APPENDIX A.  RUNNING DESIGN CHANGES/FIELD SERVICE BULLETINS


The factory provided these ten Field Service Bulletins to 8X32
dealers and customers.  Each Bulletin describes a remedial
procedure for a specific problem, or a hardware change necessary
to implement an improvement in the machine's design.


Bulletin # 1 - Panel Board Connector

Bulletin # 2 - Level Functions

Bulletin # 3 - Wrong Value R26

Bulletin # 4 - Keystone Bracket

Bulletin # 5 - 7.5V Transformer Wiring Error

Bulletin # 6 - Potential -15V Supply Intermittent

Bulletin # 7 - "Buzz Saw" Noise

Bulletin # 8 - CFD Gain Error

Bulletin # 9 - Program Update, Edition E4-0 to Edition E4-1

Bulletin #10 - Lowering the Noise Level

# URSA MAJOR, Inc.

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TITLE: PANEL BOARD CONNECTOR

UNITS AFFECTED: 8X32's with serial number 1-521 and under shipped before October 6, 1981 may have this problem.  After October 6, 1981, units will not have this problem.

PROBLEM: J5 DIP connector from panel board to CPU board may vibrate loose in shipping, resulting in failure of front panel display or control functions.

WHEN TO CORRECT PROBLEM: Certainly make the changes if you find that the connector has worked loose in a particular unit, or if the unit will be shipped or transported very much.  If the unit is simply going to be used in a relatively fixed installation, just let well enough alone.  Not all the units had the cable under sufficient stress so that this would be a problem.

HOW TO CORRECT THE PROBLEM: Unplug the unit from power.  Set it right side up with front panel facing you.  Protect the front panel with a soft cloth.  Remove the top cover with the screws around the perimeter.  Locate the ribbon cable at the front left of the unit and unplug the 24 Pin plug from J5 on the CPU-1 PC board.  Gently bend it back, out of the way, toward the front of the unit and locate the tie wrap securing the large bundle of 6 wires passing underneath the cable, and cut the tie wrap securing these wires to the mother board.  Redress that 6 wire group so that the wires are underneath the mother board and out of the way completely of the ribbon cable as it passes toward J5. Using a file, put 2 small notches (roughly 3/16" wide by 1/32" deep) 1 at each end of the plug that goes into J5.  Attach the short piece of foam tape on top of the plug that goes into J5.  Reinstall the plug into J5 and snap the new plastic clip down in place to secure the connector. Screw the cover back in place.

REQUIRED MATERIALS:
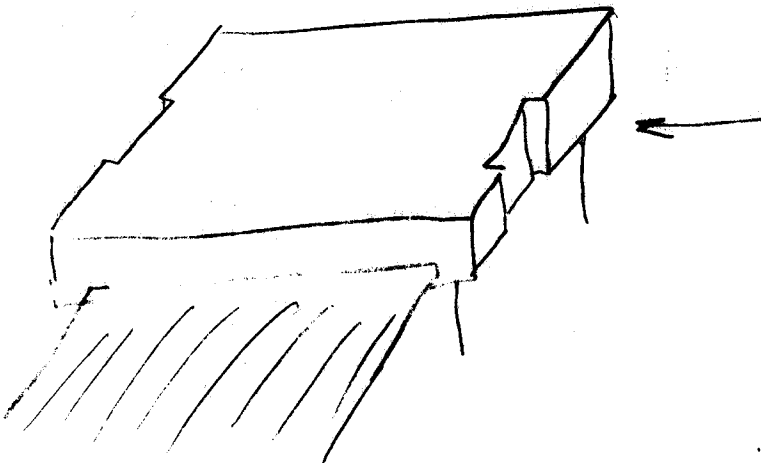1.) 1 piece foam self stick tape, 1/2" x 3/4" x 1/8".
2.) 1 eby 24 Pin DIP clamp.
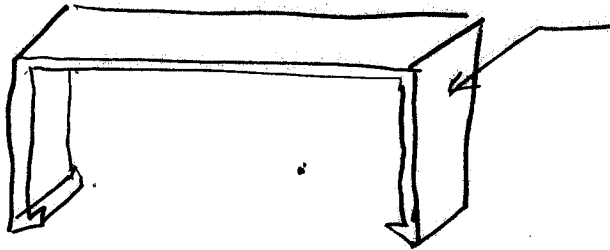
eby 24 Pin DIP clamp
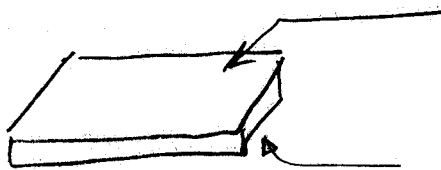
1/2" x 3/4" x 1/8" foam tape

remove protective paper

plug from panel for CPU-1, J5

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UNITS AFFECTED: 8X32's with serial number 1-521 and under
shipped before October 6, 1981 will have this error.  Units
leaving the factory later than October 6, 1981 will not have
this problem.

PROBLEM: SIP resistor network RN34 on ANA-2 PC board has its
pin 1 connected in error to +5V.  It should be connected to
+7.5V.  This may result in premature failure of IC's U2, U4,
U5, and U6.  These are Fairchild or Motorola MC14051B CMOS
IC's.
The symptom would be improper operation of the early reflec-
tion level controls and/or initial reverberation level con-
trols.  Improper operation could take the form of the
levels not changing equally in both channels, or not changing
smoothly in monotonically increasing or decreasing steps.
Another symptom could be pops or clicks as the level is
nudged up or down.

WHEN TO CORRECT PROBLEM: If the unit develops these problems,
and U2, U4, U5 or U6 has failed.  If the unit is back in-
house for service at any time and it is convenient, do the
ECO.  Otherwise, if the unit is in the hands of a customer,
wait and see if a problem develops.

HOW TO CORRECT THE PROBLEM: Disconnect the 8X32 from power.
Turn it upside down, with the front panel facing you.  Pro-
tect the front panel with a soft cloth.  Remove the screws
holding the bottom cover in place and set the bottom cover
aside.  Unplug the 2 input connectors, the connector from the
potentiometer on the rear panel and connectors going to the
output connectors on the front left side.  Unsolder the 3
green wires, having made a note in advance where they were
soldered.  Remove five number 6-32 screws around the peri-
meter of the board.  DO NOT remove the 2 screws at the very
front edge of the board.  Remove the 3 hexagonal standoffs.
Carefully bend the wires out of the way at the left rear,
and hinge the analog board upward.  Locate resistor network
RN34, near IC65 and, on the etch side of the board (the

solder side, the side without components), find Pin 1
(noted by a square pad) of RN34.  With a sharp knife
cut the edge going to Pin 1 of RN34.  Referring to the
attached diagram, run a small insulated wire from RN34,
Pin 1 to the pad near RN36 Pin 1.  Verify with an ohm
meter that this RN34 Pin 1 is now connected to +7.5V
and not to +5V.  If the unit had developed a problem
leading to carrying out this change, locate the defective
IC U2, U4, U5 or U6 by normal trouble shooting techniques
and replace as necessary.

REQUIRED MATERIALS:
1.) 2 IC's, MC14051B or equivalent
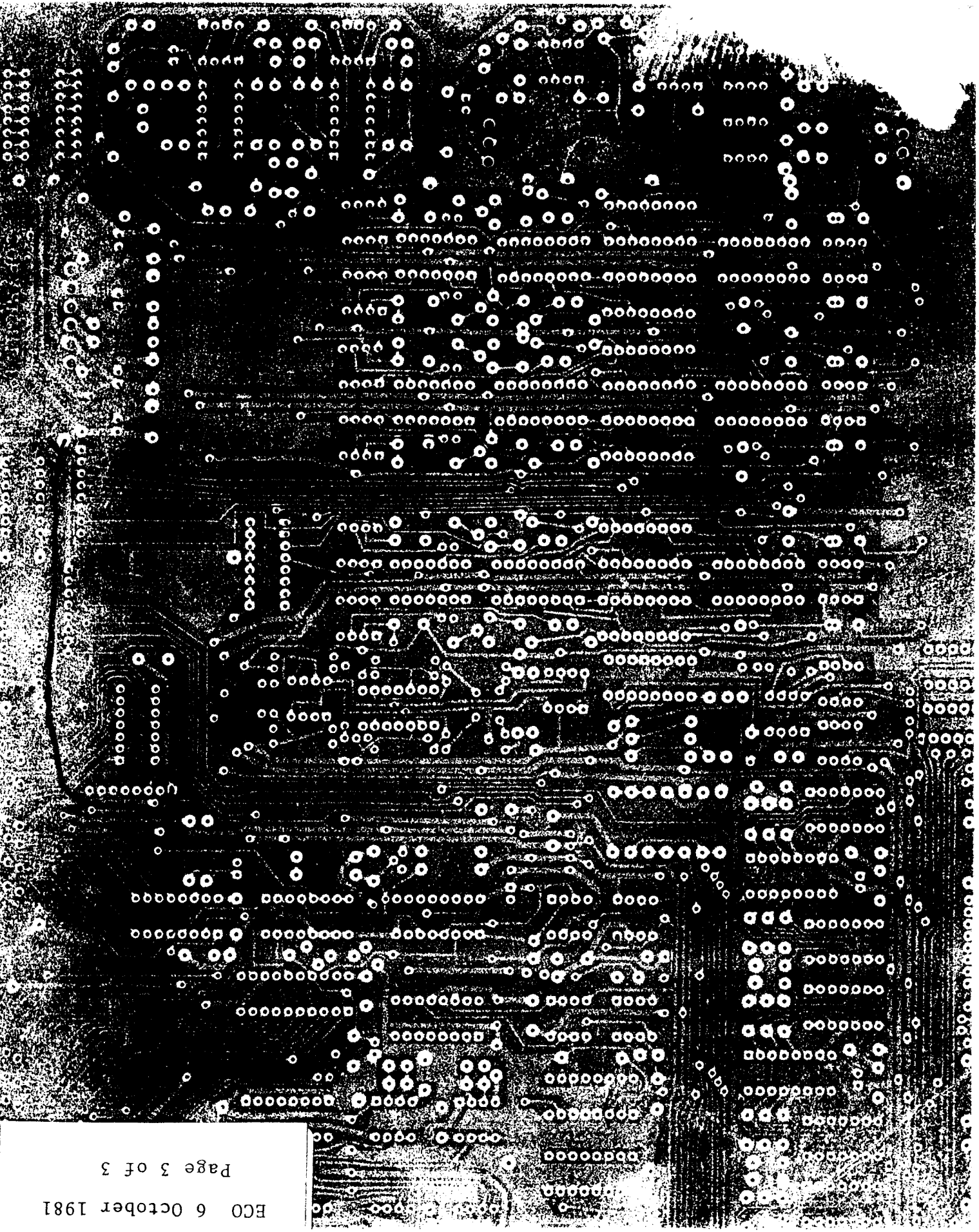
# URSA MAJOR, Inc.
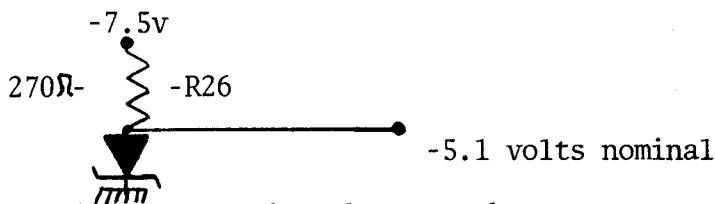
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UNITS AFFECTED: 8X32's with serial number 1-523 through 1-530.

PROBLEM: It has been discovered that a few URSA MAJOR 8X32's may
have been shipped with a resistor of the wrong value. The unit
should probably still function properly, but under severe heat
stress it could blow the resistor and this would shut down the
memory.

To avoid this failure, we ask if you would please check the
resistor in question - R26. This resistor is the voltage drop-
ping resistor in series with zener diode D17. The resistor
should be of value 270Ω ¼watt. The color code for this value
is red, purple, brown, gold. Some units may have a 27Ω ¼watt
resistor with color code red, purple, black, and gold. The
circuit looks like this:

```
                    -7.5v
                      •
         270Ω-      ⧨ ⧨  -R26
                     ⧩
                      •————————————————•
                      ▼                   -5.1 volts nominal
                    ⟊⟊⟊⟊
```

The resistor can be checked without removing the cover by
shining a bright light through the top cover vent holes, and
viewing R26. Please find enclosed a copy of the printed
circuit board layout. This picture identifies the resistor.

It is important to make a positive identification of the
brown stripe, since the wrong  resistor runs the zener diode
at ten times its normal current. If you must, remove the
top cover to see, for certain, that it is 270Ω.

HOW TO CORRECT THE PROBLEM:  If it is the wrong resistor:
1). Remove the top cover.
2). Carefully unsolder the resistor from the top side.
3). If necessary, use a solder sucker to carefully remove
    old solder.
4). Replace with new resistor (also enclosed) of value
    270Ω ¼watt.

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UNITS AFFECTED: 8X32's with Serial Number 1-545 and under may have
this characteristic.

PROBLEM: The Keystone bracket which is mounted on chassis under H17
of ANA-2, sometimes makes contact with R13 of ANA-2.

WHEN TO CORRECT PROBLEM: Although some units may have left the fac-
tory with this characteristic, none were shorting at time of ship-
ment, or the symptom--severe hum and noise and loss of signal in one
channel--would have been picked up.  It is unlikely that shipping
would vibrate the PC board into a new position shorting R13, but
if the 8X32 will be on the road, in a van, or touring, it would be
good insurance to check for the bracket and correct if it wasn't
trimmed.

HOW TO CORRECT THE PROBLEM: Remove AC power and then the bottom
cover.  Unsolder 3 green wires from connector on ANA.  Remove all
plug-in connectors from the ANA, except the 3 ribbon cables.  Remove
3 standoffs and the perimeter screws, except for the two at the
front edge of the ANA.  Hinge the board up to reveal the bracket
closest to R13.  Refer to  the figure and clip the bracket.



Top view of bracket

Chassis wall    screw hole    cut this diagonal    leaving this

Authors of ECO: Ronald A. Blomberg, Christopher Moore

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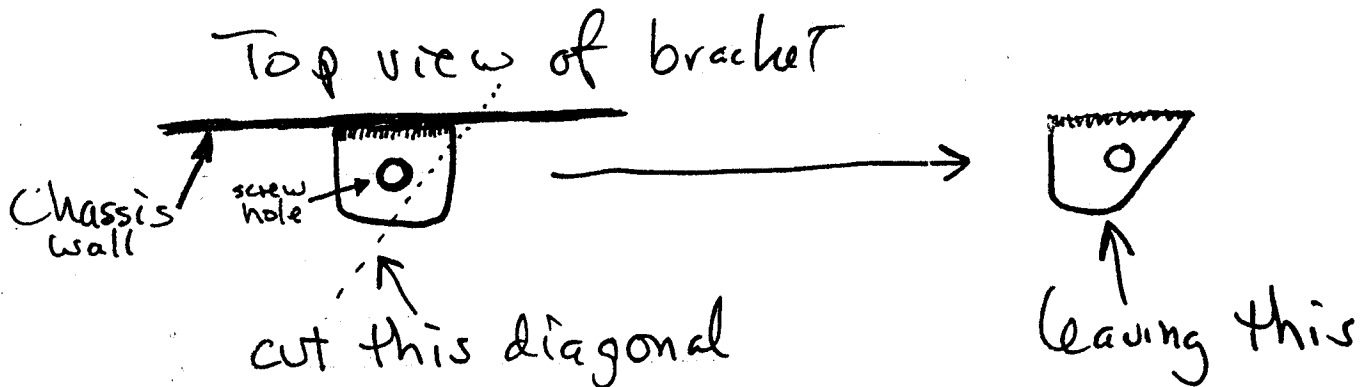8X32 FIELD SERVICE BULLETIN #5                              1981 September 14

TITLE: 7.5V TRANSFORMER WIRING ERROR

UNITS AFFECTED: 8X32's shipped before roughly September 14, 1981 may have
this problem.  A factory alert was sent out and we believe most units were
identified and corrected in the field.

PROBLEM:  Units hot to touch on chassis, right hand side. The extra heat is
due to a wiring error where the blue-yellow and one of the blue wires were
interchanged coming from the transformer secondary.

WHEN TO CORRECT PROBLEM:  If the unit seems to be running hot on the right
hand side panel, look inside to see if the problem exists.  Peer through
the top cover right hand side and find PC pads 13, 14 & 15.  Number 15
should have a blue-yellow wire.  13 and 14 should have blue wires.

HOW TO CORRECT THE PROBLEM:  Unplug the 8X32 from A/C line.  Remove the top
cover.  Find the blue-yellow wire in the wrong hole.  Unsolder the blue-
yellow wire from the top side, applying heat to the joint and pulling the
wire upward.  Also remove the blue wire in hole 15.  Reinsert the blue-
yellow wire in hole 14 and resolder from the top.

REQUIRED MATERIALS: Solder

COMMENT:  In practice, operating the unit without correcting this problem
will not lead to field failure.  There is enough thermal safety margin in
the chassis and in the regulator.

BLU-YEL wire should go here, in 15.



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TITLE:  POTENTIAL  -15V SUPPLY INTERMITTENT

UNITS AFFECTED:  8X32's with serial numbers 536 and under all have a potential for this problem.  A few units with serial numbers between 544 and 538 may also have the potential for this problem.  Units with serial number 545 and greater will not have this problem.  Units shipped after January 11, 1982 will not have this problem.

PROBLEM:  The negative lead for capacitor C26 on the mother board (MOM) passes through a hole that is not plated through.  Without the plating there is a slight chance that a connection does not exist or could become intermittent from the etch side of the PC board to the component side.  In the event that this connection did become intermittent, the  -15V power supply would drop to 0.  This would result in failure of the audio and other functions of the 8X32.

WHEN TO CORRECT PROBLEM:  This is only a potential problem.  We know that at the time each 8X32 left the factory, this problem did not exist.  Furthermore, each unit is subjected to a mechanical shock test to look for intermittents.  We would recommend carrying out this change if a unit is in for other service and the ANA board has to be dissassembled for some other reason. Another instance in which it would be good to carry out this correction, would be for 8X32's that are going to travel on the road, in vans or on tour and be subjected to a lot of vibration.  Otherwise, we do not feel it is important to recall units and carry out the change.

HOW TO CORRECT PROBLEM:  Remove the A/C line cord from the unit.  Turn the 8X32 upside down and remove the bottom cover.  Remove all the connectors going to the ANA board except the ribbon cables on the front edge.  Unsolder the three green wires going to the connector on the ANA board.  Remove the three hexagonal standoffs and all the small screws holding the ANA board down except the two at the front of the board.  Swivel the analog board upware, revealing the underside of the MOM board, (the "etch side").  Locate C26 minus pad on the etch side of the board and D25 anode on the MOM  board by observing from the component side.  Solder a short piece of #22 insulated wire from C26 minus lead to D25 anode.  Reassemble the unit.  It would be wise to verify correct -15V power supply operation before completely reassembling the unit.

REQUIRED MATERIALS:  Short length #22 wire.

FIGURE:
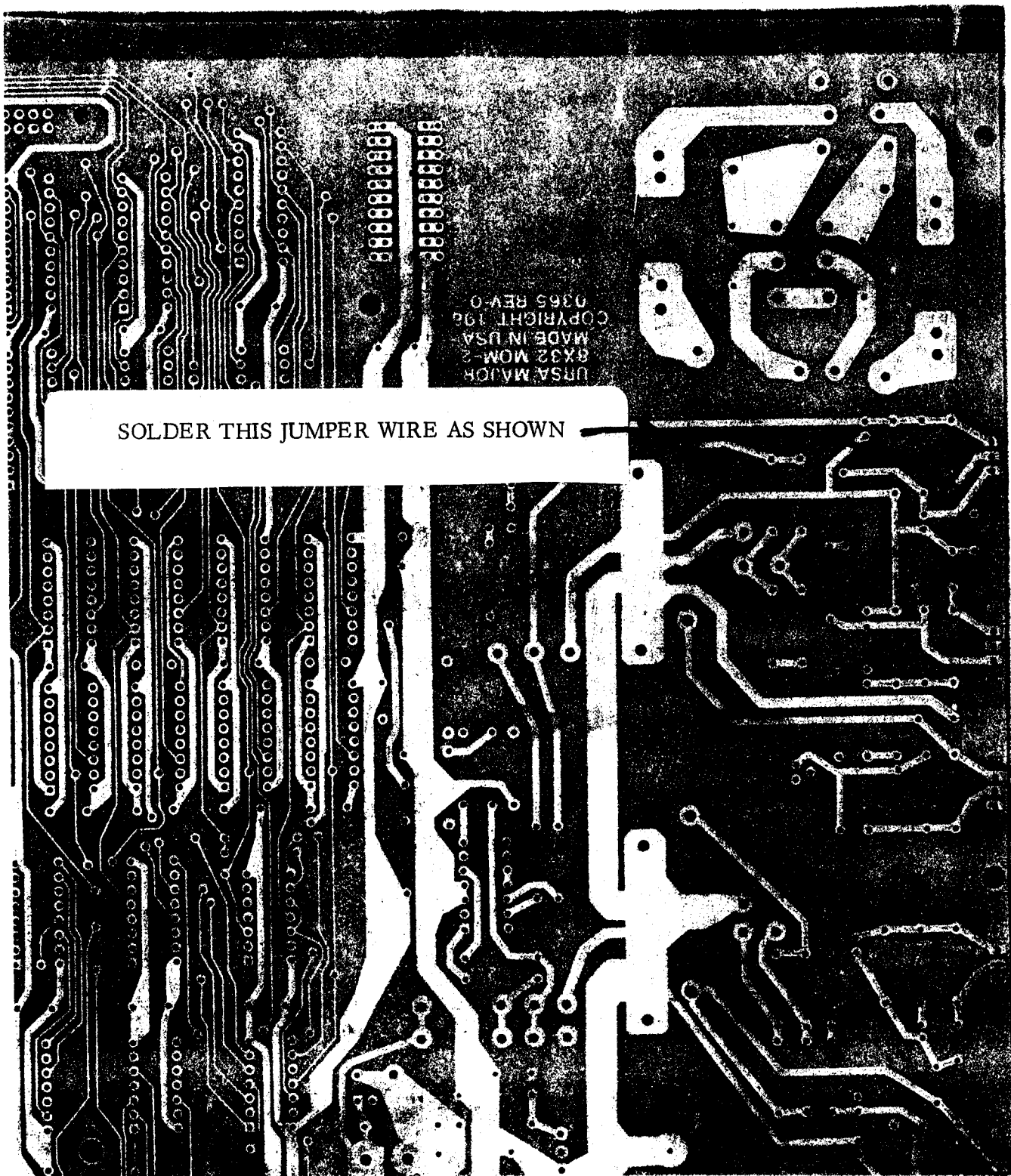


SOLDER THIS JUMPER WIRE AS SHOWN

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TITLE: "BUZZ SAW" NOISE

UNITS AFFECTED: It is necessary to distinguish between three groups
of units.  As of this date, two units, serial numbers 537 and 545
have been corrected and no further attention is necessary.  Six
other units, Serial numbers 522, 529, 540, 541, 544 and 547 have
been shipped with a partial execution of this correction.  The third
group, (which includes all other units with serial number 546 and
lower), has had no corrective changes performed for this problem.

PROBLEM:  In some units, the minor DC offsets inevitable associated
with linear and A to D components, resulted in the A to D converter
for the Ap signal resting with 0 signal at the decision point for mid
scale, (the sign decision point).  Normal circuit noise under these
conditions will permit the build up of a hollow, reedy sounding
noise in this converter which would appear at the output. This
sounds sort of like a "buzz saw".

WHEN TO CORRECT PROBLEM:  We distinguish two sets of units here.
The six units that have a partial execution of the change, should,
at the next opportunity for normal servicing on those units, have
the rest of the change carried out.  These have a 3dB greater internal
sensitivity for the reverberator.  In practice, this will not be
noticed by the end user but it would be good to get in and make the
change to fix it.

The second and larger group of units that have not had any work done
to correct this problem, should really be left alone unless they have
buzz saw noise and the end user has commented on it.  In fact, all
those units passed the factory QC and may very well not exhibit the
problem due to the possibility that the DC offsets add up to a high
enough voltage to keep the converter from the sign decision point.

HOW TO CORRECT PROBLEM: Remove the A/C line cord. Turn the 8X32
upside down. Remove the bottom cover.  Unsolder the three green wires
going to the connector on the ANA.  Remove the other molex connectors
coming from the back panel connectors and the potentiometer.  Remove
the three hexagonal standoffs and all the black screws holding the

board down except for the two at the front.  Swivel the ANA board back revealing the etch side.

If this is one of the six units in the field that has the correction partially carried out, only do the steps that follow.  On the component side, locate RN29 and RN28.  These are two resistor networks located near U68.  On the component side observe a fine etch running between RN28, pin 5 and RN29, pin 4.  With a sharp exacto knife, cut that etch.  Now, on the component side, take a small piece of #30 solid wire and solder a connection between RN28, pin 5 and U68, pin 3 nearby.

Go on to these steps if the unit is from the larger group of 8X32's that have not had any of these changes carried out at the factory.

Find a connection on the etch side from RN29, pin 4 to ground.  Cut that connection.  On the etch side, solder a short piece of wire from RN29, pin 4 to RN29, pin 3 (bare #30 wire is ok).

Using #30 insulated wire, connect RN29, pin 5 to RN19, pin 7 some distance away.  Put the wire on the etch side of the board.

After making these changes, it is necessary to readjust RV4 on the ANA board. You will need an oscilliscope with an input sensitivity of at least 10mV per division to perform this adjustment.  Connect a lead from MOM board U28, pin 15 (test signal NTLB) to the oscilliscope external trigger input and adjust the scope to trigger at roughly 5 microseconds per division sweep speed.  Connect the oscilliscope vertical input probe to RN14, pin 5 on the ANA board.  Set the 8X32 to a decay time of  0.0 seconds in any program.  Observe a negative voltage on the oscilliscope face, probably with a pedestal; (that is looking like a square wave with a lot of fuzz and noise).  If the difference between the two pedestal heights is more than about 5mV, swap a TLO74 or TLO84 op amp from positions U19, 21, 25, 27, etc. into position U63 until the step difference on the oscilliscope is 5mV or less.  Now, use the adjustment potentiometer on the ANA board RV4 to adjust for a DC level on the oscilliscope of between -10 and -30mV, preferably around -20mV.

If you had to swap another TLO74 or TLO84 into position U63 in the prior paragraph, you must readjust RV3 also. Move the scope vertical input probe to RN15, pin 11 and adjust for -20mV on the portion of the pedestal waveform that moves in response to the adjustment. Resecure the ANA board and return the covers to the unit.  That completes the change.

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ETCH SIDE VIEW

COMPONENT SIDE VIEW

RN29
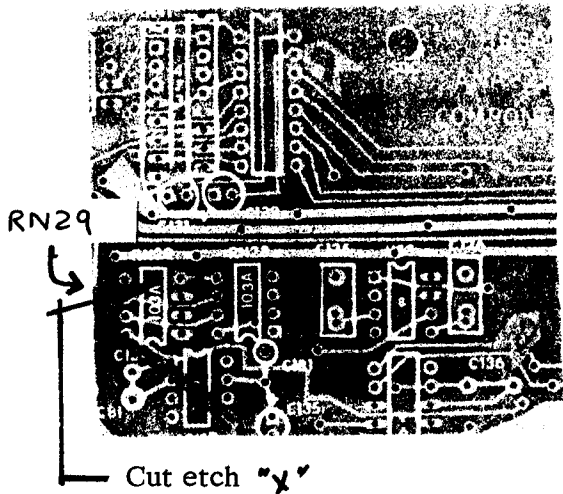
Cut etch "X"

cut etch "X"

add 3 jumpers

RN29

RN19
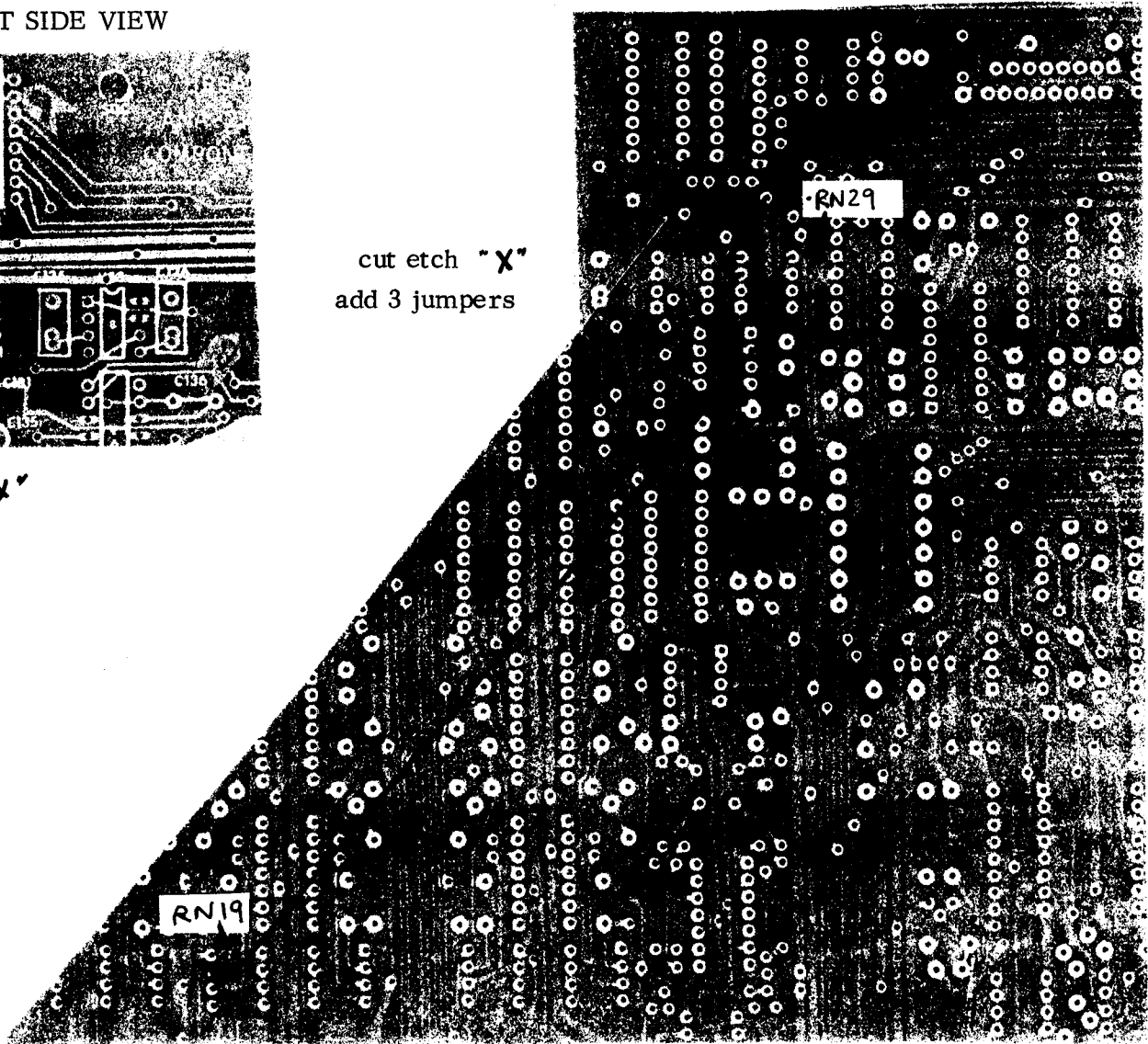
REQUIRED MATERIALS: Solder
                    #30 insulated solid wire
                    Oscilliscope 10mV per division sensitivity, external
                        sync capability

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TITLE: CFD GAIN ERROR

UNITS AFFECTED:  This error has been corrected in units with serial numbers 537 and 545 and all other units shipped after 10 January 1982.  The problem has not been corrected in any unit with serial number 547 or below shipped before 11 January 1982.

PROBLEM:  There is a 3DB gain error in the contribution of three signals going into the reverberator output due to an error failing to ground two resistors.

WHEN TO CORRECT PROBLEM:  The change in sound quality due to this error is extremely minor.  It would probably be very difficult to detect it even under a direct AB comparison.  Therefore, do not go to any trouble to correct this problem unless a unit is inhouse and disassembled to the point where the under side of the ANA board is accessible.

HOW TO CORRECT PROBLEM:  Unplug the power cord.  Turn the 8X32 upside down. Remove the bottom cover.  Unsolder the three wires going to the connector on the ANA board.  Remove all the other ANA connectors except for the three ribbon cable connectors.  Remove the three standoffs.  Remove the other screws that secure the ANA board except for the two in the front. Carefully hinge the board forward revealing the etch side.  At the rear of the board, locate OP AMP U68  and associated components.  Right next to U68 is a resistor network labeled RN41. The pin of that network closest to the back of the ANA board is pin 1.  Look at the etch side (the back side of the board). At the eight pads for this resistor network, you will notice that pins 2 and 3 are connected to a ground trace.  Use #30 solid wire to also connect pin 4 and pin 8 of the resistor network to that same ground point, pins 2 and 3.  This will decrease the gain of the stage to signals C2F, C4F and C6F.  Refer to the attached figure on following page.

REQUIRED MATERIALS: Solder
                   #30 wire

AUTHOR: Christopher Moore

FIGURE:    Install jumper from pin 3 to 4 and to 8.
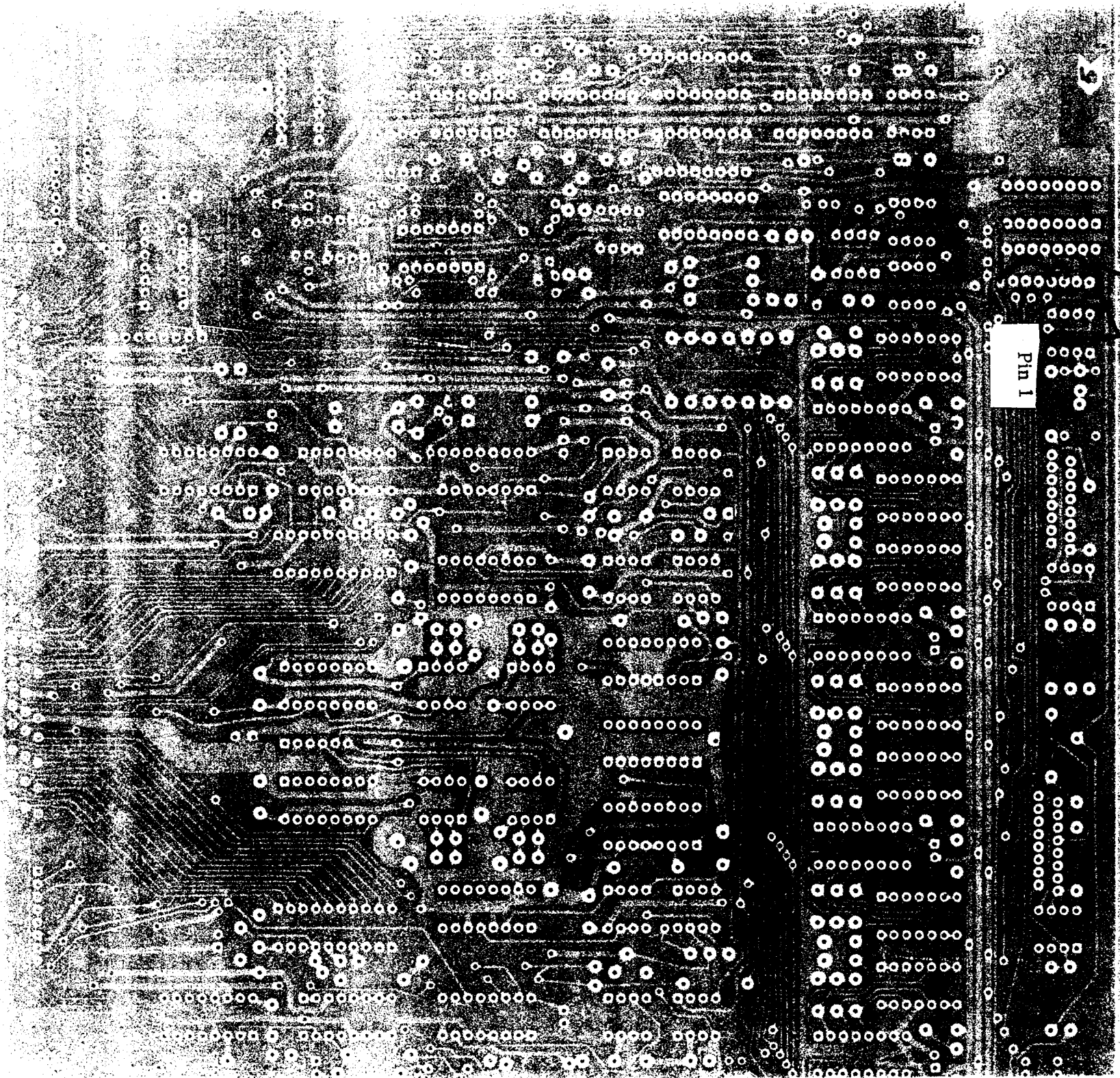
# URSA MAJOR, Inc.

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TITLE: PROGRAM UPDATE, EDITION E4-0 TO EDITION E4-1


UNITS AFFECTED:  All 8X32's shipped from the factory after June 21st and/or including Serial Numbers 575 and higher will have Edition 4-1 programs.  There will be a sticker on the top cover to indicate this.  Earlier units shipped with Edition 4.0 programs will be updated automatically if for some reason they are returned to the factory.  Ursa Major requests its dealers to perform this update at no charge on any earlier units that they have in their possession or that they have already turned over to their customers.

REASON FOR CHANGE:  Edition 4-1 programs are intended to improve the audio quality.  They feature higher echo density, greater diffusion, reduced coloration, better stereo imaging, and reduced left/right channel correlation.  We recommend that this change be carried out on all units and doubt that there will be customer preference for Edition 4-0 programs.

SCOPE OF CHANGE:  The programs are completely contained in two IC's.  The change, therefore, consists of changing two integrated circuits.  At the time of updating the IC's, however, we are asking that two resistors on the Analog board be removed. These two resistors couple out of phase reverberation signals, thus increasing left-right correlation.  We have had a number of requests to reduce or eliminate the out of phase signal; removing these two resistors does so completely.

REQUIRED MATERIALS:
#1  Edition 4-0 IC's.  Delay PROM Part # 0525-6. Gain PROM Part # 0527-6.  Sticker for top cover saying Edition 4-1.
#2  Tools: #0 Phillips screwdriver.  ¼" nut driver or closest metric equivalent.  IC extractor or small delicate screwdriver for removing IC (16 pin DIP & 24 pin DIP). Pair of diagonal cutters.

HOW TO MAKE THE CHANGE:

> DANGER: High voltage is present inside unit.  Be sure to un-
> plug and remove the line cord completely before beginning dis-
> assembly.

> WARNING:  IC's are susceptible to static electric damage. Keep
> IC's on conductive foam pad whenever not being used.  If possi-
> ble, work at a grounded work station.

1) Unplug the unit.  Put it on a padded workbench and remove the
top and bottom covers (each cover is secured by 10 small screws).

2) Turn the 8X32 upside down on the workbench with the front panel
facing you.  Refer to Fig. 1 and find the corresponding resistors
on the ANA-2 PC board.  The left hand resistor (R38) to be re-
moved is color code: red, yellow, orange, gold: 24K.  Cut it out
with diagonal cutters, being sure that the remaining leads don't
short on any nearby circuits.  The right hand resistor (R39) to
be removed is color code: yellow, purple, orange, gold: 47K. Re-
move it also.  There are no replacement parts for these two resis-
tors; they are completely deleted. This portion of the change elim-
inates the out-of-phase reverberation.

3) Turn the unit right side up, identify CPU-1 daughter board,
a 5"x9" PC board sitting up on five metal spacers to the left.
Remove the white molex connector and the 16 pin DIP plug going to
rear panel "D" connector from the CPU-1.  Use the nut driver or
other small wrench to remove the five spacers above the board.
Check as you do so that the five spacers below the board don't
rotate loose as you undo the top spacers.

Change The Delay PROM:  Referring to Fig. 2, identify the Delay
PROM, the one toward the rear of the chassis in socket position
U10.  This will either be designated as X116-5, 116-5, 0525-5 or
may possibly have no identifying sticker at all.  Note the pin 1
end of the IC (toward the rear of the chassis).  The new IC must
go in just this way.  Remove this IC with an IC extractor, or if
one is not available, gently pry up each end a little bit at a
time using a very small screwdriver.  Be very, very certain that
when the IC is removed none of the pins have become bent or dam-
aged.  Then place the IC in the conductive plastic foam.  Next,
lift the PROM provided with this kit, Part #0525-6 and check it
to be sure that the pins are parallel and straight in both axes.
Carefully position the IC with the pin 1 end toward the rear of
the unit, the same end where the pin 1 end of the original IC

was located.  Refer to Fig. 3 to clarify which end of the IC is
pin 1 if you are in doubt.  On some IC's, there may be no notch
at the pin 1 end, but a small circle, diamond, square or other
identifying dot near pin 1.  If you put the IC in backwards it
will be destroyed. Carefully mesh the pins of the IC in the 20
holes of the socket, jiggling, squirming, looking very carefully
to be sure that they are lined up and then press down, gently
at first, a little bit more firmly, if necessary, to seat the
IC in the socket.  Inspect carefully (if possible with a small
mirror) to see if any of the pins have been bent under the body
or out to one side.  All 20 pins, needless to say, have to be
in the socket for the circuit to work.

Change the Gain PROM: Refer to Fig. 2 again to identify the
second PROM for replacement.  This will be labeled 0527-4 or
possibly X124-4.  It is in IC socket position U85.  As before,
use an IC extractor or screwdriver to carefully remove the IC.
Replace it, again, carefully referring to Fig. 3 for orienta-
tion.  Carefully check that all the pins have gone into the
socket, that none have bent under the body or splayed out to
the side.

Special Notes:  The Gain and Delay PROMS are paired for proper
operation within each program. You cannot mix an Edition 4-0
PROM with an Edition 4-1 PROM in the same machine and have it
operate.

Another note: We are calling the first set of Programs shipped
Edition 4-0.  This second edition that you are installing is
Edition 4-1.  The first digit indicates the number of programs
that are available to the user in the PROM's.  Both of these
Editions contain four programs.  The second digit indicates the
revision number of the programs in the PROM's.

4)  REASSEMBLY:  Place the CPU-1 back on its five spacers and
secure it with five spacers.  Carefully plug the white molex
connector in at the right rear, being sure that it is lined up
properly.  If it is offset one pin wrong in either direction,
you can damage the CPU board. In a similar fashion, be careful
when re-installing the DIP plug at the rear of the CPU-1.

When replacing the bottom cover, be careful that the DIP-DIP
ribbon cable is folded neatly in a right angle toward the rear
as it was when the cover was removed.  Re-install the covers,
connect the power cord and turn the unit on.  It is possible,
but unlikely, that this work may have disturbed the user reg-
isters. If so, the displays will show all "E"s and register "00".

AUTHOR: Christopher Moore

Figure 2  PROM LOCATIONS

Page 5 of 6



Delay PROM

Gain PROM

Figure 3   PROM LOCATION                     Page 6 of 6

Notch, dot, diamond or other mark at this end

(TOP VIEW)

Pin 1 →

| | |
|---|---|
| | 24 |
| 2 | 23 |
| 3 | 22 |
| 4 | 21 |
| 5 | 20 |
| 6 | 19 |
| 7 | 18 |
| 8 | 17 |
| 9 | 16 |
| 10 | 15 |
| 11 | 14 |
| 12 | 13 |

Gain PROM

(TOP VIEW)

Pin 1 →

| | |
|---|---|
| 1 | 20 |
| 2 | 19 |
| 3 | 18 |
| 4 | 17 |
| 5 | 16 |
| 6 | 15 |
| 7 | 14 |
| 8 | 13 |
| 9 | 12 |
| 10 | 11 |

Delay PROM
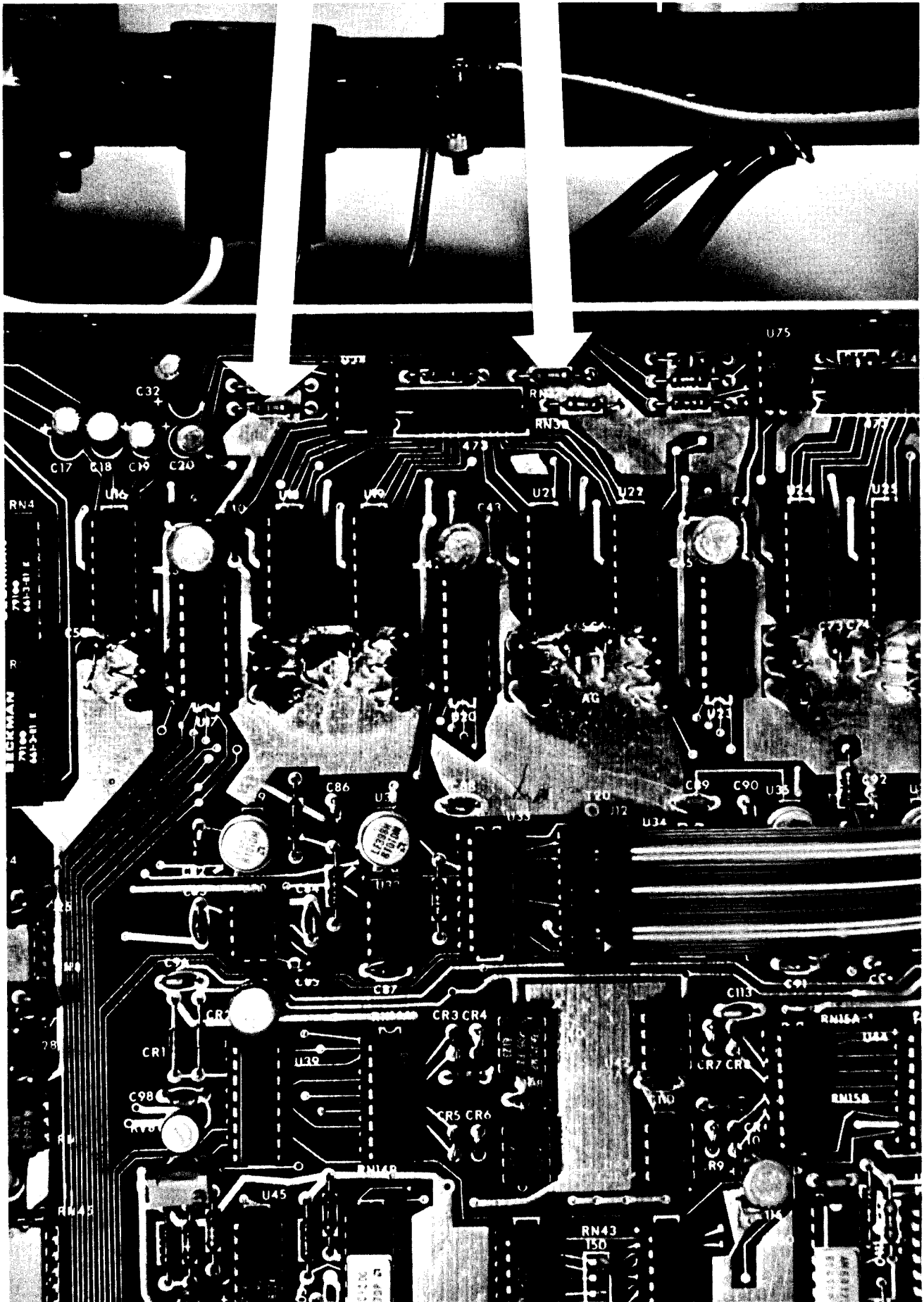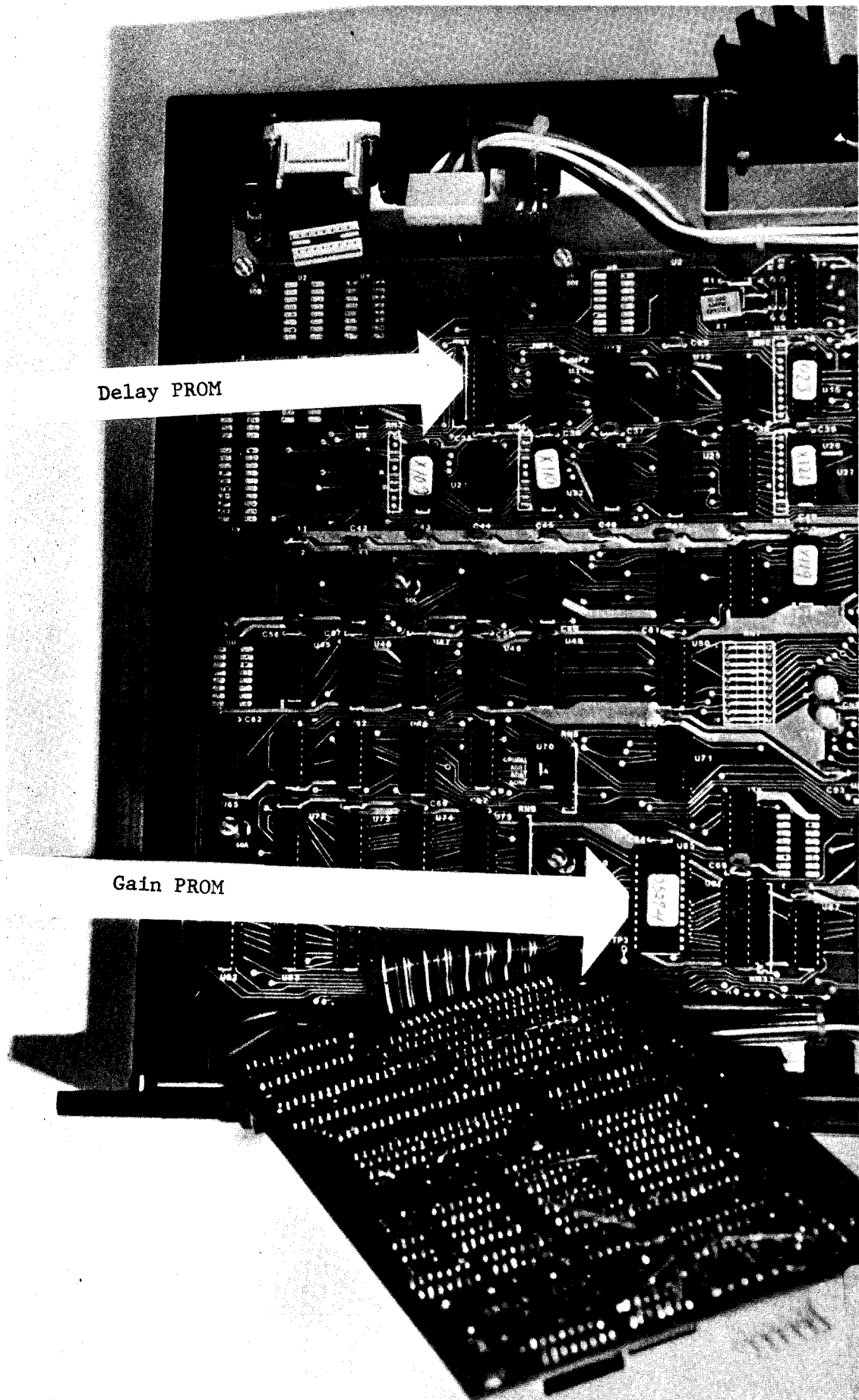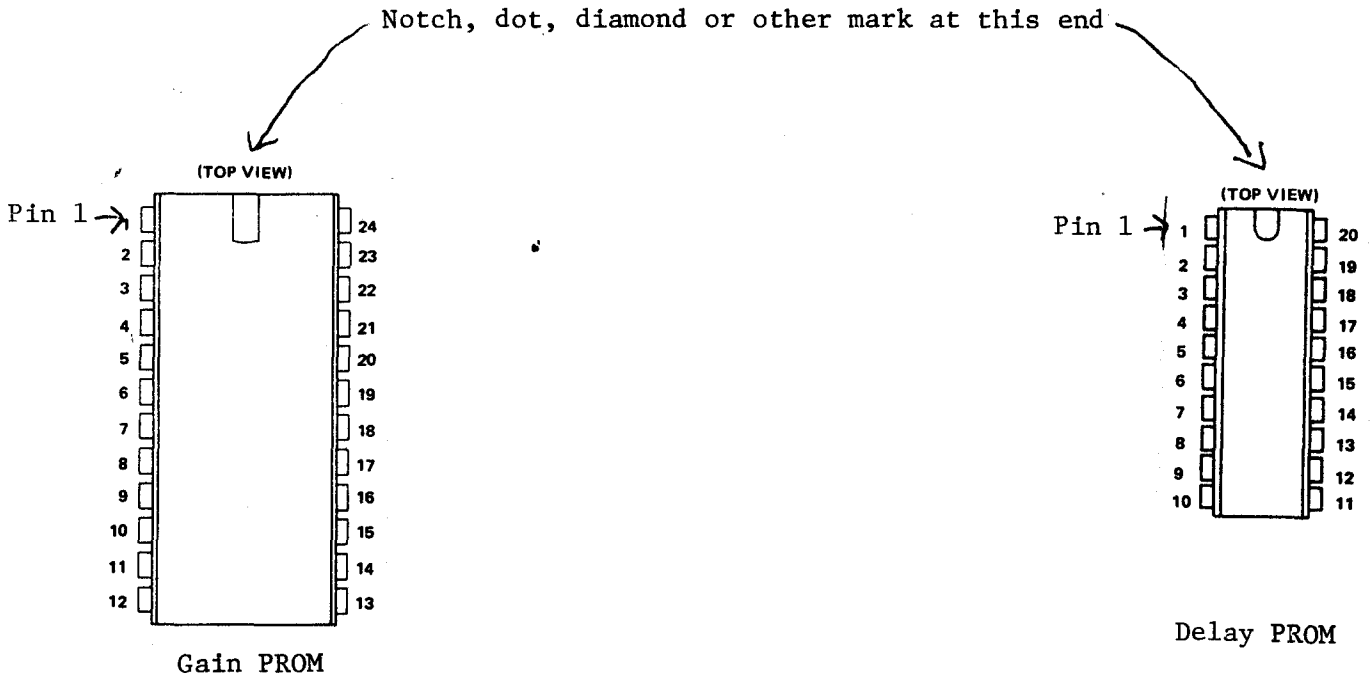
**You must re-install with pin 1 correct, or you will destroy the IC!**

# URSA MAJOR, Inc.

Box 18, Belmont, MA 02178 ● Telephone (617) 489-0303
Telex: 921405   URSAMAJOR BELM

TITLE:   LOWERING THE NOISE LEVEL

UNITS AFFECTED:   All units should have the benefit of this update.
The factory will switch over to shipping units with this update in
August, 1983 (about serial number 700-3).   Earlier units will be
updated automatically at the factory if they are returned for any
other reason; additionally, we will update units returned to us
specifically for this change.   URSA MAJOR requests its dealers to
perform this update at no charge on any units that they have in
stock, or that have already been turned over to their customers.

REASON FOR CHANGE:   Some 8X32 users have said that they'd like the
noise floor to be lower.   The idle noise of the 8X32 under some
conditions of temperature, drift, etc. can assume a reedy,
comb-filter like character which can be annoying, especially in
mixes with high levels of reverb and overall system monitor gain.
Some users would prefer a higher output signal level: these
changes raise it by 6dB.

SCOPE OF CHANGE:   The changes should take about 30 to 60 minutes
to perform.   The two covers must be removed, 3 IC's changed, 4
resistors changed, and 3 capacitors added.   The changes accomplish
a number of improvements:
  1.  Improved signal to noise ratio in all-pass circuit, reducing
      reedy idle channel noise.
  2.  Improved mid & high-frequency noise level in the presence of
      signal (due to the addition of modest pre & deemphasis
      around the reverberant decay circuits).
  3.  Improved idle channel noise due to changes in the idle
      gain states chosen by the CPU in conjunction with the Gain
      PROM.
  4.  Higher output signal level by 6dB. (Has no net effect on
      signal to noise ratio of the 8X32, but may help if the
      8X32 is connected to a console with marginal input signal
      to noise ratio or voltage gain on its Echo Receive input).

IMPORTANT! PLEASE RETURN 3 OLD PROM'S TO URSA MAJOR!!

DETERMINING IF THESE CHANGES HAVE YET TO BE DONE TO YOUR UNIT:
Place the unit right side up, with front panel toward your
stomach.  Locate the CPU board (on standoffs) partially visible
through the slots, and covering the left third of the larger
motherboard below it.  Now angle your vision to peer through the
slots near the front right edge of the CPU board to locate a large
(24 pin) IC down on the motherboard.  This is the Gain PROM, and
should have a sticker on it reading 0527-6, 0527-7, or someday
maybe even -8 or higher.  If the revision number (eg.; "-7") is
"-7" or higher, your unit has these changes.  If not, then you
should proceed further.

DETERMINING WHICH KIT YOUR UNIT NEEDS:
There are two kits, differing only in the type of CPU Program
PROM's provided.  Earlier 8X32's have the Rev-1 CPU using Programs
stored in two 2716 PROM's, while the later Rev-2 CPU uses two 2732
PROM's.  You can tell which you have in several ways:
   1. If you're using a remote unit with your 8X32, you have
      Rev-2.
   2. With the power on, enter Register Number "87" in the
      Register Display.  Now simultaneously depress the two
      buttons Early Reflection -ms and Decay Time +sec.  If all
      the panel LED's go out except for the Register Number, then
      you have a Rev-2 CPU.  Furthermore, if the displayed number
      now in the Register Number display is "04", your unit has
      not yet had these changes.  If it's "05" or higher, it has
      been updated already.
   3. Peer through the top cover at the CPU Board.  If it has two
      small screwdriver adjustments sealed with green paint at the
      right rear, it is a Rev-2 CPU.

If your 8X32 has a Rev-1 CPU, order kit 0744; if Rev-2, order kit
0745.

REQUIRED MATERIALS:
1. Tools:  soldering iron with small tip suitable for PC work.
           diagonal cutters with small nose
           needle-nose pliers and/or tweezers
           solder
           Philips size #1 screwdriver
           IC extractor for 24pin IC's

2. Kit of all parts, complete, for Rev-1 CPU units: 0744.
   Kit of all parts, complete, for Rev-2 CPU units: 0745.

                 CPU PROM'S- "Low"  for U7: Rev-1: 0633-5
                            "Low"  for U7: Rev-2: 0742-5
                            "High" for U8: Rev-1: 0634-5
                            "High" for U8: Rev-2: 0743-5

         Gain PROM:  0527-7.

         Resistors:  to replace jumper at R98: 4.99k, 1%
                     to replace resistor  R68: 3.09k, 1%
                     to replace resistor   R9: 10.0k, 1%
                     to replace resistor  R10: 10.0k, 1%

         Capacitors: mylar capacitor, C300: .018uF, 5%
                     mylar capacitor, C301: .0039uF, 5%
                     mylar capacitor, C302: .0039uF, 5%
            Note: Capacitors supplied are marked 10%, but sorted
                  at factory to 5%.

         Label: "FSB #10 INSTALLED"

---

DANGER: High voltage is present inside unit.  Be sure to unplug
and remove the line cord completely before beginning disassembly.

WARNING: IC's are susceptible to static electric damage.  Keep
IC's on conductive foam pad whenever not being used.  If possible,
work at a grounded work station.  Before picking up or touching an
IC, touch first some large nearby metal surface (work bench, 8X32
chassis, etc.) to discharge any static charge you may have built
up upon your body.

ANOTHER WARNING: Changing PROM's on the CPU involves a slight risk
of disturbing the User Register contents, including the chance
that all the memories will be lost and erased (in the case of
Rev-1 CPU's especially).  Therefore, we urge you to note down on
paper any register contents that are especially important to you
and/or difficult to replace.

---

HOW TO MAKE THE CHANGES:

1.  Unplug the unit.  Put it on a padded workbench and remove the
top and bottom covers (each cover is secured by 10 screws).

2.  Place the 8X32 right side up, panel toward your stomach.
Locate the CPU board up on its standoffs, and the two 24 pin
PROM's plugged into U7 & U8 sockets.  Verify that you have the
correct IC's to update your CPU (see earlier comments in this
bulletin).

Use Fig.1 to locate the 3 PROM's to be changed.  Note the pin 1
end of U7: the replacement IC must go in exactly this way.  Using
the IC extractor, or a small screwdriver, gently remove the IC and
set it aside on the foam pad.  Next, lift the PROM 0633-5 (or
0742-5) provided with this kit from the foam pad and check it to
be sure that the pins are parallel and straight in both axes.
Carefully position the IC with the pin 1 end toward the left, the
same end where the pin 1 of the original IC was placed.  Refer to
Fig.2 to clarify which end of the IC is pin 1 if you are in doubt.
On some IC's, there may be no notch at the pin 1 end, but a small
dot, circle, diamond or other symbol.  If you put the IC in
backwards it will be destroyed!  Carefully mesh the pins of the
IC in the 24 holes of the socket, jiggling, squirming, looking
very carefully to be sure that they are lined up and then press
down, gently at first, a little bit more firmly if necessary, to
seat the IC all the way in the socket.  Inspect carefully (if
possible with a small mirror) to see if any of the pins have been
bent under the body or out to one side.

Now repeat the last paragraph's procedure with U8, the other PROM
on the CPU, using the new PROM 0634-5 (or 0743-5) to replace the
old one.

Finally, locate the Gain PROM (see Fig.1) on the motherboard right
near the right edge of the CPU board, and replace it with the new
PROM, part number 0527-7.

You are now through with the IC replacements and with work on the
top side of the 8X32.

3. Now turn the 8X32 upside down, with the panel toward your
stomach, and refer to Fig.3 to get oriented as to where you will
be making the changes on the ANA board.

4. CHANGING A RESISTOR:  We recommend the following procedure to
replace a resistor (or the jumper at R98):

Cut and bend the resistor leads according to Fig.4.
Use the iron and solder to tack a tiny solder blob onto the ends
of the resistor leads.
Find the old resistor or jumper to be replaced.  Use the iron and
solder to tack a small solder blob on its leads where they enter
the PC board.
Now tack solder the new resistor across the old, soldering at the
points where the old resistor leads enter the PC board.  Refer
to Fig.5.
Use the diagonal cutters to carefully cut away the old resistor,
by cutting its leads near its body.  Remove and discard the
remains of the old resistor.

5. Following the procedure of (4) above, change the following
resistors:

| | Component # | Old Value | New Value |
|---|---|---|---|
| i) | R68 | 2K, 5% | 3.09K, 1% |
| | | (red,black,red, gold) | (orange,blk,white,brown) |
| | | | |
| ii) | R98 | jumper | 4.99K, 1% |
| | | (white) | (yel,white, white,brown) |
| | | | |
| iii) | R9,R10 | 5.1K,5% | 10.0K, 1% |
| | | (green,brown,red, gold) | (brown,blk,blk,red) |

Fig.3 will help you locate them.

6. Referring again to Fig. 4, prepare the 3 capacitors provided by
cutting the leads and soldering small solder blobs on the lead
ends as you did with the resistors.

7. Find the 3 resistors across which these 3 capacitors are to be
tack soldered and prepare these resistors with small solder blobs.

8. Now add the 3 capacitors as follows (Refer to Fig.6):

i)    C300    .018uF, 5%: tack solder across R98 (just installed).

ii)   C301    .0039uF,5%: tack solder across R41
      C302    .0039uF,5%: tack solder across R42
              (R41 and R42 are 12K,5%: brown,red,orange, gold)

9. Please make a last check:
Are all the solder joints sturdy?  You should be able to push
gently on each newly installed component and have it
        remain firmly soldered.
    Look carefully where you soldered for blobs, shorts, etc.
    Be sure all removed components are set aside on the foam pad
        and that none remain in the unit.
    Be sure you have carried out each step and that you have no
        leftover new components in the kit.
    Double-check your IC insertions for correct pin 1 orientation,
        correct IC's in each socket, no bent pins, etc.

10. Apply the supplied sticker "FSB #10 INSTALLED" to the chassis
rear panel.

REASSEMBLY:  Replace the top cover with its 10 screws.  It is
sometimes helpful to not tighten the screws fully until all have
been started and are engaged in the mating cover threads.

When replacing the bottom cover, be careful that the DIP-DIP
ribbon cable is folded neatly in a right angle toward the rear as
it was when the cover was removed.

When both covers are installed, connect the power cord and turn
the unit on.  It is possible that changing the CPU PROM's may have
disturbed the user register, but this is unlikely.  If they were
disturbed, CPU Rev-1's will show a display of all "E"'s and
Register "00".  Rev-2 CPU's will show a display of panel settings
with ".bd." flashing in the Register Display.  In the case of
Rev-1 CPU's, all user contents will have been lost, while in Rev-2
CPU's, the ".bd." indicates that some error in memory was found
upon power-up, but the contents will not have been erased.  Much
or most of the user register contents may still be valid, but you
should check carefully.

QUICK LISTENING VERIFICATION:  After making these changes, it's a
good idea to check for normal operation before returning to the
customer.
i) Connect input and output leads and a signal source so you can
listen to the 8X32.
ii) Set the panel to Early Reflections, Level 8; Initial Reverb,
Level 1; and Decay Time, 0.0.  You should hear equal loudness
levels in the L&R outputs.
iii) Set the panel to Early Reflections & Initial Reverb, Level 1;
Program to Plate II; Decay Time to 3.0 sec.  You should hear equal
loudness reverb in both outputs, with the same balanced frequency
response as before the changes.


IMPORTANT: Please return the 3 original PROM's to:

                URSA MAJOR, Inc.
                Box 18; 50 Trapelo Rd.
                Belmont MA 02178 USA.


AUTHOR: Christopher Moore

Pin 1

12 11 10 9 8 7 6 5 4 3 2 1

13 14 15 16 17 18 19 20 21 22 23 24
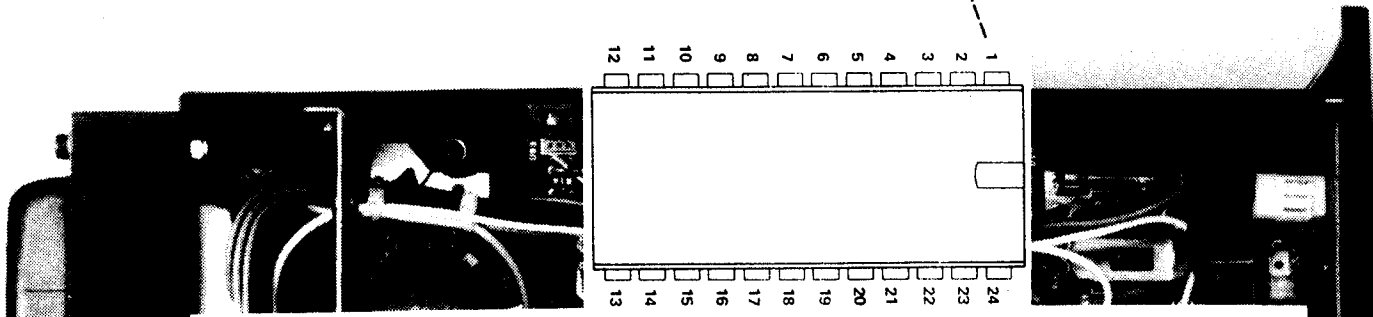
Fig.2   PROM Orientation        Notch, dot, diamond, or other
                                 mark at this end.

*** You must re-install with pin 1 correct, or you will destroy
the IC!

Gain PROM

CPU PROM's
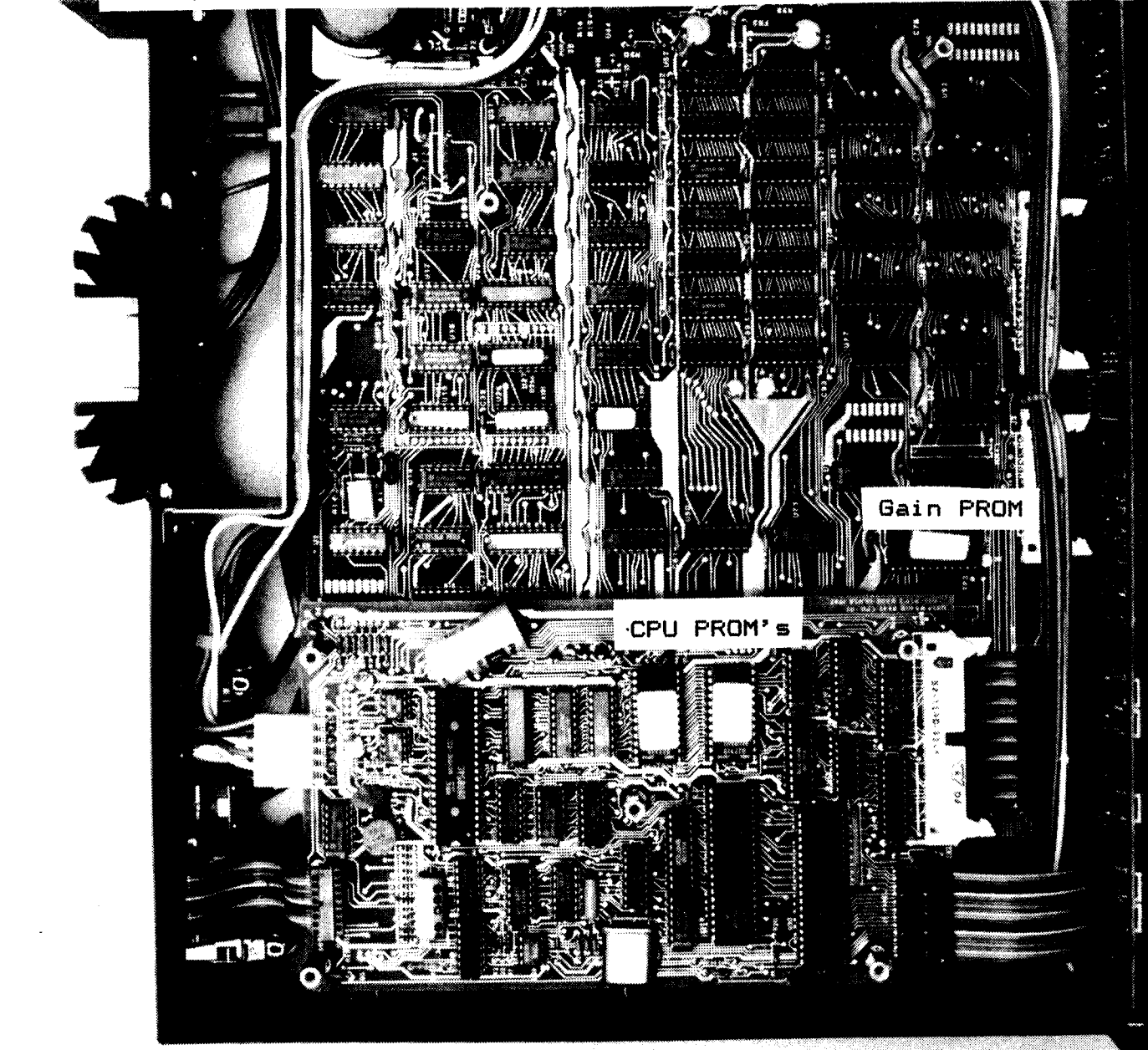
Fig.1  Location of 3 PROM's
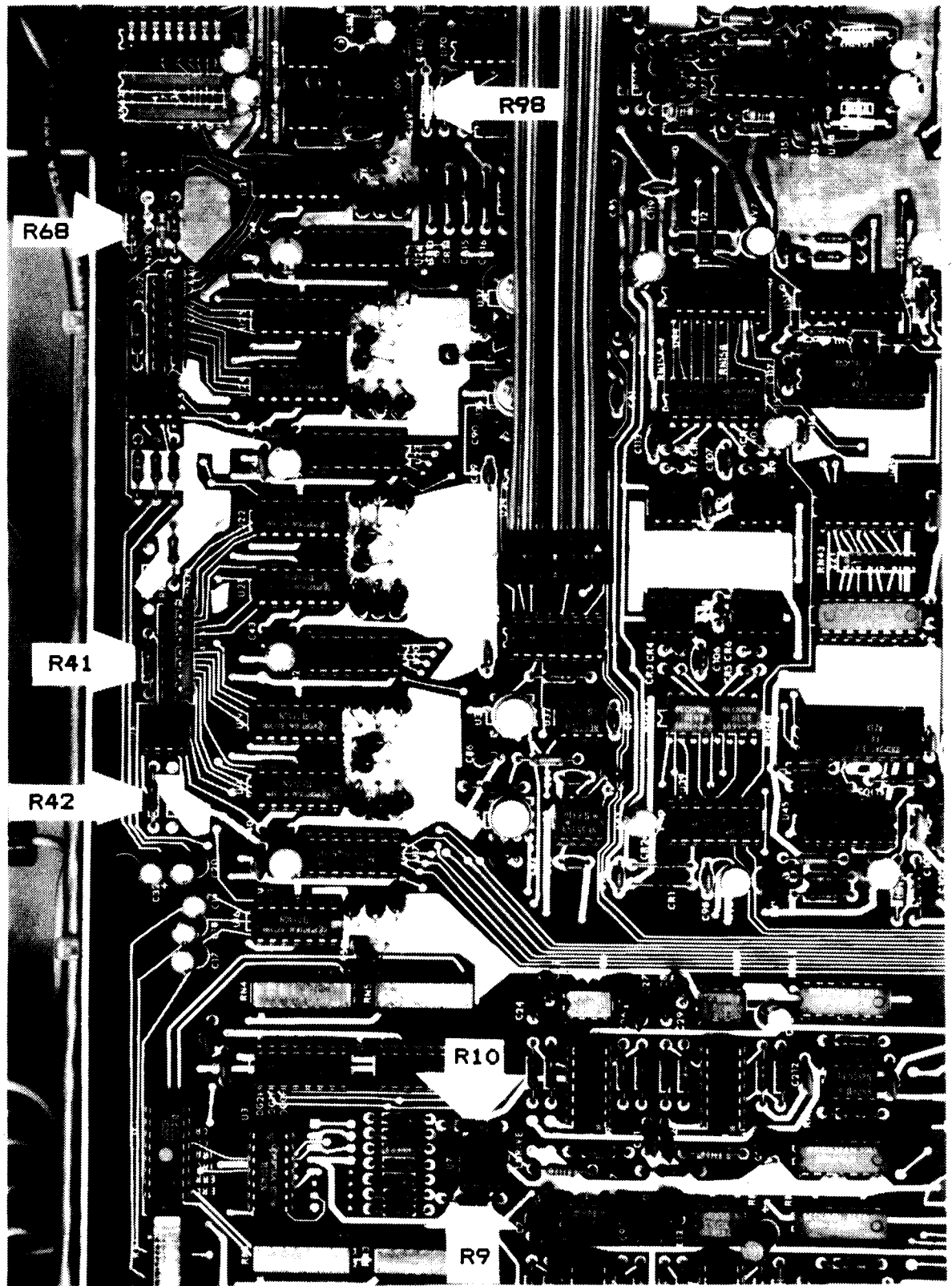
Fig. 3    ANA Board: locations of changed R's and C's

Fig.4    Resistor and Capacitor Soldered in at R98 position
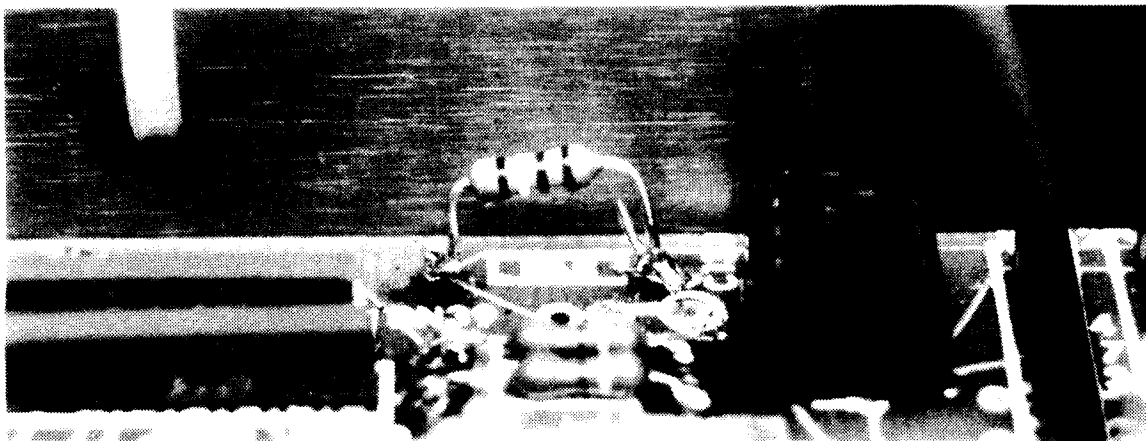


Fig.5    Resistor Tack-Soldered in place at R68 position.



Fig.6    Capacitors Tack-soldered in place across R41 & R42.

APPENDIX B.  PARTS LISTS

The following are the parts lists for the circuit modules,
the chassis, and the remote control of the 8X32.  They are
intended to help you should you ever have to replace a part
or order one from the factory.

| STOCK# | PART | LOCATION | QTY |
|---|---|---|---|
| **RESISTOR 5% ¼w CF** | | | |
| 202-0105 | 100Ω | R3 | 1 |
| 202-0106 | 150Ω | R28 | 1 |
| 202-0462 | 270Ω | R26 | 1 |
| 202-0109 | 510Ω | R13,R20 | 2 |
| 202-0110 | 1.0K | R1,R2 | 2 |
| 202-0111 | 1.1K | R18,R19 | 2 |
| 202-0112 | 2.0K | R25 | 1 |
| 202-0113 | 2.4K | R21,R22 | 2 |
| 202-0115 | 4.7K | R6,R7,R8,R9 | 4 |
| **RESISTOR 1% ¼w MF** | | | |
| 203-0470 | 124Ω | R10,R14,R17,<br>R24,R27,R31 | 6 |
| 203-0474 | 619Ω | R15,R16 | 2 |
| 203-0473 | 383Ω | R11 | 1 |
| 203-0475 | 1.07K | R23 | 1 |
| 203-0477 | 1.37K | R29,R30 | 2 |
| 203-0480 | 3.48K | R12 | 1 |
| **RESISTOR NETWORK (SIPS)** | | | |
| 207-0501 | 10pin 2.2K | RN1 | 1 |
| 206-0502 | 8pin, 2.2K | RN8 | 1 |
| 207-0500 | 10pin, 3.3K | RN9,RN10,RN11 | 3 |
| **DIODES** | | | |
| 300-0155 | 1N4004 | D3,D4,D5,D7-16,<br>D18-D25 | 21 |
| 300-0377 | MR751 | D1,D2 | 2 |
| 300-0158 | 1N4735A | D6 | 1 |
| 300-0157 | 1N5231B | D17 | 1 |
| 520-0187 | SCRC122F | SCR | 1 |
| 341-0459 | FET | Q1 | 1 |
| 280-0444 | 10MHz Crystal | XTAL | 1 |
| 270-0190 | Ferrite Bead | FB1,FB2,FB3 | 3 |
| **SOCKETS** | | | |
| 520-0148 | 8pin,Dip | | 2 |
| 520-0149 | 14pin,Dip | | 26 |
| 520-0150 | 16pin,Dip | | 48 |
| 520-0152 | 20pin,Dip | | 14 |
| 520-0153 | 24pin,Dip | | 1 |
| 522-0052 | TO220 | U93-U97 | 5 |
| **CAP, TANTALUM DIPPED** | | | |
| 241-0127 | 4.7uF/25V | C2,C6,C10,C12<br>C15,C18,C20 | 7 |
| **CAP, ALUMINUM ELECTROLYTIC** | | | |
| 240-0452 | 22uF/35V | C9,C14,C17,<br>C22,C95,C98 | 6 |
| 240-0260 | 330uF/16V | C96,C97 | 2 |
| 240-0356 | 2200uF/35V | C25-C26 | 4 |
| 240-0357 | 15000uF/16V | C4,C5 | 2 |
| **CAP MICA** | | | |
| 242-0137 | 24PF | C1 (C4 at XTAL) | 1 |
| **CAP CERAMIC DISC** | | | |
| 245-0131 | .005uF/1600V | C27,C28 | 2 |
| 245-0133 | .02uF/50-100V | C29,C31-38,C40-C48<br>C51-C78,C93,C94 | 48 |
| 245-0294 | .1uF/50V | C8,C30,C59,C49<br>C50,C79-C92 | 19 |
| 670-0191 | Jumper, .5inch | RN7 Jumper 9 | 11 |
| **MOM-2 PCB** | | | |
| 600-0192 | Fuse Clip | | 6 |
| 455-0045 | Voltage Select Switch | S1 | 1 |
| 640-0218 | Screw 4-40 x 5/16 PPB | | 1 |
| 643-0222 | Nut, KEP #4 | | 1 |

| STOCK # | PART | LOCATION | QTY |
|---------|------|----------|-----|
| **IC's DIGITAL** | | | |
| 330-0161 | 74LS00 | U14,U45 | 2 |
| 330-0162 | 74LS04 | U3,U4,U11,U29,U37,U67 U69,U76,U77,U19,U88 | 11 |
| 330-0164 | 74LS08 | U2,U23,U40,U43,U66,U87 | 6 |
| 330-0210 | 74LS10 | U32 | 1 |
| 330-0488 | 74LS11 | U7,U30 | 2 |
| 330-0166 | 74LS30 | U39 | 1 |
| 330-0167 | 74LS74 | U1 | 1 |
| 330-0315 | 74LS85 | U33,U47,U65,U83 | 4 |
| 330-0270 | 74LS86 | U31 | 1 |
| 330-0169 | 74LS163 | U16,U17 | 2 |
| 330-0334 | 74LS175 | U5,U6,U36,U50,U82,U84 | 6 |
| 330-0212 | 74LS189 | U12,U71 | 2 |
| 330-0215 | 74LS253 | U68 | 1 |
| 330-0171 | 74LS257 | U9,U13 | 2 |
| 330-0216 | 74LS283 | U21,U34,U35,U46,U48,U49 | 6 |
| 330-0316 | 74LS373 | U89-U92 | 4 |
| 330-0317 | 74LS374 | U24,U25,U28,U73,U74,U75 U78,U79,U80,U81,U86 | 11 |
| 330-0173 | 74LS393 | U18 | 1 |
| 330-0324 | 74LS670 | U72 | 1 |

| PROMS | PART | LOCATION | QTY |
|-------|------|----------|-----|
| 350-0521 | 82S123 (0521-4) | U20 | 1 |
| 350-0522 | 82S123 (0522-3) | U22 | 1 |
| 350-0523 | 82S123 (0523-2 | U26 | 1 |
| 350-0524 | 82S123 (0524-2) | U38 | 1 |
| 350-0520 | 82S123 (0520-1) | U15 | 1 |
| 350-0525 | TBP28L22N (0525-5) | U10 | 1 |
| 350-0526 | TBP28L22N (0526-7) | U27 | |
| 350-0527 | 2716 (0527-4) | U85 | 1 |

**16K RAM**

| | | | |
|-------|------|----------|-----|
| 351-0336 | 5290N | U51-U64 | 14 |

**SAR**

| | | | |
|-------|------|----------|-----|
| 330-0174 | 2502 | U41,U42 | 2 |

| STOCK # | PART | LOCATION | QTY |
|---------|------|----------|-----|
| **MISC** | | | |
| 303-0445 | Display, Red 7 segment Fl. | U44 | 1 |
| 453-0044 | Power Switch | J2 | 1 |
| 510-0425 | 26pin Header Shroud Conn. | J3 | 1 |
| 510-0426 | 34pin Header Shroud Conn. | J2 | 1 |
| 520-0151 | Socket 16pin EBY | J1 | 1 |
| 630-0430 | Standoff 5/8inch long M/F | SOA,OB,OC,OD,OE | 5 |
| 630-0433 | Standoff 1.5inch long F/F | SOF,SOG | 2 |
| 630-0631 | Standoff 13/16in long MF | SOB,SOE,SOG | 3 |
| 640-0224 | Screw 6-32 x ¼ PPB | SOF,SOA,SOC,SOD | 4 |
| 644-0288 | Washer Internal Star #6 | SOA-SOG | 7 |

| FUSES | | | |
|-------|------|----------|-----|
| 440-0581 | 8AG, 5.0 A | F3 | 1 |
| 440-0193 | 3AG, .75 SB | F1,F2 | 2 |
| 440-0195 | 3AG, .375 SB | F1,F2 | 2 |
| 680-0515 | Cable, Ribbon 40pin | J4 | 1 |

Hardware Assembly: Always

Top Side of Board

| | | |
|---|---|---|
| 5 | 5/8 inch long M/F Standoffs | SOA-SOE |
| 2 | 1.5 inch long F/F Standoffs | SOF,SOG |

Bottom Side of Board

| | | |
|---|---|---|
| 3 | 13/16 inch long M/F Standoffs | SOB,SOE,SOG |
| 4 | 6-32 x ¼ PPB Screws | SOA,SOC,SOD,SOF |
| 7 | #6 Internal Star Washers | SOA-SOG |
| 1 | EBY 16pin Socket | J1, Bottom |

| STOCK# | PART | LOCATION | QTY |
|---|---|---|---|

**Resistors CF, ¼W, 5%**

| STOCK# | PART | LOCATION | QTY |
|---|---|---|---|
| 202-0103 | 27 | R45,53,55,58 | 4 |
| 202-0105 | 100 | R69,70,80 | 3 |
| 202-0506 | 330 | R99,101 | 2 |
| 202-0463 | 390 | R82 | 1 |
| 202-0109 | 510 | R5 | 1 |
| 202-0112 | 2.0K | R21,34,68,77,78,81,97 | 7 |
| 202-0607 | 2.7K | R94 | 1 |
| 202-0114 | 3.0K | R104 | 1 |
| 202-0464 | 3.9K | R66,67,93 | 3 |
| 202-0608 | 5.1K | R9,10 | 2 |
| 202-0609 | 11.0K | R1 | 1 |
| 202-0119 | 12.0K | R40,41,42 | 3 |
| 202-0610 | 22.0K | R2,6 | 2 |
| 202-0120 | 24.0K | R3,7, | 8 |
| 202-0611 | 27.0K | R4,8 | 2 |
| 202-0124 | 240.0K | R46,47,54,56,59,100,119 121,123,125,127,129,133, 134 | 14 |
| 202-0639 | 680.0K | R135 | 1 |
| 680-0191 | Jumper, .5inch | R98,117,131 | 3 |

**Resistors MF, ¼W, 1%**

| STOCK# | PART | LOCATION | QTY |
|---|---|---|---|
| 203-0469 | 51.1 | R23,36,37,102 | 4 |
| 203-0612 | 200 | R50,57,60,103 | 4 |
| 203-0472 | 210 | R48 | 1 |
| 203-0474 | 619 | R43,44 | 2 |
| 203-0475 | 806 | R71,72 | 2 |
| 203-0083 | 1.0K | R73,74,75,76,79 | 5 |
| 203-0102 | 1.24K | R51,52,61,62 | 4 |
| 203-0478 | 2.61K | R19,32,91 | 3 |
| 203-0479 | 2.74K | R49 | 1 |
| 203-0613 | 3.09K | R113 | 1 |
| 203-0087 | 4.02K | R26 | 1 |
| 203-0600 | 4.53K | R115,122 | 2 |
| 203-0481 | 4.99K | R108 | 1 |
| 203-0615 | 5.23K | R110 | 1 |
| 203-0616 | 5.49K | R120,124 | 2 |
| 203-0617 | 6.04K | R28 | 1 |
| 203-0482 | 6.65K | R15,28,87 | 3 |
| 203-0618 | 7.68K | R106 | 1 |
| 203-0603 | 10.0K | R22,35,63-65,109,111,114,116 | 9 |
| 203-0636 | 10.7K | RN23, Unbent | 8 |
| 203-0637 | 11.0K | RN25, Unbent | 8 |
| 203-0094 | 11.3K | R18,31,90 | 3 |
| 203-0095 | 12.4K | R14,27,86 | 3 |
| 203-0619 | 17.8K | R112 | 1 |
| 203-0483 | 20.5K | R17,30,89 | 3 |
| 203-0632 | 24.9K | R20,33,92,105 | 4 |
| 203-0100 | 25.5K | R11,12,16,24,25,29,83,84,88 | 9 |
| 203-0620 | 26.1K | R13,26,85 | 3 |
| 203-0485 | 29.4K | R95,96,107 | 3 |

**Res, Net, Dip, Thin Film**

| STOCK# | PART | LOCATION | QTY |
|---|---|---|---|
| 210-0635 | 330,.05%, 8pin | RN14A,RN14B,RN15A,RN15B | 4 |
| 210-0598 | 2.0K, .05% 8pin | RN16-RN21,RN28,RN29 | 8 |
| 210-0326 | 10.0K, .05% 8pin | RN7-RN10,RN30-RN33 | 8 |
| 210-0327 | 10.0K, .1% 14pin | RN6,RN11, RN12,RN45 | 4 |

**Res, Net, Dip, Thick Film**

| STOCK# | PART | LOCATION | QTY |
|---|---|---|---|
| 205-0147 | 100n, 2%, 16pin | J18 | 1 |
| 205-0417 | 1.0Kn, 2% 16pin | RN2-RN5 | 4 |
| 205-0600 | 8.2Kn, 2%, 16pin | RN26 | 1 |
| 205-0601 | 9.1Kn, 2%, 16pin | RN24 | 1 |
| 205-0602 | 10.0K, 2%, 16pin | RN22 | 1 |
| 205-0604 | 12.0K, 2%, 16pin | RN27 | 1 |
| 205-0453 | 22.0K, 2%, 16pin | RN1 | 1 |

**SIPS**

| STOCK# | PART | LOCATION | QTY |
|---|---|---|---|
| 206-0144 | 2.0K, 8pin | RN13,34,35,36,39,40,44 | 7 |
| 206-0146 | 47.0K, 8pin | RN37,38,41,42, | 4 |
| 212-0506 | 200n, 6pin | RN43 | 1 |

## POTS

| STOCK # | PART | LOCATION | QTY |
|---|---|---|---|
| 201-0442 | 10K,RECTANGLE, MULTITURN | RV9 | 1 |
| 201-0443 | 200.0Kn, Round, SINGLE TURN | RV7,RV8 | 2 |
| 201-0586 | 200.0Kn, Rectangular, SINGLE TURN | RV1-RV6,RV10,RV11 | 8 |
| 270-0190 | Ferrite Bead | E5,6,7,8,10 | 5 |
| 300-0154 | DIODE, 1N4148 | CR1-CR16 | 16 |

Connector, Header, Right Angle, Locking, .156

| 510-0416 | 3pin | J20,J23 | 3 |
|---|---|---|---|
| 510-0672 | 4pin | J20 | 1 |
| 510-0373 | 6pin | J8,J19 | 2 |

IC's

| 315-0199 | LF398H Sample & Hold | U29,31,35,37 | 4 |
|---|---|---|---|

| STOCK# | PART | LOCATION | QTY |
|---|---|---|---|

## CAPACITORS

| STOCK# | PART | LOCATION | QTY |
|---|---|---|---|
| 245-0133 | Cer,Disc .02uF/50V | C1,2,5,6,15,16,21,22,31,33,35, 38,40,43,44,46,47,49,112, 136-143,152-157, 179,180,187, 188,207,208,211,212 | 41 |
| 245-0182 | Cer,Disc .01uF/50V | C101,121 | 2 |
| 245-0294 | Cer, Monolithic .1uF/50V | C83,84,87,88,89,91,93,94,96, 98,100,102,103,106,107,108, 110,113,116,117,119,120,122, 124,167--172,207,208 | 32 |
| 240-0136 | Alum,Elec,RAD 4.7uF/35V | C14,17-20,30,32,135,197 | 9 |
| 240-0452 | Alum,Elec,RAD 22uF/25V | C39,42,45,48,97,99,104,115, 118,123,131,132,160-165,182, 184,186,200,202,204,206,209 | 26 |
| 242-0495 | Axial 330uF/16V | C3 | 1 |
| 243-0139 | Polypropylyne 120pf | C85,C94 | 2 |
| 243-0140 | Polypropylyne 220pf | C96 | 1 |
| 243-0141 | Polypropylyne 1000pf | C7-13,C23-29,C50-82,86,90,92 145-151,159,174-178,185,189- 195, 198, 173 | 75 |
| 247-0599 | Stacked Film .22uF/63V | C125-130 | 6 |
| 241-0128 | Tant-Dipped 22uF/16V | C109 | 1 |

## SOCKETS

| 520-0148 | 8pin | U1,7,12,13,28,30,32,36,38, 53,54,55,68,69,71,72,75,76,78 | 19 |
|---|---|---|---|
| 520-0149 | 14pin | U3,8-11,14,15,16,18,19,21,22, 24,25,27,62-67,73,74,77 | 24 |
| 520-0150 | 16 Pin | U2,4,5,6,17,20,23,26,33,34, 39,44,45,46,48,49,51,52, 56-61,70, J13, J17 | 27 |
| 520-0152 | 20 Pin | U47, U50 | 2 |
| 520-0151 | EBY 16 Pin | J1, J11, J12 | 3 |
| 710-0396 | ANA-02 8X32 | | 1 |

8X32  ANA-2  ASSEMBLY 2

| STOCK # | PART | LOCATION | QTY |
|---|---|---|---|
| **OP-AMP's** | | | |
| 340-0579 | TLO72 | U1,7,28,53,54,55,68,69,72,76 | 10 |
| 340-0203 | TLO74 | U3,16,18,19,21,22,24,25,27,62-64 | 12 |
| 340-0207 | 4741 | U8-11,73,74,77 | 7 |
| 340-0337 | 5532N | U12,13,32,36,71,75,78 | 7 |
| 340-0198 | 5534N | U30,38 | 2 |
| | | | |
| **COMPARITOR's** | | | |
| 340-0568 | CMP-5FZ | U40,41,42,43 | 4 |
| **ANALOG SWITCH** | | | |
| 345-0200 | MC14051B | U2,4,5,6,17,20,23,26,39,44 | 10 |
| 345-0201 | MC14052B | U33,34,56-61,70 | 9 |
| **DAC** | | | |
| 355-0337 | DAC-08HQ | U45,46,51,52, | 4 |
| 355-0322 | AM6012DC or PMI DAC312FR | U47,50 | 2 |
| **LOGIC** | | | |
| 330-0163 | 7406 | U14,15, 65,66,67 | 5 |
| 330-0334 | 74LS175 | U48 | 1 |
| 330-0215 | 74LS253 | U49 | 1 |
| **MISC.** | | | |
| 680-0513 | Ribbon Cable,26pin | J2 | 1 |
| 680-0514 | Ribbon Cable,34pin | J3 | 1 |
| 670-0498 | Dip shunt,16pin | J13 | 1 |
| 205-0147 | Res,Net,Dip,16pin, 2%, 100n | J17 | 1 |

| STOCK# | PART | LOCATION | QTY |
|--------|------|----------|-----|
| **Resistor, ¼w, 5%, CF** | | | |
| 202-0606 | 330n | R8 | 1 |
| 202-0110 | 1.0kn | R7,R16 | 2 |
| 202-0720 | 2.2kn | R13 | 1 |
| 202-0114 | 3.0kn | R14 | 1 |
| 202-0721 | 3.3kn | R9 | 1 |
| 202-0464 | 3.9kn | R11,R20 | 2 |
| 202-0117 | 8.2kn | R10,R12 | 2 |
| 202-0572 | 33.0kn | R5,R18 | 2 |
| 202-0727 | 110.0kn | R17 | 1 |
| 202-0124 | 240.0kn | R4 | 1 |
| 202-0569 | 1.0Mn | R1,R2,R15 | 3 |
| 202-0722 | 2.2Mn | R19 | 1 |
| 202-0728 | 3.0Mn | R6 | 1 |
| **Resistor, Network, 2%, 10 PIN, SIP** | | | |
| 207-0504 | 1.0Mn | RN1 | 1 |
| **Resistor, Variable, PC Mount** | | | |
| 201-0729 | Cermet, Single Turn, Round, 10Kn | RV1,RV2 | 2 |
| **Ferrite Beads** | | | |
| 270-0190 | | FB1,FB2 | 2 |
| **Crystal** | | | |
| 280-0715 | 1.8432 MHz | XTAL | 1 |
| **Diodes** | | | |
| 300-0154 | 1N4148 | D1,D2,D4 | 3 |
| **Diode Schottky** | | | |
| 304-0725 | 1NG263 | D3 | 1 |
| **Transistors** | | | |
| 342-0717 | 2N3904 | Q2,Q3,Q5 | 3 |
| 342-0718 | 2N3906 | Q4 | 1 |
| **Cap, Alum Elec, Axial** | | | |
| 242-0259 | 0.47uf/50v | C1 | 1 |
| 242-0495 | 330uf/16v | C10 | 1 |
| **Cap, Tant, Dipped** | | | |
| 241-0128 | 22uf/16v | C9,C11 | 2 |
| **Cap, Ceramic, Monolithic** | | | |
| 245-0294 | .1uf/50v | C2,3,13,C15-21 | 10 |
| **Cap, Ceramic Disc** | | | |
| 245-0726 | 56pf | C7 | 1 |
| 245-0130 | 100pf | C5,C8 | 2 |
| **Sockets, EBY** | | | |
| 521-0151 | 16 PIN | J10 | 1 |
| 521-0440 | 24PIN | | 1 |
| **Socket, Dip, Solder Tail** | | | |
| 521-0148 | 8 PIN | | 3 |
| 520-0149 | 14 PIN | | 8 |
| 520-0150 | 16 PIN | | 4 |
| 520-0459 | 18 PIN | | 2 |
| 520-0152 | 20 PIN | | 6 |
| 520-0153 | 24 PIN | | 2 |
| 520-0460 | 40 PIN | | 3 |
| **Headers, Male, Right Angle** | | | |
| 510-0373 | 6 PIN, .156" spacing | J6 | 1 |
| 510-0427 | 40 PIN, .1 Grid Shroud | J4 | 1 |

8X32 CPU-01 Rev 2 ASSEMBLY 1

PCB

710-0406          8X32, CPU-01, Rev 2                                    1

ASSEMBLY NOTES

Mask:  Battery, SOA-SOE, J9
Glue under XTAL
Solder J6

CPU-01 Rev 2 OPTION "FOR NON-REMOTE UNITS"

Remove U19 (WD2123 UART)
       U27 (74LS02)
       U18 (74LS244)

Substitute into U19 a Header jumpered together PIN 8, 13, 10 and 7.


8X32 CPU-01 Rev 2  ASSEMBLY 2


| STOCK#  | PART | LOCATION | QTY |
|---------|------|----------|-----|
| IC, LOGIC | | | |
| 330-0161 | 74LS00 | U1,9,16 | 3 |
| 330-0209 | 74LS02 | U27* | 1 |
| 330-0167 | 74LS74 | U21,25 | 2 |
| 330-0332 | 74LS138 | U13,15,17,24 | 4 |
| 330-0170 | 74LS244 | U11,12,18* | 3 |
| 330-0316 | 74LS373 | U4 | 1 |
| 330-0317 | 74LS374 | U10,14 | 2 |
| IC, PROMS, MEMORY | | | |
| 350-0724 | 2732 programmed to: | | 2 |
| 352-0633 | PROGRAM #633/U7 | | 1 |
| 352-0634 | PROGRAM #634/U8 | | 1 |
| IC, RAMS, MEMORY, STATIC | | | |
| 330-0494 | UPD444/65144 | U5,U6 | 2 |
| IC, VOLTAGE REGULATOR | | | |
| 340-0716 | ICL8212CPA | U2,U28 | 2 |
| IC, INTERFACE | | | |
| 342-0381 | 1488 | U23 | 1 |
| 342-0382 | 1489 | U22 | 1 |
| MISC | | | |
| 340-0383 | Timer NE555 | U26 | 1 |
| 330-0386 | IC, Keyboard/Display Interface 82792 | U20 | 1 |
| 330-0380 | IC,uP, 8085A | U3 | 1 |
| 330-0709 | IC, Dualuart, WD2123P or A | U19* | 1 |
| 900-0496 | Battery, Lithium, 3.0v, 1Ah  Header, 14PH, DIP | BAT | 1 |
| 510-0731 | | | |


ASSEMBLY NOTES:

Header to be programmed and returned not mounted.
* may be removed and returned to stock.
BATTERY DANGEROUS, WILL EXPLODE IF REVERSED, GROUNDED, SHORTED, OR TOUCHES OTHER
BATTERIES.

| STOCK# | PART | LOCATION | QTY |
|---|---|---|---|
| SWITCHES | | | |
| 450-0330 | Black push button legend + | N2,4,6,8,10 | 5 |
| 450-0330 | Black push button legend - | N1,3,5,7,9, | 5 |
| 450-0331 | Black push button with LED saddle | N11-N26 | 16 |
| | Black push button Legend: | | |
| 450-0329-0 | 0 | N27 | 1 |
| 450-0329-1 | 1 | N28 | 1 |
| 450-0329-2 | 2 | N29 | 1 |
| 450-0329-3 | 3 | N30 | 1 |
| 450-0329-4 | 4 | N31 | 1 |
| 450-0329-5 | 5 | N32 | 1 |
| 450-0329-6 | 6 | N33 | 1 |
| 450-0329-7 | 7 | N34 | 1 |
| 450-0329-8 | 8 | N35 | 1 |
| 450-0329-9 | 9 | N36 | 1 |
| IC's | | | |
| 340-0354 | ULN-2803A | U1 | 1 |
| 330-0332 | 74LS138 | U2 | 1 |
| 330-0387 | 4514 | U3 | 1 |
| 340-0356 | UDN-2981A | U4,US | 2 |
| CAPACITORS | | | |
| 241-0128 | 22uF/25V TANT | C1 | 1 |
| 245-0294 | .1/50V CERAMIC | C2 | 1 |
| 242-0495 | 330uF/16V Alum. Elec. Axial | C3 | 1 |
| CONNECTORS | | | |
| 510-0046 | 3pin Male Header | J1 | 1 |
| 680-0512 | 24pin Cable Dip to Dip | J2 | 1 |
| RESISTORS | | | |
| 204-0581 | 75$\Omega$ ½w 5% Res | R9,R10 | 2 |
| 204-0582 | 100$\Omega$ ½w 5% Res | R1-8,R11-15 | 13 |

| STOCK # | PART | LOCATION | QTY |
|---|---|---|---|
| LEDs | | | |
| 270-0190 | Ferrite Bead | FB1 | 1 |
| 302-0352 | Red T.I.Package | D28-D42,D15 | 15 |
| 302-0353 | Green T.I. Package | D43 | 1 |
| 302-0345 | Red Top Hat | D1,D8 | 2 |
| 302-0347 | Yellow Top Hat | D2,D9 | 2 |
| 302-0346 | Green Top Hat | D3-D7,D10-D14 | 10 |
| 7 SEGMENT DISPLAYS | | | |
| 303-0349 | Red Left Hand Decimal Point | D17,D20,D23 | 3 |
| 303-0348 | Red Right Hand Decimal Point | D18,D19,D21, D22,D24,D25 | 6 |
| 303-0350 | Green Right Hand Decimal Point | D27 | 1 |
| 303-0351 | Green Left Hand Decimal Point | D26 | 1 |
| 710-0415 | PAN-1 PCB | | 1 |
| 915-0564 | MASK,8X32 | | 1 |
| 915-0659 | MASK, 8X32 Remote | | 1 |

8X32 FRONT PANEL ASSEMBLY WITH PAN-1

| STOCK # | PART | QUANTITY |
|---|---|---|
| 702-0283 | Front Panel | 1 |
| 640-0446 | Screw 4-40 x 4/16 PP | 6 |
| 644-0223 | #4 Internal Star Washers | 6 |
| 701-0238 | Bracket Keystone #617 | 4 |
| 640-0449 | Screw, Socket Flat Head 6-32 x 5/16 | 4 |
| 643-0227 | Kep Nut #6 | 4 |
| 715-0340 | Window Large | 1 |
| 715-0341 | Window Small | 1 |

| _STOCK:_ | _PART_ | _LOCATION_ | _QTY_ |
|---|---|---|---|
| 202-0118 | Res,CF,¼w,5% 10.0Kn | R1 | 1 |
| 300-0154 | Diode, 1N4148 | D1,D2 | 2 |
| 270-0190 | Ferrite Bead | FB1 | 1 |
| 280-0692 | Crystal, 2.4576 MHz | X1 | 1 |

_CAPACITOR_
_Aluminum, Electrolytic, Axial_

| | | | |
|---|---|---|---|
| 242-0694 | .47uf/50v | C2 | 1 |
| 242-0690 | 47uf/25v | C6,C7,C10 | 3 |
| 242-0495 | 330uf/16v | C1,C8,C9 | 3 |
| 245-0294 | Tantalum, Dipped 22uf/16v | C15 | 1 |
| 241-0128 | Monolithic, Ceramic .1uf/50v | C3,C11,C12,C13 C14 | 5 |
| 510-0427 | 40Pin,Male Header, Right Angle Shroud | J1 | 1 |

_Sockets, Solder Tail, Dip_

| | | | |
|---|---|---|---|
| 520-0148 | 8 Pin | | 2 |
| 520-0149 | 14 Pin | | 7 |
| 520-0150 | 16 Pin | | 7 |
| 520-0459 | 18 Pin | | 3 |
| 520-0153 | 24 Pin | | 1 |
| 520-0460 | 40 Pin | | 2 |
| 640-0218 | 4-40x5/16 PPB Screw | | 1 |
| 643-0698 | 4-40 ESNA Nut | | 1 |
| 620-0701 | Terminal Ring, #4 | | 2 |
| 680-0552 | Wire, 2.0 inch, 20 AWG | | 2 |
| 710-0661 | PCB, REM-01 | | 1 |
| 740-0682 | LM2930T-5.0 REG | U22 | 1 |

8X32 REM-02 REV 0 ASSEMBLY 2

| _STOCK:_ | _PART_ | _LOCATION_ | _QTY_ |
|---|---|---|---|

_IC, INTERFACE_

| | | | |
|---|---|---|---|
| 340-0381 | 1488 | U19 | 1 |
| 340-0382 | 1489 | U20 | 1 |

_IC, CMOS, LOGIC_

| | | | |
|---|---|---|---|
| 330-0675 | 4011 | U8,U11 | 2 |
| 330-0681 | 4015 | U9 | 1 |
| 330-0676 | 4023 | U4 | 1 |
| 330-0677 | 4040 | U3,U21 | 2 |
| 330-0678 | 174 | U7 | 1 |
| 330-0679 | 4556 | U17 | 1 |
| 330-0689 | 4081 | U6 | 1 |
| 330-0633 | 4584 | U13 | 1 |

_MISC, IC_

| | | | |
|---|---|---|---|
| 330-0384 | 4712 | U14 | 1 |
| 330-0385 | 6402 | U1 | 1 |
| 330-0386 | 8279 | U2 | 1 |
| 330-0387 | 4514 | U10 | 1 |

_IC, DRIVERS_

| | | | |
|---|---|---|---|
| 340-0356 | UDN-2981A | U15,U16 | 2 |
| 340-0354 | ULN-2803 | U18 | 1 |

_IC, REGULATORS_

| | | | |
|---|---|---|---|
| 340-0683 | ICL-7660-CPA | U5,U12 | 2 |
| 680-0708 | Dip to D Cable-30" | J2 | 1 |

## 8X32 PAN-02 ASSEMBLY

| STOCK: | PART | LOCATION | QTY |
|---|---|---|---|
| 450-0330(+) | Black Push Button Legend (+) | N2,4,6,8,10 | 5 |
| 450-0330(-) | Black Push Button Legend (-) | N1,3,5,7,9 | 5 |
| 450-0331 | Black Push Button With Saddle | N11-N26 | 16 |
| | | | |
| 450-0329-0 | Black Push Button Legend 0 | N27 | 1 |
| 450-0329-1 | Black Push Button Legend 1 | N28 | 1 |
| 450-0329-2 | Black Push Button Legend 2 | N29 | 1 |
| 450-0329-3 | Black Push Button Legend 3 | N30 | 1 |
| 450-0329-4 | Black Push Button Legend 4 | N31 | ·1 |
| 450-0329-5 | Black Push Button Legend 5 | N32 | 1 |
| 450-0329-6 | Black Push Button Legend 6 | N33 | 1 |
| 450-0329-7 | Black Push Button Legend 7 | N34 | 1 |
| 450-0329-8 | Black Push Button Legend 8 | N35 | 1 |
| 450-0329-9 | Black Push Button Legend 9 | N36 | 1 |

### RESISTORS

| | | | |
|---|---|---|---|
| 204-0582 | 100n,½w,5/6,CF | R1-R10 | 10 |

### LEDS

| | | | |
|---|---|---|---|
| 302-0349 | RED, T1 PACKAGE | D1,D8,D15,D28-D42 | 17 |
| 302-0691 | YELLOW, T1 PACKAGE | D2,D9 | 2 |
| 302-0353 | GREEN, T1 PACKAGE | D3-D7, D10-D14,D43 | 11 |

### DISPLAYS, SEVEN SEGMENT, .3 inch common an

| | | | |
|---|---|---|---|
| 303-0349 | RED, Left Decimal | D17,D20,D23 | 3 |
| 303-0348 | RED, Right Decimal | D18,D19,D21,D22 D24,D25 | 6 |
| 303-0350 | GREEN, Right Decimal | D27 | 1 |
| 303-0351 | GREEN, Left Decimal | D26 | 1 |
| | | | |
| 710-0656 | PAN 02 | | 1 |
| 915-0659 | MASK 8X32 REMOTE | | 1 |
| 690-0707 | Ribbon Cable, 40 Pin, Transition to Shroud | | 1 |

## REMOTE ASSEMBLY 8X32

| STOCK | PART | LOCATION | QTY |
|---|---|---|---|
| 715-0641 | Window, Remote 8X32 Small, Red | | 1 |
| 715-0647 | Window, Remote 8X32 Large, Grey | | 1 |
| 702-0655 | 8X32 Remote, Bottom Cover | | 1 |
| 702-0697 | 8X32 Remote, Top Cover | | 1 |
| 702-0643 | 8X32 Remote, Side Piece | | 2 |
| 541-0696 | Foot, Adhesive Rubber .5 inch rec | | 4 |
| 640-0217 | 4-40 x 3/16 PPB | | 2 |
| 640-0218 | 4-40 x 5/16 PPB | | 7 |
| 640-0660 | 6-32 x 5.483 inch | | 2 |
| 640-0593 | Jacksocket Assembly | | 1 |
| 644-0223 | #4 Internal Starwasher | | 4 |
| 630-0684 | Spacer,Hex,.250inch,4-4U,M/F | | 5 |
| 630-0685 | Spacer,Hex,.375inch,4-4U,M/F | | 5 |
| 690-0695 | 12 inch, Plastic Tubing, OP .250, ID .160 | | |
| 915-0659 | Mask, 8X32 Remote | | 1 |
| 720-0265 | 1 inch, Foam Tape, Adhesive ½" x 1/8" | | |
| 730-0705 | Box, 8X32 Remote, Inner Carton | | 1 |
| 730-0704 | Box, 8x32 Remote, Outer Carton | | 1 |
| 730-0706 | Set, Foam Pad, 8X32 Remote | | 1 |

Cable Assembly, 8X32 Remote

## 8X32 REMOTE CABLE ASSEMBLY

| STOCK | PART | LOCATION | QTY |
|---|---|---|---|
| 490-0710 | AMP205206-1 Male Plug "D" 15 Pin | | 1 |
| 510-0711 | AMP205205-1 Female Plug "D" 15 Pin | | 1 |
| 525-0712 | Pin, Male Terminal | | 5 |
| 525-0713 | Pin, Female Terminal | | 5 |
| 500-0714 | Hood | | 2 |
| 640-0593 | Screw lock Assembly (Pair) | | 1 |
| 640-0594 | Screw with Clip (Pair) | | 2 |
| 670-0733 | Cable, 4 conductor with Drain and Shield | | |

### PIN OUT FOR MALE & FEMALE PLUG OF CABLE ASSEMBLY

| | | |
|---|---|---|
| Pin #1 | Shield | Drain |
| Pin #3 | White | Data from Remote to 8X32 |
| Pin #8 | Black | Ground |
| Pin #11 | Green | Data to Remote from 8X32 |
| Pin #15 | Red | Raw Vcc |

### D to DIP PIN OUT

| D Pin | Dip Pin |
|---|---|
| 15 | 15 |
| 8 | 1 |
| 11 | 11 |
| 3 | 6 |
| 1 | 8 |

## CHASSIS ASSEMBLY 8X32 PARTS LIST

### MISC.

| STOCK # | PART | QTY | |
|---|---|---|---|
| 704-0370 | Heat Sink, TO3 Style | 1 | |
| 640-0372 | Cover, TO3 | 1 | |
| 640-0558 | Screw Cover | 2 | Bell Housing |
| 630-0423 | Insulator, TO3 | 1 | 4 Fibre Washers |
| 630-0282 | Insulator, TO-220 | 5 | |

### IC's

| STOCK # | PART | QTY | |
|---|---|---|---|
| 340-0435 | Voltage Regulator LM317T | 3 | Located:U93,U95,U96 |
| 340-0436 | Voltage Regulator LM337T | 2 | Located:U94,U97 |
| 340-0437 | Voltage Regulator LM388K | | |

### MISC.

| STOCK # | PART | QTY |
|---|---|---|
| 605-0444 | Bushing, .50 inch | 1 |
| 605-0445 | Bushing, .750 inch | 1 |
| 702-0422 | Bracket, 8X32 | 1 |
| 702-0418 | Chassis, 8X32 | 1 |
| 470-0309 | Transformer, 8X32 | 1 |
| 702-0509 | Plug Cover, 8X32 | 1 |
| 680-0516 | Cable, Dip to "D" Female connector with hardware | 1 |

### SCREWS

| STOCK # | PART | QTY |
|---|---|---|
| 640-0218 | 4-40 x 5/16, Black,Phillip,Panhead | 7 |
| 640-0219 | 4-40 x 5/16, Black,Phillip,Flat 82° | 8 |
| 640-0224 | 6-32 x 4/16. Black,Phillip,Panhead | 14 |
| 640-0560 | 6-32 x 12/16,Black,Phillip,Panhead | 2 |
| 640-0447 | 6-32 x 6/16, Hex cap, Black | 4 |
| 640-0561 | 8-32 x 4/16 Sheet metal,Black,Phillip Panhead | 2 |
| 640-0562 | 8-32 x 1 12/16 Hex head, Black Screw | 4 |

CHASSIS ASSEMBLY 8X32 PARTS LIST con't

NUTS

| STOCK # | PART | QTY |
|---------|------|-----|
| 643-0688 | #4 ESNA nut | 5 |
| 643-0222 | #4 Kep nut | 2 |
| 643-0227 | #6 Kep nut | 4 |
| 643-0450 | #6 ESNA nut | 2 |
| 643-0561 | #8 ESNA nut | 4 |

WASHERS

| STOCK # | PART | QTY |
|---------|------|-----|
| 644-0234 | #4 Nylon shoulder washer | 5 |
| 644-0228 | #6 Internal star washer | 13 |
| 644-0559 | #6 Lock washer | 2 |

MISC.

| STOCK # | PART | QTY |
|---------|------|-----|
| 701-0281 | Bracket #614 Keystone | 2 |
| 530-0272 | Tie wrap | 15 |

| | | |
|---------|------|-----|
| 701-0281 | Bracket #614 Keystone to be sent to L & M Sheet Metal | |
| 640-0593 | Set, Jacksocket Assembly, 4-40 Hardware for "D" connector to chassis/ | |

CHASSIS ASSEMBLY CONNECTOR PARTS LIST

| STOCK # | PART | QTY |
|---------|------|-----|
| 490-0257 | AC Power Receptacle | 1 |
| 523-0371 | Socket TO3 | 1 |
| 490-0243 | XLR-3 Male Bulkhead Mount | 2 |
| 490-0247 | XLR-3 Female Bulkhead Mount | 2 |
| 490-0451 | XLR-AN3 Male Cable | 1 |
| 490-0264 | Female,3 pin, .156 Spacing, Locking | 5 |
| 490-0539 | Female, 6 pin,.156 Spacing, Locking | 2 |
| 200-0388 | Pot, 10K, Bulkhead Mount with two nuts and a washer | 1 |
| 490-0673 | Female, 4 pin, .156 Locking | 1 |
| 525-0057 | Pin, Crimp, 22 AWG-26 AWG | 28 |
| 525-0376 | Pin, Crimp, 18 AWG-24 AWG | 2 |
| 525-0300 | Pin, Crimp, Power Receptacle | 3 |
| 620-0239 | Solder Lug, Ring Terminal | 2 |
| 670-0671 | Wire, 43.0 inch,Shield, 3 conductor, UL1015, Cut and Strip | |
| 670-0275 | Wire, 6.0 inch, Shielded, 2 conductor UL1015, Tinned, Cut and Stripped .250 inch | |
| 680-0549 | Black, 9.0 inch, 20 AWG | |
| 680-0550 | Blue, 11.0 inch, 20 AWG | |
| 680-0552 | Black, 2.0 inch, 20 AWG | |
| 680-0555 | Black, 3.0 inch, 20 AWG | |
| 680-0554 | Red, 3.0 inch, 20 AWG | |
| 680-0551 | Red, 2.0 inch, 20 AWG | |
| 680-0556 | Green, 3.0 inch, 20 AWG | |
| 680-0553 | Green, 2.0 inch, 20 AWG | |
| 680-0546 | White, 15.5 inch, 20 AWG | |
| 680-0547 | Black, 16.0 inch, 20 AWG | |
| 680-0548 | Green, 3.50 inch, 20 AWG | |
| 680-0564 | Green, 16 inch, 20 AWG | |
| 680-0557 | Purple, 11.5 inch, 16 AWG | |
| 680-0558 | Red, 11.5 inch, 16 AWG | |
| 680-0563 | Bare wire, 20 AWG | |
| 680-0273 | 6 inch, Shrink tubing, .250 inch, 20 AWG | |

## 8X32 POST BURNIN ASSEMBLY NOTES

ANA

STANDOFF

| STOCK # | PART | QTY |
|---------|------|-----|
| 630-0432 | Standoff, 3/4, Female/Male | 3 |
| 640-0224 | Screw, 6-32 x ¼, Phillip,Panhead,Black | 7 |
| 644-0228 | Washer, Internal star #6 | 7 |

CPU

| STOCK # | PART | QTY |
|---------|------|-----|
| 630-0429 | Standoff, 13/16, Female/Female, Hex 6-32 | 5 |

## 8X32 POST BURNIN AND SHIPPING

| STOCK # | PART | QTY |
|---------|------|-----|
| 640-0687 | 6-32 x 2/16 Screw, Panhead, Black, Phillip | |
| 640-0224 | 6-32 x 4/16 Screw, Panhead, Black, Phillip | 2 |
| 640-0217 | 4-40 x 3/16 Screw, Panhead, Black, Phillip | 22 |
| 644-0288 | #6 Internal star washer | 20 |
| 530-0268 | Cable clamp, EBY 16 pin socket | 5 |
| 530-0441 | Cable calmp, EBY 24 pin socket | 1 |
| 680-0511 | Cable, Ribbon DIP-DIP, 16 pin, 9.0 inch | 2 |
| 550-0428 | Button, Power, 8X32 | 1 |
| 702-0420 | Cover, Top, 8X32 | 1 |
| 702-0421 | Cover, Bottom, 8X32 | 1 |
| 541-0253 | Rubber foot, Adhesive backed | 4 |
| 680-0266 | Power cord | 1 |
| 730-0566 | Shipping carton, 8X32 | 1 |
| 730-0542 | Bag, Plastic 8X32 | 1 |
| 730-0567 | Foam End cap, 8X32 | 2 |
| 730-0702 | Outer shipping carton, 8X32 | 1 |
| 730-0703 | Shock absorbers, 8X32 | 8 |
| 530-0272 | Tie wraps | 3 |