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SPARS NEW YORK REGIONAL MEETING

PART I

3/19/81

REVIEW : "PROBLEMS AND SOLUTIONS / AMPEX 1200"
SPEAKER: MICHAEL GUTHRIE, DIRECTOR OF ENGINEERING
RECORD PLANT STUDIOS, LTD. -NYC

Dear MM-1200 User:

The following package of information has been compiled by the Maintenance staff of Record Plant Studios to aid the users of this machine.

It contains solutions to common problems with this machine. It is not a cure-all, and it is not a substitute for good maintenance, or for knowing what you are doing. All of the changes indicated have been made in many machines, and in our experience are reliable. We cannot, however, be responsible for these or any other changes you make in your machine. We especially recommend that you advise Ampex of all problems, and possible modifications during the warantee period.

We would like to thank the many people who have contributed ideas to this list. I am especially grateful to Bob Michaud, and Ben Oniki at Ampex for the help they have given us over the years, and would note that they contributed many of the changes. Good luck.

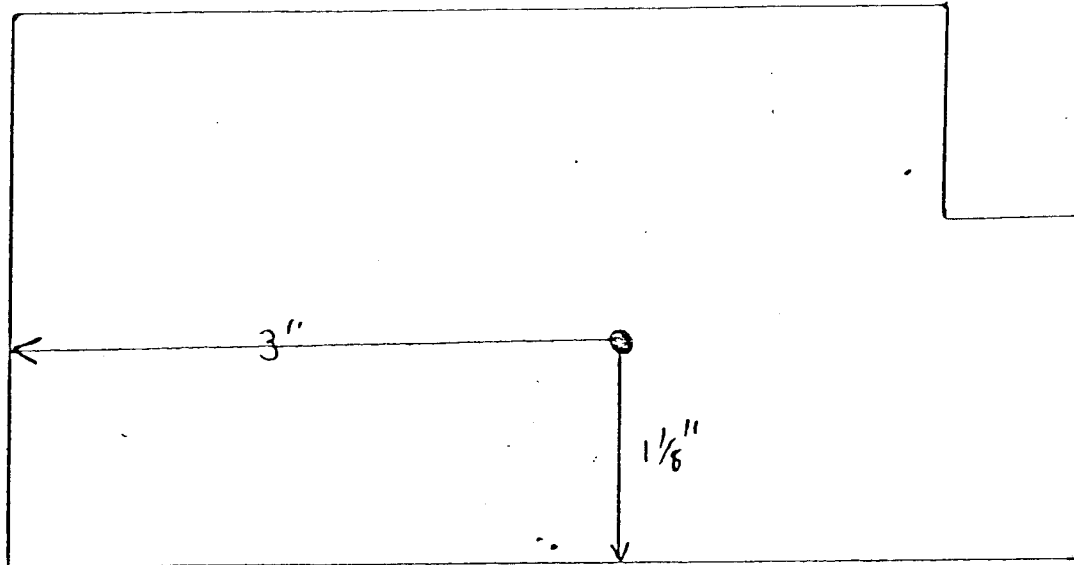
Good luck.

Michael Guthrie
Director of Engineering
Record Plant Studios, Ltd. (NYC)

Record Plant Studios MM-1200 modification procedures:

- 1) Add tension bulb indicator. Failure of the tension bulb during a session can cause huge client problems if it is not noted BEFORE the most important take of the day. The machine still runs, but with improper tensions.

Drill a 3/16" hole in the indicated position on the tension sense cover, and glue a small red lense on the inside. reinstall on machine. Inform all operators not to operate machine without lit indicator.



- 2) Check C-22 on the Capstan servo card. It must be 3300 pF. If not, change it. Erratic servo lock results on 80% of the machines with the original cap.
- 3) Check for improper fuse size, and especially slo-blow fuses in the 39 and 27 volt power supplies. Slo-blow fuses cause failure of the crowbar in event of over voltage condition.
- 4) Modify the controll box as follows:
Add a 270 ohm 1W resistor in series with R1,3,6,8,9.
Add a 3ohm 2W resistor in parallel with R13,14 on the standby switcher card
Add an 1N4001 in series with the lead to point E4 on the main board, coming from E4 on the LED board. The banded end faces the main board.
Change R41,42,44,45,38 to 680 1/2W.

these changes increase the lamp life and cool the controll buttons, prevent logic latchup, prevent LED ghosting, and improve controll switch life respectively.

- 5) Any machine used in a high RF field (all of NYC) should have a 1 uH choke placed in series with the base of Q1 on each Reproduce PWA. This is especially effective against TV interference common in New York.
- 6) The upper right corner of the reproduce head shield should be rounded off with a file to prevent tape damage when unthreading the machine to edit. To do this, remove the head assembly from the machine. Remove the head shield from the assembly, and carefully, with a small file remove the sharp corner from the shield. Enough material should be removed to make it easy to get

- (6) the tape between the shield and the tape guide without the danger of edge damage.
- 7) While the head assembly is off the machine, check the female head connectors on the machine for damage, and that they are regularly spaced on the top plate. They are able to move quite a bit when loosened. Check the male connectors on the head assembly for damage, and check that the nuts which attach them are tightened enough to engage the nylon in the small NYLOCK nut. on most of these, there is not enough length in the hardware to accomplish this and still maintain slop for self alignment. In this case, substitute an ordinary nut, and lock it in place with a little locktight. Head assemblies which have had the web destroyed by tightening the assembly down with improper alignment of the connectors can be saved by removing the nuts on top of the connectors. removing the broken section of web, or bending it back in place, and substituting a thin piece of threaded aluminium going across all the connectors for the nuts. The assembly then goes back together with plain nuts and locktite.
- 8) Machine side panels should have a piece of very heavy neoprene rubber or foam glued into the space between the mounting channels to prevent rattles and to damp the resonance of the panel if the machine is to be used in the audio monitoring field. This also reduces fan noise.
- 9) If the machine is to be used in a room which has 110V VSO's for 440 machines the VSO socket should be changed to a 6 pin. plugging a 110V VSO into this socket will produce spectacular results.
- 10) Either a narrow pinch wheel, or an Ampex tension Kit should be installed on all machines. All machines not so equipped will run between .5 and 1.5% slow at the end of a 10.5" reel after 1000 or so hours of operation, the exact figures depend on many factors, including tape type, amount of stopping and starting etc. The problem is much worse with 14" reels, and with increasing wear on the capstan shaft. the narrow pinch wheel could be of the MM-1000 type, the type used on the 2" VTR, or a regular assembly with the material cut back leaving rubber only where the tape will be (allow about a sixteenth on either side for mechanical and guidance tolerance) ie leave 1 7/8 inches of material in the center of the pinch wheel. United Research 16 E 52 d St. NYC NY can supply pinch wheels to this spec resurfaced with ML6 material on old pinch wheels. These have not been tested, however, cut neoprene pinch wheels made to these dimensions have, and work quite well. Machines with either the pinch wheel change or the tension kit will maintain speed spec from end to end of a 16" reel.
- 11) When installing the tension controller kit, the following changes have been found to be beneficial. Complete instructions follow. The two 1N34 diodes and the 1N5256 make the stop and RW tensions independent of the play tension. This also leaves the pots which set these tensions closer to their centers. The regulator shown reduces the tension change with change in the 27 V power supply. This reduces drift, and allows repairs and adjustments of the 27 V supply without tension readjustment.
- 12) The powersupply modification which follows reduces the hum and low freq. garbage present in the output of the machine. These noises are below the noise of an individual channel, but when 24 tracks are summed in phase in a mix situation they become the SN limit of the machine. Note that this mod would probably

(12) not be necessary if the 39 V common in the power supply were lifted from ground and the ground connections of C28,30 and R49,53 on the transport control PWA were taken to transport connector J5, pin 5. This would prevent noise on the 27 V common line from entering the EQ lines. Also note that it is advisable to add a 1N5298 constant current diode from each EQ line to ground. This bleeds away current when the line is low, bringing it below the turn on voltage of the diodes in the Reproduce amplifiers. About 1 or 2 % of these diodes are very noisy when slightly on as when these constant current diodes are not in the machine. A more effective way would be to add a transistor to pull the line low when not in use. The MPS-U56 circuit is not necessary, but will pay for itself in meter lamps in less than a year. Note that it will also save your ears and monitor speakers if someone forgets to mute them when switching on the machine. The time up can be raised or lowered by scaling the 22K resistor. It is about 3 sec with the values shown. Note also that this mod reduces power supply noise slightly.

13) MDA mods.

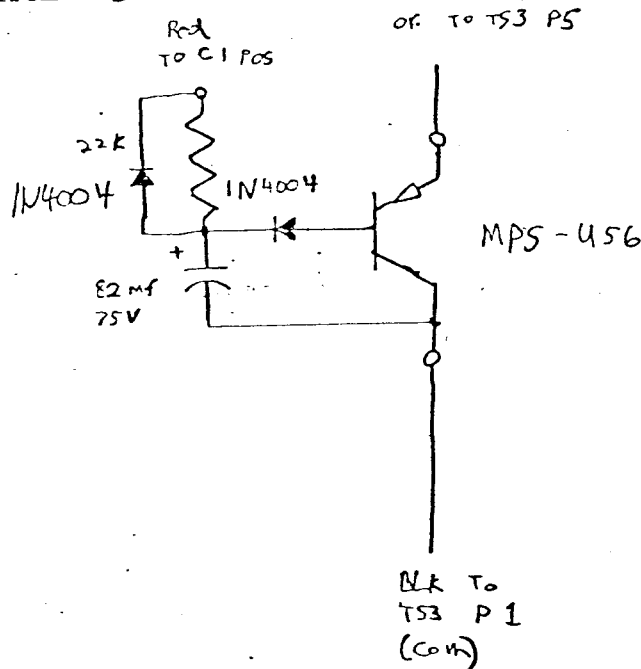
- 1) install SFT 31307 transistors in Q101,102,105,106. Add the 220 ohm resistors, and the diodes as shown in the tension kit instructions. Note the 013-678 can be replaced with a 1n4004 etc. if you're not an Ampex dealer.
- 2) add two fuse holders to the PWA panel as shown. cut the lands leading to the Q1,7 collectors between C2,9 and the transistors. Drill two holes to pick up these lands on each side and wire to the fuse holders. install 1/4 or 3/8 A sol blow fuses in the fuse holders. These fuses will, at least in most cases, protect Q1,7 from failure when the transistors on the heatsink assembly fail.
- 3) if installing a tension kit, follow the instructions concerning further mods that go with that kit. Do not do these unless you are installing the kit.
- 4) Make two duct plates as shown in the drawing. these should be black anodise aluminium if possible or painted flat black if not. Drill and tap four holes for 6-32 screws in each heat sink, and use 6-32 X 1 1/4" screws, lock washers, and flat washers to attach the duct plates to the heat sinks.
- 5) Remove the fan, and turn it around when reinstalling it. it will now blow out. Do not install a filter in this location.

Power Supply Modification Procedure

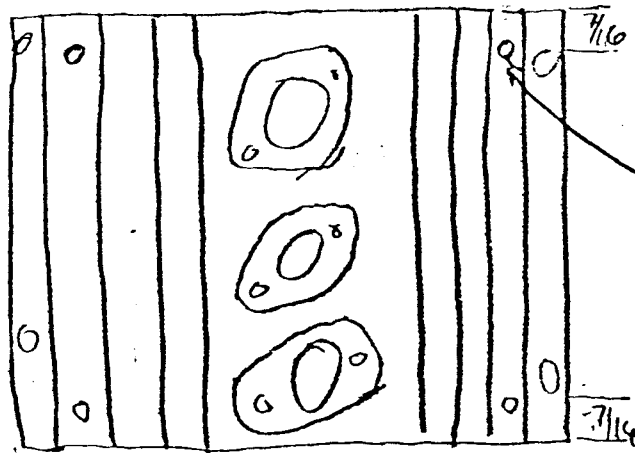
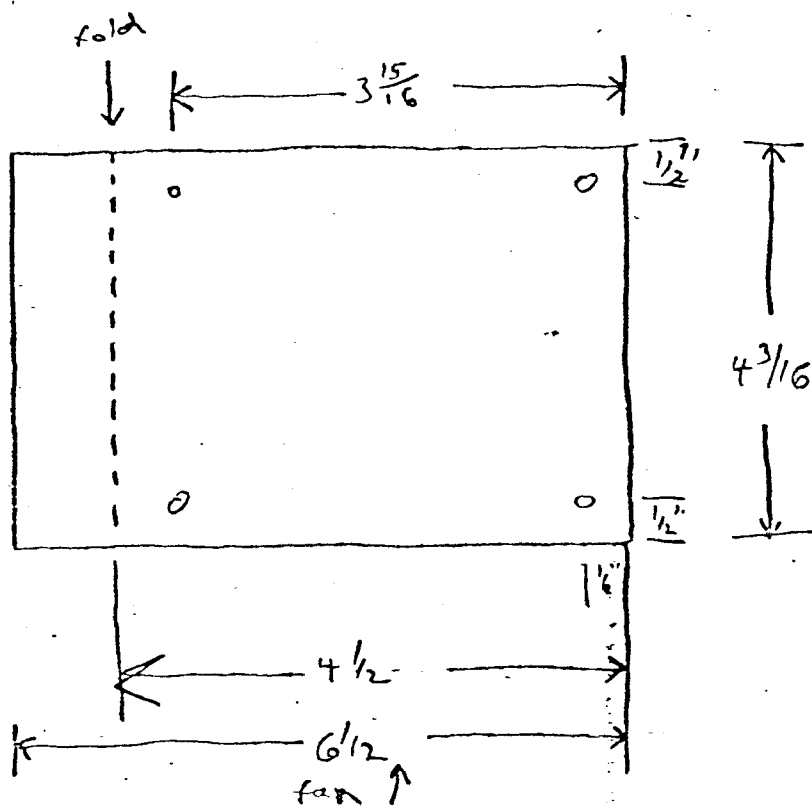
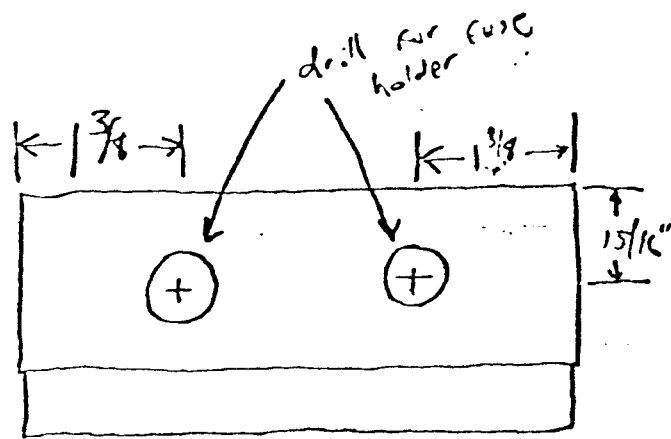
Purpose:

Ground loops in machine wiring introduce noise from motors and controll logic into reproduce preamps via EQ switch lines. Modification removes these interactions and provides improved signal to noise ratio.

- 1) remove powersupply assembly from machine and remove top and heat sink assembly
- 2) remove jumper connecting C2 neg to chasis
- 3) remove jumper connecting C4 Neg to C5 Neg.
- 4) remove jumper connecting pins 6 and 8 on J1
- 5) remove jumper connection between pin 1 and pins 4,7,10 on J2.
- 6) remove jumper connecting pin 11 and pins 2,5,8 on J2
- 7) add a 16 ga wire from 2,5,8 of J2 to TS2 pin 5 (on heatsink ass), leave existing yellow wire on pin 11 (J2) and existing grey on 2,5,8 (J2).
- 8) add a 16 ga wire from 4,7,10 of J2 to C2 Neg. Leave the existing black wire on pin 1 (J2).
- 9) add a 16 ga wire from C7 Neg (E4) to the heatsink assembly near A4, and connect a 4.7mf 10 v or greater Tant. between A4 input and the added ground wire. the cap can be added to a small terminal strip added a few inches from A4. The input of A4 is the pin that would be the base of a To-3 transistor.
- 10) remove C3 from TS3. near TS3, mount a small turet board with the following on it.



- 11) the MPS-U56 collector connects where C3 neg was. the emitter connects where C3 pos was, and the resistor gets a new wire back to C1 pos.
- 12) solder all ring lugs, both new and existing, and add a lockwasher between the lowest lug and the cap on C1,C2,C4,C5. Neatly tie all new wiring, and reassemble the power supply.
- 13) add an 18 ga wire from Transport Connector J5 (burndy) ^{pin 5} to transport controll chassis J1 pin 15.
- 14) reassemble machine, check audio noise with notape, in play, with the head gate closed. reset tensions and power supply voltages if necessary and check for proper operation of all functions.

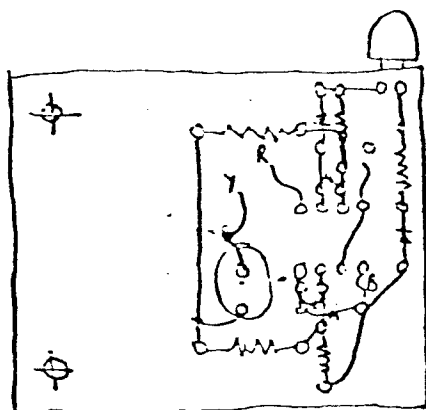
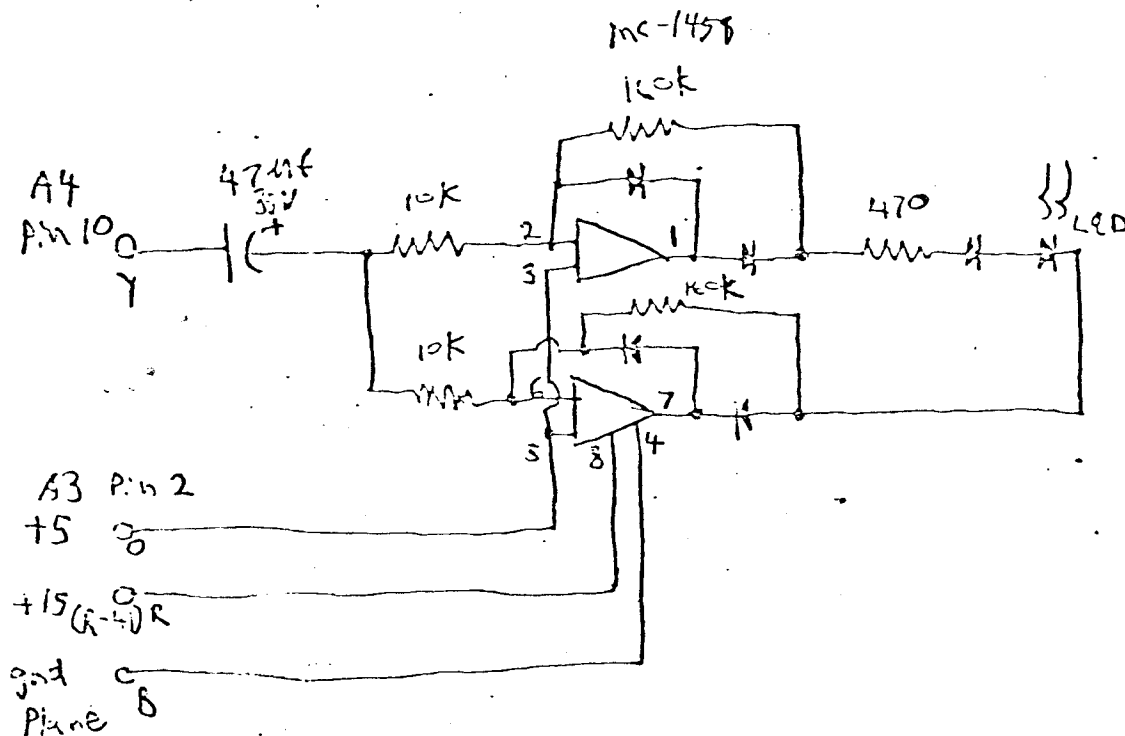


drill and
Tap 4 Holes
6-32

- 14) Here are two unnecessary, but nice additions for the MM-1200. the first is a piggy back board for the capstan servo card, which indicates the presence of bad bearings, servo oscillations, heavy corrections from synchronisers etc which might cause flutter. It is quite sensitive, with a little practice, you can learn to identify flutter below .07%, before it becomes a problem.

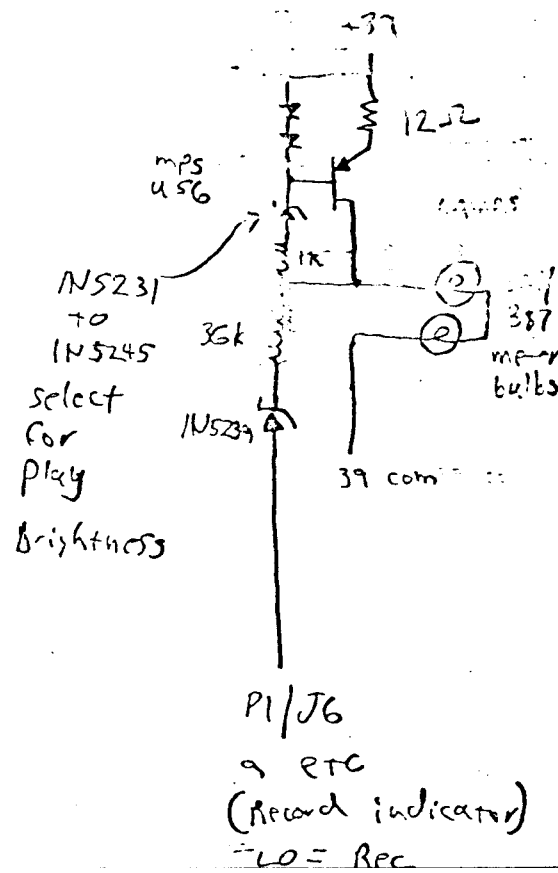
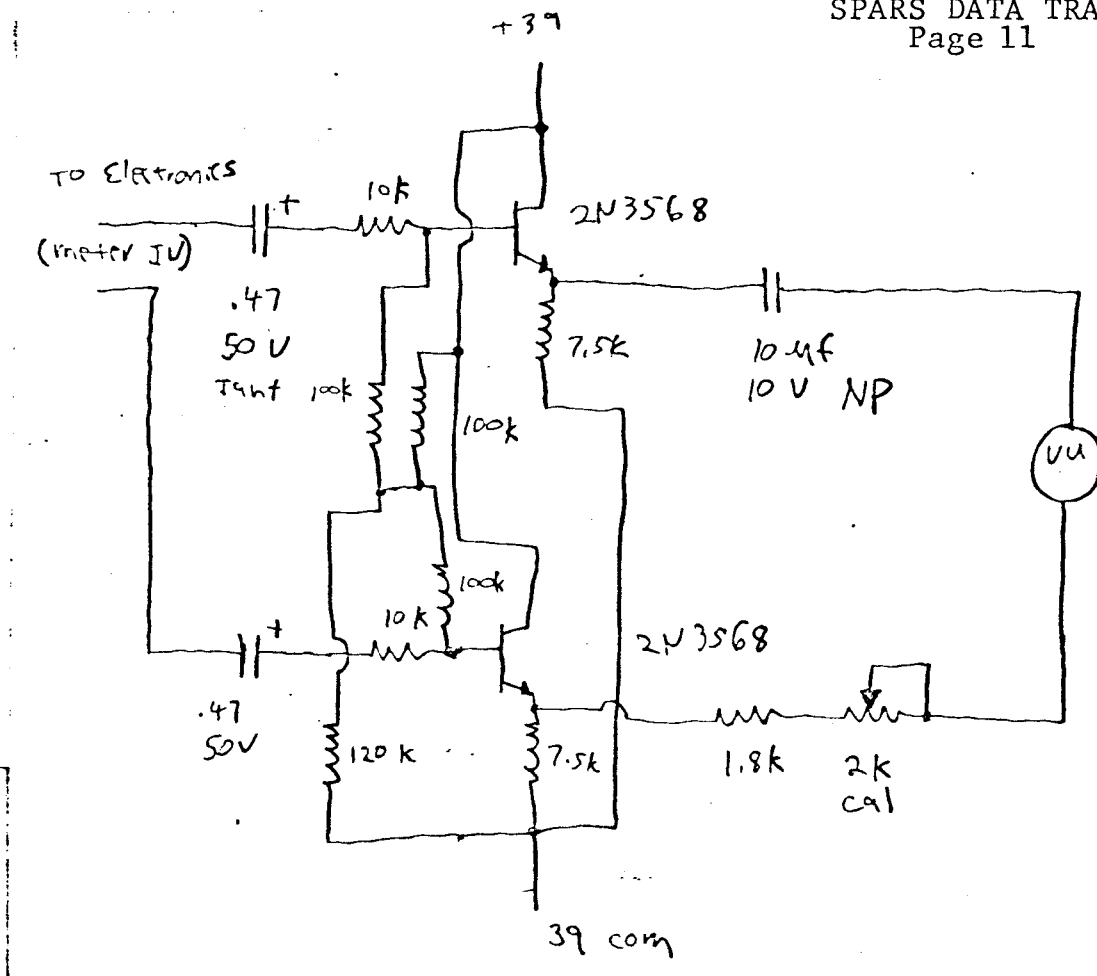
MM-1200 flutter indicator mod

m-6. - 10/11



This one is a meter buffer amplifier that will eliminate the distortion caused by the VU meters. This distortion can, under some conditions, be as great as the distortion from the tape. also on this card is a meter lamp buffer that dims the lamps in play, and brightens them in record, giving record indication on the front of the machine. the amplifier does not affect bias metering as an op-amp might, and does not affect the common mode floating of the output transformer.

SPARS DATA TRACK
Page 11



CHANGES AND ADDITIONS TO TAKEUP TENSION CONTROLLER KIT * Record Plant Studios
2/16/81

Page 1

Do not install R 29, but rather install a wire to go to new regulator board. This wire goes in the hole connected to A2 pin 5. (this eyelet is near A2 P1)

Do not install R 24, install a wire here also. the eyelet which connects to A2 P4, near A2 p1

Build the aux 24V regulator shown below, and install on card.

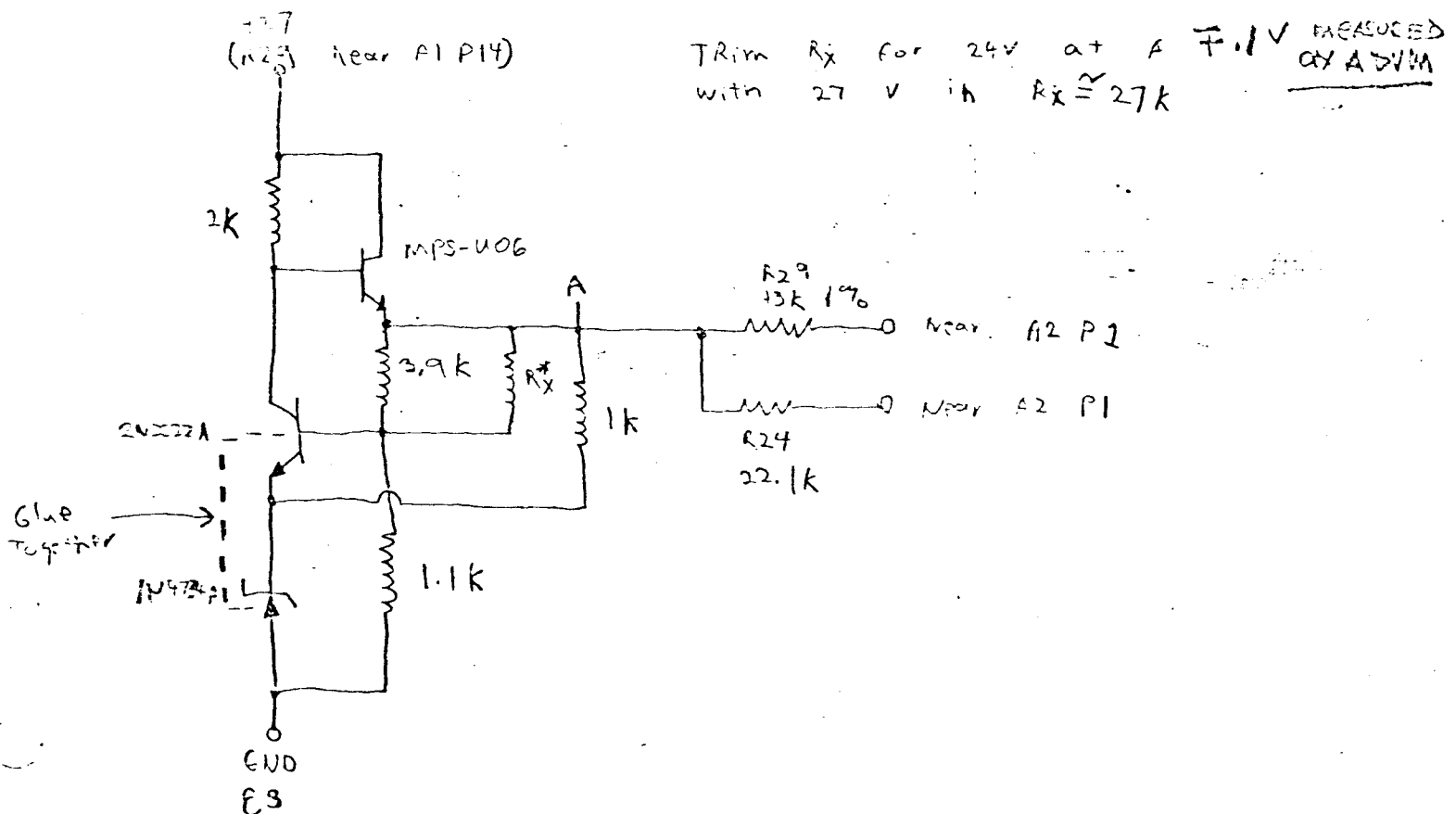
Be sure the MDA has SDT31307 transistors on heatsink, and add the diode to the collectors of Q6 and Q3.

Be sure the fuses on the rear panel are wired, and that 3/8 A MDL fuses are installed.

Complete the ppggyback on Capstan Servo PWA as instructed.

Page 1A

Note changes in takeup MDA, and regulator addition shown below



Page 2

Note dimension change on hole location. This prevents interference between meter wiring and Tension controller PWA.

Page 3

Note change in location of the Motor Control Indicator, because of Power supply indicators now on top of spacer.

note also that VR1 on Indicator board must be changed as per schematic Page 6A

Page 6

Before completing installation as per page 6, modify the Tension Controller PWA as following; (note changes on schematic, Page 6A)

Add two 1N34 diodes from the bases of Q19, Q20 respectively to the Servo Disable line U10 p13. use tubing on the leads, and place them on the top side of the board

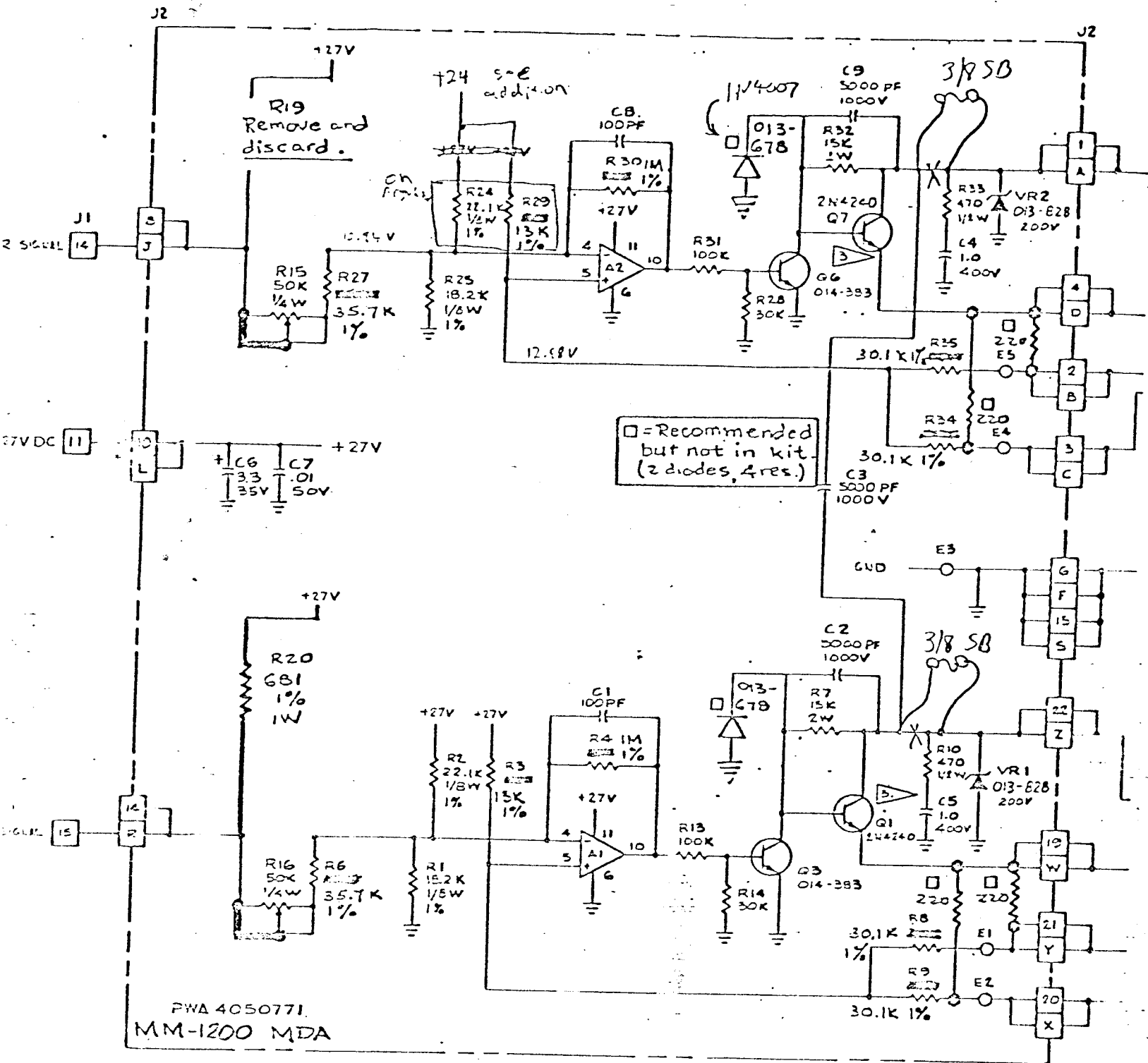
add a 1N5256B zener across c12. the banded end goes to the side connecting to U1 p2. Place this diode on the back side of the board, under C12.

SETTING TENSIONS

after checking operation of unit as per page 6, set tensions as follows

- 1) place transport controller PWA on extender. turn machine on, and block the tape break arm in on position. turn machine on.
- 2) turn FF and RW tensions all the way down (four turns CCW)
- 3) place machine in RW, and adjust the TU gain until the motor just ceases turning
- 4) place the machine in FF, and similarly adjust the Supply Gain.
- 5) thread tape. put the machine in FF, and adjust FF supply tension so that after acceleration, the tension stabilizes just short of the 2" mark on the tension arm.
- 6) put the machine in RW, and adjust RW tensions the same.
- 7) go to the head of the reel, place the machine in play, and adjust R60 on the Tension Controller PWA for 16 oz of takeup tension. Adjust supply tension for 5½ oz.
- 8) go to the center of the reel (10½" or a quarter of the way 14") and check tensions. supply should be 6+-1 oz. Takeup should be 16 oz +- 1.5 oz
- 9) go to the end of the reel (10½" or about 2/3 of 14") and check tensions again. same numbers

- 10) on larger reels (14,16") the supply tension should be able to maintain 6 ± 1 oz, anywhere in reel. The takeup should be able to maintain 16 ± 1 to the end of a $10\frac{1}{2}$ ", and nearly to the end of a 14". Beyond the end of a 14, tension will fall off due to lack of torque in takeup motor.
- 11) in case of problems, check the voltage at TP1 on tension controller PWA if takeup isn't right, or at pin 7 on the transport controller PWA in the case of the supply.
- 12) TP1 should be 30 ± 2 V on all wind and stop modes, below 10v with no tape up, and should be variable by R60 from about 3 to 30 v. in play. (reel motor stopped). With reel motor turning, the voltage should drop as the motor spins faster.



OTHERWISE SPECIFIED
RESISTOR VALUES ARE IN OHMS, 1/4W, 5%
CAPACITOR VALUES ARE IN MICROFARADS
RESISTOR VALUES ARE IN OHMS, 1/4W, 5%
CAPACITOR VALUES ARE IN MICROFARADS

AMPEX P/N	NEAREST COMMERCIAL EQUIVALENT
014-353	2N2484
014-832	MPS3638A
580-729	2N5239
580-248	UA741 (54774-353)

REFERENCE DESIGNATION	LAST USED	NOT USED
R35		R17, R23
C9		
G7		
E2		
VR2		
A2		

3.0 TRANSPORT CONTROL PWA; PART NO. 4050706; MODIFICATION:

3.1 REMOVE AND DISCARD R18 AND 20.

SPARS DATA TRACK

Page 16

ENC: MODIFIED TRANSPORT CONTROL SCHEMATIC

4.0 INSTALLATION OF THE TENSION CONTROLLER PWA BRACKET:

4.1 PULL OUT THE ARREST AND METER PANEL AS FAR AS THE SLOTS IN THE ADJUSTABLE SIDE-ARMS WILL ALLOW.

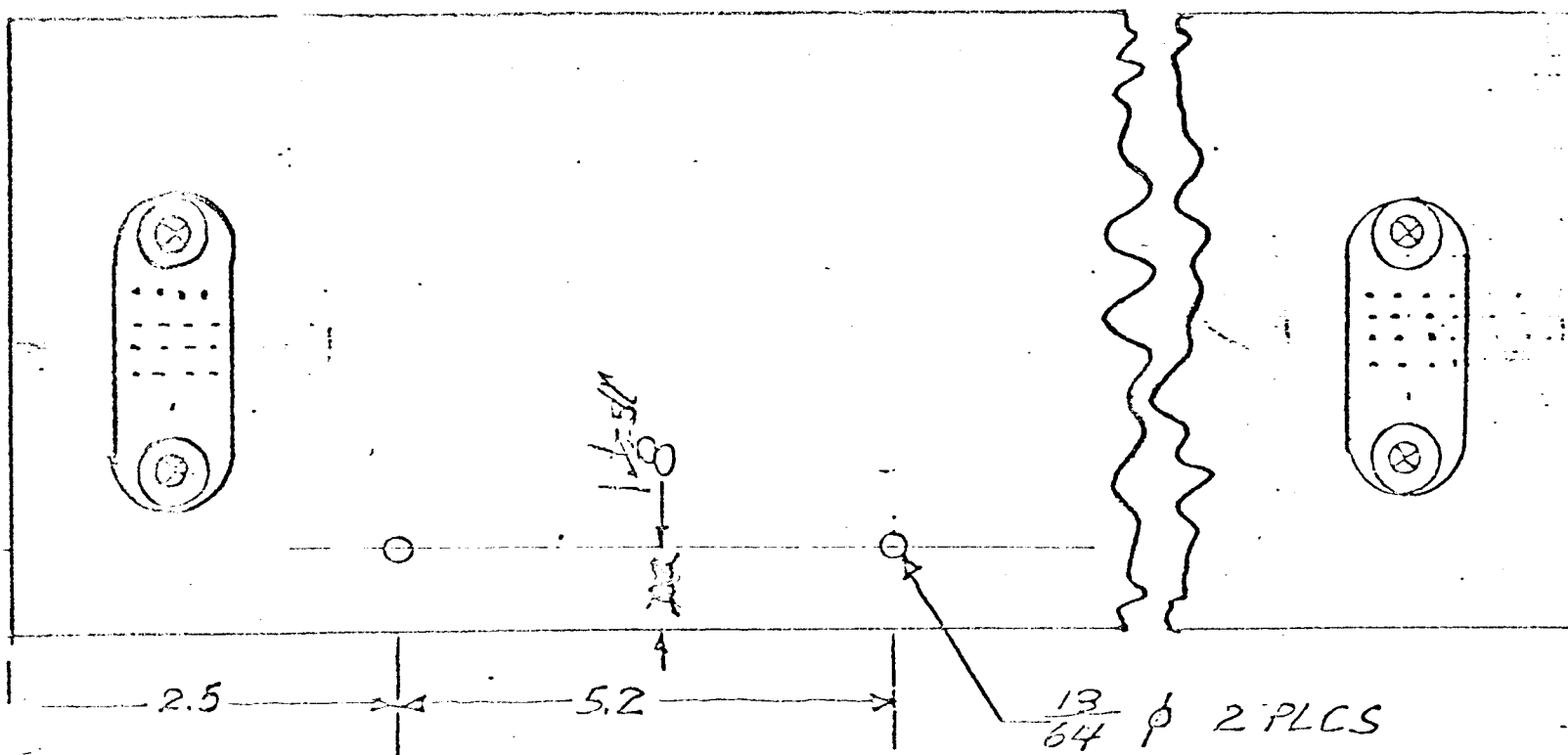
4.2 REMOVE THE TRANSPORT CONTROL BOX.

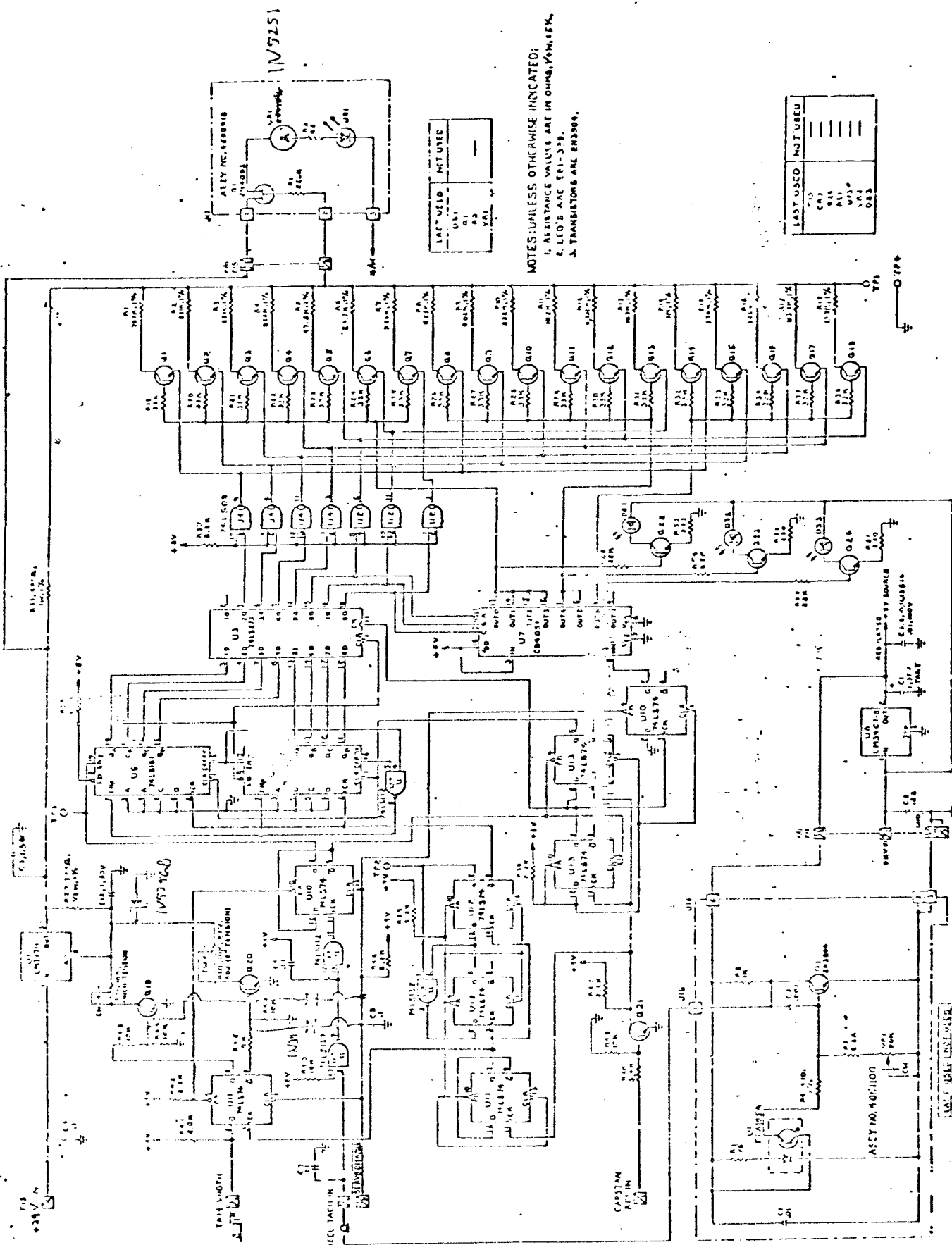
4.3 REMOVE THE SHELF THAT SUPPORTS THE TRANSPORT CONTROL BOX.

4.4 REMOVE THE BLACK SPACER PIECE THAT IS LOCATED BETWEEN THE TRANSPORT CONTROL CHASSIS AND THE TRANSPORT CONTROL BOX. A NO. 2 PHILLIPS SCREWDRIVER IS NECESSARY TO REMOVE THE MOUNTING SCREWS.

4.5 DRILL TWO HOLES 0.2 INCHES IN DIA. ON A LINE 0.62 INCHES FROM THE FRONT EDGE OF THE SHELF. THE HOLES ARE 5.2 INCHES APART AND THE FIRST HOLE IS 2.5 INCHES FROM THE LEFT EDGE OF THE SHELF.

4.6 MOUNT TENSION CONTROLLER MOUNTING BRACKET WITH TWO NO. 8-32 SCREWS AND FLAT WASHERS SO THAT IT EXTENDS DOWNWARD FROM THE SHELF WHEN THE SHELF IS IN ITS NORMAL POSITION. THE SLOTS FOR THE PWA EDGE CONNECTOR SHOULD BE TO THE LEFT. SET ASIDE THE RESULTING ASSEMBLY UNTIL A LATER STEP.

TRANSPORT CONTROL BOX SUPPORT SHELF
NEW HOLES LAYOUT



NOTES: UNLESS OTHERWISE INDICATED:
1. RESISTANCE VALUES ARE IN OHMS, KΩ, MΩ.
2. LED'S ARE EPI-219.
3. TRANSISTORS ARE 2N3305.

LAST USED	NOT USED
Q1	—
Q2	—
Q3	—
Q4	—
Q5	—
Q6	—
Q7	—
Q8	—
Q9	—
Q10	—
Q11	—
Q12	—
Q13	—
Q14	—
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Q94	—
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Q96	—
Q97	—
Q98	—
Q99	—
Q100	—

LAST USED	NOT USED
Q1	—
Q2	—
Q3	—
Q4	—
Q5	—
Q6	—
Q7	—
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Q100	—

AMPX1	SCHEMATIC DIAGRAM	TENSION CONTROLLER
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