141~C143	5260160550	Elec.	0.47 μF	50 V	
C144, C145	5260162850	Elec.	10 μF	50 V	
VARIABLE RESISTORS					
R108~R111	5150154000	Semi-fixed	5 kΩ (B)		
R120	5150154000	Semi-fixed	10 kΩ (B)		
R140	5150157000	Semi-fixed	100 kΩ (B)		
R141	5150156000	Semi-fixed	50 kΩ (B)		
R156	5150152000	Semi-fixed	2 kΩ (B)		
R176	5280001102	Semi-fixed	20 kΩ (B)		
COILS					
L101, L102	5286021100	Choke, 1.2 mH			
L103	5286011000	Choke, 2.4 mH	Variable		
L104	5286011100	Choke, 3.6 mH	Variable		
L105	5160044000	Trap, 3 mH	Variable		
L106	5286011400	Choke, 1.3 mH	Variable		
L107	5286021100	Choke, 1.2 mH			
L108	5286011500	Choke, 200 μH			
CONNECTOR SOCKET					
J101	5122375000	4P			
J102	5122378000	7P			
J103	5122377000	6P			
J104, J105	5122378000	7P			
J106	5122379000	8P			
J107	5122378000	7P			
J108	5122375000	4P			
MISCELLANEOUS					
T101	6046631000	Step-up Transformer			
	6800289400	Step-up Metal Fitting			
K101	5290009500	Relay, 24 V G2E-182P-H			
K102	5290009800	Relay, Reed; RPIA24			
K103	5290010400	Relay, 24 V MR62-24S			

POWER SUPPLY PCB Ass'y

REF. NO.	PARTS NO.	DESCRIPTION
	*5200074303	PCB Ass'y, Power Supply
	*5210074300	PCB, Power Supply
	IC	
U801	⚠5220405100	μPC-78M05H
	TRANSISTORS	
Q801	5145133000	2SC1645B
Q802	5042625000	2SC1318S
Q803	⚠5145087000	2SD313E
Q804	5145091000	2SC945AK
Q806, Q807	5145091000	2SC945AK
Q808	⚠5145087000	2SD313E
Q809, Q810	5042553000	2SA733P
Q811	⚠5145129000	2SB507E
Q812, Q813	⚠5145091000	2SC945AK
	DIODES	
D801~D805	⚠5224014500	1SR35-200HJ
D806	5143118000	1S2473HJ
D807~D810	⚠5224014500	1SR35-200HJ
D811	5224540901	RD6.2E-B2, Zener
D812~D815	⚠5224014500	1SR35-200HJ
D816	5224540901	RD6.2E-B2, Zener
D817	5143118000	1S2473HJ
D818	⚠5228007200	D4BB20, Silicon Stad
D819~D822	⚠5224014500	1SR35-200HJ
D823	5224545501	RD24E-B3, Zener
D824	5224543601	RD15E-B1, Zener
D825	⚠5224014500	1SR35-200HJ
	RESISTORS	
	All resistors are rated ±5 % tolerance, 1/4 W and of carbon type unless otherwise noted.	
R801	⚠5180050000	47 Ω 1/2 W
R802	⚠5180050000	47 Ω 1/2 W
R803	5183104000	8.2 kΩ
R804	5183114000	22 kΩ
R805	⚠5184302000	1.5 Ω Cement 2 W ±10%
R806	5183102000	6.8 kΩ
R807	5183106000	10 kΩ
R808	5183096000	3.9 kΩ
R809	5183112000	18 kΩ
R810	5183102000	6.8 kΩ
R812	5183090000	2.2 kΩ
R813	5183098000	4.7 kΩ
R814	5183058000	100 Ω
R815	5183090000	2.2 kΩ
R816	5183082000	1.0 kΩ
R817	5183102000	6.8 kΩ
R818	5183100000	5.6 kΩ
R819	5183106000	10 kΩ
R820	5183090000	2.2 kΩ
R821	5183098000	4.7 kΩ
R822	5183058000	100 Ω
R823	5183090000	2.2 kΩ
R824	5183146000	470 kΩ
R825, R826	5183106000	10 kΩ
R827	⚠5184249000	100 Ω Nonflammable
R828	5183092000	2.7 kΩ
R829	5184249000	100 Ω Nonflammable
R830	5183086000	1.5 kΩ
R831	5183128000	82 kΩ
R832	⚠5183130000	100 kΩ

REF. NO.	PARTS NO.	DESCRIPTION
	CAPACITORS	
C801	⚠5173081000	Elec. 1000 μF 16 V
C802	⚠5173079000	Elec. 1000 μF 6.3 V
C803	⚠5173084000	Elec. 1000 μF 50 V
C805	5173056800	Elec. 220 μF 35 V
C806, C807	5173075000	Elec. 470 μF 50 V
C808	5260166152	Elec. 100 μF 25 V
C809	5260160750	Elec. 1 μF 50 V
C810	5260166152	Elec. 100 μF 25 V
C811	5054204000	Ceramic 0.01 μF 50 V ±10%
C812, C813	5173075000	Elec. 470 μF 50 V
C814	5260166152	Elec. 100 μF 25 V
C815	5260160750	Elec. 1 μF 50 V
C816	5260166152	Elec. 100 μF 25 V
C817	5054204000	Ceramic 0.01 μF 50 V ±10%
C818, C819	⚠5173084000	Elec. 1000 μF 50 V
C820, C821	⚠5173089000	Elec. 2200 μF
C822	5260160750	Elec. 1 μF 50 V
C823	5054928500	Ceramic 0.1 μF 100 V
C824	5173075000	Elec. 470 μF 50 V
C826	5173048000	Elec. 100 μF 35 V
C827	5173073000	Elec. 470 μF 25 V
C829	5260166152	Elec. 100 μF 25 V
C830, C831	5260162850	Elec. 10 μF 50 V
C832~C836	⚠5263164500	Metalized 0.047 μF 250 V ±10%
C837	5173047800	Elec. 100 μF 35 V
C838	⚠5263164500	Metalized 0.047 μF 250 V ±10%
C840	5260160750	Elec. 1 μF 50 V
C841	5173066000	Elec. 330 μF 50 V
	MISCELLANEOUS	
	5800303400	Bracket, Power Supply PCB
	5800303500	Heat Sink
	5033291000	Plate, Insulating; 1S-313D
	5033295000	Tube, Insulating; P

FUSE PCB Ass'y (PC Board Omitted)

REF. NO.	PARTS NO.	DESCRIPTION
	*5200078520	PCB Ass'y [E, UK, A]
	*5200078510	PCB Ass'y [All except E, UK, A]
	*5210076400	PCB [E, UK, A]
	*5210078500	PCB [All except E, UK, A]
	FUSES	
F501~F504	⚠5142189000	T2A 250 V [E, UK, A]
F505, F506	⚠5142193000	T5A 250 V [E, UK, A]
F507, F508	⚠5041140000	T1A 250 V [E, UK, A]
F501~F504	⚠5307004100	2A 250 V [All except E, UK, A]
F505, F506	⚠5307004700	7A 125 V [All except E, UK, A]
F507, F508	⚠5307003600	1A 250 V [All except E, UK, A]
	⚠5332014200	Fuse Holder [E, UK, A]
	⚠5041237000	Fuse Holder [All except E, UK, A]

Parts marked with * require longer delivery time.

MOTHER PCB Ass'y

REF. NO.	PARTS NO.	DESCRIPTION
	*5200163700	PCB Ass'y
	*5210163700	PCB
	CONNECTOR PLUGS	
P101	5122356000	4P, AD
P102	5122359000	7P, AD
P103	5122358000	6P, AD
P104, P105	5122359000	7P, AD
P106	5122360000	8P, AD
P107	5122359000	7P, AD
P108	5122356000	4P, AD
P111~P114	5122145000	2P, (WHT)
P121~P124	5122126000	2P, (WHT)
P131	5122128000	4P, (WHT)
P141	5122301000	4P, (RED)
P142	5122129000	5P, (WHT)
P143	5122127000	3P, (WHT)
P144	5122300000	3P, (RED)
P145	5122145000	2P, (WHT)
P151~P154	5122299000	2P, (RED)
P161~P164	5122183000	2P, (BLK)
P171	5122135000	11P, (WHT)
P172	5122126000	2P, (WHT)
P173	5122128000	4P, (WHT)
P176	5122305000	8P, (RED)
P180	5122129000	5P, (WHT)
P181	5122128000	4P, (WHT)
P182	5122132000	8P, (WHT)
P183	5122301000	4P, (RED)
P184	5122134000	10P, (WHT)
P185	5122301000	4P, (RED)
P186	5122185000	4P, (BLK)
P187	5122132000	8P, (WHT)
P188	5122128000	4P, (WHT)
P191	5122132000	8P, (WHT)
P192	5122126000	2P, (WHT)
P201, P202	5122363000	11P, AD
P203	5122359000	7P, AD
P204, P205	5122362000	10P, AD

MONITOR AMPL. PCB Ass'y

REF. NO.	PARTS NO.	DESCRIPTION	
	*5200163800	PCB Ass'y, Monitor Ampl.	
	*5210163800	PCB, Monitor Ampl.	
	IC's		
U201, U202	5220414300	4560D	
U261, U262	5147028000	4558DD	
	TRANSISTORS		
Q211, Q221	5145103000	2SK68M, FET	
Q231, Q241	5145103000	2SK68M, FET	
Q251	5145150000	2SA1015GR	
Q252~Q254	5230776520	2SC1685R	
Q261	5230773800	2SC2655Y	
Q262	5230014000	2SA1020Y	
Q281	5145150000	2SA1015GR	
Q282	5230776520	2SC1685R	
Q283	5145150000	2SA1015GR	
Q284	5230776520	2SC1685R	
	DIODES		
D211, D221	5143118000	1S2473HJ	
D231, D241	5143118000	1S2473HJ	
D261	5224015300	MC931	
D281~D283	5143118000	1S2473HJ	
D284	5042554000	RD-6.2EB, Zener	
D285~D288	5143118000	1S2473HJ	
	CARBON RESISTORS		
	All resistors are rated ±5% tolerance and 1/4 W.		
R211, R221	5181434000	10 Ω	
R231, R241	5181434000	10 Ω	
R212, R222	5181508000	12 kΩ	
R232, R242	5181508000	12 kΩ	
R213, R223	5181550000	680 kΩ	
R233, R243	5181550000	680 kΩ	
R214, R224	5181554000	1 MΩ	
R234, R244	5181554000	1 MΩ	
R215, R225	5181474000	470 Ω	
R235, R245	5181474000	470 Ω	
R216, R226	5181500000	5.6 kΩ	
R236, R246	5181500000	5.6 kΩ	
R217, R227	5181530000	100 kΩ	
R237, R247	5181530000	100 kΩ	
R218, R228	5181530000	100 kΩ	
R238, R248	5181530000	100 kΩ	
R219, R229	5181474000	470 Ω	
R239, R249	5181474000	470 Ω	
R251	5181530000	100 kΩ	
R252	5181522000	47 kΩ	
R253, R254	5181530000	100 kΩ	
R255, R256	5181522000	47 kΩ	
R257	5181530000	100 kΩ	
R258	5181522000	47 kΩ	
R261	5181482000	1 kΩ	
R262	5181530000	100 kΩ	
R263	5181496000	3.9 kΩ	
R264	5181514000	22 kΩ	
R265	5181530000	100 kΩ	
R266, R267	5181482000	1 kΩ	
R268	5181530000	100 kΩ	
R269, R270	⚠5183546000	4.7 Ω	Nonflammable
R271	5181530000	100 kΩ	
R272, R273	5181508000	12 kΩ	
R274, R275	⚠5183542000	3.3 Ω	Nonflammable

Parts marked with * require longer delivery time.

REF. NO.	PARTS NO.	DESCRIPTION
R276	5181506000	10 kΩ
R277	5181498000	4.7 kΩ
R278	⚠5185672000	22 Ω Nonflammable
R281	5181492000	2.7 kΩ
R282	5181530000	100 kΩ
R283	5181522000	47 kΩ
R284	5181492000	2.7 kΩ
R285, R286	5181530000	100 kΩ
R287	5181484000	1.2 kΩ
R288	5181514000	22 kΩ
R289	5181456000	82 Ω
R290	5181530000	100 kΩ
R291	5181456000	82 Ω
R292	5181530000	100 kΩ
R293	5181456000	82 Ω
R294	5181530000	100 kΩ
	CAPACITORS	
C211, C221	5260162850	Elec. 10 μF 50 V
C231, C241	5260162850	Elec. 10 μF 50 V
C212, C222	5260065650	Elec. 1 μF 50 V, (BP)
C232, C242	5260065650	Elec. 1 μF 50 V, (BP)
C213, C223	5260165252	Elec. 47 μF 25 V
C233, C243	5260165252	Elec. 47 μF 25 V
C214, C224	5260162850	Elec. 10 μF 50 V
C234, C244	5260162850	Elec. 10 μF 50 V
C215, C225	5260166052	Elec. 100 μF 16 V
C236, C246	5172200000	Ceramic 10 pF 100 V
C235, C245	5260166052	Elec. 100 μF 16 V
C236, C246	5172200000	Ceramic 10 pF 100 V
C251, C261	5260162850	Elec. 10 μF 50 V
C262	5172204000	Ceramic 220 pF 50 V
C263	5260067050	Elec. 10 μF 16 V
C264, C265	5173072000	Elec. 470 μF 16 V
C266	5172204000	Ceramic 220 pF 50 V
C267	5260162850	Elec. 10 μF 50 V
C268	5260067050	Elec. 10 μF 16 V, (BP)
C269	5260162850	Elec. 10 μF 50 V
C281	5260165252	Elec. 47 μF 25 V
C282~C284	5260162850	Elec. 10 μF 50 V
	MISCELLANEOUS	
U251	5292201500	Master DSC Unit, 150 kHz
J201, J202	5122382000	Connector Socket, 11P
J203	5122378000	Connector Socket, 7P
J204, J205	5122381000	Connector Socket, 10P
L261	5292805400	Filter, 150 kHz

FUNCTION SELECT PCB Ass'y

REF. NO.	PARTS NO.	DESCRIPTION
	*5200075500	PCB Ass'y, Function Select
	*5210075500	PCB, C
	*5210075600	PCB, D
R281~R284	5183098000	Carbon Resistor 4.7kΩ 1/4 W ±5%
P281	5122129000	Connector Socket 5P
S281	5300027900	Push-Switch, 4-gang

Parts marked with * require longer delivery time.

CONNECTOR PCB Ass'y

REF. NO.	PARTS NO.	DESCRIPTION
	*5200100000	PCB Ass'y, Connector
	*5210100000	PCB, Connector
Q001	5145151000	Transistor 2SC-1815GR
D001	5143118000	Diode 1S2473HJ
R001, R002	5181506000	Carbon Resistor 10kΩ ±5% 1/4W
R003	5181482000	Carbon Resistor 1 kΩ ±5% 1/4W
R004, R005	5181498000	Carbon Resistor 4.7kΩ ±5% 1/4W
C001, C002	5260162050	Capacitor, Elec. 4.7 μF 35 V
	5122339000	Connector Socket, 6P
	5555700000	Nut, Plate

POWER SUPPLY SUB PCB Ass'y

REF. NO.	PARTS NO.	DESCRIPTION
	*5200086000	PCB Ass'Y, Power Supply Sub
	*5210086000	PCB, Power Supply Sub
	TRANSISTORS	
Q851	⚠5145087000	2SD313E
Q852	5145091000	2CS945AK
Q853	5145043000	2SA720Q
	CARBON RESISTORS	
R851	5183084000	1.2 kΩ ±5 % 1/4 W
R852	5183092000	2.7 kΩ ±5 % 1/4 W
R853	5183082000	1 kΩ ±5 % 1/4 W
R854	⚠5183562000	22 Ω ±5 % 1/4 W, Nonflammable
	DIODE	
D851	5224540901	RD6.2EB1, Zener
	CAPACITORS	
C851	5260162850	Elec. 10 μF 50 V
C852	5260160750	Elec. 1 μF 50 V
C853	5173047800	Elec. 100 μF 35 V
	MISCELLANEOUS	
	5800369000	Bracket, Power Supply Sub
	5033291000	Plate, Insulating
	5033295000	Tube, Insulating

INPUT SELECT PCB Ass'y

REF. NO.	PARTS NO.	DESCRIPTION
	*5200163900	PCB Ass'y, Input Select
	*5210163900	PCB, Input Select
R301~R304	5181490000	Carbon Resistor 2.2kΩ ±5% 1/4W
R301	5300028800	Push Switch, 4-gang
P301	5122130000	Connector Plug, 6P (WHT)
P302	5336107600	Connector Plug, 6P (YEL)
P303	5336107500	Connector Plug, 5P (YEL)

OUTPUT SELECT PCB Ass'y

REF. NO.	PARTS NO.	DESCRIPTION
	*5200164000	PCB Ass'y, Output Select
	*5210164000	PCB, Output Select
	CARBON RESISTORS	
R321, R322	5181482000	1 kΩ ±5% 1/4 W
R323	5181498000	4.7 kΩ ±5% 1/4 W
R324	5183090000	2.2 kΩ ±5% 1/4 W
R325	5181484000	1.2 kΩ ±5% 1/4 W
	CAPACITORS	
C321	5173435000	Ceramic 0.047μF 50 V
C322, C323	5260067250	Elec. 10 μF 35 V (BP)
	MISCELLANEOUS	
S321	5300028000	Push Switch, 3-gang
P321	5122128000	Connector Plug, 4P

PHONES SELECT PCB Ass'y

REF. NO.	PARTS NO.	DESCRIPTION
	*5200164101	PCB Ass'y, Phones Select
	*5210164101	PCB, Phones Select
R311~R314	5181530000	Carbon Resistor 100 kΩ ±5% 1/4 W
R315~R318	5181484000	Carbon Resistor 1.2 kΩ ±5% 1/4W
S311	5300041500	Push Switch, 4-gang
P311	5122127000	Connector plug, 3P (WHT)
P312	5122132000	Connector Plug, 8P (WHT)
P313	5122186000	Connector Plug, 5P (BLK)

PHONES JACK PCB Ass'y

REF. NO.	PARTS NO.	DESCRIPTION
	*5200164200	PCB Ass'y, Phones Jack
	*5210164200	PCB, Phones Jack
C361	5054204000	Ceramic Cap. 0.01 μF 50 V
J361	5330010100	Jack, Phones

LED PCB A Ass'y

REF. NO.	PARTS NO.	DESCRIPTION
	*5200164300	PCB Ass'y, LED A
	*5210164300	PCB, LED A
D301	5225007900	LED, GL-9PR2; (RED)
D302	5225010600	LED, GL-9HY2; (YEL)
D303	5225007100	LED, GL-9NG2; (GRN)

Parts marked with * require longer delivery time.

LED PCB B Ass'y

REF. NO.	PARTS NO.	DESCRIPTION
	*5200164400	PCB Ass'y LED B
	*5210164300	PCB, LED B
D301~D304	5225007900	LED, GL-9PR2; (RED)

LED PCB C Ass'y

REF. NO.	PARTS NO.	DESCRIPTION
	*5200164500	PCB Ass'y, LED C
	*5210164300	PCB, LED C
D301~D304	5225010600	LED, GL-9HY2; (YEL)

LED PCB D Ass'y

REF. NO.	PARTS NO.	DESCRIPTION
	*5200164600	PCB Ass'y, LED D
	*5210164300	PCB, LED D
D301~D304	5225007100	LED, GL-9NG2; (GRN)

IN/OUT PCB Ass'y

REF. NO.	PARTS NO.	DESCRIPTION
	*5200164700	PCB Ass'y, IN/OUT
	*5210164700	PCB, IN/OUT
	CARBON RESISTORS	
R341	5181522000	47 kΩ ±5 % 1/4 W
R342	5181524000	56 kΩ ±5 % 1/4 W
R343	5181522000	47 kΩ ±5 % 1/4 W
R344	5181524000	56 kΩ ±5 % 1/4 W
R345	5181522000	47 kΩ ±5 % 1/4 W
R346	5181524000	56 kΩ ±5 % 1/4 W
R347	5181522000	47 kΩ ±5 % 1/4 W
R348	5181524000	56 kΩ ±5 % 1/4 W
	CAPACITORS	
C341~C344	5054204000	Ceramic 0.01 μF 50 V
	MISCELLANEOUS	
P341	5122149000	Connector Plug, 6P (WHT)
P342	5122457000	Connector Plug, 6P (RED)
	5327007101	Terminal Board, IN/OUT; 8P

MIC IN PCB Ass'y

REF. NO.	PARTS NO.	DESCRIPTION
	*5200165200	PCB Ass'y, Mic IN
	*5210165200	PCB, Mic IN
C351~C354	5054204000	Ceramic Cap. 0.01 μF 50 V
J351~J354	5330008300	Jack, Mic

PUNCH IN/OUT PCB Ass'y

REF. NO.	PARTS NO.	DESCRIPTION
	*5200077700	PCB Ass'y, Punch In/Out
	*5210077700	PCB, Punch In/Out
Q901, Q902	5145178000	Transistor, 2SC1684S
R901	5183034000	Carbon Resistor 10 Ω 5% 1/4W
R902	5183122000	Carbon Resistor 47 kΩ 5% 1/4W
R903	5183098000	Carbon Resistor 47 kΩ 5% 1/4W
R904	5183106000	Carbon Resistor 10 kΩ 5% 1/4W
R905	5183122000	Carbon Resistor 47 kΩ 5% 1/4W
C901	5260161150	Capacitor, Elec. 2.2 μF 50 V
J901	5330008300	Jack, Mic

SPEED SW PCB Ass'y (PC Board Omitted)

REF. NO.	PARTS NO.	DESCRIPTION
	*5200074501	PCB Ass'y, Speed SW
	*5210074501	PCB, Speed SW
	5300027700	Switch, Push; 3-gang
	5122170000	Connector, Socket; 8P (WHT)
	5122164000	Connector, Socket; 2P (WHT)

OPERATION PCB Ass'y (PC Board Omitted)

REF. NO.	PARTS NO.	DESCRIPTION
	*5200073600	PCB Ass'y, Operation
	*5210073600	PCB, Operation
D601	5225007900	LED, GL-9PR2 (RED)
D602	5225007100	LED, GL-9NG2 (GRN)
S601~S606	5138011000	Switch, Tact; AKC-8S
J503	5122172000	Connector Socket, 10P (WHT)
	5336112000	Connector Plug, 10P
	5336113000	Connector Plug, 10P

Parts marked with * require longer delivery time.

REMOTE PCB Ass'y (PC Board Omitted)

REF. NO.	PARTS NO.	DESCRIPTION
	*5200073700	PCB Ass'y, Remote
	*5210073700	PCB, Remote
J902	5334010100	Connector Socket
	5554099100	Bracket, Connector

PITCH CONTROL PCB Ass'y (PC Board Omitted)

REF. NO.	PARTS NO.	DESCRIPTION
	*516893800	PCB Ass'Y, Pitch Control
	*5167938000	PCB, Pitch Control
	5150239000	Variable Resistor, 5 kΩ(B)

COUNTER PCB Ass'y (PC Board Omitted)

REF. NO.	PARTS NO.	DESCRIPTION
	*5200074000	PCB Ass'y, Counter
	*5210074000	PCB, Counter
S609	5300025700	Push Switch, 2-2
S610	5300028100	Push Switch, 2-2 NR

SENSOR PCB Ass'y (PC Board Omitted)

REF. NO.	PARTS NO.	DESCRIPTION
	*5200073900	PCB Ass'y, Sensor
	*5210073900	PCB, Sensor
PH502, PH503	5228007500	Photo Interrupter, SJ3W
	5800299300	Bracket, Photo Interrupter

SHUT OFF PCB Ass'y (PC Board Omitted)

REF. NO.	PARTS NO.	DESCRIPTION
	*5200073800	PCB Ass'y, Shut OFF
	*5200073800	PCB, Shut OFF
PH501	5228007400	Photo Interrupter, SM3B

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SCHEMATIC DIAGRAM **34B** REC/PLAY AMPL PCB

1 2 3 4 5 6 7

A B C D E

U101 D101 | U101 Q101∿Q104 D120 D102∿D105 | Q107 D119 | Q105 D106 | Q106 D107 D109 | Q108∿Q110 D112 D108 D118 | Q111 D121 D123 | Q112 Q121 Q122 D122 D124 | D110 D111 | U102 Q113 D125 | U102 Q123 | Q117 Q116 | U103 Q120 Q119 Q118 D114 D117 D115 D116

REC/PLAY AMPL PCB

TO P101∿P108 OF MOTHER PCB Ass'y

U101	: 4558DD	Q101∿Q107	: 2SK68AM	Q113	: 2SC1684S or 2SC1685	D101 ∿ D109	: IS2473HJ
U102	: 4559DD	Q108	: 2SC1684S or 2SC1685	Q116 ∿ Q118	: 2SC1684S or 2SC1685	D110	: 1K60
		Q109	: 2SA733P	Q119	: 2SC1815S	D111	: 1K60
		Q110	: 2SK68AM	Q120 ∿ Q122	: 2SC1684S or 2SC1685	D112	: IS2473HJ
		Q111	: 2SC1684S or 2SC1685	Q123	: 2SA1015Y, GR	D116 ∿ D125	: IS2473HJ
		Q112	: 2SA733P				

TASCAM 34B REC/PLAY AMPL PCB
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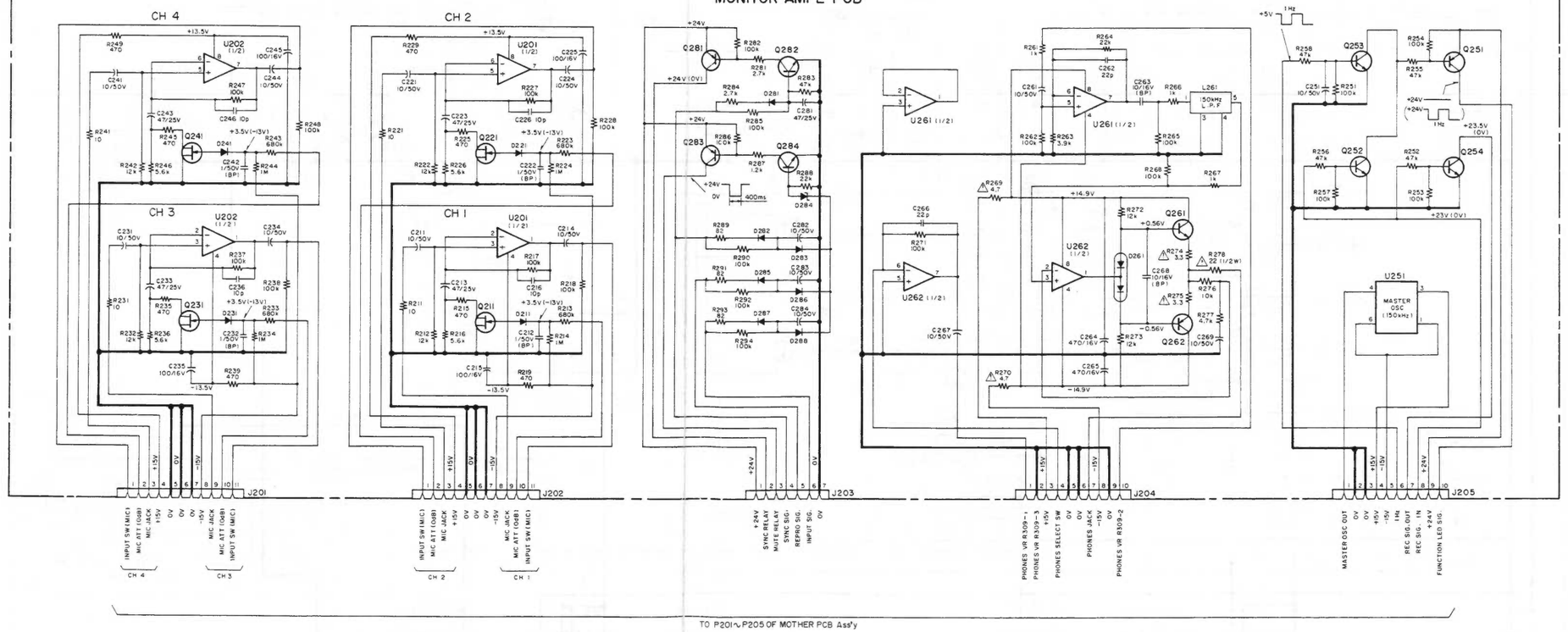
U202	U201		U261,U262	U261,U262		U251	
Q231,Q241	Q211,Q221	Q281,Q283	Q282,Q284		Q261,Q262	Q252,Q253	Q251,Q254
D231,D241	D211,D221		D281 ~ D288		D261		

MONITOR AMPL PCB



TO P201~P205 OF MOTHER PCB Ass'y

U201 , U202	:	4560D
U261 , U262	:	4558DD

Q211 , Q221	:	2SK68M
Q231 , Q241	:	2SK68M
Q251	:	2SA1015GR
Q252 ~ Q253	:	2SC1684S or 2SC1685R
Q261	:	2SC2655Y

Q262	:	2SA1020Y
Q281	:	2SA1015GR
Q282	:	2SC1684S or 2SC1685R
Q283	:	2SA1015GR
Q284	:	2SC1684S or 2SC1685R

D211 , D221	:	IS2473HJ
D231 , D241	:	IS2473HJ
D261	:	MC931
D261 ~ D283	:	IS2473HJ
D264	:	RD-6.2EB
D285 ~ D288	:	IS2473HJ

△(R269 , R270 , R274 , R275 , R278) : NON FLAMMABLE RESISTOR

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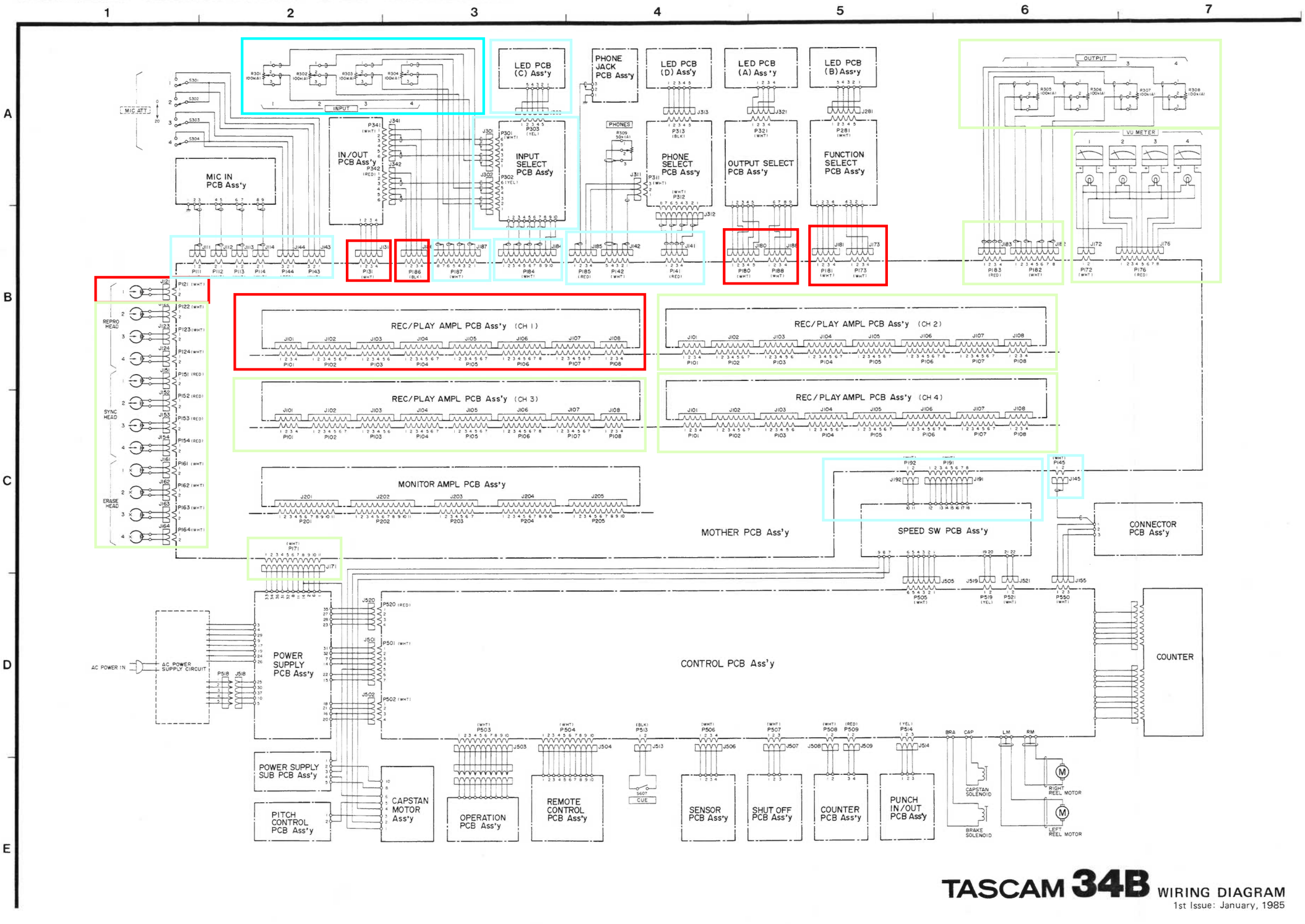
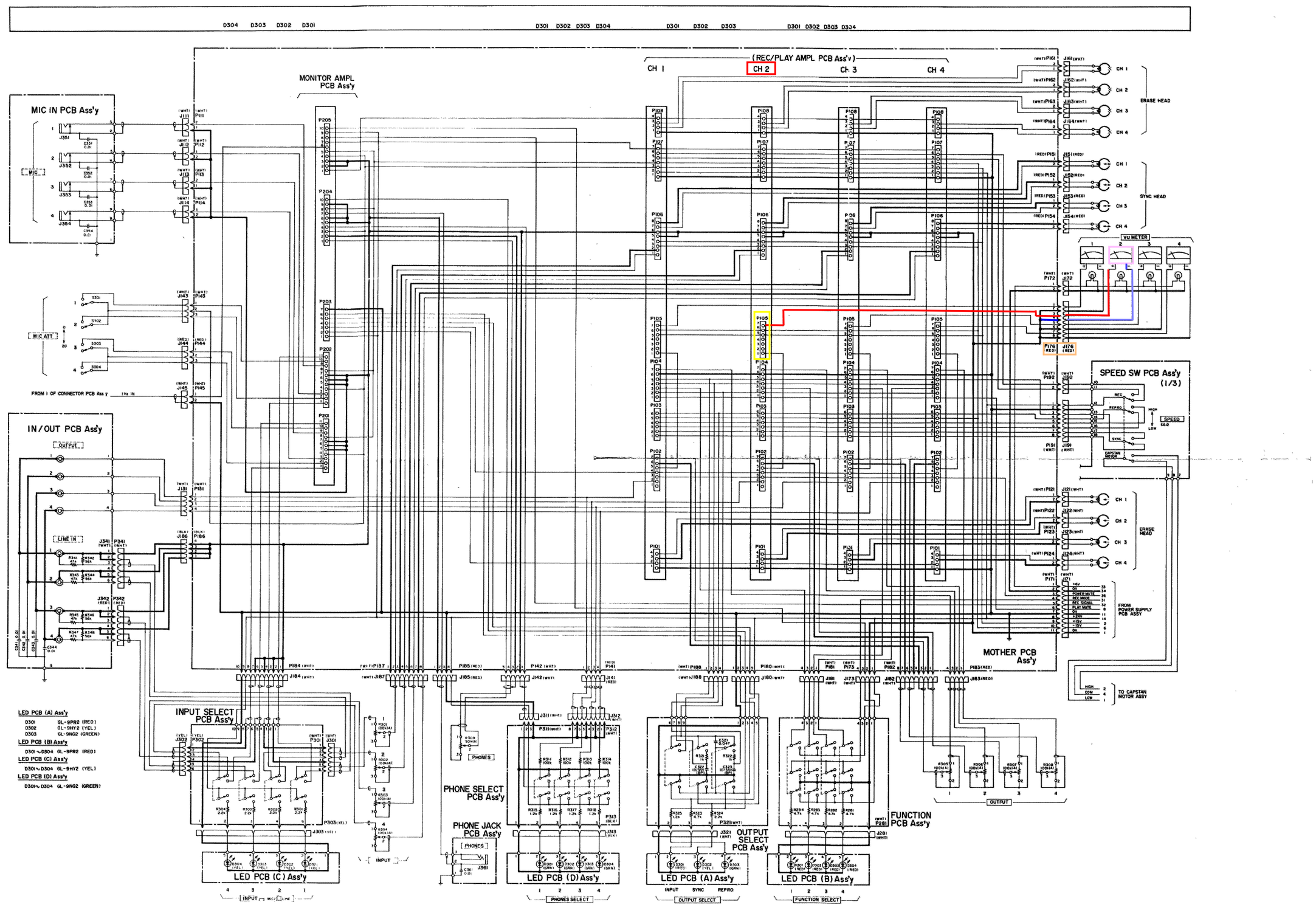
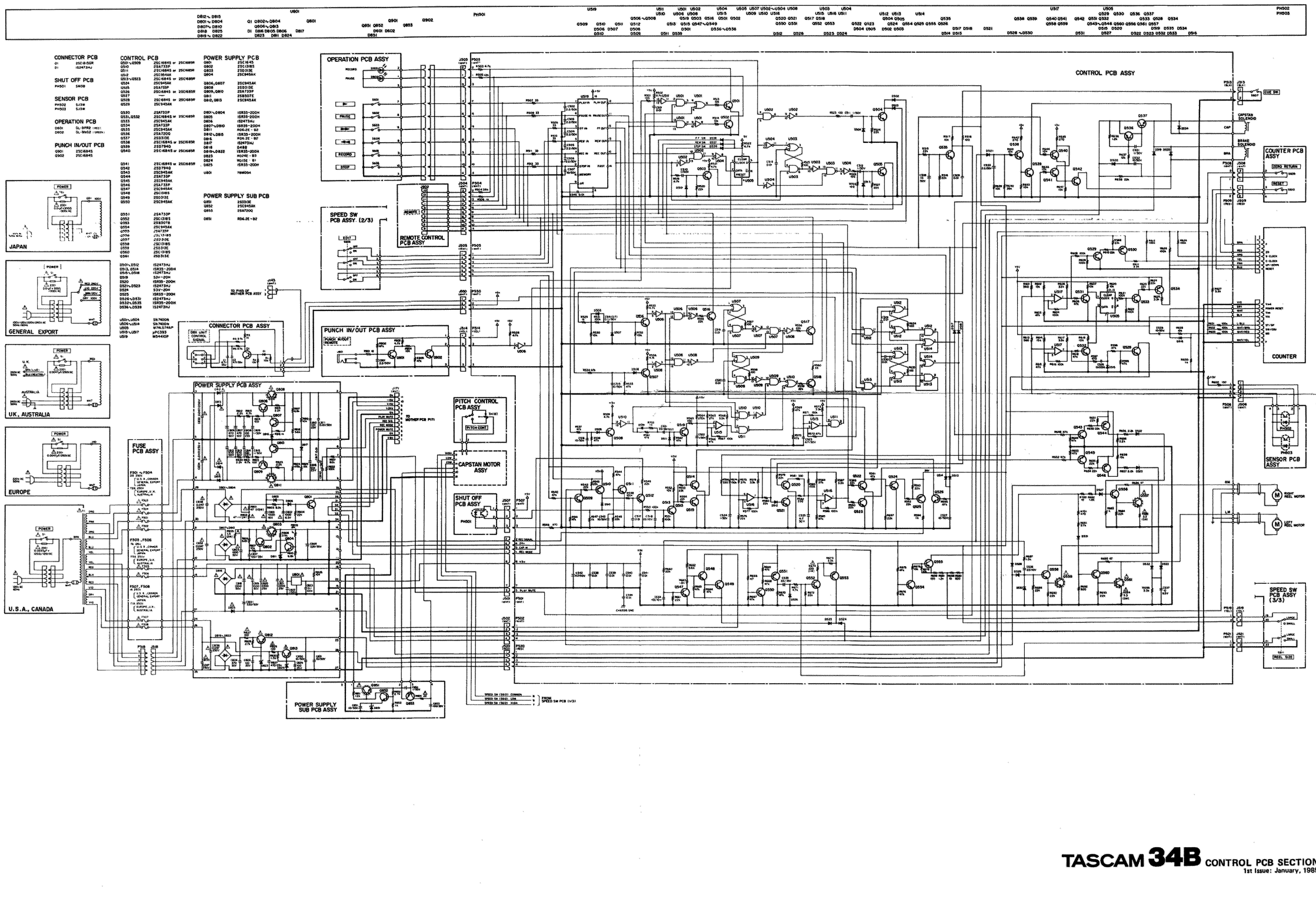
SCHEMATIC DIAGRAM **34B** WIRING DIAGRAM



TASCAM 34B WIRING DIAGRAM
1st Issue: January, 1985


MIC IN PCB Ass'y
MIC
J351
J352
J353
J354
MIC ATT
FROM I OF CONNECTOR PCB Ass'y
LINE IN
IN/OUT PCB Ass'y
OUTPUT
MONITOR AMPL PCB Ass'y
(REC/PLAY AMPL PCB Ass'y)
CH 1
CH 2
CH 3
CH 4
ERASE HEAD
SYNC HEAD
VU METER
SPEED SW PCB Ass'y (1/3)
REC
REPRO
SYNC
SPEED
HIGH
LOW
CAPSTAN MOTOR
FROM POWER SUPPLY PCB ASSY
TO CAPSTAN MOTOR ASSY
MOTHER PCB Ass'y
INPUT SELECT PCB Ass'y
PHONES
PHONE SELECT PCB Ass'y
PHONE JACK PCB Ass'y
OUTPUT SELECT PCB Ass'y
FUNCTION PCB Ass'y
LED PCB (A) Ass'y
D301 GL-9PR2 (RED)
D302 GL-9HY2 (YEL)
D303 GL-9NG2 (GREEN)
LED PCB (B) Ass'y
D301~D304 GL-9PR2 (RED)
LED PCB (C) Ass'y
D301~D304 GL-9HY2 (YEL)
LED PCB (D) Ass'y
D301~D304 GL-9NG2 (GREEN)
INPUT
SYNC
REPRO
PHONES SELECT
OUTPUT SELECT
FUNCTION SELECT


CONNECTOR PCB
SHUT OFF PCB
SENSOR PCB
OPERATION PCB
PUNCH IN/OUT PCB
CONTROL PCB
POWER SUPPLY PCB
POWER SUPPLY SUB PCB
OPERATION PCB ASSY
SPEED SW PCB ASSY. (2/3)
REMOTE CONTROL PCB ASSY
CONNECTOR PCB ASSY
PUNCH IN/OUT PCB ASSY
POWER SUPPLY PCB ASSY
POWER SUPPLY SUB PCB ASSY
PITCH CONTROL PCB ASSY
CAPSTAN MOTOR ASSY
SHUT OFF PCB ASSY
FUSE PCB ASSY
CONTROL PCB ASSY
COUNTER PCB ASSY
COUNTER
SENSOR PCB ASSY
SPEED SW PCB ASSY (3/3)
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