Service Manual

EPS 16 PLUS

Keyboard and Rack

P/N 9312 0013 01-A

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NOTES:

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IMPORTANT THINGS TO KNOW ABOUT THE EPS–16 PLUS

IF YOU DON'T READ ANY OTHER PART OF THIS MANUAL, READ THIS SECTION.

As with every ENSONIQ product, all EPS–16 PLUS service will be handled through the ENSONIQ Module Exchange Program. Rather than diagnose and exchange individual components, you will replace complete modules. We feel that this is the most time and cost effective method of repair, both for you and your customers.

The instructions in this manual are for both the EPS–16 PLUS Keyboard and Rack unless otherwise noted. Where the instructions say to check the keyboard of the EPS–16 PLUS, substitute a check of the KPC simulator board on the EPS–16 PLUS Rack.

When troubleshooting an EPS–16 PLUS, remove any optional modules that might be present. This will prevent a faulty option from complicating your troubleshooting.

1. GETTING AROUND THE EPS–16 PLUS

You will need:

a. EPS–16 PLUS Operating System (O.S.) Disk
b. EPS–16 PLUS Test Disk (including test sounds)
c. Communications Test Board
d. EPS–16 PLUS *Musician's Manual*

2. KEYBOARD AND RACK SIMILARITIES

The Main Board and Power Supply board are the same for both the EPS–16 PLUS Keyboard and Rack. However, there are physical differences that will require you to specify which unit you are ordering parts for. The disk drive is the same for both units. The Keypad/Display boards are different.

Instead of a Poly-Key Keyboard assembly (with KPC board), the Rack has a KPC simulator board. The KPC simulator board passes information between the Keypad/Display board and the Main Board (like the KPC board does for the Keyboard unit). In the rest of this manual, whenever you see "Keyboard assembly," substitute KPC simulator for the Rack (except where otherwise noted).

The operating system is only on the EPS–16 PLUS O.S. disk. This disk is the same for both the EPS–16 PLUS Keyboard and Rack.

The EPS–16 PLUS Rack has the OEX-6 Output Expander and ME-16 PLUS memory expander built-in. These two expanders are options for the Keyboard unit. FLASHBANK (FB-1 and FB-2 Kits) and SCSI (SP-2 Kit) are options for both.

3. THE EPS–16 PLUS KEYBOARD ASSEMBLY and the KPC SIMULATOR BOARD

The Poly-Key™ Pressure Keyboard assembly on the EPS–16 PLUS (and the KPC simulator board on the Rack) is a complex module that contains its own computer and software. So, when necessary, you will be swapping it out as a whole unit. Display information sent to and from the Main Board is processed through the Keyboard assembly/KPC simulator. What might appear to be a frozen display, therefore, could be a bad Keyboard assembly/KPC simulator. For more troubleshooting hints, see Communications Path on pp. 5-6 and flow charts on pp. 9, and 12-15.

IMPORTANT! Keyboard assembly EPROM Version **(EPS–16 PLUS Keyboard only)**
Each version of the Keyboard assembly EPROM is optimized for the hardware that is within the keyboard assembly. For more information about the Poly-Key Keyboard assembly, see ENSONIQ Service Bulletins #9B and 11.

The 20-pin Ribbon Cable (Keyboard assembly/KPC Simulator)
When reconnecting this cable to the Main Board, make sure that the striped side is aligned with pin 1 and that the cable is not mis-pinned. If the cable is mis-pinned or installed backward, fuses F3 and F4 on the power supply board will blow. **NOTE:** If one fuse blows, the other will also blow; you must replace both.

When installing the keyboard assembly back into the EPS–16 PLUS, be sure that the keyboard assembly cable is flat under the keyboard assembly and that the ferrite bead is not trapped on top of the main board.

4. THE DISK DRIVE

Transporting a unit
There is a printed label near the Disk Drive on every new unit shipped. This label contains important information concerning the care of the EPS–16 PLUS Disk Drive and lists recommendations regarding the treatment of the drive during transport. **We do not, under any circumstances, recommend the insertion of an actual disk during transport.** Transport the unit only with nothing in the drive at all.

PLEASE DO NOT SHIP AN EPS–16 PLUS OR A REPLACEMENT DISK DRIVE IN A BOX PACKED WITH PEANUTS. If you must, wrap the entire unit in plastic first. These peanuts may cause severe damage to the Disk Drive or Keyboard assembly.

What disks to use
It is very important to use double-sided, double-density 3.5" micro-floppy disks. The EPS–16 PLUS writes information to every track on a disk, so it is imperative that the disk be of superior quality and certified for double-sided use.

Testing the Disk Drive
The best way to test the Disk Drive is by formatting a disk. When a disk is formatted, the EPS–16 PLUS reads and writes every track on that disk. If the formatting attempt fails, it is likely that the disk itself is faulty. Always try formatting another blank disk before determining that the Disk Drive is faulty. Unlike some computer systems, the EPS–16 PLUS does not automatically discard bad sectors when formatting. The entire disk must be good for successful formatting.

See Hardware Notes – Rack Only for notes about the Panasonic Disk Drive.

5. OPERATING SYSTEM (O.S.)

An EPS–16 PLUS O.S. takes up approximately 170 blocks on a disk so without the O.S. on a disk you have more room for sounds. The O.S. version on the disk can be easily updated (call ENSONIQ Customer Service for the latest O.S. version). You cannot copy the O.S. to a disk onto which you have already saved instruments or sequences, but not the O.S. Attempts to do so will result in an error message.

To update O.S. Version on a floppy disk:

- Insert the disk containing the O.S. you want to copy (the source disk) into the floppy drive.
- Press ***Command***, then ***System•MIDI***, then ***1*** (Env1). The display shows COPY OS TO DISK.
- Press ***Enter•Yes***. The display says MUST ERASE MEMORY, OK? If you need to save any sounds or sequences, press ***Cancel•No*** and save the data before proceeding.
- Press ***Enter•Yes***. The display says READING OS INTO MEMORY, and then INSERT FORMATTED DISK.
- Insert the disk onto which you want to copy the O.S. (the destination disk) into the floppy drive.
- Press ***Enter•Yes***. The display shows WRITING OS TO DISK while the O.S. is being copied to the disk.

When it's done, the display reads COPY OS DONE. ANOTHER? If you want to copy the same O.S. to another floppy disk, insert another formatted disk and press ***Enter•Yes***. You can repeat this procedure as many times as you like.

- When you are done, press ***Cancel•No***.

6. PLASTIC CASE (EPS–16 PLUS Keyboard only)

Avoid Stripping Screws

Because the structural components (Base, Control panel, and Wheel cover) are made of plastic, *great care* should be exercised when assembling or disassembling any part of the EPS–16 PLUS. **Avoid over-tightening screws in the plastic case when executing any repair procedure!**

When replacing any of the self-tapping screws, it is possible to over-tighten the screws and strip a hole in the case, making it necessary to replace the case or control panel. To keep this from happening, follow these procedures:

a. Before replacing a self-tapping screw (or screws) into a stripped hole, put a drop or two of LOCKTITE, Super Glue Gel, or RTV into the hole.
b. Install the screw, and tighten it only until the sub-assembly being attached is snug against the case. **Do not tighten the screw any further.** When the glue sets, the screws will hold the sub-assembly tightly in place.

It is important to make sure that there are no loose screws inside the unit, as they may come loose and short out something.

Brass Inserts

To prevent stripping, there are brass inserts in the Main Board ground boss (mounting standoff) and in the four control panel holes. Be sure to use machine screws in these locations. **Do not use a self-tapping screw in a brass insert as this will ruin the insert.**

7. EPS–16 PLUS RACK SCREWS

Because the Control Panel is an aluminum extrusion, great care should be taken when assembling or disassembling any part of it. To avoid stripping and to aid in alignment, you should use no more than 8 inch/lbs of torque and try to install the screws into the existing holes in the panel.

8. HIGH-RETENTION FORCE CONNECTORS (Repair Technicians Label)

In all EPS–16 PLUS Racks and in later Keyboards, there is warning/information label just for you. We just wanted to let you know that we have switched to a higher retention force connector on our transformers. This means it will be very difficult to remove this connector by just pulling. We recommend the use of a scribe, screwdriver or similar object to remove this connector. Due to the benefits of a high-retention force connector, we will be adding them in other places on the EPS–16 PLUS harness. Watch out for them, and please don't pull on the wires!

We have found that some units have developed further problems once a module has been changed. This may be a result of improper handling of cables. We suggest removing all cable connectors using the angled end of a scribe (see below).

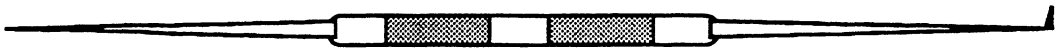


Figure 1 – Scribe

These can be found in the following catalogs:

- Techno-Tool catalog 38, page 204, part number 400PR144
- Newark catalog 110, page 1024, part number 76-1510

COMMUNICATIONS PATH

It is important that you completely understand the communications path of the EPS–16 PLUS. Please read this carefully.

The EPS–16 PLUS Main Board, Keypad/Display Board and Keyboard assembly are complete computer systems in themselves, each with its own microprocessor and operating software. The modules communicate with each other using serial communication ports. Whenever a key is played on the Keyboard, for example, the Keyboard assembly microprocessor transmits this information to the microprocessor on the Main Board.

The Keypad/Display Board communicates with the Main Board through the Keyboard assembly. Whenever the Main Board wants to put a message on the Display, it sends the message to the Keyboard assembly which then passes it on to the Display. Whenever a button is pressed on the control panel, the Keypad/Display Board sends the message to the Keyboard assembly which, in turn, passes it on to the Main Board.

The communications path is shown in Figure 2. The Main Board communicates with the Keyboard assembly over a two-line asynchronous interface carried by the 20-pin Keyboard assembly ribbon cable. The Keyboard assembly communicates with the Keypad/Display Board over a three-line synchronous interface which is carried over to the Main Board via the 20-pin ribbon cable, then up to the Keypad/Display Board via the 7-pin Display cable on the EPS–16 PLUS and the 10-pin Display cable on the EPS–16 PLUS Rack.

Due to the complexity of the modules involved, it is often difficult to determine which module is at fault when a communications problem occurs. To facilitate troubleshooting, a Communication Test Board, Test Disk and Burn-in Test Disk are available.

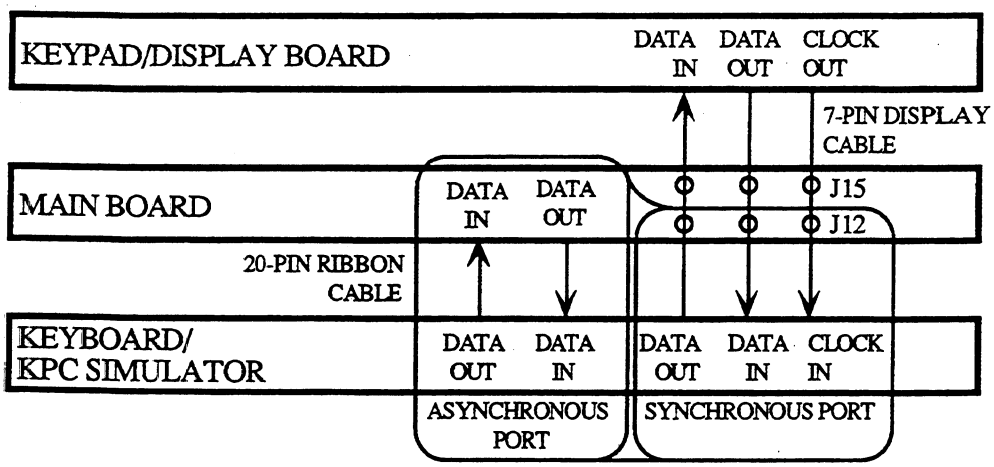


Figure 2 –Communications Path

If a communication problem occurs (i.e., no display or no response to button presses or keys), it could be something as simple as a bad ribbon cable or Display cable, or it could be a problem in one of the modules. To help you identify a faulty module, a special Communication Test Board is included available from ENSONIQ Customer Service. The Communication Test Board simulates the operation of the Keyboard assembly and can be used as a "known good" module in place of the Keyboard assembly for troubleshooting.

IMPORTANT!
When using the Communication Test Board, keep in mind that it is sensitive to static discharge. Handle the board by the edges and store it in the anti-static shipping bag when not in use. Do not let the board short out when testing, place an insulator (cardboard, paper, etc.) underneath it.

Attaching the Communications Test Board
If an EPS–16 PLUS has a communications problem, turn the unit off and unplug the 20-pin Keyboard assembly ribbon cable from the Main Board at connector J12. Plug the 20-pin ribbon cable from the Communication Test Board into J12. This will eliminate the Keyboard assembly as a variable. Turn the system on. If the communications problem persists, you know the Keyboard assembly is not at fault. If communication is restarted, however, the Keyboard assembly is at fault. See the flow charts on pp. 12-15 for troubleshooting procedures.

There is one further complication. Since the communications path between the Keyboard assembly and Keypad/Display Board is routed through the Main Board, there is a remote possibility that the printed circuit connections between the two connectors are defective. If you have an EPS–16 PLUS that has a problem communicating with its Keypad/Display Board, you may want to verify continuity between the connectors on the Main Board. Turn off the power and unplug the 20-pin ribbon cable from the EPS–16 PLUS Main Board at J12 and the EPS–16 PLUS 7-pin Display cable from the Main Board at J15. Using an Ohmmeter, verify continuity between the following points on the Main Board:

20-pin Keyboard Connector	7-pin Display Connector
Pin 1	to Pin 1
Pin 3	to Pin 2
Pin 5	to Pin 3

CHECKING THE POWER SUPPLY

Many EPS–16 PLUS problems may be related to a faulty Power Supply, Transformer or Line Filter. You should check these before troubleshooting the rest of the unit.

Check to make sure that all the cable connections are secure and correct. Plug the EPS–16 PLUS in and turn it on. After the EPS–16 PLUS has warmed up for five minutes, begin to test the voltages at the points shown in Figures 3 and 4. If the voltages vary outside the allowable limits, follow the procedure described under TESTING THE POWER SUPPLY UNLOADED before replacing it.

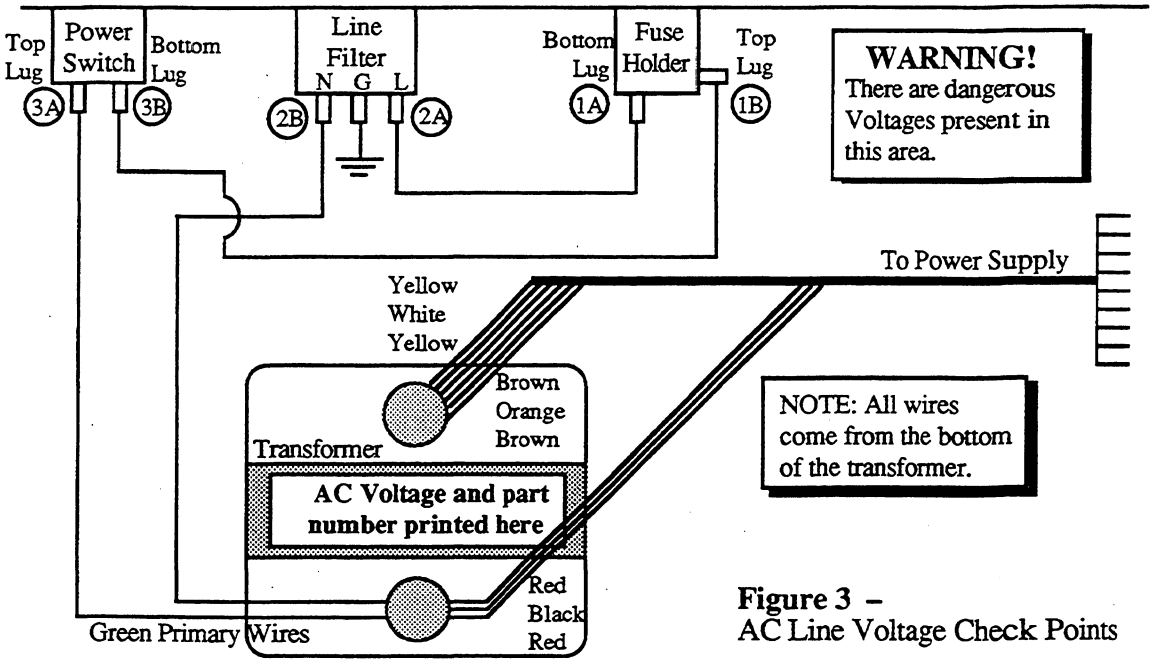


Figure 3 –
AC Line Voltage Check Points

AC LINE VOLTAGE MEASUREMENTS (see Figure 3)	
With the power switch **OFF**, the proper AC Line Voltage should read from: 2B-1A, 2B-2A, 2B-3B	With the power switch **ON**, the proper AC Line Voltage should read from: 2B-1A, 2B-1B, 2B-3B, 2B-3A There should be no voltage across the power switch.

POWER SUPPLY MEASUREMENTS

The voltage and part number of the Transformer is denoted by the label on the top of the Transformer. The Power Supply part number is silk-screened on the left side of the Power Supply PC board.

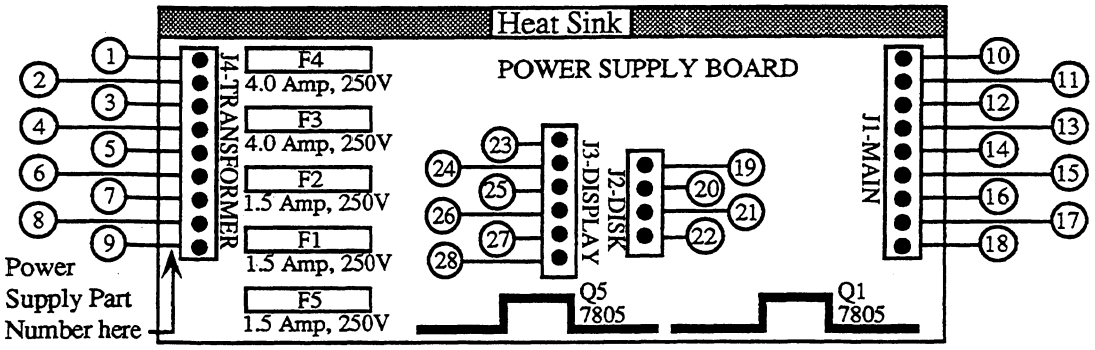


Figure 4 – Power Supply Voltage Check Points

The Transformer part numbers for the EPS–16 PLUS are:

100V	1450000622	230V	1450000252
120V	1450000242	240V	1450000832

TRANSFORMER AND POWER SUPPLY VOLTAGE CHECK POINTS

The proper AC Line Voltage for each EPS–16 PLUS should be printed on the top of the Transformer. Figure 3 shows the check points for reading the AC Line Voltage. Figure 4 shows the connector terminal numbers for the Power Supply and Transformer. It is normal for Line Voltage to vary +/- 10%.

The following chart lists the voltage ranges for proper operation of each supply (fully loaded) and the appropriate terminals to read across with the volt meter (refer to Figure 4 for terminal locations):

Designation	Terminals +	Terminals -	Connector	Allowable range			Units
Digital Supply	1	3	J4	13.00	to	18.70	VACrms
Analog Supply	4	6	J4	22.00	to	28.60	VACrms
Display Filament	7	9	J4	4.70	to	6.05	VACrms
+VA	10	11	J1	+20.00	to	+28.00	VDC
-VA	12	11	J1	-20.00	to	-28.00	VDC
+5 Analog	14	13	J1	+4.75	to	+5.25	VDC
+V Digital	15	13	J1	+7.20	to	+12.10	VDC
+5 Memory	16	13	J1	+4.75	to	+5.25	VDC
+5 Digital	18	17	J1	+4.75	to	+5.25	VDC
+5X	24	23	J3	+4.75	to	+5.25	VDC
-35	25	23	J3	-29.00	to	-37.20	VDC
Filament	27	28	J3	4.70	to	6.05	VACrms
Display Offset	27	26	J3	-22.70	to	-31.50	VDC
+5X	19	20	J2	+4.75	to	+5.25	VDC

TESTING THE POWER SUPPLY UNLOADED

If the Power Supply readings exceed the indicated tolerance (particularly the +5 Digital line between terminals 18 and 17 or +5 Memory line between terminals 16 and 13) it is possible that a defective component on the Main Board is drawing the Power Supply down. In this case, you should test the Power Supply unloaded before proceeding.

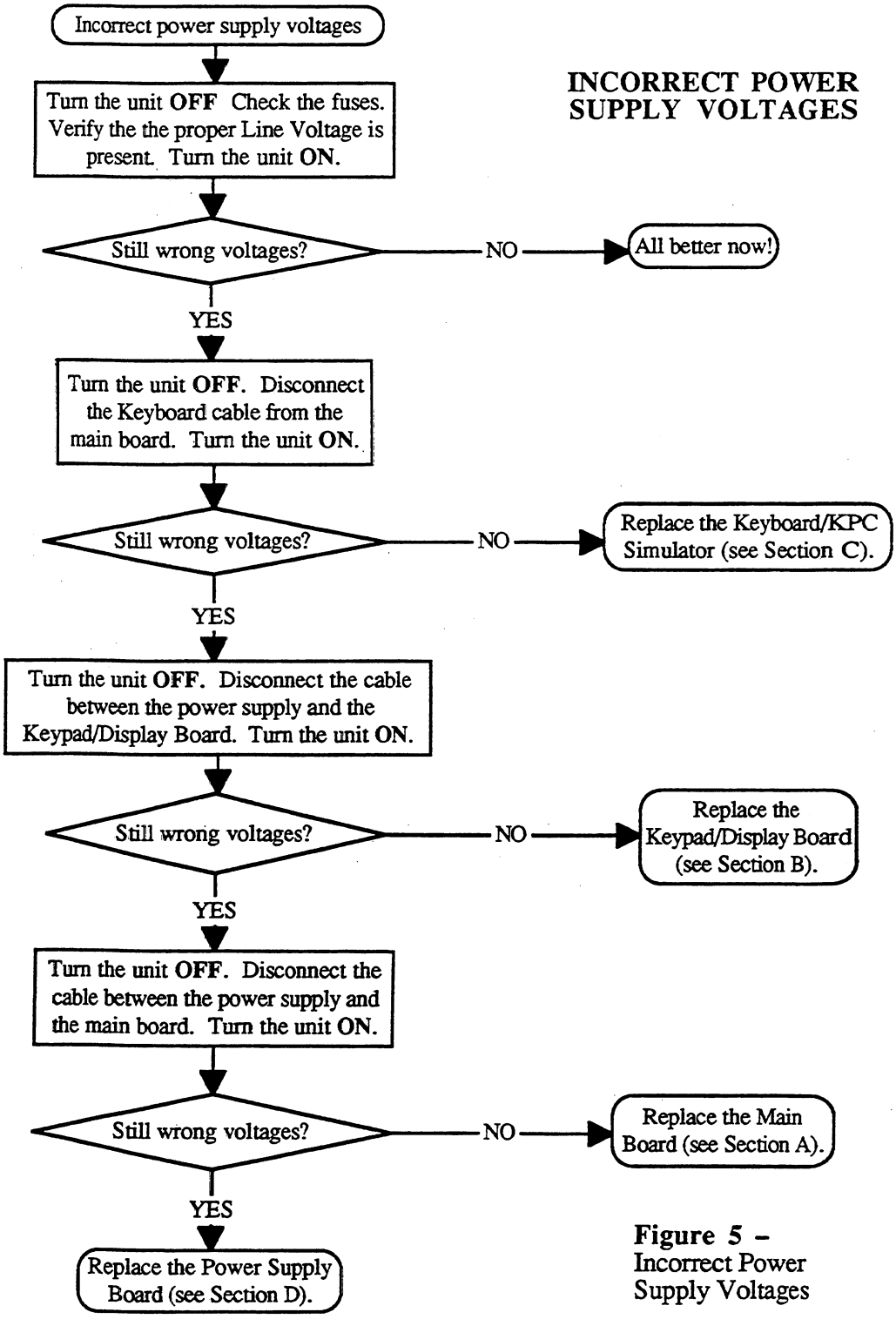


Figure 5 – Incorrect Power Supply Voltages

DISPLAY SELF-TEST MODE

When the Keypad/Display is receiving power from the Power Supply but is not in proper communication with the Main Board, the Keypad/Display Board enters **Self-test mode.** In Self-test mode, the Display remains blank until you press the buttons on the control panel. Pressing various control panel buttons will cause the Display to print characters, home the cursor, etc.

Using Self-test Mode to Diagnose the Keypad/Display Assembly

1. **If the unit comes in with a blank display, but is in Self-test mode** (i.e., the Display prints out characters when control panel buttons are pressed according to the chart below) this indicates the problem is either the Main Board or the communication link between the Main Board, Keyboard assembly and the Keypad/Display Board. Before replacing anything, check all connections, particularly the 20-pin cable to the Keyboard assembly.

   If pressing buttons causes only the leftmost character of the display to change, this usually indicates a defective cable connection (20-pin ribbon cable) between the Main Board and Keyboard assembly or possibly a bad Keyboard assembly.

2. **If the unit is in Self-test mode but the display does not respond according to the chart below,** the problem is most likely in the Keypad/Display Board. If certain buttons do not function properly during normal EPS–16 PLUS operation, test them while the display is in Self-test mode.

If you can't isolate a problem that seems related to the display, the display can be forced into Self-test mode using the following procedure. With the power off, face the front of the unit, then:

Jumper the left (-) side of C19 (located below the MIDI Out jack) to pin 13 of U20 (WD1772). On power up, the display will stay in Self-test as long as the jumper is connected, allowing you to check the Keypad/Display Board independently.

The Chart below details how the control panel buttons are mapped in Self-test mode:

Press:	Display Reads:	Press:	Display Reads:
LOAD	8	Down Arrow	4.
COMMAND	$	Left Arrow	.
EDIT	1.	Right Arrow	/
INSTRUMENT	-	CANCEL•NO	?
SEQ•SONG	3	ENTER•YES	(Home Cursor)
SYSTEM•MIDI	9	Instrument•Track 1	Space
EFFECTS	'	Instrument•Track 2	&
1/ENV 1	+	Instrument•Track 3	,
2/ENV 2	0	Instrument•Track 4	2
3/ENV 3	1	Instrument•Track 5	"
4/PITCH	6	Instrument•Track 6	(Home Cursor)
5/FILTER	7	Instrument•Track 7	5.
6/AMP	<	Instrument•Track 8	4
7/LFO	=	EFFECT SELECT•BYPASS	2.
8/WAVE	(Home Cursor)	SAMPLE	>
9/LAYER	(Home Cursor)	RECORD	0.
0/TRACK	*	STOP/CONTINUE	5
Up Arrow	3.	PLAY	6.

TROUBLESHOOTING GUIDE

Often the faulty module in an EPS–16 PLUS can be determined through normal use. Sometimes, it is difficult to isolate the problem. The following flowcharts can help you diagnose units that appear dead (no display).

When troubleshooting an EPS–16 PLUS, always disconnect any expansion devices that may be present (such as the memory expander, SCSI Interface or OEX–6 Output Expander). This will prevent a faulty expander from complicating your troubleshooting. The procedures for testing the Memory Expander and the SCSI Interface are included with the corresponding expander. The procedure for testing the OEX–6 can be found on p. 19.

The following pages include troubleshooting flow charts:

Page	Problem
9	Incorrect Power Supply Voltages
12	Footswitch problems
13	EPS–16 PLUS with No LEDs Lit
14	EPS–16 PLUS with Some LEDs Lit
15	EPS–16 PLUS with All LEDs Lit, No Display

Troubleshooting an EPS–16 PLUS with a Footswitch Problem (see Figure 6)

If one or both of the footswitches do not operate properly, make sure that the footswitches are set to the proper mode (on the Edit/System•MIDI page). See Section 2 of the EPS–16 PLUS *Musician's Manual*) for more information.

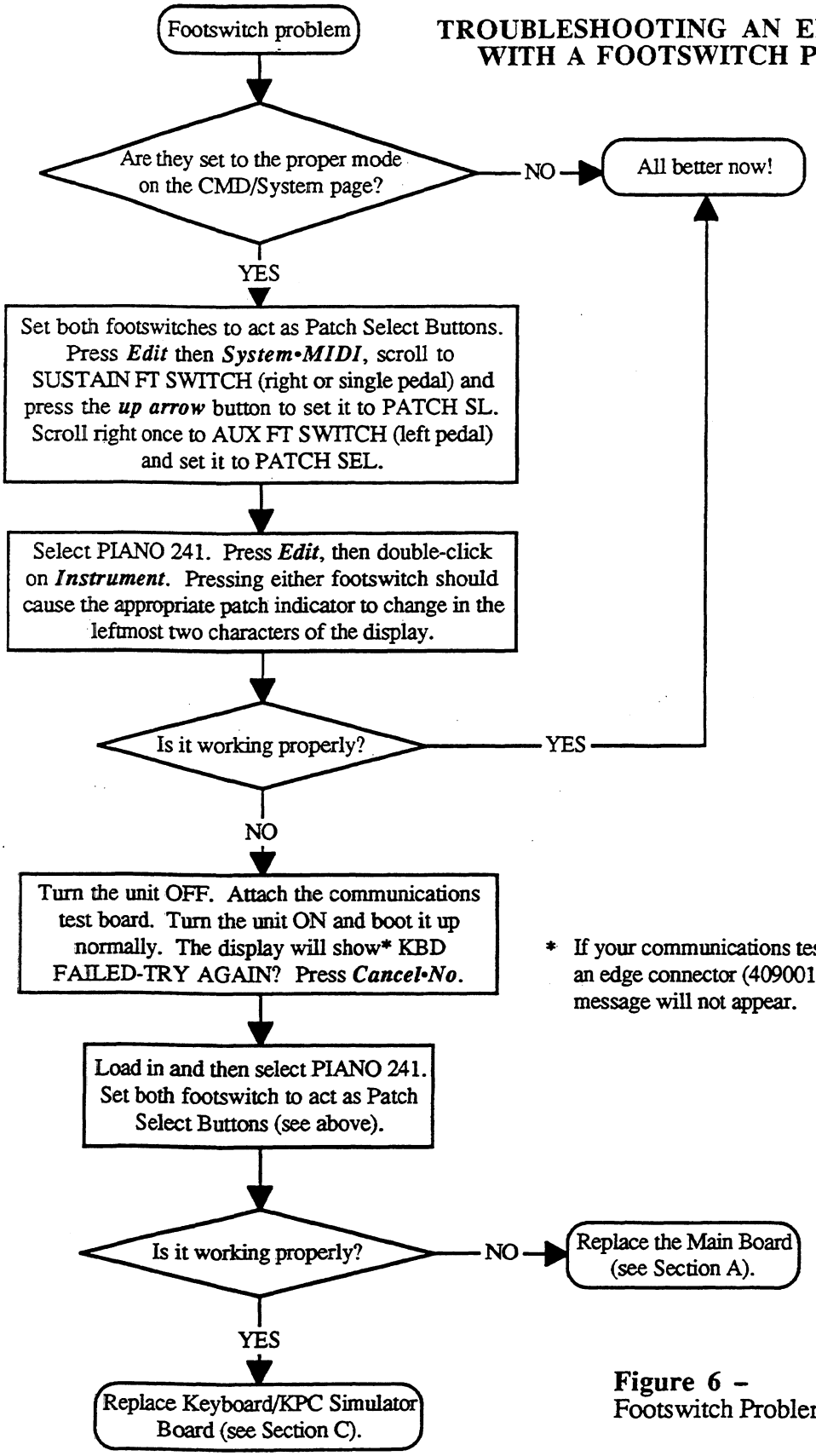
The SUSTAIN FT SWITCH parameter corresponds to the right pedal of SW-5 or single pedal SW–1. The AUX FT SWITCH parameter corresponds to the left pedal of SW-5 only. The SW–5 is the Dual Footswitch (piano-type) available from ENSONIQ.

On the Edit/System•MIDI page:

	SUSTAIN FT SWITCH	AUX FT SWITCH
Footswitch	SW-1 single footswitch, or SW-5 right pedal	SW-5 left pedal
Default	SUSTAIN	OFF
Option	right PATCH SL button	sequencer START/STOP
Option	—	left PATCH SEL button

If the footswitch mode is correct and the footswitch still doesn't function properly, there is either a problem with the Main Board, the Keyboard/KPC or the 20-pin ribbon cable connecting the two. Although the footswitch jack is mounted on the Main Board, the footswitch signals are carried over to the Keyboard/KPC by the 20-pin ribbon cable, where they are sensed by the Keyboard/KPC microprocessor.

TROUBLESHOOTING AN EPS–16 PLUS WITH A FOOTSWITCH PROBLEM



* If your communications test board has an edge connector (4090013601) this message will not appear.

Figure 6 –
Footswitch Problem

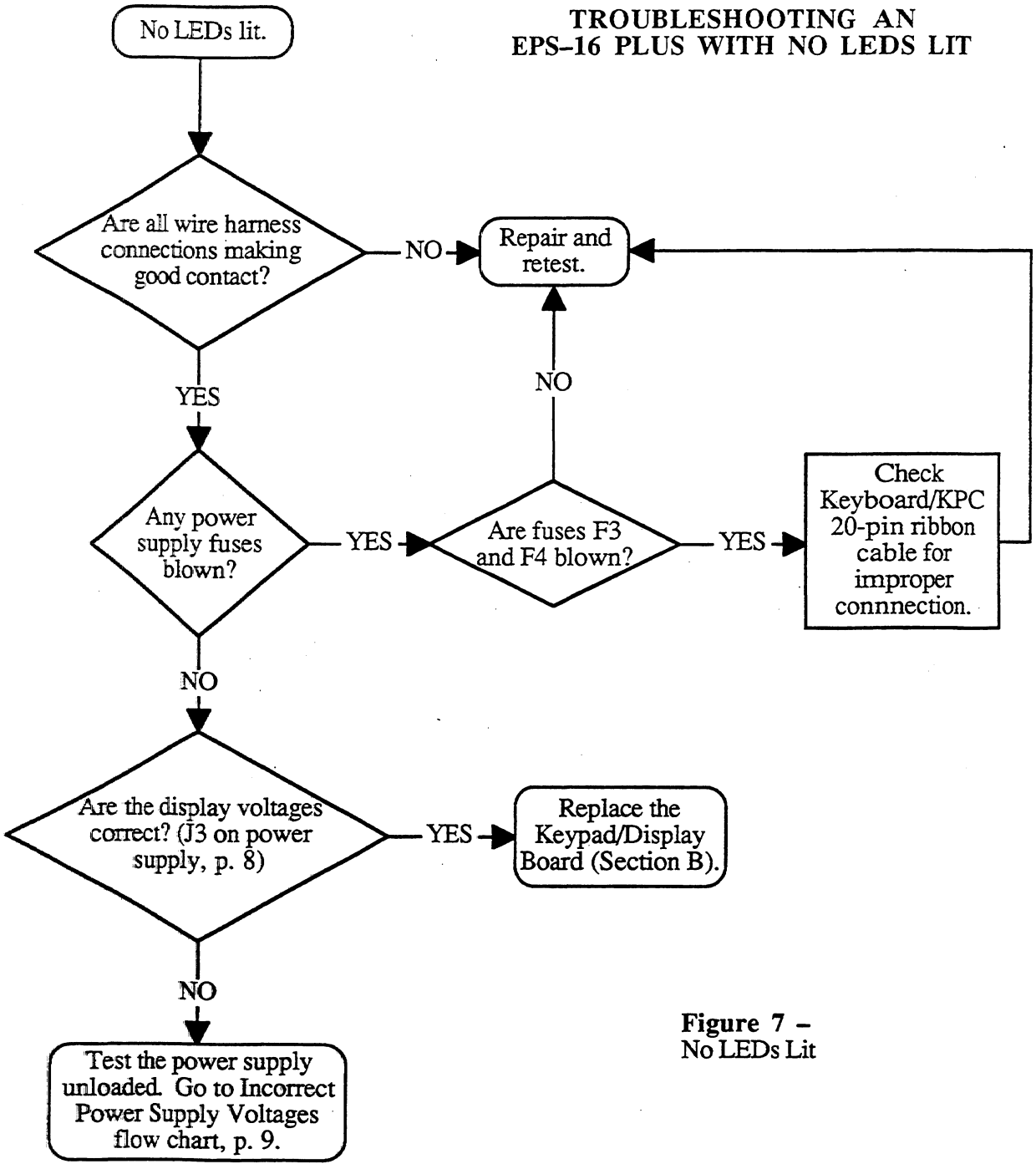


Figure 7 –
No LEDs Lit

TROUBLESHOOTING AN EPS-16 PLUS WITH SOME LEDS LIT

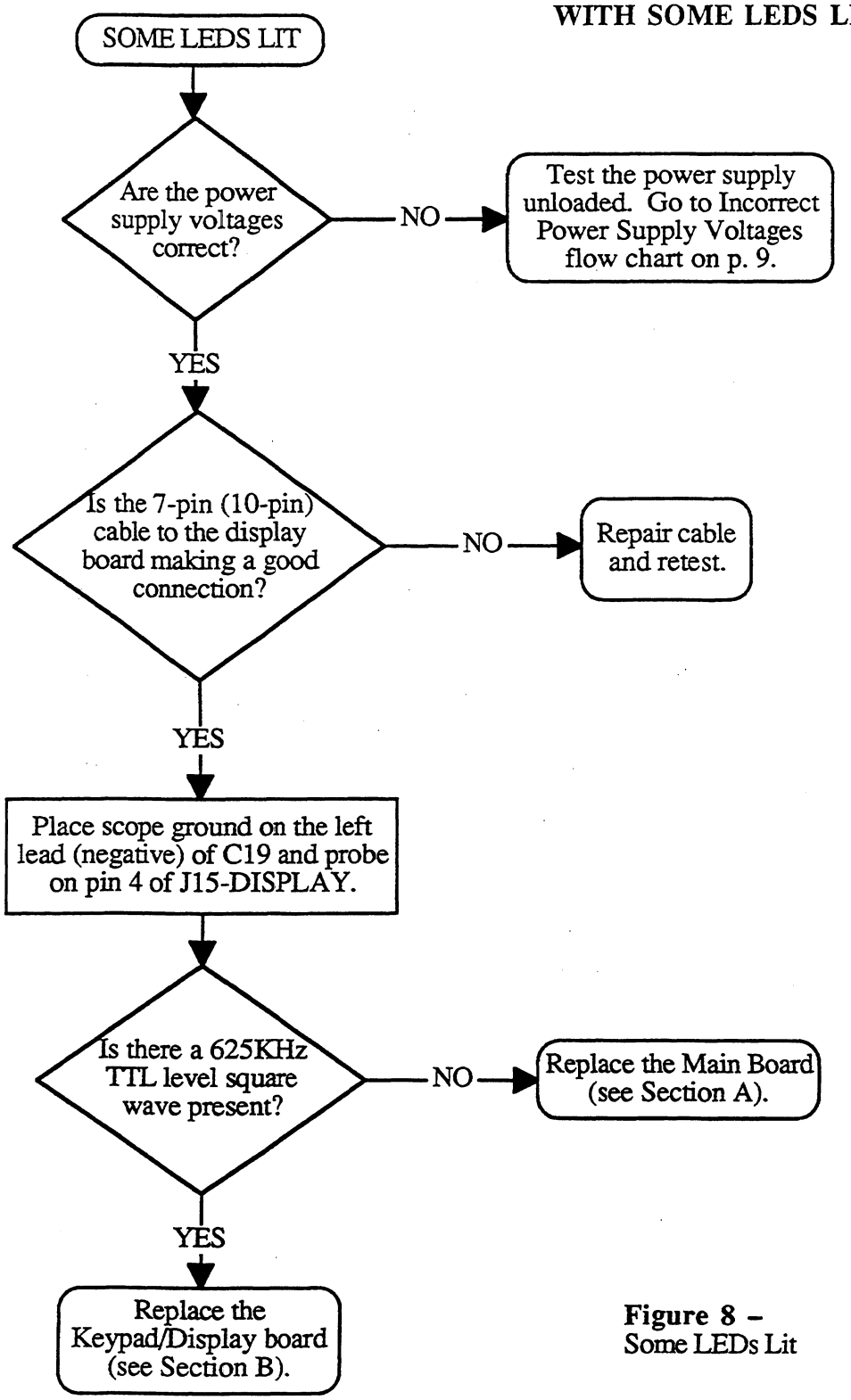


Figure 8 –
Some LEDs Lit

TROUBLESHOOTING AN EPS–16 PLUS WITH ALL LEDS LIT, NO DISPLAY

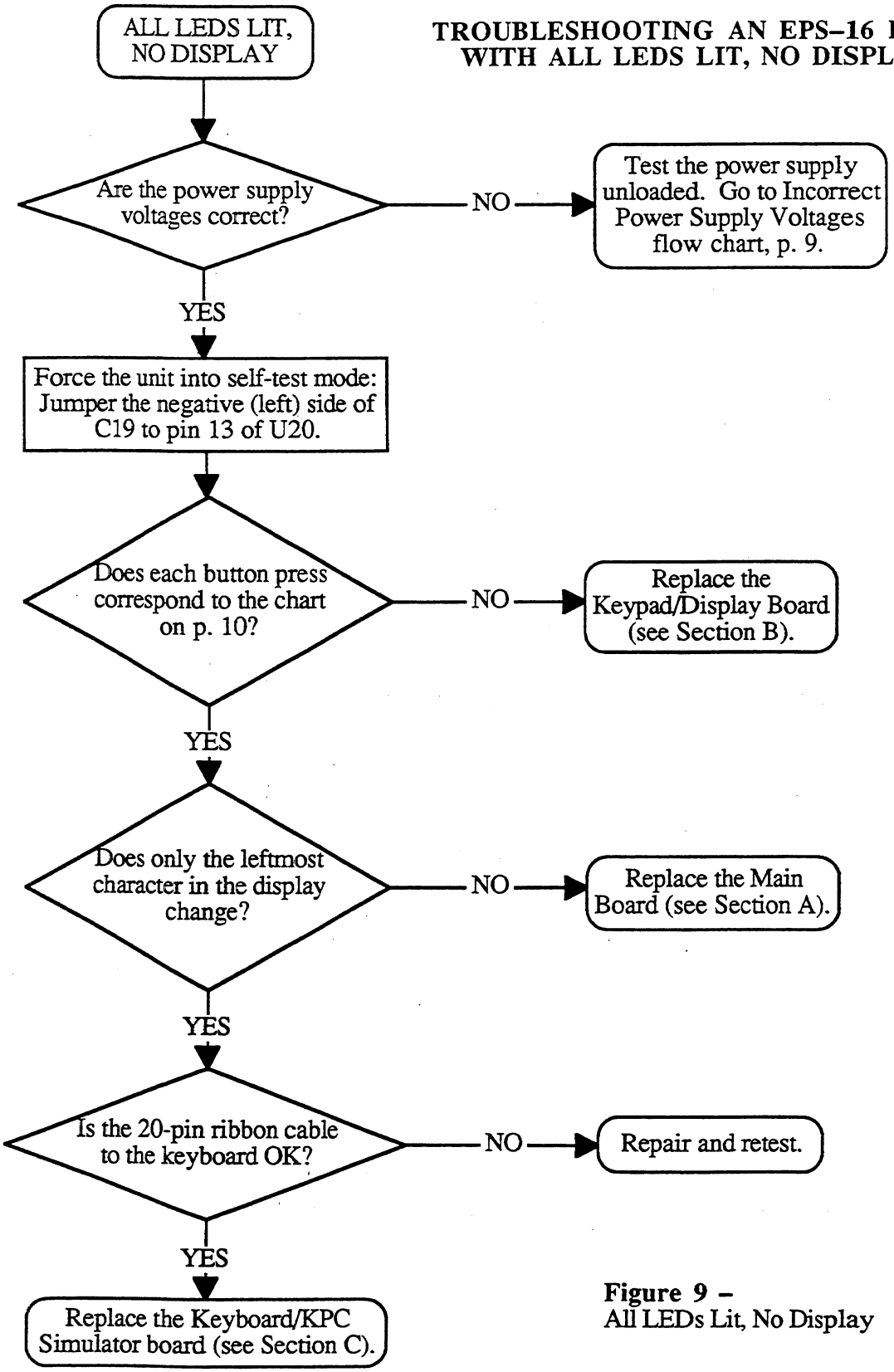


Figure 9 –
All LEDs Lit, No Display

MOST COMMONLY ASKED USER QUESTIONS

The following questions are the most commonly asked by end users. Our Customer Service Representatives (CSRs) resolve these situations over the telephone daily.

Question: How do I Mix a Track or a Song?

CSR:

Sequences (Tracks)

1) Set RECORD MODE to ADD *(see Section 8 of the Musician's Manual)*
2) Select the Instrument•Track
3) Press ***Edit*** then ***Track***, scroll left to MIX
4) Set mix to the desired value
5) Hold ***Record*** and press ***Play***
6) Let the Sequencer play one bar
7) Press ***Stop***
8) Answer YES to KEEP=OLD - NEW

In Song Mode

1) Chain sequences into a Song
2) Set RECORD MODE to ADD
3) Select the Instrument•Track
4) Press ***Edit*** then ***Track***, scroll left to MIX
5) Hold ***Record*** and press ***Play***
6) Mix Track through entire Song using the Data Entry Slider or the CV Pedal with PED=VOL
7) Answer YES to KEEP=OLD - NEW

Question: The EPS–16 PLUS will not record a sequence from external sequencer in MULTI mode.

CSR: You must have O.S. version 1.1 or higher.

Question: Why won't the EPS–16 PLUS let me edit converted Mirage sounds?

CSR: WS=1 contains the actual wavesample information for the Lower sound, WS=17 for the Upper. All other wavesamples (30 of them) are copies of WS=1 or WS=17. Therefore, isolate the desired wavesample(s) as follows:

1) Create a new Instrument *(see Section 3 of the Musician's Manual)*
2) Create a new Layer in that Instrument *(see Section 7 of the Musician's Manual)*
3) Copy desired wavesample into the new Layer *(see Section 6 of the Musician's Manual)*
4) Truncate the new wavesample *(see Section 6 of the Musician's Manual)*
5) Edit as you wish

Question: Why do some other manufacturer's instruments crash when played from an EPS–16 PLUS keyboard?

CSR: These instruments cannot handle the vast amount of MIDI data that Poly-Key generates. Turn the key pressure settings to CHAN or OFF on MIDI and each INSTRUMENT, as follows:

1) Press ***Edit***, then ***System•MIDI*** *(see Section 2 of the Musician's Manual)*
2) Scroll to BASECHANNEL PRESSURE=KEY
3) Change it to CHANNEL or OFF
4) Press ***Edit***, then ***Instrument*** *(see Section 3 of the Musician's Manual)*
5) Scroll to PRESSURE MODE=KEY
6) Change it to CHANNEL or OFF

EPS–16 PLUS TEST PROCEDURE

The following procedure will ensure the thorough testing of the EPS–16 PLUS and also will aid in troubleshooting the unit. To do the following tests you will need a MIDI cable, a Dual Footswitch (model SW-5), and a Control Voltage Pedal (model CVP-1). The EPS–16 PLUS should be connected to a sound system in stereo.

If it is not known whether the Keypad/Display board is good, it can cause confusion in tracking down the problem. If you do not have known-good correlation modules and suspect a Keypad/Display problem, you should test this module first (see Self-test Mode p. 10).

1. **Power Up** (see Section 1 of the *EPS–16 PLUS Musician's Manual* for more information)
   a. Turn unit on. All the LEDs above the Instrument•Track buttons should light and the display should read ENSONIQ EPS–16 PLUS, then PLEASE INSERT DISK.
   b. Insert O.S. disk. The display should read LOADING SYSTEM. The EPS–16 PLUS (Keyboard unit only) will then display TUNING KBD - HANDS OFF. When the keyboard is tuned, all LEDs should go out.

2. **Load in Sounds** (see Section 1 of the EPS–16 PLUS *Musician's Manual* for more information)
   a. Eject the O.S. disk. Insert the Test disk.
   b. Load bank IN-OUT BURN from the test disk (press ***Load***, ***Instrument***, ***Enter•Yes***). The display will say LOADING <filename> and the top yellow LED (red/orange on the Rack) will blink while loading.
   c. The file is done loading when the display shows FILE LOADED and the top yellow LED (red/orange on the Rack) stays on. The following sounds will be loaded into the Instruments•Track1 through 6:

Instrument 1	PIANO 241
Instrument 2	PRESSURE
Instrument 3	6-OUT TEST
Instrument 4	20 VOX TEST
Instrument 5	SAMPLE INST
Instrument 6	3 BUS TEST

3. **Keyboard Test (EPS–16 PLUS Keyboard Only)**
   a. Select PRESSURE (Instrument•Track2).
   b. Play a chromatic scale across the entire keyboard. Press each key down only until normal key travel ends. Do not press into pressure zone. Verify that no pressure effect occurs.
   c. Press the key into the pressure zone and verify that pressure causes a pitch bend.
   d. Using PRESSURE play all six "C" keys and verify that the pitch rises 1 octave smoothly when the key is pressed down hard.
   * **Failure indicates a Keyboard problem.**

4. **Disk Check**
   a. Select PRESSURE (Instrument•Track2). Save PRESSURE back to the disk. Press ***Command***, and double-click on the ***Instrument*** button. The display shows SAVE INSTRUMENT, press ***Enter•Yes***.
   b. The display will show NAME= PRESSURE. Press ***down arrow*** to change the name to ORESSURE.
   c. Press ***Enter•Yes***. The display will say DELETE OLD VERSION? (except the first time you save this sound). Press ***Enter•Yes*** to save ORESSURE (DISK COMMAND COMPLETE will appear briefly when finished).
   d. Eject the test disk and then press ***Load***. Verify that the display shows DISK DRIVE NOT READY.

e. Reinsert the test disk and then press ***Load***. Verify that the display shows FILE 1 IN-OUT BURN.
f. Eject the test disk and then reinsert the test disk and press ***Load***. A file name should appear in the display. If the message DISK DRIVE NOT READY appears then **FAIL** the unit.
g. **REPEAT** step f 5 times.
* **If there is a failure, check the components in the following in order: 1) disk, 2) disk drive cables, 3) Disk Drive, and 4) Main Board.**

5. Sound Check
a. Select PIANO 241 (Instrument•Track1). Play a bit to check sound quality. Play up the keyboard to verify that PIANO 241 pans from left to right.
b. Select 20 VOX TEST (Instrument•Track4). Press and hold down the three lowest white keys. Twenty notes will play in succession with the last note dropping an octave. Verify that there are no missing notes, distortion on a note, etc.
c. Select 3 BUS TEST (Instrument•Track 6). Press one key and you should hear 3 notes play in succession.
* **Failure indicates a main board problem.**

6. Mono Output and Headphone Test
a. Select PIANO 241 (Instrument•Track1).
b. Unplug the LEFT/MONO output cable and verify that both the high and low end of the keyboard are heard in the RIGHT output (there will be no output from the left).
c. Plug in the Left cable and unplug the RIGHT/MONO output cable and verify that both the high and low end of the keyboard are heard in the LEFT output (there will be no output from the right).
d. Plug headphones directly into headphone jack.
e. Play a few notes to check for stereo and sound quality.
f. Reconnect the audio cables.
* **Failure indicates a Main Board problem.**

7. MIDI Test (EPS–16 PLUS Keyboard Only)
a. Select PRESSURE (Instrument•Track2).
b. Connect *MIDI In* to *MIDI Out* with a MIDI cable.
c. Hold down a few keys.
d. Disconnect one end of the MIDI cable.
e. When you release the keys, the notes should sustain.
f. Play twenty or more keys simultaneously to reinitialize the voices.
* **Failure indicates a Main Board problem.**

8. Footswitch Tests
a. Plug the Dual Footswitch into the *Ft. Sw.* jack on the back of the EPS–16 PLUS.
b. Press ***Edit***, the ***System•MIDI*** and scroll to AUX FT SWITCH = OFF.
c. Press the ***up arrow*** button to change it to AUX FT SWITCH = START/STOP.
d. Create a short sequence by holding down ***Record*** and pressing ***Play***. Use the sustain (right) pedal to verify that sustain works, then stop the sequencer using the sequencer (left) pedal. Press ***Cancel•No***.
* **If the footswitches do not operate correctly, see the flowchart on p. 12.**

9. Analog Test Page

a. Plug Volume Pedal (model CVP-1) into the Pedal•CV jack.
b. Go to the Analog Test Page (press ***Command, Env 1***, scroll right until EXAMINE ANALOG INPUTS is displayed, then press ***Enter•Yes***).
c. Examine the analog inputs using the following procedure:
Press the ***Up Arrow*** button to select the appropriate input, then press ***Enter•Yes*** to take a reading. Verify that the values are as follows:

Controller	Down	Up	Center	
1) PITCH WHEEL	0	127	64	**(Rack-always=0)**
2) MOD WHEEL	0	127		**(Rack-always=0)**
3) VOLUME (slider)	0	127		
4) PEDAL (CV)	0	127	unplugged = 127	

When testing the Data entry slider (Mr. Knob), you must scroll right so that the value is underlined. Press ***Enter•Yes*** to take readings.
5) MR. KNOB (data slider) 0 255

Scroll left then up to test the Patch Select Buttons.
6) PATCH (select buttons) both up=0 right=32 left=64 both=127

* **Failure indicates a problem with the corresponding part, although it also could indicate a Power Supply failure or a Main Board problem. If all readings are off, then it is most likely a problem with the Main Board.**

10. Sampling Test

a. Plug the microphone into the *Audio In.*
b. Press ***Sample,*** the display shows LOAD OS DISK-HIT ENTER.
c. Eject the test disk and insert the O.S. disk and then press ***Enter•Yes.***
d. The display shows PICK SAMPLE INST. Press Instrument•Track5, then ***Enter•Yes*** for the VU meter.
e. Scroll right to INPUT LEVEL and set it to MIC, then scroll back to the VU meter.
f. Press ***Enter•Yes*** and sample by speaking into the microphone. You should hear what you are sampling at the Audio Output.
g. Press ***Cancel•No*** to stop sampling. Play the sample and listen critically.
h. Press the ***Up Arrow*** button once and play the sample in BACKWARD, NO LOOP mode.
j. Unplug the microphone from the *Audio In* jack.

* **Failure indicates a Main Board problem. For more information on Sampling, see Section 5 of the EPS–16 PLUS *Musician's Manual.***

11. OEX–6

When troubleshooting an EPS–16 PLUS with an OEX–6 that is not operating properly, you will need to determine whether the EPS–16 PLUS or the OEX–6 is at fault. If possible, try the OEX–6 with another EPS–16 PLUS, or try the problem EPS–16 PLUS with a different OEX–6. The operation of the OEX–6 can be tested using the following procedure:

a. Load and select the sound called 6-OUT TEST.
b. While playing the same note on the keyboard, listen to each OEX–6 output individually. You should hear a single square-wave tone in each output and the tone in each successive output should be a semitone higher in pitch than the previous output.

Note that the OEX–6 outputs are not designed to drive headphones directly and should be plugged into a suitable line-level pre-amp such as a mixing board.

* **If the EPS–16 PLUS itself is defective, the problem is in the Main Board.**

12. ESP Effects Test 1

a. Eject the O.S. disk and insert the Test disk.
b. Press ***Load*** then ***Instrument***. Scroll to the Bank file FILE 2 FX TEST 1 and press ***Enter•Yes***. Wait for all the instruments to load. The following sounds will be loaded into the Instruments•Track1 through 8:

Instrument 1	PIANO 241
Instrument 2	ROOM REVERB
Instrument 3	HALL REVERB
Instrument 4	HIFI REVERB
Instrument 5	DUAL DELAYS
Instrument 6	HIFI DELAYS
Instrument 7	PHASER+REVRB
Instrument 8	CHORUS+REVRB

c. Select each instrument one at a time and play it. Listen for ESP effects problems, sound clarity, noise etc. Also watch for ESP download errors as an instrument is selected (either a SYSTEM ERROR ### or the outputs playing dry instead of with effects).

* **Failure indicates a Main Board problem.**

13. ESP Effects Test 2

a. Press ***Load*** button then ***Instrument***. Scroll to the Bank file FILE 3 FX TEST 2 and press ***Enter•Yes***. Wait for all the instruments to load. The following sounds will be loaded into the Instrument•Track1 through 8:

Instrument 1	PIANO 241
Instrument 2	FLANGER+REV
Instrument 3	CHOR+REV+DDL
Instrument 4	ROT SPKR+REV
Instrument 5	CMP+DIST+REV
Instrument 6	DIST+CHO+REV
Instrument 7	WAH+DIST+REV
Instrument 8	SPLASH TEST

b. Select each instrument one at a time and play it. Listen for ESP effects problems, sound clarity, noise etc. Also watch for ESP download errors as an instrument is selected. Download errors will show up as either a SYSTEM ERROR ### or as the outputs playing dry instead of with effects.

* **Failure indicates a Main Board problem.**

BURN-IN TEST PROGRAM

To run the Burn-in Test Program, you must have the following items:

- One EPS–16 PLUS Burn-in Test Disk
- One MIDI Cable
- One 1/4" Mono to 1/4" Mono cable
- One 1/4" Stereo to 1/4" Stereo cable

The Burn-in Test Program is used at ENSONIQ to exercise the system hardware of a complete unit. There are two test operations that the program can perform: 1) A continuous (burn-in) test of all components, and 2) a keypad integrity test.

The continuous operations test the Dynamic RAM, Disk Drive Read and Write, MIDI In/Out, Keyboard, Sustain Footswitch, Aux Footswitch, Disk Drive Index Pulse, ESP RAM, ESP GPR Registers, and ESP Instruction Registers. The Disk Drive Read and Write tests are run approximately every ten minutes and take about five minutes to run. Failures of components can be automatically detected in all operations.

BURN-IN TEST

1. Plug MIDI Loop Cable into *MIDI In* and *MIDI Out* jacks. Plug the Mono to Mono cable into the *Audio Out/Left* and *Pedal•CV* jacks. Plug the Stereo to Stereo cable into the *Headphones* and *Ft. Sw.* jacks.
2. Power up the unit and insert the BURN-IN TEST DISK VER. X.X, making certain that the disk is not write-protected (i.e., the window must be closed).
3. Once the disk has been loaded, the display will read: DISK TEST COUNT XXX. If no buttons are pressed the Burn-in Test cycle will begin automatically after twenty seconds.

NOTE: The "Disk Test Counter" is used to automatically monitor test disk usage and to indicate when a test disk becomes unreliable. The "counter" is increased by one every time a DISK WRITE test is done. After about two weeks of continuous Burn-in Testing, the "counter" will reach its limit, and the disk will not boot the system properly. Instead, the display will read: DISK NO LONGER USABLE. Contact ENSONIQ Customer Service for a replacement disk.

4. Press *Enter•Yes*. The display will read: DO BUTTON TEST ?

NOTE: If you wish, press ***Cancel•No*** to by-pass the Button and Display tests and immediately begin the Burn-in Test cycle. The display will read: OK-HIT ENTER TO START. Go to Step 9 to start the Burn-in Test cycle.

5. Press ***Enter•Yes***. All the special segments on the left side of the display will light and the display will read: LEFT SIDE ON-HIT ENTER.
6. Press ***Enter•Yes***. All the special segments on the right side of the display will light and the display will read: RIGHT SIDE ON-HIT ENTER.
7. Press ***Enter•Yes***. All the LEDs will light and the display will read: LEDS ALL ON-HIT ENTER.
8. Press ***Enter•Yes***. The display will read: PRESS EVERY BUTTON. Press all the control panel buttons in any order. All the LEDs will flash as each button is pressed (don't forget to press the eight Instrument•Track buttons). Once all the buttons are pressed, the display will read: OK-HIT ENTER TO START.
9. Press ***Enter•Yes*** to start the Burn-in Test cycle. As the Burn-in Test runs, the display will indicate which of the tests is currently active. If the Dynamic Ram is being tested, for example, the display will read TESTING DYNAMIC RAM.

BURN-IN FAILURE MODES

1. If there is a failure in any of the tests, the special segments in the display and the control panel LEDs will flash alternately. The test cycle will continue.
2. To determine which test has failed, press ***Cancel•No***. When the test that is currently being performed is finished the display will indicate a "PASS/FAIL STATUS" mode. If the Dynamic Ram has passed, for example, the display will read DYNAMIC RAM GOOD.
3. Pressing any of the arrow keys will cause the program to page through and display the pass/fail status of each of the eleven tests. Once the failed test has been located, you can clear the pass/fail status mode by pressing ***Cancel•No***. This should be done ONLY as a diagnostic function. Once all failure status indicators have been cleared, press ***Enter•Yes*** to restart the Burn-in Test cycle at the displayed test.
4. Pressing the ***Edit*** button will display the number of times the test has been performed and the number of times the test has failed. The format is shown below:

Test Iterations	Test Failures	
xxxxx	xxxxx	(xxxxx = 5 digit count value)

Failed Test	Problem in order of likelihood
DYNAMIC RAM	Main Board
DISK WRITE	Test Disk, Disk Drive cable, Disk Drive, Main Board
DISK READ	Test Disk, Disk Drive cable, Disk Drive, Main Board
MIDI IN/OUT	Check cable continuity and cable insertion, Main Board
KEYBOARD	Keyboard cable, Keyboard
SUSTAIN FOOTSWITCH	Check cable continuity and cable insertion, Main Board, Keyboard
AUX FOOTSWITCH	Check cable continuity and cable insertion, Main Board, Keyboard
INDEX PULSE (Disk Drive)	Disk Drive cable, Disk Drive, Main Board
ESP RAM	Main Board
ESP GPR REGISTERS	Main Board
ESP INSTR REGISTERS	Main Board

HARDWARE NOTES

EPS–16 PLUS KEYBOARD AND RACK

FLASHBANK Format Errors

On Rev C and lower Main boards ONLY (4001013501 with Rev letter is located next to the MIDI Thru jack) a trace cut must be made in order for the unit to work properly with a FLASHBANK option (see Figure 10). If this trace is not cut all the way through, you may get a FLASH FORMAT ERROR message when formatting a FLASHBANK.

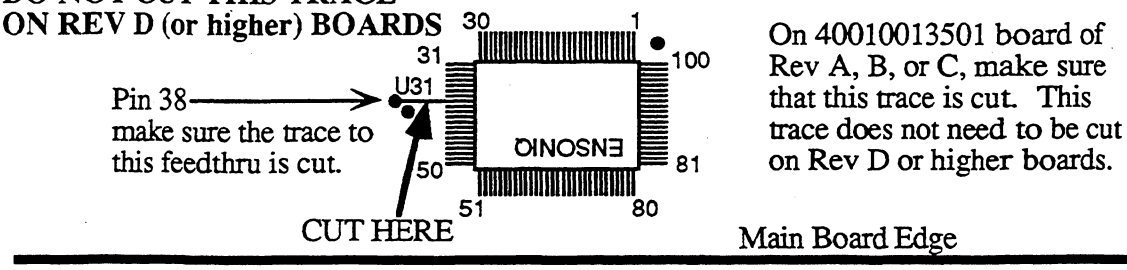


Figure 10 –Trace cut for Rev A, B, or C Main Boards

For best results, be sure that the EPROMs are version 1.00F or higher. For more information, see Keyboard and Rack Similarities on p. 1.

EPS–16 PLUS KEYBOARD ONLY

1. OEX-6 CAUTION!!! IMPORTANT!!!
   The 8-pin mini-DIN connector on the rear panel of the EPS–16 PLUS should only be used to connect the OEX-6 Output Expander to the unit. This connector does not simply supply audio outputs and signal ground and, therefore, cannot be used to generate separate outputs without the OEX-6. The EPS–16 PLUS generates digital signals which must be converted externally. The signals present on this connector include digital control signals and +/- 15VDC. Improper connections to these signals could easily damage the EPS–16 PLUS or any external device connected. The OEX-6 should never be plugged in or unplugged with the EPS–16 PLUS power on, as this could damage the EPS–16 PLUS.

2. Keyboards that think that they are a Rack
   The O.S. disk and EPROMs are the same for both the EPS–16 PLUS keyboard and rack. With O.S. disk Version 1.00, the software determined whether the unit was a keyboard or a rack by the value/position of the pitchwheel. If the pitchwheel was off center, the unit would not go through the keyboard calibration routine and would act just like a rack. To fix this, update the unit to the latest software (EPROMs and disk).

EPS-16 PLUS RACK ONLY

1. Dim Displays or Extra Segments (S/N 10000 to 10244)
   On early EPS–16 PLUS Racks, there is a potential for the Display to short out to the front panel. This can cause extra segments of the display to light or the whole display may appear dim. To fix this problem, remove the keypad/display board from the front panel. Place insulating tape along the flat inside edge of the front panel (both top and bottom). Reinstall the Keypad/Display.

2. Panasonic JU-257 Disk Drive
   On early EPS–16 PLUS Racks that have a Panasonic JU-257 disk drive, there is a potential for a short between the disk drive mounting bracket and the case of the disk drive that may cause audio noise during a floppy disk access. There are two ways to fix this problem:
   - Place insulating tape on the sides of the drive to isolate the it from the mounting bracket, *or*
   - Carefully remove (desolder) the surface-mounted resistor labeled R130 from the disk drive PCB. With the bezel closest to you (PCB side up), R130 is located on the right side of the PCB next to the PCB mounting screw.

3. Main Board PEM (threaded mounting standoff)
   On some early units, one main board screw was left out due to the misplacement of a Main Board mounting PEM. If there is no screw in this location (see Figure 11), don't insert one.

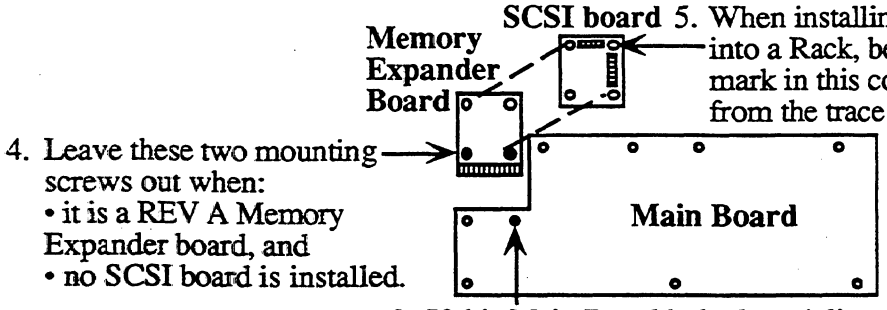


Figure 11 – Hardware Notes for the Rack only

4. ME-16 PLUS Memory Expander Board
   On some REV A boards, one of the mounting screws could connect a +5V trace to the grounded chassis (see Figure 11). On power up, the unit would show LOADING SYSTEM but get no further. Leave these two screws out when a REV A memory expander board is used and when no SCSI board is installed (no screw head will touch the trace when a SCSI board is installed).

5. SCSI Board
   On some REV A SCSI boards, a mounting screw could connect a +5V trace to the grounded chassis (see Figure 11). Use a razor knife to disconnect the bottom left corner of the "R" in REV A from the trace next to it.

Error Messages

Occasional error messages are not unusual, and unless they become chronic, they are not a cause for concern. It is important to realize that these messages are diagnostics and do not necessarily indicate a problem. These messages were designed to help our software engineers in the development of the software, not as hardware diagnostics.

The following error messages could be caused by software:

ID #	Description	ID #	Description
16	poly or mono pressure events sent to VC	133	trapv instruction overflow error
20	unknown button event	134	privilege violation
48	parameter error	135	trace
49	layer error	137	line 1111 emulator
80	bad buffer to MIDI	138	spurious interrupt
128	bus error	139	unused vector
129	odd address error	192	load all data error (from MIDI or card)
130	divide by zero	193	keyup playback error
131	illegal instruction	194	out of SDBs error
132	chk instruction register out of bounds		

Main Board Problems

The following unexpected event messages could be caused by a problem on the Main Board:

32	bad download	40	bad ESP error
33	bad ESP chip	138	spurious interrupt
34	bad ESP RAM	145	unknown DUART interrupt error

MIDI or Main Board Problems

The following unexpected event message is usually caused by too much incoming MIDI data. It also could be caused by a problem with the keyboard:

144 out of buffers

SOFTWARE NOTES

To Check the Software Version from the front panel:

- Press ***Command, Env1***. The display shows NO COMMANDS ON PAGE.
- Repeatedly press the ***left*** or ***right arrow*** button until the display shows SOFTWARE INFORMATION.
- Press ***Enter•Yes***. The display shows RAM VERSION = X.XX, press ***Enter•Yes***, the display shows ROM VERSION = Y.YY, press ***Enter•Yes***, the display shows KEYBOARD VERSION = XXX (for the Rack, this will always read 1).

BOOTUP ROM CHANGES

The following change was included in ROM Version 1.00B (Keyboard only, S/N 10460):
Extended the acceptable range of Mod wheel and other analog inputs.

The following change was included in ROM Version 1.00C (Keyboard only, S/N 11646):
This version of ROM supports loading the operating system from FLASHBANK.

The following change was included in ROM Version 1.00D (Keyboard S/N 12440):
This version of ROM fixes a problem when the FLASH memory is completely filled (0 blocks free). All EPS–16 PLUS Racks have at least this version.

The following change was included in ROM Version 1.00E:
(Keyboard S/N 12471, Rack S/N 10290)
A change was made to allow the CV pedal value on the Analog Test page go full range (0-127).

The following change was included in ROM Version 1.00F:
(Keyboard S/N 13871, Rack S/N 10738)
A bug was fixed that caused a DISK TYPE ERROR when saving instruments to FLASHBANK.

The following changes were included in O.S. DISK VERSION 1.10:

In version 1.10, the MULTI-TRACK RECORD feature, which was omitted from version 1.00, has been implemented.

In addition, there are two additional refinements added as of v 1.10 to make the software a little more user-friendly:

- When you go into Record after loading or deleting instruments (a condition that requires the EPS-16 PLUS to shuffle memory for a second or two) the display will show SHUFFLING DATA, until the click starts and it is ready to record. Previously there was no visual feedback during this time, causing users to wonder what was going on.
- When the sequencer is synced to MIDI (CLOCK SOURCE=MIDI on the EDIT/Seq•Song page) and you press record, the display shows WAITING... to indicate that the unit is waiting for a MIDI Start and clocks before going into Record.

  If the sequencer is synced to MIDI and it needs to shuffle memory before going into record, it will show SHUFFLING DATA for as long as necessary, then go to WAITING... Always wait until the display shows waiting before starting the sending device.

The following is a summary of changes which were included in version 1.10:

HANGING NOTES

- It was possible to make notes hang while playing DIST GUITAR sound (related to layer delay).

PITCH WHEEL

- Pitch wheel reading drifted as the unit warmed up.

MIDI

- If TRANSMIT ON=INST CHAN, it didn't send proper values for key pressure out MIDI.
- Sustain pedals from MIDI were not recorded properly by the sequencer.

LOADING AND SAVING

- When you loaded an Instrument into a copy of an already loaded instrument, it sometimes crashed, displaying ERROR 129.
- The EPS-16 PLUS did not handle errors properly when saving multi-disk files, particularly when resaving an existing one. Sometimes it created two Disk 1's and a Disk 2 for a 3-disk sound.
- When a bank should have been loading sounds from hard disk, the unit seemed to ask for a floppy, then displayed WRONG DISK INSERTED when you inserted the floppy, because it was really looking at the hard disk but with the wrong disk label.
- When an EPS (classic) bank was loaded, the track PAN values were translated incorrectly in the presets.

SEQUENCER

- It was possible to edit track parameters when no Instrument was loaded.
- Click pan defaulted to +3; it should default to 0 (center).
- On CHORUS + REVERB algorithm, click assigned to BUS3 still came out left channel when BUS3=OFF.
- Click assigned to BUS3 periodically snuck into BUS1, creating a reverb splash, especially with 44KHZ effects.
- Overdub Standby state was not cleared when an unlooped sequence stopped.

EFFECTS

- Effects could howl when loading a bank with a playback rate different from the existing one.
- On 44KHZ REVERB algorithm, Detune Rate and Amt parameters were interconnected, changing either one changed the other.

SAMPLING

- Entering and exiting sampling while holding keys and sustain pedal could confuse the unit, causing sustain pedal to hang, or be ignored, or worse.

EPS-16 PLUS KEYBOARD ONLY SECTION

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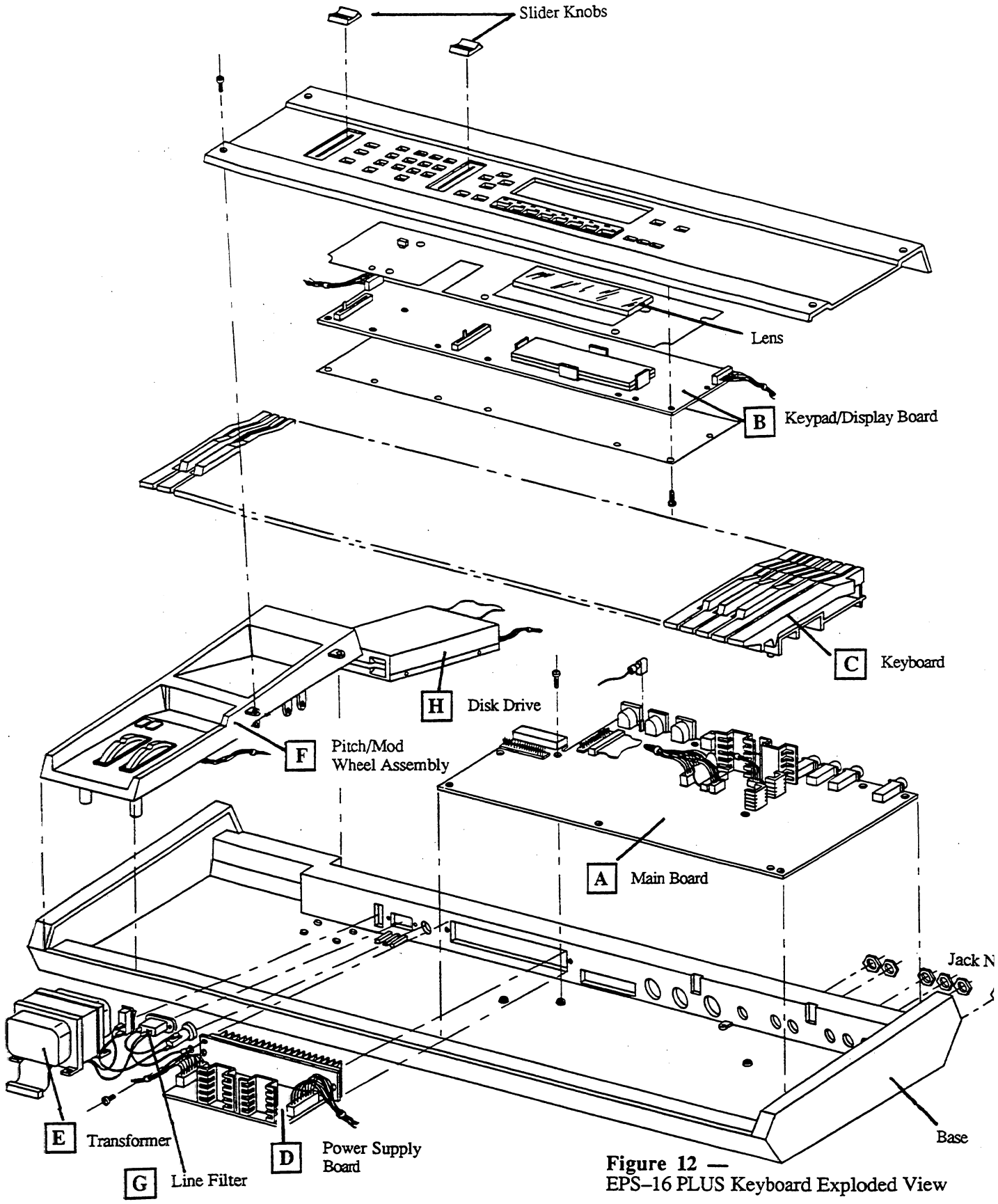

Figure 12 —
EPS–16 PLUS Keyboard Exploded View

SECTION A

Replacing the Main Board

Removing

1. Remove all cables connected to the EPS–16 PLUS, including the Power cord.
2. Remove the four (4) screws that fasten the control panel with a 2.5mm hex wrench and raise the control panel. **NOTE:** These are machine screws.
3. Remove the Keyboard (see Section C). Note that you should remove the 20-pin ribbon cable from the Main Board (at J12) instead of from the Keyboard.
4. Disconnect all cables from the Main Board:
   a. Push-on ground wire (located between the MIDI Thru and MIDI Out jacks)
   b. J4-DISK, 34-pin ribbon cable
   c. J11-POWER, 9-wire cable
   d. J13-WHEELS,
   e. J15-DISPLAY,
   f. J2-NON-VOLATILE MEMORY and/or J3-AUX EXPANSION (if present)
5. Remove the six (6) 15mm nuts from the rear panel jacks marked *Ft. Sw., Pedal•CV, Left/Mono, Right/Mono, Audio In* and *Phones.*
6. Remove the eight (8) self-tapping screws and one ground machine screw with star washer that attach the Main Board to the case and remove the board.

Installing

7. With the board tilted on a slight angle, insert the jacks into the holes in the rear panel. Press the board down and into place.
8. Replace the Main Board screws and secure the jacks with the nuts.
9. Reconnect the cables. Reinstall the Keyboard (see Section C).
10. Power up, test the unit, and close the control panel.

SECTION B

Replacing the Keypad/Display Board

Removing

1. Remove all cables connected to the EPS–16 PLUS, including the Power cord.
2. Remove the Volume and the Data Entry knobs. Remove the four (4) screws that fasten the control panel with a 2.5mm hex wrench and raise the panel. **NOTE:** These are machine screws.
3. Remove the six-wire cable from the left side and seven-wire cable from the right side of the Keypad/Display board. **Note** that these cables are keyed.

IMPORTANT! The individual colored buttons are held in place only by the Keypad/Display board underlay. Make sure the control panel is open all the way to prevent the buttons from falling out when the board is removed. If they do fall out, see Figure 13 for button color placement.

4. Remove the fourteen (14) screws that hold the Keypad/Display in place and carefully remove the Keypad/Display. Remove the cardboard insulator that covers the bottom of the Keypad/Display board.

Installing

5. To reassemble, first make sure that the underlay and all the buttons are in place and that the lens is clean and in its proper position.
6. Install the new Keypad/Display board with the cardboard insulator using the fourteen (14) screws. Reconnect the two cables paying particular attention to the polarity. Reinstall the knobs on the Data Entry and Volume sliders.
7. Power up, test the unit, and close the control panel.

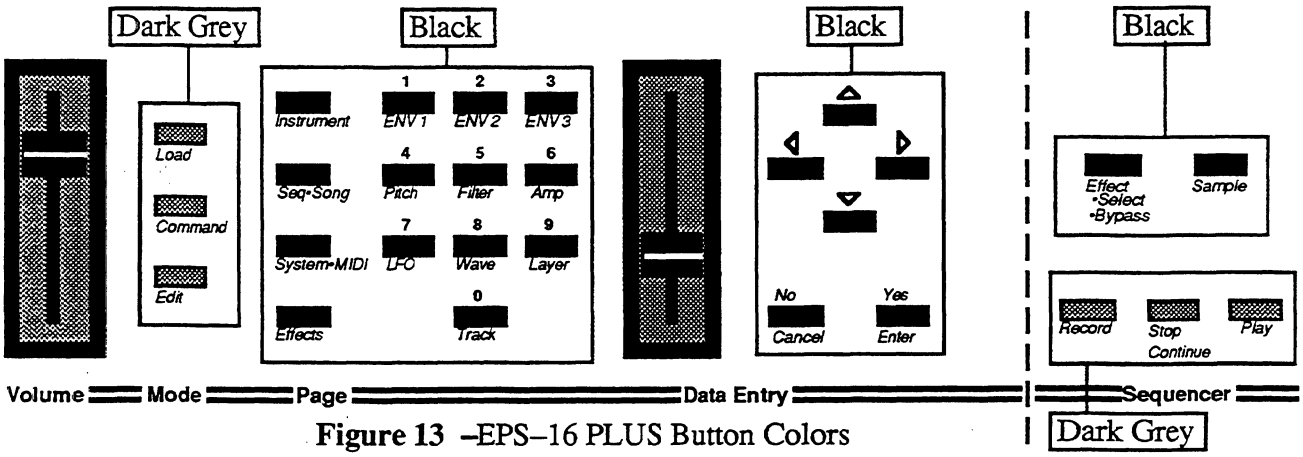

Figure 13 –EPS–16 PLUS Button Colors

SECTION C

Replacing the Keyboard

Removing

1. Remove all cables connected to the EPS–16 PLUS, including the Power cord.
2. Remove the four (4) screws that secure the control panel with a 2.5mm hex wrench. **NOTE:** These are machine screws.
3. Place the unit upside down on a soft surface and remove the ten (10) screws that attach the Keyboard to the case. See Figure 14 for location of screws.
4. Carefully turn the unit right side up. Raise the control panel and disconnect the Keyboard Ribbon cable (J12) from the Main Board, paying particular attention to the polarity.
5. Remove the Keyboard from the case by gently lifting up the front of it while pulling it toward the front of the unit. Once the rear of the Keyboard has cleared the control panel mounting tabs, the Keyboard can be removed from the Keyboard cavity (see pp. 1-2.).

Installing

6. While paying particular attention to polarity, remove the Keyboard Ribbon cable from the old Keyboard and install it on the new Keyboard.
7. Connect the Keyboard Ribbon cable to the Main Board. Be sure that the cable lies flat beneath the Keyboard and is not pinched under the Keyboard frame.

IMPORTANT! If the ribbon cable is mispinned, fuses F3 and F4 on the power supply will blow.

8. Insert the new Keyboard rear first into the unit at the front of the Keyboard cavity. Gently slide the Keyboard toward the rear of the unit, lowering the front of the Keyboard as needed to clear the control panel mounting tabs.

IMPORTANT! Make sure the Disk Drive ribbon cable is not caught under the Keyboard standoffs.

9. Turn the unit upside down on a soft surface and replace the ten (10) screws that secure the Keyboard to the case.
10. Power up, test the unit, and close the control panel.

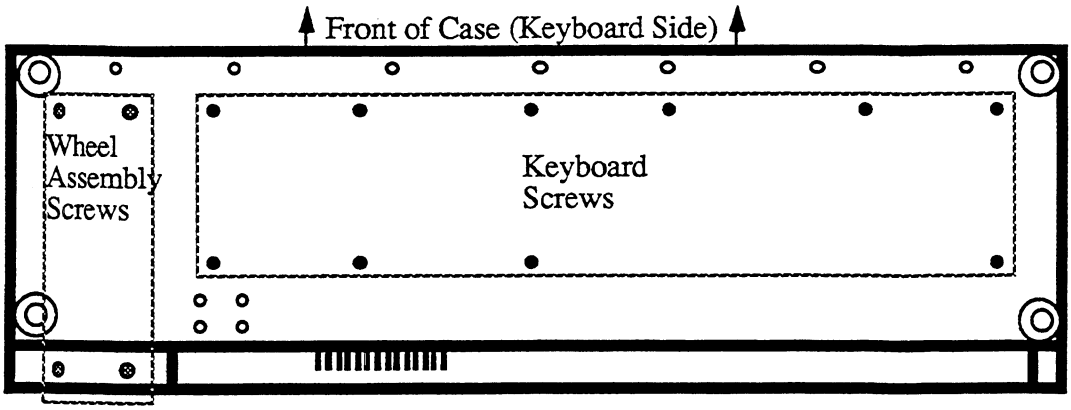

Figure 14 –Bottom of Case

SECTION D

Replacing the Power Supply Board

Removing

1. Remove all cables connected to the EPS–16 PLUS, including the Power cord.
2. Remove the four (4) screws that fasten the control panel with a 2.5mm hex wrench. **NOTE:** These are machine screws.
3. Disconnect the 9-pin connectors (J1, J4), the 6-pin connector (J3), and the 4-pin connector (J2) from the Power Supply Board. Note that these connectors are keyed.

IMPORTANT! The connector on the 9-pin cable from the transformer has a high retention force. Please use a scribe, screwdriver, or similar tool to remove it (see p. 4). Do not pull on the wires!

4. Remove the screw and star washer that connect the ground wire to the heatsink.
5. Remove the two (2) screws and nuts that secure the Power Supply to the case (note that there are star washers on each screw).
6. Remove the Power Supply board by pulling the front of the board toward the Keyboard and then lifting it up so that the finned heat sink clears the case.

Installing

7. Insert the replacement Power Supply Board into the case finned heat sink first. Lift the finned heat sink from the outside of the case so that it is centered in the opening. The standoffs are intended only for support and should not be stuck down to the case.
8. Reinstall the Power Supply screws and star washers and be sure to connect the ground wire to the heat sink. Carefully reconnect the four cables, paying particular attention to the alignment of pins and connectors.
9. Power up, test the unit, and close the control panel.

SECTION E

Replacing the Transformer

Due to problems that may occur with the plastic case, all units that need the Transformer replaced should be sent back to the factory. Contact your distributor if you are located outside the U.S.

SECTION F

Replacing the Pitch/Mod Wheel Assembly

The Pitch and Mod Wheels are replaced as an assembly along with the main harness cables.

Removing

1. Remove all cables connected to the EPS–16 PLUS, including the Power cord.
2. Remove the four (4) screws that fasten the control panel with a 2.5mm hex wrench. **NOTE:** These are machine screws.
3. Place the unit upside down on a soft surface and remove the four (4) screws that attach the Wheel Assembly to the case. See Figure 14 for location of screws.
4. Return the unit to an upright position. Raise the control panel and cut the wire ties that hold the wire harness to the chassis.
5. Disconnect the main harness from the Main Board, the Power Supply, the Keypad/Display and the line filter. **Note** that these connectors are keyed and have connector locks.
6. Carefully lift the Wheel Assembly out of the case.
7. Disconnect the cables from the Disk Drive, paying particular attention to the polarity.

Installing

8. Remove the Disk Drive and place it into the new assembly as described in Section H. Reattach the Disk Drive cables.
9. Connect the new wire harness to:
   a. the Main Board (J11, J13, J15, and ground lug),
   b. the Power Supply (J1, J2, J3, and ground wire to the heat sink),
   c. the Keypad/Display (left sides), and
   d. the line filter ground lug

   paying particular attention to the alignment of pins and connectors.
10. Reconnect the wire harness to the case using wire ties.
11. Reattach the Wheel Assembly to the case using the four screws.
12. Power up, test the unit, and close the control panel.

SECTION G

Replacing the Line Filter

Removing

1. Remove all cables connected to the EPS–16 PLUS, including the Power cord.
2. Remove the four (4) screws that fasten the control panel with a 2.5mm hex wrench. **NOTE:** These are machine screws.
3. Remove the three (3) wires connected to the back of the Filter, paying particular attention to the polarity.
4. Remove the two (2) screws and nuts that secure the Filter to the case. Note that there are star washers on the inside only.

Installing

5. Install the new Line Filter from outside the case using the two screws, star washers and nuts.
6. Reconnect the three wires to the Filter, again noting the proper polarity.

IMPORTANT! Failure to connect the wires to their proper posts can lead to a potential shock hazard (see Figure 3).

7. Power up, test the unit, and close the control panel.

SECTION H

Replacing the Disk Drive

Removing

1. Remove all cables connected to the EPS–16 PLUS, including the Power cord.
2. Remove the four (4) screws that fasten the control panel with a 2.5mm hex wrench. **NOTE:** These are machine screws.
3. Turn the unit over, top down, and remove the four (4) screws that attach the Wheel assembly to the case. See Figure 14 for location of screws. Return the unit to an upright position and raise the control panel. Carefully lift the wheel assembly out of the case.
4. Disconnect the two cables from the Disk Drive, paying particular attention to the polarity (see p. 2, the Disk Drive).
5. Remove the four (4) screws and star washers that attach the Disk Drive to the wheel assembly.
6. Carefully slide the Disk Drive out of the wheel assembly.

Installing

7. Immediately place the defective drive in the anti-static bag that the new drive came in.
8. Slide the new Disk Drive into place and mount it using the four screws and star washers. Reconnect the two cables, paying particular attention to the alignment of pins and connectors.
9. Reattach the wheel assembly to the case using the four screws.
10. Power up, test the unit, and close the control panel.

NOTES:

EPS-16 PLUS RACK ONLY SECTION

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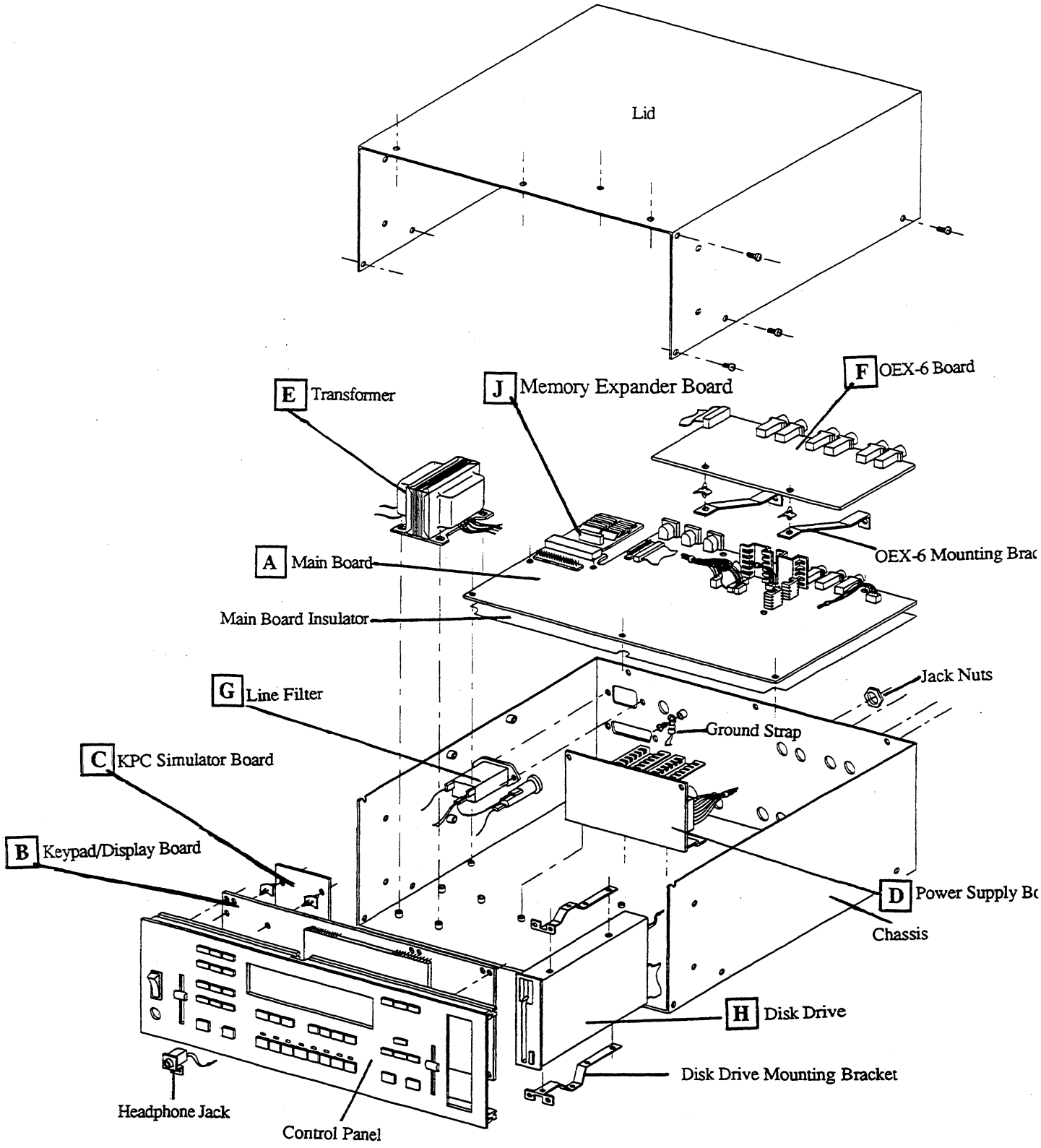

Figure 16 —
EPS–16 PLUS Rack Exploded View

SECTION **A**

Replacing the Rack Main Board

Removing

1. Remove all cables connected to the EPS–16 PLUS Rack, including the power cord.
2. Remove the lid (see below). Remove the OEX-6 board (see Section F steps 3-6).
3. Remove the five (5) 15mm nuts from the rear panel jacks marked *Audio In, Right/Mono, Left/Mono, Pedal•CV*, and *Ft. Sw.*
4. Disconnect all cables from the Main Board.
5. Remove the ten (10) machine screws (and one star washer from the ground pad) from the Main Board (one screw is located in the middle of the board between VR6 and C68). See Rack Hardware Notes items #3 and 4 on p. 24.

Installing

6. Before installing the new circuit board, make sure the mylar insulator is in place.
7. With the board tilted on a slight angle, insert the jacks into the holes in the rear panel. Press the board down and into place.
8. Replace the Main Board screws, and secure the jacks with the nuts. Reconnect the cables.
9. Reinstall the OEX-6 board (see Section F) and secure the jacks with the nuts.
10. Power up, test the unit, and reattach the lid (see below).

REMOVING THE LID

Removing

Remove the twenty-two (22) screws that fasten the cover:

1. Remove the one (1) 6-32 machine screw from above the disk drive (about an inch back from the front panel) that attaches the cover to the disk drive bracket,
2. Remove the four (4) #8-32 machine screws and star washers from ***each*** side panels of the unit (the ones that could attach the mounting ears).
3. Remove the four (4) #6 x 1/4" self-tapping screws that attach the lid to the front panel.
4. Remove the nine (9) #5 x 1/4" self-tapping screws that attach the lid to the base:
   a. remove two (2) screws from ***each*** side of the unit, and
   b. remove five (5) from the back of the unit. **Note** that the center screw has a star washer.
5. Carefully remove the lid from the unit.

REATTACHING THE LID

IMPORTANT! Be sure to install all screws into the Control Panel with a hand screw driver to avoid stripping the holes (see p. 4).

Installing

1. Install the five (5) self-tapping screws on the back of the unit. Make sure that there is a star washer on the center screw.
2. Install the two (2) self tapping screws on either side of the unit.
3. Install the one (1) machine screw on the top of the unit located about 1" back from the control panel.
4. Install the four (4) self-tapping screws on the top of the unit closest to the control panel.
5. Install the four (4) machine screws and star washers into each side of the unit (the ones that could attach the mounting ears).

SECTION B

Replacing the Rack Keypad/Display Board

Removing

1. Remove all cables connected to the EPS–16 PLUS Rack, including the power cord.
2. Remove the lid (see Section A).
3. Remove the two cables from the disk drive, three cables from the keypad/display board, two wires to the power switch, and unplug the headphones cable from the main board.
4. Carefully tip the unit onto its rear panel. Remove the four (4) self-tapping screws and one star washer from the bottom of the unit closest to the control panel.
5. Remove the one (1) machine screw from the bottom of the unit located about 1" back from the control panel (this screw goes through the disk drive mounting bracket inside the unit).
6. Carefully remove the Control Panel from the unit just enough to unplug the 20-pin ribbon cable from the KPC simulator board.
7. Place the Control Panel face down on a soft surface. Remove the eleven (11) screws that attach the Keypad/Display Board to the control panel.

Installing

8. See Hardware Notes p. 24. Install the new Keypad/Display board onto the new control panel using the eleven screws.
9. Reconnect the 20-pin ribbon cable to the KPC simulator board before sliding the new assembly into place (make sure the striped side of the ribbon cable is on pin 1).

IMPORTANT! **Reconnect the 20-pin ribbon cable to the KPC simulator board before sliding the new assembly into place. Be sure to install all screws into the Control Panel with a hand screwdriver to avoid stripping the holes (see p. 4).**

10. Install the four (4) self-tapping screws (one with a star washer) on the bottom of the unit closest to the control panel.
11. Install the one (1) machine screw from the bottom of the unit located about 1" back from the control panel (this screw goes through the disk drive mounting bracket inside the unit).
12. Connect the two cables to the disk drive, three cables to the keypad/display, two wires to the power switch (see Figure 2), and plug the headphones cable into the main board paying particular attention to polarity.
13. Power up, test the unit, and reattach the lid (see Section A).

SECTION C

Replacing the Rack KPC Simulator Board

Removing

1. Remove all cables connected to the EPS–16 PLUS Rack, including the power cord.
2. Remove the lid (see Section A).
3. Remove the control panel (see Section B) OR remove the transformer (see Section E).
4. Disconnect the 20-pin ribbon cable from the KPC simulator board.
5. Pop the KPC simulator board from the four white standoffs by squeezing the standoffs.

Installing

6. Install the new KPC simulator board onto the standoffs making sure the side of the board with the 20-pin connector is closest to the base of the unit.
7. Connect the 20-pin ribbon cable making sure that the striped side is on pin 1.
8. Reinstall the control panel (see Section B) OR the transformer (see Section E).
9. Power up, test the unit, and reattach the lid (see Section A).

SECTION D

Replacing the Rack Power Supply Board

Removing

1. Remove all cables connected to the EPS–16 PLUS Rack, including the power cord.
2. Remove the lid (see Section A).
3. Disconnect the 9-pin cables (J1, J4), the 6-pin cable (J3), and the 4-pin cable (J2) from the Power Supply Board. Note that these cables are keyed.

IMPORTANT! The connector on the 9-pin cable from the transformer has a high retention force. Please use a scribe, screwdriver, or similar tool to remove it (see p. 4). Do not pull on the wires!

4. Carefully tip the unit onto its rear panel. While holding onto the Power Supply board with one hand, remove the three screws from the bottom that attach it to the base.
5. Remove the Power Supply board.

Installing

6. Insert the replacement Power Supply Board.
7. Reinstall the Power Supply screws. Carefully reconnect the four cables, paying particular attention to the alignment of pins and connectors.
8. Power up, test the unit, and reattach the lid (see Section A).

SECTION E

Replacing the Rack Transformer

Removing

1. Remove all cables connected to the EPS–16 PLUS Rack, including the power cord.
2. Remove the lid (see Section A).
3. Disconnect the transformer cables to the power supply, line filter, and power switch.
4. Remove the four screws and flat washers that hold the Transformer in place.

Installing

5. Insert the new Transformer and attach it to the base using the four screws and flat washers.
6. Reattach the cables to the power supply, line filter, and power switch.
7. Power up, test the unit, and reattach the lid (see Section A).

SECTION F

Replacing the Rack OEX-6 Board

Removing

1. Remove all cables connected to the EPS–16 PLUS Rack, including the power cord.
2. Remove the lid (see Section A).
3. Disconnect the ribbon cable from the OEX-6 board.
4. Remove the six (6) 15mm nuts from the rear panel jacks marked *Bus3/Right, Bus3/Left, Bus2/Right, Bus2/Left, Aux1/Right,* and *Aux1/Left.*
5. Pop the OEX-6 board from the two white standoffs by squeezing the standoffs.
6. Remove the OEX-6 board from the unit.

Installing

7. With the new OEX-6 board tilted on a slight angle, insert the jacks into the holes in the rear panel and snap the board onto the standoffs.
8. Reconnect the ribbon cable from the main board making sure that the striped side is on pin 1.
9. Secure the jacks with the nuts.
10. Power up, test the unit, and reattach the lid (see Section A).

SECTION G

Replacing the Rack Line Filter

Removing

1. Remove all cables connected to the EPS–16 PLUS Rack, including the power cord.
2. Remove the lid (see Section A).
3. Remove the three (3) wires connected to the back of the Filter, paying particular attention to the polarity.
4. Remove the two (2) screws and nuts that secure the Filter to the case. Note that there are star washers on both sides.

Installing

5. Install the new Line Filter from the inside of the base using the screws, star washers and nuts.
6. Reconnect the three wires to the Filter, again noting the proper polarity.

IMPORTANT! Failure to connect the wires to their proper posts can lead to a potential shock hazard (see Figure 3).

7. Power up, test the unit, and reattach the lid (see Section A).

SECTION H

Replacing the Rack Disk Drive

Removing

1. Remove all cables connected to the EPS–16 PLUS Rack, including the power cord.
2. Remove the lid (see Section A). Remove the control panel (see Section B).
3. Disconnect the two cables from the Disk Drive, paying particular attention to the polarity (see p. 2, the Disk Drive).
4. Remove the four (4) screws that attach the Disk Drive mounting brackets to the control panel.
5. Remove the four (4) screws that attach the mounting brackets to the Disk Drive.
6. Immediately place the defective drive into the anti-static bag that the new drive came in.

Installing

7. Attach the mounting brackets to the new Disk Drive using the four screws.

IMPORTANT! **Be sure to install all screws into the Control Panel with a hand screw driver to avoid stripping the holes** (see p. 4).

8. Attach the mounting brackets to the control panel trying to use the same holes.
9. Attach the control panel to the base (see Section B).
10. Connect the two cables, paying particular attention to the alignment of pins and connectors.
11. Power up, test the unit, and reattach the lid (see Section A).

SECTION J

Replacing the Rack Memory Expander Board

Removing

1. Remove all cables connected to the EPS–16 PLUS Rack, including the power cord.
2. Remove the lid (see Section A). Remove the control panel (see Section B).
3. With the front panel close to you, the memory expander board is located in the left corner of the unit.
4. Remove the screws that attach the memory expander to the base. If the memory expander board is a REV A, there should only be two screws holding it in. If the memory expander is a REV B or higher, there should be four screws holding it in place. **See Rack Hardware Notes item #4 on p. 24.**
5. Wiggle the memory expander board side to side and up a bit to remove it.

Installing

6. Before installing the replacement board, make sure that the connector fingers are clean. If needed, clean them using a pencil eraser.
7. Insert the board fingers into the main board connector.
8. Attach the board to the chassis using the correct number and placement of screws. **See Rack Hardware Notes item #4 on p. 24.**
9. Power up, test the unit, and reattach the lid (see Section A).