Service Manual

TS▾10
TS▾12

ensoniq ®

THE TECHNOLOGY THAT PERFORMS

NOTES:

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IMPORTANT THINGS TO KNOW ABOUT THE TS-10/TS-12

As with every ENSONIQ product, all TS 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.

About this manual: The instructions in this manual are for both the TS-10 and TS-12 unless otherwise noted.

Known Areas of Concern
Those items marked with a ☛ are known areas of concern, other items are important things to know about the TS.

1. Operations System (O.S.) Versions
To Check the TS Software Version: While holding down **Presets**, press **System.**
The TS-10 display briefly shows ENSONIQ TS-10 SOFTWARE ROM V X.XX KPC YYY.
The TS-12 display briefly shows ENSONIQ TS-12 SOFTWARE ROM V X.XX.

☛ **TS-10:** The TS-10 was released at O.S. version 1. Version 2 added the capability to read SCSI devices when a SCSI board is installed and added auto-load of sampled sounds when used in a sequence. Version 3 adds General MIDI compatibility. **Updating a TS-10 to Version 3 requires making one cut, adding one jumper, and moving one zero ohm resistor on the digital board.** A General MIDI update kit is available from ENSONIQ Customer Service.

☛ **TS-12:** The TS-12 was released at O.S. version 2 which included the capability to read SCSI devices when a SCSI board was installed. Version 3 adds General MIDI compatibility. **Updating a TS-12 to Version 3 requires making one cut, adding one jumper, and moving one zero ohm resistor on the digital board.** A General MIDI update kit is available from ENSONIQ Customer Service.

☛ **TS-10:** Loading and playing sequences created with O.S. version 2 or higher in a TS-10 with O.S. version 1.X will cause the unit to appear broken. Do not load ENSONIQ demo sequences from TSD-200 or any demo whose name ends with "V2" into a TS-10 with O.S. 1.X. **We recommend updating any TS-10 that is in for repair to at least version 2.**

2. TS Fuses Ratings (all fast blow, as of February 94)

	UL rated fuses (100V,120V,240V)	IEC127 rated fuses (230V units only)	Where Used
F1	2.0A	F2.0A	Line Fuse
F2 and F3	3.0A	F3.15A	+VD,+5D,+5M,digital,keypad/display
F4 and F5	1.6A	F1.6A	±VA, analog, Vbb keypad/display
F6	1.6A	F1.6A	±9VAC keypad/display

• **The 20-pin Keyboard/Keyboard Processor Board Ribbon Cable:** When reconnecting this cable to the digital board, make sure the striped side is aligned with pin 1 and the cable is not mis-pinned. If the cable is mis-pinned or installed backward, fuses F2 and F3 on the power supply board will blow. **NOTE:** If one fuse blows, the other will blow also; you must replace both.

3. The Disk Drive

- **Transporting a unit: 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 TS 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.
- **What disks to use:** It is very important to use double-sided, double-density (DD) or high density (HD) 3.5" micro-floppy disks. The TS writes information to every track on a disk, so it is imperative that the disk be of superior quality.
- **Testing the Disk Drive:** The best way to test the disk drive is by formatting a disk. When a disk is formatted, the TS reads and writes every track on that disk. If the formatting fails, the disk itself may be faulty. Try formatting another disk before determining that the disk drive is faulty. Unlike some computer systems, the TS does not automatically discard bad sectors when formatting. The entire disk must be good for successful formatting.
- ☞ A few different disk drives were used in the TS: two types of Panasonic drives and one Sony drive. Make sure that when you install a new Panasonic disk drive that the switches on the rear of the drive are set as shown in Figure 1. On some Panasonic disk drives, the Drive Select Switch has only two positions instead of four. The drive select should always be set to zero (0).
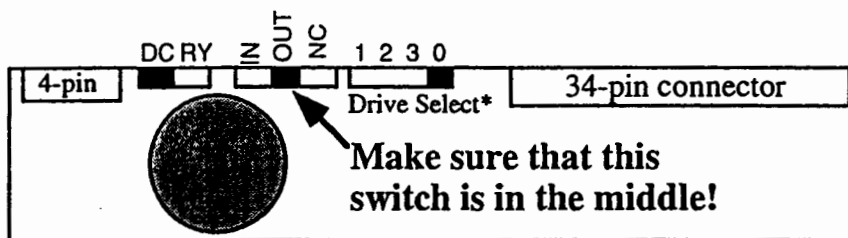
Figure 1 – Rear view of Panasonic Disk Drive

*on some Panasonic drives, this switch has only two positions. The drive select should always be set to zero.

- ☞ Customers may complain that their TS will not read some of their disks. Please be aware that High Density (HD) disks that have been formatted as Double Density (DD) on a DD drive in a unit such as an EPS, EPS-16 PLUS, or a Macintosh Plus will not be recognized in machines that have an HD drive. This would include the TS and ASR-10, as well as an IBM PC or clone.
- ☞ On early TS-10s, removing the disk drive may cause the disk drive bezel to break.
- ☞ SONY DRIVES: On some TS units, Sony MPF420-1 disk drives were used. If you are replacing a Panasonic disk drive with a Sony disk drive you must order a new 34-pin cable. Make sure that the jumpers on the bottom of the Sony drive are as shown in Figure 2.
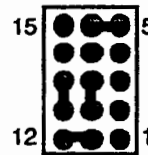
Figure 2 – Sony Disk Drive Jumper Configuration

In the TS-10, some plastic on both the wheel cover and end cap has to be removed. See the information included with the Sony drive.

4. Unit Sounds Distorted

- Make sure that the cables to the jack board are connected properly.
- ☞ ESP download failures will show up as either a "SYSTEM ERROR xxx" or as the outputs playing "dry" without any effects, with garbled effects, or with no sound at all. If sounds set to DRY sound fine, but sounds with effects don't, replace the digital board.

5. Customer Thinks the Unit is Broken

☞ **TS-10:** Loading and playing sequences created with O.S. version 2 or higher in a TS-10 with O.S. version 1.X will cause the unit to appear broken. Do not load ENSONIQ demo sequences from TSD-200 or any demo whose name ends with "V2" into a TS-10 with O.S. version 1.X. **We recommend updating any TS-10 that is in for repair to at least O.S. version 2.** An EPROM update kit is available from ENSONIQ Customer Service.

☞ **TS owners must have a SCSI board and O.S. version 2 or higher installed in their unit for SCSI read-only capability to be available.**

To Check the TS Software Version: While holding down **Presets**, press **System**.
The TS-10 display briefly shows ENSONIQ TS-10 SOFTWARE ROM V X.XX KPC YYY.
The TS-12 display briefly shows ENSONIQ TS-12 SOFTWARE ROM V X.XX.

- Customers may complain that their TS will not read some of their disks. Please be aware that High Density (HD) disks that have been formatted as Double Density (DD) on a DD drive in a unit such as an EPS, EPS-16 PLUS, or a Macintosh Plus will not be recognized in machines that have an HD drive. This would include the TS and ASR-10, as well as an IBM PC or clone.

6. Reinitialization

The TS is essentially a computer with over 256 KBytes of RAM. It is possible for the TS to become confused if bad data is loaded into this memory. This can result from loading data off a bad disk or a bad MIDI Sys-Ex transfer. If the memory does get scrambled, it will be necessary to reinitialize the system. So, periodic backing up of all data is recommended.

The TS is heavily software dependent and, as with all computers, certain events can cause a unit to glitch and contract a severe case of amnesia. Sometimes these units merely require reinitialization. Since scrambled software can cause problems that at first glance appear to be hardware-related, reinitialization is recommended as a first step in troubleshooting. For more information on reinitializing, see Section 1 of the *Musician's Manual*.

A given unit is likely to have data in its memory that is near and dear to the owner of that unit. When reinitializing, all the current data will be lost. However, the ROM sounds and presets are automatically loaded back into memory after reinitializing. It is <u>highly</u> recommended that all data be saved by the customer before servicing. See the Storage Section of this manual for instructions on saving data.

IMPORTANT! Unplug all audio cables before reinitializing. The audio outputs of the unit may make a pop when reinitializing.

TO REINITIALIZE THE TS FROM THE FRONT PANEL:
- Save all Sound, Preset and Sequence data (see the Storage Section).
- While holding down **Presets**, press the upper left soft button.
- Select YES to ERASE MEMORY AND REINITIALIZE. After selecting YES, the unit erases its memory and then starts up just as it does when you turn the power on, and reinitialization is complete. The ROM Sounds and Presets are automatically placed into memory.

If the system is so scrambled that the front panel isn't working, try the Reset Sequence. If the unit is open, you can try the following Hard Reset.

SYSTEM RESET SEQUENCE:
- Turn the unit off and then on slowly (at approximately two second intervals) seven times.
- The eighth time you turn it on, the unit should automatically reinitialize itself and show the wake-up screen. If it doesn't then there is another problem.

HARD RESET:
- **Make sure the power is off!**
- Short the minus side of the battery to the pin 32 of U3 for a few seconds.

If the above methods do not return the system to normal operation then there is a problem in one of the modules.

7. Mechanical Issues
- **TS-10:** On early units, you may break the disk drive bezel when removing the disk drive from the unit. The wheel cover was modified on later units to prevent this.
- **TS-10:** If the mounting posts for the wheel brackets break, call ENSONIQ for a new wheel cover that has the posts reinforced.
- **TS-10:** Early units may have buttons sticking. To make sure that buttons don't stick on later units, an M4x10mm hex head set screw was added to the extrusion rail that the keypad/display board mounts to to locate the keypad/display board properly. Don't remove this set screw.
- ☛ **TS-12:** If you hear a clacking sound when you press down on a key, there may be a broken swivel weight on that key or a key weight may have come loose. If this happens, the keyboard must be replaced.
- **TS Case** (Avoid Stripping Screws): Care should be taken when assembling or disassembling any part of the TS. **Avoid over-tightening screws when repairing a unit! Use no more than 8 inch/lbs of torque when tightening any screw.** The TS case is made of aluminum extrusions and steel. Some parts are held in place by screws that tighten into aluminum mounting rails that are part of the case. When replacing any of these screws, it is possible to over-tighten the screws and strip out a hole.
- **High-Retention Force Connectors** (Repair Technicians Label): Inside the TS is warning/information label just for you. We wanted to let you know that we use high retention force connectors in the TS. This means it is very difficult to remove a connector by just pulling. We recommend using a scribe, screwdriver or similar object when disconnecting cables. Please don't pull on the wires!

    We have found that some units develop further problems once a module has been changed. This may be a result of improper handling of cables. We recommend removing cable connectors using the angled end of a scribe (see below).
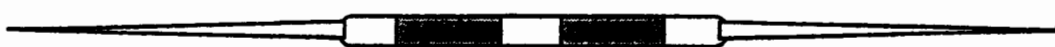
Figure 3 – Scribe

These can be found in the following catalogs:
- Techni-Tool catalog 43, page 103, part number 400PR144
- Newark catalog 112, page 1115, part number 76-1510

8. SIMMS
- SIMMs must be installed by Repair Stations because the base pan must be removed.
- The TS uses 30-pin, D-RAM, 1Meg x 8 or 4Meg x 8 (Macintosh-type) non-parity SIMMs (not 1Meg x 9 or 4Meg x 9 parity SIMMs). The TS will not accept static RAM or ROMs.
- We do not recommend using parity SIMMs (designed for IBM PC compatibles). These SIMMs may not operate properly, and may damage the TS.
- We recommend using SIMMs with an access speed of 80 nanoseconds or faster.
- If SIMMs are installed in a less than optimal configuration (see Important Information About SIMMs), the display will read SIMMS IN WRONG SOCKETS after booting. If this message is displayed, you should power off and check the SIMMs configuration.
- SIMMS that have GAL (gate array logic) or PAL (programmable array logic) chips on them may be too thick to fit into the standard sockets that are used on the TS. Even if the SIMMs with GALs or PALs fit, they will draw too much power and certain configurations (i.e. 2Meg x 8 SIMMs) will not work properly.
- **See Important Information About SIMMs.**

How the TS Works
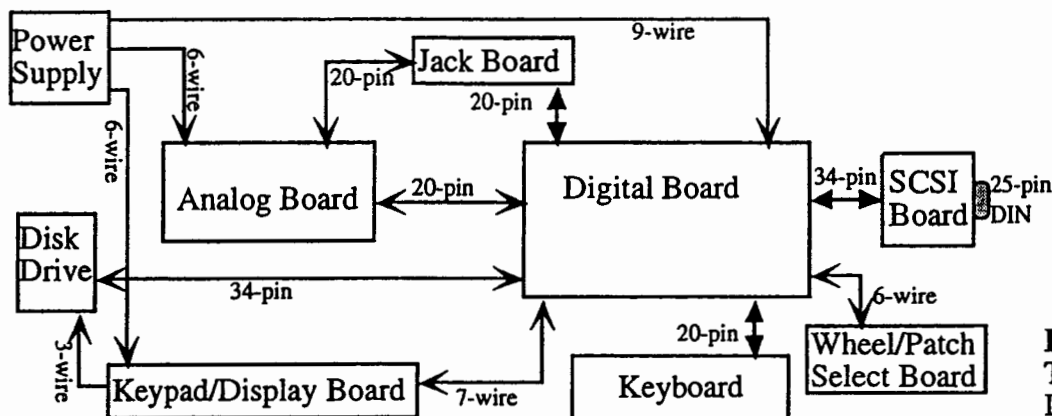
Figure 4 – TS Block Diagram

TS-10 and TS-12 Similarities and Differences
All circuit boards are electrically the same for both the TS-10 and the TS-12. However, there are physical differences that will require you to specify for which unit you are ordering parts. The TS-10 and TS-12 have different operating system EPROMs. See the Glossary for board part numbers.

The main difference between the TS-10 and TS-12 (besides the case) is the keyboard. The TS-10 has a 61-note Poly-Key™ keyboard and the TS-12 has a 76-note mono-pressure piano-style keyboard. The mono-pressure is interpreted by the keyboard processor board mounted to the bottom of the 76-note keyboard near the wheel assembly. The keyboard processor board passes information between the keypad/display board and the digital board (like the keyboard does for the TS-10). In this manual, when you see "keyboard," substitute keyboard processor board for the TS-12 (except when otherwise noted).

COMMUNICATIONS PATH
It is important that you completely understand the communications path of these units. Please read this carefully.

The digital board, keypad/display board and keyboard are complete computer systems in themselves, each with its own microprocessor and operating software. The modules communicate with each other using serial communication ports. For example, when a key is played on the keyboard, the keyboard microprocessor transmits this information to the microprocessor on the digital board.

The keypad/display board communicates with the digital board through the keyboard. When the digital board wants to put a message on the display, it sends the message directly to the keypad/display board. When a button is pressed on the control panel, the keypad/display board sends the message to the keyboard which, in turn, passes it on to the digital board.
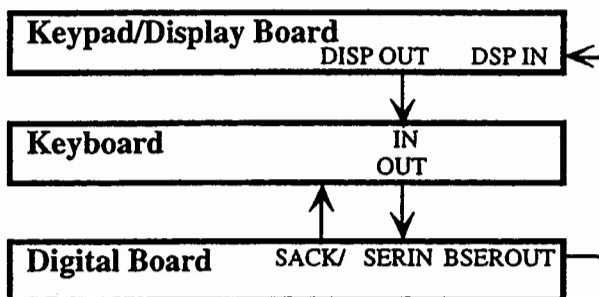
Figure 5 – Communications Path

The communications path is shown above. The digital board communicates with the keyboard over a two-line asynchronous interface carried by the 20-pin keyboard ribbon cable. The keypad/display board communicates with the digital board via a 7-wire cable.

Due to the complexity of the modules involved, it is often difficult to determine which module is at fault when a communications problem occurs. 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 keyboard ribbon cable or bad display cable, or it could be a problem in one of the modules.

There is one further complication. Since the communications path between the keypad/display board and keyboard is routed through the digital board, there is a remote possibility that the circuit board connections between the two connectors are defective. If you have a TS that has a problem communicating with its keypad/display board, you may want to verify continuity between the connectors on the digital board. Turn off the power and unplug the 20-pin ribbon cable and the 7-wrie display cable from the digital board. Using an ohmmeter, on the digital board verify continuity between pin 19 of J14 and pin 1 (DISPOUT) of J3.

TROUBLESHOOTING
Often the faulty module in an TS can be determined through normal use. Sometimes, it is difficult to isolate the problem. When troubleshooting an TS, always disconnect any expansion devices that may be present (such as the SCSI Interface). This will prevent a faulty expander from complicating your troubleshooting. The following pages include troubleshooting information.

CHECKING THE POWER SUPPLY

Some TS problems may be related to a faulty power supply, transformer or line filter. You should check these before troubleshooting the rest of the unit. **Measure continuity across all the fuses to make sure they are not blown.**

Make sure that all the cable connections are secure and correct. Plug the TS in and turn it on. After it has warmed up for five minutes, begin to test the voltages at the points shown in Figures 6 and 7. It is normal for Line Voltage to vary +/- 10%. If the voltages vary outside the allowable limits, follow the procedure described under TESTING THE POWER SUPPLY UNLOADED (pp. 9-10) before replacing it.

There is a label on top of the transformer that calls out its voltage and part number. The power supply part number is silk-screened near the center of the power supply PC board. The transformer part numbers are: 100V/115V=1450000802; 230V/240=1450000452.
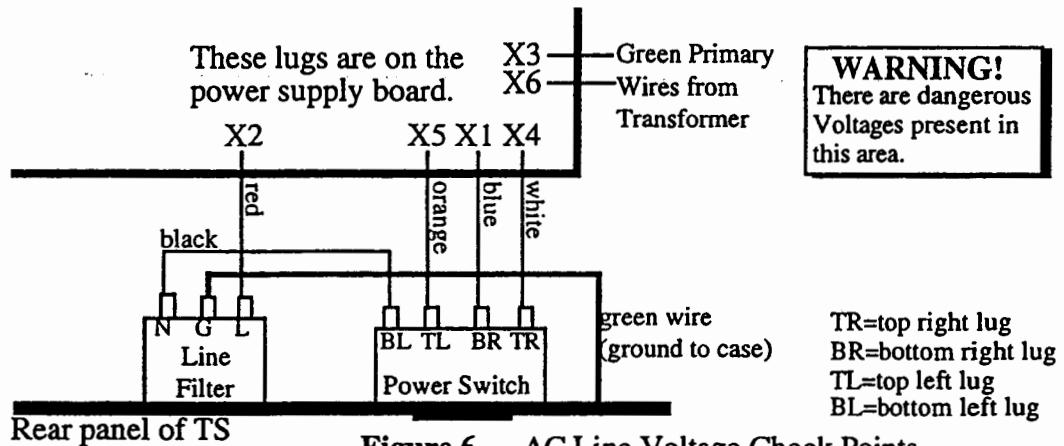
Figure 6 – AC Line Voltage Check Points

AC LINE VOLTAGE MEASUREMENTS (see Figure 6)	
With the power switch **OFF**, the proper AC Line Voltage should read from: N-L, BL-BR	With the power switch **ON**, the proper AC Line Voltage should read from: N-L, BL-BR, TL-TR There should be no voltage across the power switch.

Analog Board Regulator Voltages

There are four regulators (VR1 through VR4) attached to the analog board heat sink. You can easily check to make sure that they are generating the correct voltages. The correct voltages are silkscreened onto the analog board next to the regulator name. Place your ground (-) probe on the tab of VR1. To measure the output, place the other probe on pin 3 of the regulator (when the regulator legs are closest to you, pin 3 is the right leg). It is normal for the voltage to vary ±5%.

POWER SUPPLY VOLTAGE CHECK POINTS

Below are the voltage ranges for proper operation of each fully loaded supply and the pins to read across with the voltmeter (see Figure 7). It is normal for line voltage to vary +/- 10%.

Designation	Where Used	Connector	Pins +	Pins -	Allowable range			Units
Digital Supply	digital	J1	1	3	18.8	to	23.3	VACrms
Analog Supply	analog	J1	4	6	37.0	to	46.3	VACrms
Display Filament	display	J1	7	9	8.3	to	10.3	VACrms
Display Offset	display	J1	9	2	+10.8	to	+13.9	VDC
+VD	display/digital/kbd	J2	1	2	+10.80	to	+13.90	VDC
+5D	digital	J2	5	4	+4.75	to	+5.25	VDC
+5M	digital	J2	9	4	+4.75	to	+5.25	VDC

These voltages can also be measured on the digital board (near the J5-power connector) with the ground (-) probe on the - side of C105: +5D at FB19; +5M at FB18; and +VD at FB20.

| +VA | analog | J3 | 1 | 3 | +23.5 | to | +29.7 | VDC |
| -VA | analog | J3 | 6 | 3 | -23.5 | to | -29.7 | VDC |

J3 power supply voltages also may be measured on the same pins of J1 on the analog board.
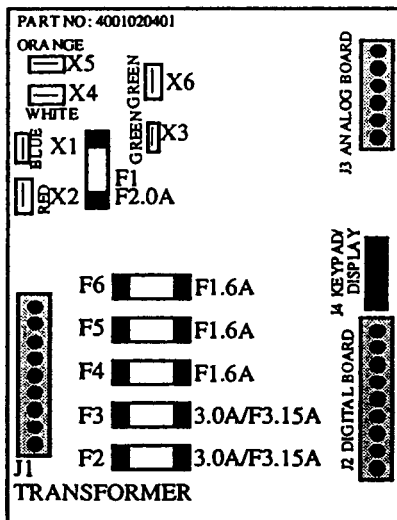
All fuses are fast blow.

digital board uses: +VD, +5D and +5M (F2 and F3)
analog board uses: +VA and -VA (F4 and F5)
keypad/display uses: +VD (F2 and F3), Vbb (F4 and F5), +9VAC, and -9VAC (F6)

Figure 7 –
TS Power Supply

TESTING THE POWER SUPPLY UNLOADED

If the power supply readings exceed the indicated tolerance it is possible that a defective component on one of the other boards is drawing the power supply down. In this case, you should test the power supply unloaded before proceeding. This involves unplugging circuit boards from the power supply one at a time to see which board might be causing a problem. The following two flowcharts tell you the order in which to unplug the boards.

INCORRECT ANALOG POWER SUPPLY VOLTAGES

Incorrect analog power supply voltages

↓

Turn the unit OFF Check the fuses. Verify the the proper Line Voltage is present. Turn the unit ON.

↓

Still wrong voltages? —NO→ All better now!

YES ↓

Turn the unit OFF. Disconnect the Jack board cable from J3 on the analog board. Turn the unit ON.

↓

Still wrong voltages? —NO→ Replace the Jack Board (see Section C).

YES ↓

Turn the unit OFF. Disconnect the Analog board cable from J10 on the digital board. Turn the unit ON.

↓

Still wrong voltages? —NO→ Replace the Analog Board (see Section B).

YES ↓

Replace the Power Supply Board (see Section D).

Figure 8 –
Incorrect Analog Power
Supply Voltages

(Incorrect digital power supply voltages)

**INCORRECT DIGITAL
POWER SUPPLY VOLTAGES**

Turn the unit OFF Check the fuses. Verify that the
proper Line Voltage is present. Turn the unit ON.

Still wrong voltages? ──NO──► (All better now!)

YES

Turn the unit OFF. Disconnect the 20-pin keyboard
cable from J4 of the digital board. Turn the unit ON.

Still wrong voltages? ──NO──► Replace the TS-10 Keyboard
(Section E) or TS-12 Keyboard
Processor Board (Section N).

YES

Turn the unit OFF. Disconnect the 3-wire disk drive
power cable from the disk drive. Turn the unit ON.

Still wrong voltages? ──NO──► Replace the Disk Drive
(see Section G).

YES

Turn the unit OFF. Disconnect the 6-pin cable between the
power supply and the keypad/display board. Turn the unit ON.

Still wrong voltages? ──NO──► Replace the Keypad/Display
Board (see Section F).

YES

Turn the unit OFF. If present, disconnect the SCSI
cable from J9 of the digital board. Turn the unit ON.

Still wrong voltages? ──NO──► Replace the SCSI
Board (see Section M).

YES

Turn the unit OFF. Disconnect the power supply cable
from J5 on the digital board. Turn the unit ON.

Still wrong voltages? ──NO──► Replace the Digital Board
(see Section A).

YES

(Replace the Power Supply Board (see Section D).)

Figure 9 –
Incorrect Digital Power
Supply Voltages

Using Self-test Mode to Diagnose the Keypad/Display Board
When the keypad/display is receiving power from the power supply but is not in proper communication with the digital board, the keypad/display 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.

1. **If the sign-on message appears but the unit doesn't respond to button presses,** perform the system reset sequence as described on p. 4.
2. **If the unit is in self-test mode but the display does not respond according to the following chart,** the problem is most likely in the keypad/display board. If certain buttons do not function properly during normal operation, test them while the unit is in self-test mode. If the same buttons function properly in self-test mode, then the problem is most likely scrambled software (the unit will need to be reinitialized as outlined on p. 4).

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:

On the digital board, jumper the minus (-) side of C105 (located near J5, the power connector) to the side of R27 (by J3) closest to the edge of the board. 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:

DISPLAY SELF-TEST CHART

Press:	Display Reads:	Press:	Display Reads:
Up arrow	(enter normal mode)	Replace Track Sound	space
Down arrow	(enter flashing underscore mode)	1-6	up arrow
Seqs•Songs	3	7-12	*
Presets	4	System	7.
Sounds	5	Storage (Disk)	7
BankSet	6	MIDI Control	(backup cursor)
0	?	Edit Song	Ø
1	<	Edit Sequence	8
2	(enter flashing mode)	Edit Track	(clear screen)
3	(advance cursor)	Click	1
4	(erase underscore at cursor)	Sequencer Control	9
5	(erase underscore at cursor+adv. cursor)	Locate	(clear line 1)
6	(erase underscore 7 characters)	Record	2
7	(erase underscore 8 characters)	Stop/Cont	(enter flashing mode)
8	space	Play	(clear line 2)
9	space	LFO	(underscore 5 characters)
Soft button #1	(underscore at cursor)	Env 1	$
Soft button #2	(erase underscore 5 characters)	Env 2	space
Soft button #3	+	Env 3	space
Soft button #4	(underscore at cursor + adv. cursor)	Pitch	(underscore 6 characters)
Soft button #5	(erase underscore 6 characters)	Pitch/Mods	'
Soft button #6	space	Filters	space
Mix/Pan	space	Output	space
Attack/Release	space	Wave	(underscore 7 characters)
Brightness/Timbre	9.	Mod/Mixer	=
Key Zone/Velocity	space	Program Control	space
Tuning	space	Program Effects	space
Controllers On/Off	down arrow	Select Voice	(underscore 8 characters)
Performance Options	space	Copy	8.
Track/MIDI	>	Write Program	space
Track/Effects	space	Compare	space

NOTE: Loading a Version 2 demo into a version 1 TS-10 can cause it to have a blank display. Reset the unit (turn on and off 7 times), and see Operation System Versions, p. 1.

TROUBLESHOOTING A TS WITH A BLANK OR FROZEN DISPLAY

BLANK OR FROZEN DISPLAY

Peform the reset sequence or hard reset, see p. 4.

OK? — YES → All better now!

NO

Are all wire harness connections making good contact? — NO → Repair and retest

YES

Any fuses blown? — YES → Are F2 and F3 blown? — YES → Check keyboard ribbon cable for improper connection.

NO → (back to Repair and retest)

NO

Turn unit OFF. Disconnect 7-pin display cable from the digital board. Turn unit ON.

Is the display in self-test mode? — NO → Are the display voltages correct (J4 on the power supply)? — YES → Replace the keypad/display board (see Section F).

YES

Replace the digital board (see Section A).

NO

Test the power supply unloaded. Go to the Incorrect Power Supply Voltages flow charts.

Figure 10 –
TS with a Blank or Frozen Display

The TS-10 Poly-Key™ Pressure Keyboard and the TS-12 Keyboard Processor Board
The Poly-Key Pressure Keyboard on the TS-10 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 digital board is processed through the keyboard/keyboard processor board. What might appear to be a frozen display, therefore, could be a bad keyboard. For more troubleshooting hints, see Communications Path.

The 20-pin Keyboard Ribbon Cable
When reconnecting this cable to the digital 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 **F2 and F3** on the power supply will blow. **NOTE:** If one fuse blows, the other will blow also; you must replace both.

TS Foot Switches
If one or both of the foot switches do not operate properly, make sure that the foot switches are set to the proper mode (press **System** until the display shows FOOT-SW).

The default state is a single pedal foot switch (like the SW-2 or SW-6) or the right pedal of a dual foot switch (piano-type, like the SW-5 or SW-10) plugged into the Foot Switch 1 jack acting as a Sustain pedal. Either foot switch type plugged into the Foot Switch 2 jack will not have any effect unless you set it to something on the System page.

On the System page all four foot switch inputs (two dual inputs) can be set to one of the following selections: UNUSED; SUSTAIN; SOSTENUTO; PATCH-R; PATCH-L; FX-SW-MOD; PRESET-UP; PRESET-DN; PLAY/STOP; STOP/CONT; STEP-REC; or SONG-STEP.

Foot Switch 1 Jack
Although this foot switch jack is mounted on the jack board, the foot switch signals go to the keyboard, where they are sensed by the keyboard microprocessor.

Foot Switch 2 Jack
Make sure that this input is programmed to do something on the System page. The parameters for this jack are Foot-SW2-L and Foot-SW2-R. Unlike Foot Switch 1, the Foot Switch 2 signals go directly to the digital board to be sensed.

IMPORTANT!
If the customer is using a single foot switch (SW-2 or SW-6) in either of the TS Foot Switch jacks, the FOOT-SW-1-L and/or FOOT-SW-2-L values on the System page should always be set to UNUSED. This will prevent note drones. The foot switch jacks are optimized for use with a dual foot switch (SW-5 or SW-10), and when a single foot switch is connected it behaves like the RIGHT foot switch. For more information, see page 13 of the *TS-10 Musician's Manual* or page 18 or the *TS-12 Musician's Manual*.

TROUBLESHOOTING A TS WITH A FOOT SWITCH PROBLEM

Foot Switch problem

Plug foot switch into the Foot Switch 1 jack.

Is Foot Switch 1 set to the proper mode on the System page?

NO → Set the foot switches to the desired mode. → All better now!

YES

Press **System**. Set foot switch 1 to act as Patch Select buttons.

Press **Select Voice**. Pressing the foot switch should cause the appropriate patch indicator to change in the leftmost two characters of the display.

Is it working properly? — YES

NO

Plug the foot switch into the Foot Switch 2 jack. Press **System**. Set foot switch 2 to act as Patch Select buttons.

Press **Select Voice**. Pressing the foot switch should cause the appropriate patch indicator to change in the leftmost two characters of the display.

Is it working properly? — NO → Replace the digital board (see Section A).

YES

Set the foot switches to the desired mode.

Replace the TS-10 keyboard (Section C) or TS-12 Keyboard Processor board (Section N).

Figure 11 –
Foot Switch Problem

TS-12 KEYBOARD

The TS-12 uses the same keyboard as the KS-32 that has "bubble" switches. Instead of mechanical switches, this keyboard has a molded rubber bubble under each key. The keyboard circuit board has conductive carbon contacts printed on it (which appear as small black strips under each key). Each rubber bubble also has small conductive carbon dots printed on the inside. The bubbles are made in strips which attach to the circuit board using small nubs. The nubs on a strip are pushed through holes in the circuit board, in order to hold the strip in place.

As a key is pressed, it forces the bubble down until the carbon dots on the bubble hit the carbon contacts on the circuit board. This completes the circuit. The circuit has two contacts per key, a back contact and a front contact. The back contact closes first when a key is pressed, then the front contact closes. We measure the amount of time between when the back contact closes and when the front contact closes. This tells us how fast the key was hit, making the keyboard "velocity-sensitive." In other words, we can tell how hard the musician is playing and can adjust the volume and brightness of the sound in response to the playing style. Each bubble switch also has a diode in series with it for proper circuit operation.

Although bubble switches are more reliable than mechanical switches, there are many things that can go wrong with this keyboard. If the bubble switches don't switch in the proper order (first the back contact, then the front contact) or if the switches don't make clean contact, several problems can occur. These include:

- Keys that don't sound at all
- Erratic keys that "chatter" as they are played, held or released
- Keys that sound much louder than other keys
- Keys that sound much quieter that other keys

These problems can be caused by several things, including:
- Open or shorted traces on the circuit boards
- Bad or dirty carbon contacts on the circuit boards
- Bad or dirty carbon contacts on the bubbles
- Torn or otherwise damaged bubbles
- Bubble strips that are installed backward
- Interference between the key and the bubble (such as foreign material trapped between the key and the bubble)
- Improper alignment between the key and the bubble
- Bad diodes

Usually failures will fall into two categories; either one key is bad, or a group of keys is bad. If a group of keys is bad, all the keys may be grouped together (usually a group of eight) or they may be spread across the keyboard (usually every eighth key).

If keys fail in a group of eight or every eighth key fails, the problem is most likely an open or shorted trace on the circuit board or a problem with the keyboard processor board (that is mounted to the bottom of the keyboard). Check this first and repair as shown on the following two pages.

If only one key is bad (or if groups of keys are bad but not in groups of eight or every eighth key), the problem could be any of the above. The first thing to do is remove the key and see if there is anything obviously wrong with the bubble:

- **Look for damage to the bubble itself.**
  If the bubble is damaged, the circuit board must be removed so the strip can be replaced.
- **Check that the bubble strip is seated flat against the circuit board.**
  If the strip is improperly seated, use an appropriate tool (a straightened paper clip works well; don't use a sharp tool as it can puncture the rubber strip) to force the nubs on the strip into the holes on the circuit board. The strip should lay flat against the circuit board.
- **Check that the bubble isn't backward. If installed correctly, the deeper of the two bubble contacts should be at the rear of the keyboard.**
  If the strip is in backward, remove the circuit board, pull the strip off the circuit board, turn it around and reinstall it.
- **Remove any foreign material caught between the bubble and the key.**
- **See if the plunger on the key makes proper contact with the top of the bubble.**
  If the plunger on the key forces the bubble down unevenly (with one side of the bubble being much higher than the other side), loosen the screws that hold the circuit board in place and slide the circuit board over slightly to better align the key and the bubble, then retighten the screws.
- **Check that both diodes for that key are inserted properly (the banded end of all diodes should face the same way).**
  If a diode is in backward, the circuit board must be removed and the diode must be unsoldered, reversed and resoldered.
- **Check that both diodes for that key are working properly.**
  Select the "diode check" setting on an ohmmeter and test the diodes. The diode should conduct when the negative (black) lead of the ohmmeter is on the cathode (banded) end of the diode and the positive (red) lead of the ohmmeter is on the anode (unbanded) end of the diode. The diode should not conduct when the negative (black) lead of the ohmmeter is on the anode (unbanded) end of the diode and the positive (red) lead of the ohmmeter is on the cathode (banded) end of the diode. If a diode is bad, replace it with a 1N914B diode.

If there is no obvious problem, remove the circuit board:
- **Examine the circuit board for short circuits.**
  These are usually caused by solder bridging. Touch up any shorts with a soldering iron and/or razor knife.
- **Look for open traces.**
  These usually occur at the break-away points along the edge of the board and near the connectors. Solder a wire jumper in place to fix any broken connections.
- **Remove the bubble strip and clean both the circuit board contacts and the bubble contacts with alcohol and a cotton swab.**
  Allow them to air dry before putting the bubbles back on the circuit board.

If after all this the keyboard still doesn't work properly, replace the circuit board and bubbles with a new board assembly.

TS-12 Keys that don't sound, or
Erratic keys that "chatter" as they are played, held or released, or
Keys that sound much louder than other keys, or
Keys that sound much quieter than other keys.

Is it every 8th key or a group of 8 keys? —— Yes ——▶ Replace the TS-12 Keyboard (see Section E).

No

Remove the Key Contact PC Boards. See Section O.

Look for damage to the bubble for the bad key.

Check that the bubble strip is seated flat against the circuit board.

Remove any foreign material caught between the bubble and the key.

See if the plunger on the key makes proper contact with the top of the bubble.

Clean contacts on bubbles and circuit board with alcohol and cotton swabs.

Check that both diodes for that key are working properly.

Fixed? —— Yes ——▶ All better now!
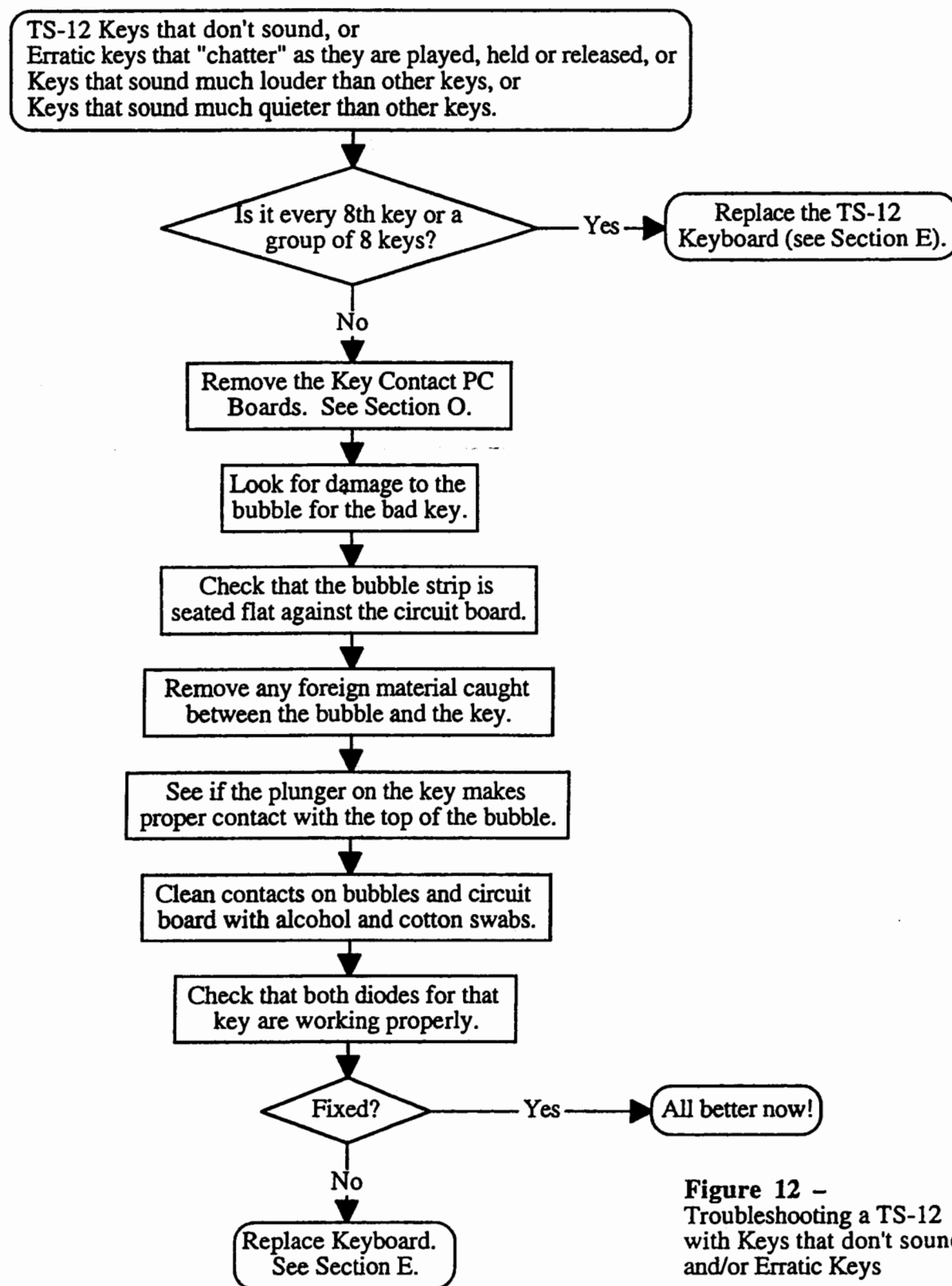
No

Replace Keyboard. See Section E.

Figure 12 –
Troubleshooting a TS-12
with Keys that don't sound
and/or Erratic Keys

The TS-12 keyboard, like the KS-32 and SQ-2, has mono pressure response. This allows a modulation effect to increase as you press harder on a key. Pressing harder on any key will affect all other keys. To produce mono pressure, two pressure sensitive strips are inside the keyboard assembly. Pressing on a key exerts a downward pressure on the strips. Two strips are used because of the large 76-note span. The signals from the two strips are combined by the mono pressure circuit that resides on the keyboard processor board that is mounted to the bottom of the 76-note keyboard near the wheel assembly. A 20-pin cable carries the combined signal over to the digital board. Note that it is normal for pressure response to vary depending on the number of keys being pressed.
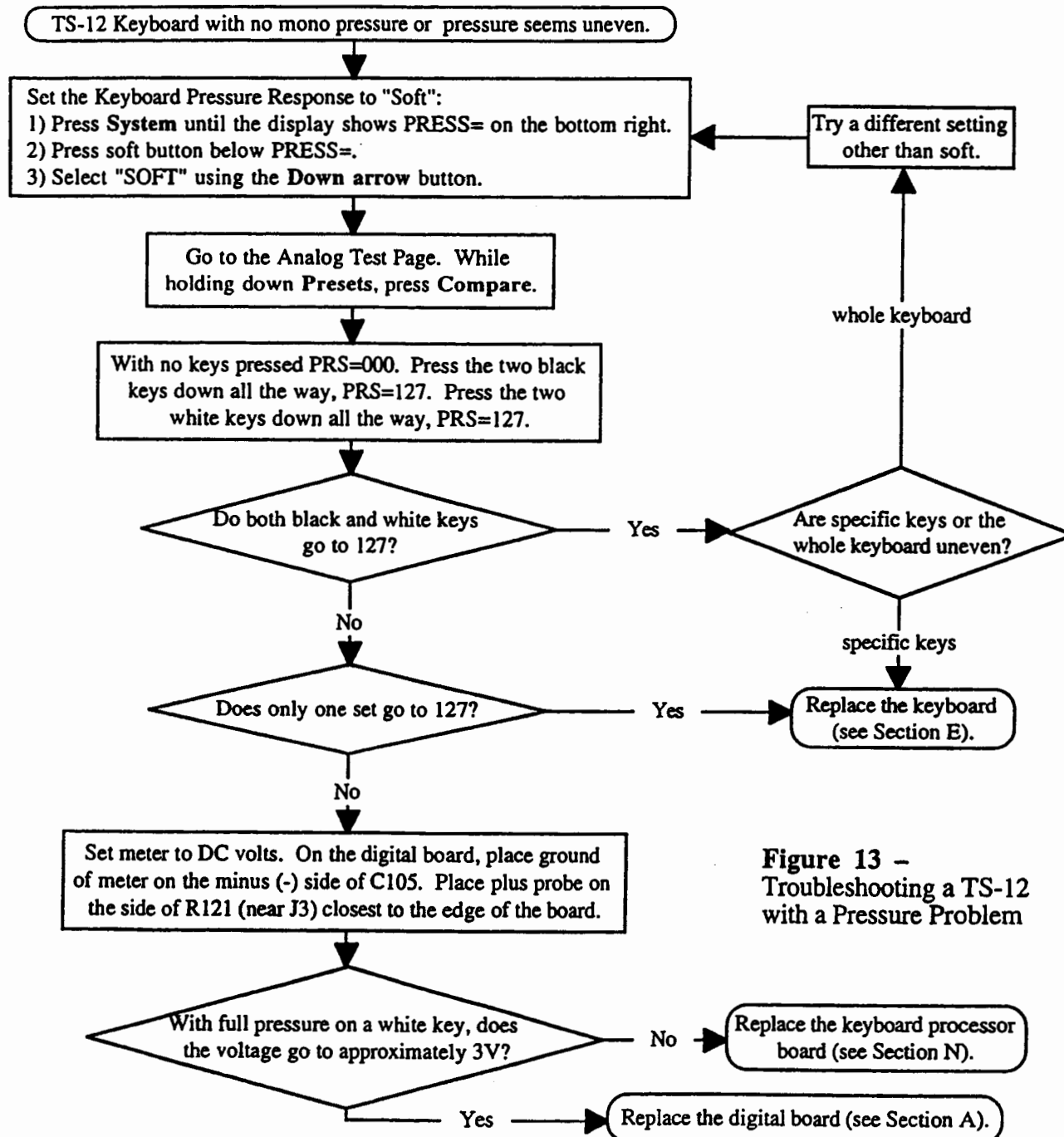
```
┌────────────────────────────────────────────────────────────┐
│ TS-12 Keyboard with no mono pressure or  pressure seems uneven. │
└────────────────────────────────────────────────────────────┘
                              │
                              ▼
┌──────────────────────────────────────────────────────┐       ┌──────────────────────┐
│ Set the Keyboard Pressure Response to "Soft":        │◄──────│ Try a different setting │
│ 1) Press System until the display shows PRESS= on    │       │   other than soft.      │
│    the bottom right.                                 │       └──────────────────────┘
│ 2) Press soft button below PRESS=.                   │                 ▲
│ 3) Select "SOFT" using the Down arrow button.        │                 │
└──────────────────────────────────────────────────────┘                 │
                              │                              whole keyboard
                              ▼                                           │
        ┌────────────────────────────────────┐                           │
        │ Go to the Analog Test Page.  While │                           │
        │ holding down Presets, press Compare.│                          │
        └────────────────────────────────────┘                          │
                              │                                           │
                              ▼                                           │
    ┌───────────────────────────────────────────┐                        │
    │ With no keys pressed PRS=000.  Press the   │                        │
    │ two black keys down all the way, PRS=127.  │          ┌─────────────────────────┐
    │ Press the two white keys down all the way, │          │ Are specific keys or the│
    │ PRS=127.                                   │          │ whole keyboard uneven?  │
    └───────────────────────────────────────────┘          └─────────────────────────┘
                              │                      Yes ───►       ▲         │
                              ▼                                     │    specific keys
        ╱─────────────────────────────╲  ──── Yes ──────────────────┘         │
        ╲ Do both black and white keys ╱                                       ▼
        ╱      go to 127?             ╲                         ┌─────────────────────────┐
        ╲─────────────────────────────╱                         │ Replace the keyboard    │
                              │                                  │ (see Section E).        │
                             No                                 └─────────────────────────┘
                              ▼
        ╱─────────────────────────────╲
        ╲ Does only one set go to 127? ╱ ──── Yes ───────────►
        ╱─────────────────────────────╲
                              │
                             No
                              ▼
┌──────────────────────────────────────────────────────┐
│ Set meter to DC volts.  On the digital board, place  │
│ ground of meter on the minus (-) side of C105.  Place│
│ plus probe on the side of R121 (near J3) closest to  │
│ the edge of the board.                               │
└──────────────────────────────────────────────────────┘
                              │
                              ▼
        ╱─────────────────────────────╲
        ╲ With full pressure on a white ╱ ── No ──►  ┌──────────────────────────┐
        ╱ key, does the voltage go to   ╲            │ Replace the keyboard     │
        ╲ approximately 3V?            ╱             │ processor board          │
        ╱─────────────────────────────╲             │ (see Section N).         │
                              │                      └──────────────────────────┘
                             Yes ────────────►  ┌────────────────────────────────────┐
                                                │ Replace the digital board          │
                                                │ (see Section A).                   │
                                                └────────────────────────────────────┘
```

Figure 13 –
Troubleshooting a TS-12
with a Pressure Problem

Battery Cautions

In order to comply with safety agency requirements, translations of the warning on the battery label inside the TS are listed here.

English   CAUTION!
           Danger of explosion if battery is incorrectly replaced. Replace only with the same or equivalent type recommended by the equipment manufacturer. Discard used batteries according to manufacturer's instructions.

Denmark   ADVARSEL!
           Litiumbatteri - Eksplosionsfare ved fejlagtig handtering. Udskiftning ma kun ske med batteri af samme farbrikar og type. Lever det brugte batteri tilbage til leverandøren.

Finland   VAROITUS!
           Paristo voi räjähtää, jos se on virheellisesu asennettu. Vaihda paristo ainoastaan laitevalmistajan suosittelemaan tyyppin. Hävitä käytetty paristo valmistajan ohjeiden mukaisesti.

Sweden   VARNING!
           Explosionsfara vid felaktig batteribyte. Använd samma batterityp eller en ekvivalent typ som rekommenderas av apparattillverkaren. Kassera använt batteri enligt fabrikantens instruksjon.

LOW BATTERY MESSAGE

A number of things could cause this message to appear when the unit is powered up:

WARNING - - LOW BATTERY VOLTAGE
SAVE DATA - SEE USER MANUAL *CONTINUE*

Sometimes the unit in question can wake up in a state of mild confusion and this message might appear. Go to the Analog Test Page (while holding **Presets**, press **Compare**). The value next to BAT should read less than 010. If this is the case, it usually indicates that the system is confused and you should reinitialize (see p. 3), and check it again. See the following flowchart (Figure 14 - Low Battery Message).

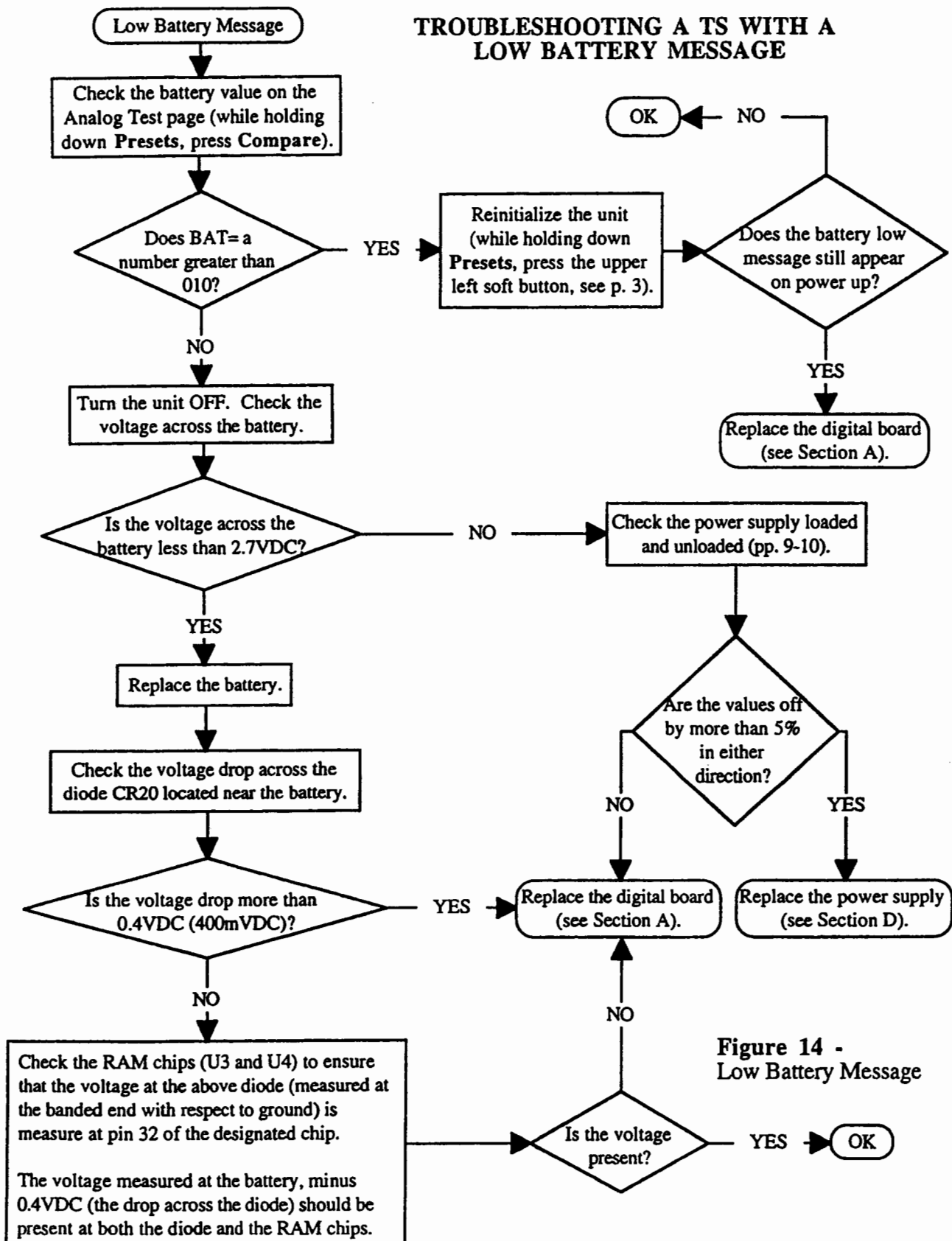## TROUBLESHOOTING A TS WITH A LOW BATTERY MESSAGE

(Low Battery Message)

↓

Check the battery value on the Analog Test page (while holding down **Presets**, press **Compare**).

↓

Does BAT= a number greater than 010?

→ YES →

Reinitialize the unit (while holding down **Presets**, press the upper left soft button, see p. 3).

→

Does the battery low message still appear on power up?

NO → (OK)

YES ↓

(Replace the digital board (see Section A).)

↓ NO

Turn the unit OFF. Check the voltage across the battery.

↓

Is the voltage across the battery less than 2.7VDC?

→ NO →

Check the power supply loaded and unloaded (pp. 9-10).

↓ YES

Replace the battery.

↓

Check the voltage drop across the diode CR20 located near the battery.

↓

Is the voltage drop more than 0.4VDC (400mVDC)?

→ YES →

Are the values off by more than 5% in either direction?

NO ↓ / YES ↓

(Replace the digital board (see Section A).)   (Replace the power supply (see Section D).)

↓ NO

Check the RAM chips (U3 and U4) to ensure that the voltage at the above diode (measured at the banded end with respect to ground) is measure at pin 32 of the designated chip.

The voltage measured at the battery, minus 0.4VDC (the drop across the diode) should be present at both the diode and the RAM chips.

→

Is the voltage present?

NO ↑ (to Replace the digital board)

YES → (OK)

Figure 14 -
Low Battery Message

TS 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.

Software Messages

The following error messages could be caused by software:

ID #	Description	ID #	Description
16	poly or mono pressure events sent to VC	131	illegal instruction
17	unexpected OTTO interrupt	132	chk instruction
20	unknown button event	133	trapv instruction
21	bad track number	134	privilege violation
22	illegal BankSet number	135	trace
23	illegal SBIN number	137	line 1111 emulator
48	parameter error	138	spurious interrupt
49	layer error	139	unused vector
50	EPS parameter type error	170	task stack corrupted error
56	DRAM allocation error	192	sequencer data bank load error
60	unknown DOS status error	193	sequencer key up playback error
80	bad buffer to MIDI	194	sequencer out of SDBs error
128	bus error	195	sequencer track data error
129	odd address error	196	sequencer controller event error
130	divide by zero		

Digital Board Problems

The following unexpected event messages could be caused by a problem on the digital board:

ID	Description	ID	Description
32	bad microcode download	40	bad ESP error during burn-in
33	bad ESP chip	138	spurious interrupt
34	bad ESP DRAM	145	unknown DUART interrupt error
35	microcode table download error		

MIDI or Digital 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

To Check the TS Software Version:
- While holding down **Presets**, press **System**.
- The TS-10 display briefly shows ENSONIQ TS-10 SOFTWARE ROM V X.XX KPC YYY
- The TS-12 display briefly shows ENSONIQ TS-12 SOFTWARE ROM V X.XX

TS SOFTWARE NOTES

TS-10 Version 1.02 (released 16 APR 93)

This release contains fixes for problems that have been discovered since the version 1.00A.

MIDI
- MIDI BANK SELECT TRANSMISSION — Fixed a bug that caused the Bank Select message (always sent along with MIDI Program Changes) to have the bank number in the MSB (controller 0) instead of the LSB (controller 32) when SEND=BASE on the MIDI Control page.

SEQUENCER
- RECORDING CHANNEL PRESSURE EVENTS — This release corrected a problem that caused Channel Pressure events to be recorded incorrectly (they were transformed into LFO Rate events).
- UNDEFINED TRACKS LAYERED IN NEW SEQUENCES — It is no longer possible to create a new sequence and find UNDEFINED tracks layered with track 1.

VOICE
- SELECTING PROGRAMS WHILE PLAYING KEYS — This release prevents a crash that could occur if programs with voice delay are played while selecting other programs. The temporary fix prevents the crash, and a complete fix will be available in a later release.

MISCELLANEOUS
- COPY WAVELIST — In this release, the copy button is ignored when the copy context is Wave List (i.e. from the Wave List editor pages) instead of presenting an invalid Copy page. This fix is temporary and will remain only until the Copy function is changed to support Wave Lists.

TS-10 Version 1.10 (released 3 MAY 93)

This release contains new features and fixes for problems that have been discovered since the version 1.02 release. Note that * indicates a new feature added in this release.

MIDI:
- MIDI PROGRAM CHANGE NUMBER DISPLAY — The display of MIDI Program Change numbers has been modified to show 0 to 127 instead of 1 to 128. This change was mede to correspond to documentation changes made to the manual and to eliminate confusion.
- * MIDI PROGRAM CHANGE HANDLING — The MIDI program change handling mechanism was updated to correspond to the functionality documented in the manual. The displayed track program and bank numbers are updated in response to valid MIDI messages. Another bug was fixed that caused incorrect handling of program changes in OMNI/POLY/MONO A modes when sequencer tracks were selected.
- * CONTROLLER HANDLING — Inbound Attack, Brightness, Rate and XCTRL track controllers are now recognized and handled as Timbre&Release were previously.
- XCTRL HANDLING — If XCTRL is set to one of the locally recognized controller numbers, they will override the assigned XCTRL function inbound. Outbound XCTRL events will continue to be transmitted as controllers with the assigned XCTRL number.

SEQUENCER:
- * EDIT TRACKS SWITCH — The setting of this switch is now saved with individual Songs and will be restored when the song is selected.
- * EVENT EDITOR "B" SUFFIX — The Program Changes/Bank Select data in the Event Editor is now followed with a "B" suffix to indicated that the second field is the Bank value (as per the manual).
- ILLEGAL BANK SELECTS — Fixed a bug that caused Program Change events with out of range Bank Select values to cause a system error. These events will now be ignored by the local track and are still transmitted via MIDI.

VOICE:
- SUSTAINING VOICES AFTER RELEASING KEYS — Voices that are no longer active are now silenced completely instead of being allowed to continue at a low level as in previous versions.
- TRACK DETUNE FOR SAMPLED SOUNDS — The Detune track parameter will now affect Sampled Sounds. Previously it did not.

MISCELLANEOUS:
- * BANKSET BUTTON — Pressing the BankSet button will now always display the *next* bank set of programs or presets. The "direct-dial" function is also always active. In earlier releases, BankSet functions were sometime inactive.
- * COPY WAVELIST — In this release, the Copy function is available when the copy context is WaveList (i.e. from the Wave List editor pages). In addition, it is no longer possible to recall Wave-List or Drum-Map data into a program not having the required option enabled.

- COPY DISK AFTER SYSEX RECORDER — A bug was corrected that could cause problems in the Copy Disk function after the SysEx recorder was used.
- NEW PROGRAMS AND PRESETS — The ROM programs have been tweaked and the ROM presets have been modified and completely reorganized.
- NEW EFFECT VARIATIONS — The ROM effect variations have been tweaked and improved.
* 6-PROGRAM FILE TYPE CHANGES — It is now possible to save 6-PROGRAM files from the USER 1 RAM bankset. New setting were added tot he Save and Load pages to allow setting the source/destination bank from U0-0 to U1-9.

TS-10 Version 1.12 (released 4 JUNE 93)

This release contains fixes for problems that have been discovered since the version 1.10 release.

MIDI:
- EFFECT CONTROLLERS — Fixed bug that had broken inbound MIDI modulation of effects.
- MIDI PROGRAM CHANGE HANDLING — Make sure that the most recently displayed program or preset bank determines the BankSet for MIDI Program Changes received without Bank Select Controllers.
- MIDI VOLUME CONTROLLER TRANSMISSION — A very minor change was made to prevent MIDI Volume messages from being transmitted with offset values higher by one than the displayed Mix page values.

SEQUENCER:
- SAMPLES SOUNDS IN SONGS — Fixed problem in Song mode where track parameters could become corrupted when changing to the next song step if the new step's sequence contained Sampled Sounds on any of its tracks.
- LOCKUP DURING COUNTOFF — Fixed bug that could cause system to lockup when STOP was pressed during countoff with MIDI active status on more than one track.
- SELECTING SEQS AND SONGS — In Song mode, the system does not allow sequences or songs to be selected from the sequencer bank pages unless the sequencer is stopped (a warning is displayed). In any of the record modes, neither sequences nor songs may now be selected (the attempted select is ignored).
- CHANGING TRACKS IN RECORD — It is no longer possible to change the primary selected sequence or song track while in record mode.
- CREATING SEQUENCES — Install default MIDI bank and program numbers (that agree with the default program) on track 1 after creating new sequence or song.
- FILTERING PITCHBEND EVENTS — In previous releases it was not possible to use the track filter to remove pitch bend events from a recorded track. This problem has been fixed and the change may also fix potential problems encountered with other event types.

MISCELLANEOUS:
- DISPLAYING TRACK PROGRAM LOCATION — A change was made to correctly display the BankSet and bank number for Sampled Sounds assigned to tracks. Previously the display always showed S8-0 or S9-0 instead of the correct bank location.

DISK:
- The DISK COMMAND COMPLETED message is suppressed after loading subdirectories and after loading Sample Edit files.
- Do NOT reset Sampled Sound Size or Path flag at cold reset or after loading SBIN Bank file.
- Add warning when loading Sample Bank file that all sampled sound RAM will be lost.
- EXIT from Sampled Sound bank select page (during Load procedure) now returns to Load page.
- Update the Load page when disk is changed to prevent incorrect file type.
- Make sure a valid SAMPLEDSOUND or 1-SEQ file is selected when *YES* is pressed on Load page. Show warning message if YES is pressed with *NO-FILES* selected.
- Select directory file type on the Load page if no Sampled Sound files exist in the newly loaded directory.

SOUNDS:
- REVISED PROGRAM CATEGORIES — A number of programs in each of the RAM and ROM BankSets had invalid category settings (Program TYPE) and were revised.
- CLICKS REMOVED — Two programs were slightly modified to eliminate clicks (INDIAN_PERC in BankSet R3 and MULTI-BASS in BankSets R4 and U0).

TS-10 Version 1.14 (released 16 JUNE 93)

This release contains fixes for problems that have been discovered since the version 1.12 release.

DISK:
- DISK FILE LOADING — A problem was created in the version 1.12 release that could interfere with the loading of disk files. This problem has been fixed.
- NOT ENOUGH FILES — A problem was fixed that caused the maximum number of files of a TS-10 disk to be limited to 39 instead of 78 if an EPS/ASR disk had been loaded once since power on.
- COMPUTER FORMATE DISKS — A change was made to allow the TS to recognize diskettes with the "computer" format. Earlier versions do not recognize this format.

SEQUENCER:
- SELECTING SEQS AND SONGS — Pressing soft buttons while the SEQUENCER MUST BE STOPPED message was on the display after selecting a sequence or song could cause a system error or lockup. This problem has been fixed.

- DISPLAYING TRACK PROGRAM LOCATION — A change was made to display the BankSet and bank number for undefined sequencer tracks as "****".

SOUNDS:
- DISTORTION REMOVED — The ROM program SOLO VIOLIN in BankSet R4 was slightly modified to eliminate distortion.

TEST:
- DRAM TEST — A new quick DRAM test was added to the AAT Sys-Ex test system to verify OTTO as well as processor DRAM addressing.
- ROM INDEPENDENCE — Changes were made to allow the burn-in disk to be independent of the OS ROM version (after 1.14).

TS-10 Version 1.20 (released 12 JULY 93)

This release contains fixes for problems that have been discovered since the version 1.14 release. Note that * indicates a new feature added in this release.

GENERAL SYSTEM:
- * WAKE UP WITH PRESET SELECTED — The system will now always power up (after reset) with the first preset in bank U0-0 selected. In addition, the program bank displayed if the Sounds button is pressed is also always reset to U0-0. These changes are intended to make product demonstration easier and more consistent.
- * PRESET BANK PAGE IDENTIFIER — All preset bank pages are now identified with PSET in the lower left corner of the display.
- * SURROGATE TRACK NAME — The track name pages will now show *SURROGATE* for tracks with muted or not-loaded Sampled Sounds assigned.

DISK:
- 6 PROGRAM TYPE FILE LOADING — A problem has been fixed that caused 6 Program files saved from banks U1-6 through U1-9 to lose their source bank information when they were reloaded.
- APPLYING SAMPLE-EDITS TO DIFFERENT FILES — A problem was fixed that could cause a crash when trying to load a different sampled sound during the loading of a sample edit file. Certain wavesample-specific data is now not applied if the wave samples are different. Also, the system will show a new message when sample edits are applied to confirm the action and clarity the subsequent redisplay of the Load page as the end of the process.

SEQUENCER
- HANGING NOTES — A bug was fixed that caused sequencer tracks whose status has MIDI transmission enabled to lose key up events causing notes to sustain during playback.
- LOCATING IN EMPTY SONGS — The system now checks to make sure the current song has at least 1 step defined before allowing the Song Locate GOTO subpage to be displayed. A warning message is displayed.if GOTO is pressed and the song has no steps defined. This problem previously could cause a system error.
- RECORDING MIXDOWN PAN EVENTS — A problem was fixed that caused the sequencer to record mixdown pan events with negative values as volume events and to sometimes play pan events back incorrectly.
- PROGRAM DISPLAY IN SONG MODE — A change was made to ensure that the correct song track information is always displayed and is not confused with song step sequence track information.
- REPLACE PROGRAM WITH EFFECTS — Using the Replace Program with FX function while in record will now save a program change in the track that will load a new effect when played back.
- COPYING TRACK TO AND WITHIN A SONG — A problem was fixed that could cause a system error when copying a track into a song or from one track to another within a song.
- TROUBLE AFTER USING SYSEX RECORDER — Attempting some sequencer operations cause a system error or a corrupted display. The system will now show the confirmation message "Sequencer Memory Reset" before displaying the sequence bank page in response to the first sequencer-related button pressed after using the SysEx recorder. Two important features will not work normally until the confirmation message has been displayed: 1) the sequencer transport buttons will be ignore and 2) the track pages will NOT have the sequencer status displayed in the lower left corner and changes to sequencer tracks will not be savable. Additionally, loading SysEx Recorder files that were small enough to fit into memory without requiring all seq data to be erased would corrupt part of the sequencer data in memory. This problem has also been fixed.
- TEMPO CORRUPTION AFTER AUDITION — Entering Audition mode while editing track parameters using up and down arrow buttons could cause the tempo parameter on the subsequently displayed Locate page to automatically "race" toward either extreme value if the buttons happened to be held down at just the wrong moment. This problem has been fixed.
- MUTED TRACKS AFTER MULTI-TRACK RECORD — In previous releases, after recording incoming MIDI data using multi-track record, all tracks other than track 1 were usually muted and the MIDI Bank data may have been forced to 01. This problem has been fixed.
- 30 SEQ FILE SONG PLAY PROBLEM — In previous releases, songs within a 30-Seq/Song file reloaded to a bank other than the one it was saved from and would not play correctly. This problem has been fixed.
- EVENT EDITING TRACKS — Reentering the event editor from the Audition page while using the EVENT-LIST command could cause a later system error upon exiting. This problem has been fixed.
- INVALID SONG TRACK PROGRAM CHANGES — In previous releases, when sequence track program changes were played back, the song track in the corresponding location also changed to the same program, although there was no program change on the song track. This happened only when viewing the song tracks and not when viewing the seq tracks. This problem has been fixed.

- NOTES MISSING WHEN CHAINING SEQUENCES — Manually chaining sequences could cause some notes to drop out on the downbeat as the sequences switched from one to the other. This did not happen if you played the sequences from within a song. This problem has been fixed.
- CHANGES FOR TEMPO TRACK COMPATIBILITY — In anticipation of the upcoming Tempo Track feature, a few changes were made to make tempo events harmless when played back by non-tempo track OS versions. In previous releases, if tempo track events were played back, a system error would immediately occur. The track MIDI status should show *-TEMPO-* for Song Track 12 if tempo track data is present in the current song.

SOUNDS:
- REVISED PROGRAMS AND PRESETS — The ROM and RAM programs and presets have been revised. The programs received adjustments for greater volume consistency, some names have been changed for clarity, and one program has been replaced. The presets have been reordered, renamed, adjusted, and in some case reprogrammed (refer to TS-10 Software Update 1.20 Sheet, p/n 9311005401, for more information).

TEST:
- DRAM ADDRESSING TEST — Fixed bug in processor DRAM read test that was always returning an error and modified DRAM test to perform all test components and return individual status for each part. Additional OTTO wave ROM test components and code to return individual status for each part were also added.

TS-10 Version 2.01 (released 28 OCT 93)

This release contains fixes for over 250 software problem reports (SPRs) that have been discovered since the version 1.20 release. The TSD-200 disk has been updated with revised ROM and RAM programs and presets, and must be included with 2.01 equipped units because the backup files on the disk need to reflect the actual contents of the ROM banksets. The TS-10 Software Update for Version 2.0 addendum (part number 93110005501) contains detailed descriptions of the significant new features. Note that * indicates a new feature added in this release.

* New WAKE-UP MODE Parameter
* New System Page Parameters: New ROM System Pitch-Table (Turkish-A); New Track MIDI Status Setting (MIDI-LOOP); Recording into the Sequencer in a MIDI Loop.
* New Sampled Sound Items: Sampled Sound Bank pages; Sampled Sound OPTIONS page; Erasing All Sampled Sound Data From Memory; Loading a Sampled Sound into an Occupied Sampled Sound Bank; Lack of Memory Message
* Sample-Bank File Items: Updating Sample-Banks Files Saved with Software Earlier than Version 2.0; Saving a Sample-Banks File; Saving Sample-Banks along with a 60 SEQ/SONGS File; Loading 60 SEQ/SONGS Files that Contain Programs and/or Sample Banks; Auto-Loading Sampled Sounds.
* Version 2.01 includes read-only SCSI capability when the SP-4 SCSI Interface is installed.
* New Sequencer Functions: Sequencer Status Field; Finding the BankSet, Bank, and Display Location for Sounds on Sequencer Tracks; Sequencer Tempo Track; Tempo Track Edit Functions.
* Save Changes Parameter Function
* New SoundFinder™ Feature
* New MIDI SYS-EX Parameter Value
* SCSI read-only capability added. A TS-10 must have at least 2.01 for SCSI to be available.

TS-10/TS-12 Version 2.02 (released 2 NOV 93)

This release contains fixes for problems that have been discovered since the version 2.01 release.

STORAGE/DISK:
- SYSEX RECORDER — A problem has been fixed which caused the WAITING... status to be incorrectly displayed while the system was receiving data. In addition, all incoming messages except System Exclusives will now be ignored while the SysEx Recorder is active. Reentering the recorder immediately after exiting will no longer show SEQUENCER MEMORY RESET and jump to the Seqs/Songs bank page.
- SENDING/RECEIVING ALL SEQ DATA VIA SYSEX — A problem was corrected which caused SysEx dumps containing all sequencer data either sent from or received by the TS to generate invalid sequencer data that could cause trouble later if it could be received at all.
- RECEIVING ALL PRESET DATA VIA SYSEX — In previous releases the TS was unable to receive a dump of both banks (All) of preset data from another TS. This problem also occurred when receiving an ALL dump that contains both preset banks.

SEQUENCER:
- ERROR 192 REPLACED — If invalid sequencer data is detected after loading sequencer data from disk or SysEx, the system will no longer generate System Error 192. Instead, the sequencer memory is reset and an error message is displayed for the user.

TS-10/TS-12 Version 3.00 (released 28 FEB 94)

This release contains fixes for problems that have been discovered since the version 2.02 release. Version 3 adds General MIDI compatibility. **Updating a TS to Version 3 requires making one cut, adding one jumper, and moving one zero ohm resistor on the digital board.** A General MIDI update kit is available from ENSONIQ Customer Service.

PROGRAMMING:
- After turning a Program into a Drum Map Program, the Wave page SAMPLE-START-OFFSET and DELAY values incorrectly defaults to the values that were set in the original Program. Both should default to zero.
- If you copy the effects from a Program, and then recall them into a Preset, the Sounds and COMPARE LEDs will incorrectly light, and the Bank LEDs will reflect the current Sounds mode Bank. This should not happen.
- The following sources fail to trigger the VCF Envelope with keydowns any of the parallel FX that have the VCF: 1) Sequencer Playback of note events; 2) MIDI-In note events in MULTI and MONO-B modes; 3) Playing the live keyboard in Songs. Set VELOC to modulate VCF ENV AMT, MIN=2, MAX=12 to hear this easily.
- When saving an *-EDITED-* Preset, the name always defaults to the name of the Preset that is stored in the current location selected. It should default to the name of the Preset that was edited.
- There is a spelling mistake in one of the effect variations for 73 VAN DER POL FILTER. Variation #2 SIXTYS CURVE should be spelled SIXTIES CURVE.
- You cannot latch Pressure output with the Sostenuto Pedal on Sampled Sounds. You can latch Pressure output on Sampled Sounds with the Sustain Pedal, (and with both Sustain and Sostenuto on TS Programs) so Sostenuto should too.

STORAGE/DISK/SCSI:
- Wrong message appears after changing from an 'empty disk' to another disk. The display incorrectly shows FILE DOES NOT EXIST. It should show DISK HAS BEEN CHANGED.
- You cannot save the Prog in Bank 7, Location 6, any BankSet, to disk as a 1 Program File. You incorrectly get a SAMPLED SOUND NOT SELECTED message.
- After autoloading a 60 Seq/Song file that contains sampled sounds, loading a 2nd one that also contains sampled sounds, but answering NO to AutoLoad, fails to purge the original Sampled Sounds from RAM. The names of the Sampled Sounds from the second file appear in parentheses (as they should), but you cannot get your sample RAM back.
- Attempting to save a TS sound to disk from a specific RAM location results in a "SAMPLED SOUND NOT SELECTED" message. In any BankSet (U0, U1, R2, R3, R4), attempting to save a sound from Bank 7 / Location 6 causes the message.
- When SCSI was the last Storage Option selected, and the current SCSI DEVICE-ID is INVALID, pressing the Storage button twice (or Storage, followed by *LOAD*) incorrectly displays the DISK DRIVE NOT RESPONDING message. INVALID SCSI DEVICE STATUS should be displayed.
- Copying EPS/ASR format floppy disks (both DD and HD, Computer DD and Computer HD -- all 4 formats) on the TS misbehaves in several ways, showing incorrect error messages, and copying EPS/ASR files onto TS format disks. Some rules need to be established (only do image copy, etc.) so that the TS can be used to back-up EPS/ASR disks.
- When the SAVE CHANGES page is displayed, pressing either any Bank button, Storage, Sounds or BankSet incorrectly behaves as though *NO* was pressed.
- After Sys-Ex Recorder Mode, TS-10 can't load sequences from disks. The TS should perform the Sequencer Memory reset to erase any loaded Sys-Ex data if you scroll to a Sequencer file type on the Storage page, or if you press *EXIT* from the Sys-Ex recorder.

SEQUENCER:
- The TS incorrectly allows users to perform the "hold Presets and press button x" functions while the sequencer is running. These include Reinitialize, Erase All Seq Memory, and Soft Restart. Strangely, the Erase All Sampled Sounds function gets to the prompt page, but displays SEQUENCER MUST BE STOPPED if you answer YES or NO. These functions are now disabled unless the seq is stopped.
- Sequences lose their FX edits in first new Sequence created after reinitialization and then loading a 60 Seq/Song w/Progs file.
- When two or more tracks have been recorded, using the GOTO command (on Locate page) twice consecutively causes PATCHSEL and PRESSURE settings (on Performance Options page) to be lost! Also note the strange behavior of the sequencer status on PATCHSEL page. Other track parameters seem unaffected.
- The ACTUAL tempo value on the Seq Control page is not updated when the page is first displayed or when the inc/dec centering function is used to "zero" the value.
- TS-10 crashes with a System Error 170 during multi-track record. This seems related to hitting the 64K memory boundary on multi-track record. Maximum Multi-track record is now a bit less than 64K.
- Incoming MIDI Program changes are not being recorded properly by the sequencer in MULTI mode. If you send Program changes 0-20 (with or without accompanying Bank Select values) into the TS with the sequencer in Record, the recorded Bank Select value will incorrectly increment from 0-20, and the Prog Change value will randomly increment.
- If *SONG-END* is the currently displayed step in the Song Editor, pressing the top right soft button above TRACKS, and editing the MUTE TRACKS value for a Track will cause a -BLANK- Sequence to be inserted as a new Step in the Song. The new version prevents access to Tracks subpage if step is -BLANK- or *SONG-END*.
- When a track is set to Reset-Controllers = YES, the TS does not correctly display the program change number, nor will it send new program changes if editing is desired. It always displays program change #64. Turning off the Reset Controllers parameter clears up this situation.
- Certain event types should be displayed as signed values in the Event Editor, like the TEMPO events are, to correspond to their real value ranges. These events are: PAN, REL, ATK, BRT, RAT, MXP and BND. They should be expressed as -64 to +63 in the Event Editor, just as they are in the rest of the system.
- If you double-click the Tracks 1-6 or 7-12 buttons, or set EDIT TRACKS=SEQ in a Song that contains no Seq steps, saving the changes to the Song, and then subsequently using Replace Track Sound causes an Error 21 crash. We should disallow both actions, and when the user attempts them we should display the SONG IS EMPTY error message.
- Punching into record on a new track, causes the newly recorded track to play back out of time (shifted about 44 to 59 clocks).
- Defining a new Seq or Song track shouldn't copy the previous track's MIDI channel. Each Track should default to the like numbered MIDI channel (Trk5-Ch5, etc). It should still copy all other track attributes. As it is, setting up for Multi mode reception is a hassle, because you have to edit each Track's MIDI Channel after defining each Track.

- If *SONG END* is the currently displayed step in the Song Editor, editing the REPS=XX parameter causes a -BLANK- sequence to be inserted as a new step in the Song. NOTE: Editing the TRACKS parameter caused this same problem.
- TS-10 tempo changes not always updated on the Sequencer Control Page. It behaves fine on the Click and Locate pages.
- After reentry to Event Editor from special audition page, pressing Play, Stop, or Rec-Play will illegally exit from event editor and setup an undesirable "meta" state. This condition should be prevented by intercepting state change messages.
- The TS sequencer fails to record all MIDI controllers (sustain, mod wheel, etc.) if they are received from incoming MIDI and the TS is in OMNI, POLY or MONO-A MIDI-In Mode. This works fine in MULTI and MONO-B Modes.

MISC:
- Using the "double-click Replace Track Sound to Include FX" function should automatically force the Track FX-MODS value to CNTRL-FX and BUS to VOICE for the Track that the sound is being replaced on. This would ensure that FX mod will work after the Sound is installed with its FX. It should happen in Presets, Seqs & Songs.
- On power-up, when the TS is in OMNI, POLY, MONO-A modes, the "AUTO-LOAD ALL SAMPLED-SOUNDS" prompt disappears after receiving MIDI program-change messages, but internally, the TS-10 remains in this prompt mode. This also happens on ENTER GENERAL MIDI MODE prompt page, SAVE CHANGES prompt page, and other prompt pages.

MIDI:
- When the TS is in OMNI, POLY or MONO-A modes, and the Sequencer is running, sending a stream of program changes into the TS causes an Error 129. SEQUENCER MUST BE STOPPED is correctly displayed each time, but TS crashes after receiving 10 prog chgs. It happens because the TS is trying to enter sounds mode, & this is not allowed when the Seq is running. The TS now ignores Program Changes when the seq is running in OMNI, POLY, MONO-A modes.
- When Presets are selected, they fail to transmit via MIDI the Program Changes and Track Parameter values for the MIDI enabled Tracks that are Selected or Stacked, in a consistent manner. Which Tracks will actually transmit is incorrectly determined by which Tracks were selected or stacked in the previous Preset, not in the one that has just been selected.
- TS is not defensive about receiving an "end-of-exclusive" message when it is not expecting one. It misinterprets an end of system-exclusive byte on any MIDI Channel ($Cx $F7 where x=the MIDI channel #) as MIDI Program Change 119. Originally found in the TS.
- Sys-Ex messages can incorrectly cause the TS to exit from dialogue pages (*YES* *NO*) and the Event Editor. Sys-Ex messages should be ignored on dialogue pages and in the Event Editor. Sys-Ex should also be ignored in Audition Play; currently this put the TS into an illegal hybrid sounds/seqs mode.

SAMPLED SOUNDS:
- Sampled Sounds do not pay attention to the following Track Controller enables: SOSTENUTO ON/OFF, PITCH-BEND ON/OFF, MODWHEEL ON/OFF. When set to OFF, Sampled Sounds still incorrectly respond to the Pitch Bender, Mod Wheel, and the Sostenuto Pedal, whether it is set to ON or OFF.
- Sampled Sounds fail to respond to the Sostenuto Pedal, regardless of the setting of the Track SOSTENUTO Controller Enables switch.
- All 12 of the new ASR 44.1 kHz effects need to have a TS conversion scheme when ASR Instruments that contain those effects are loaded into the TS-10. They should select the best guess of the available TS effect, with a best guess Variation to generally represent the 44.1 kHz effect.
- In an 8 meg TS, loading a large sampled sound (7372 blocks), powering off & on, answering *NO* to AUTOLOAD prompt, loading the same sound into another bank, powering off & on, and answering *YES* to AUTOLOAD, incorrectly loads the sampled sound into the first location, and upon trying to load into the second location, unit crashes with ERROR 48, and resets.
- When System page PITCH-BEND=##H (i.e., a Held Pitch Bend range is selected), and a Sampled Sound is selected, pressing the Sostenuto Pedal incorrectly disables pitch bending on any notes that are held when the pedal is pressed. This bug was introduced because of fixing Sampled Sound latched pressure with Sostenuto pedal.
- The TS fails to do the correct effect conversions when Sampled Sounds are loaded that were saved on the ASR with the following algorithms: NLIN REVRB 2, NLIN REVRB 3, GUITAR AMP2, GUITAR AMP3.

TS-10/TS-12 Version 3.02 (released 8 MAR 94)

This release contains fixes for problems that have been discovered since the version 3.00.

- In General MIDI mode, GM-PROG #095 (HALO-PAD) has too slow an attack when compared to a SoundCanvas™.
- If the TS receives program changes, either from sequencer playback or from MIDI-In, notes can hang if the TS changes from a Program with a delayed voice to one in which the same voice is muted (delayed or not delayed). This was fixed in the ASR, but never fixed in the TS. (Note: This problem could happen when playing any program containing a voice with a non-zero delay value, but was particularly noticeable on some General MIDI sequences used during testing.)
- When the TS exits General MIDI Mode, it should reset the hidden track Volume (not the visible Mix value, but the invisible MIDI Controller 7/Pedal Volume value) to 127. It was possible for the Preset Tracks used in General MIDI Mode to incorrectly have their track Volume left at 100.
- Using the Change LENGTH command to Add Bars or Delete Bars interferes with AutoLocate (GOTO) Function. After adding or deleting bars to the end of a sequence, locating to the previous location does not work properly. Even changing the GOTO location by a few bars didn't locate correctly. Locating to the beginning of the sequence or pressing Play corrected the problem. The sequence is now effectively reselected after the edit, which resets the GOTO destination and the locate mechanism will work correctly (albeit more perhaps slowly on the first locate thereafter).

TS TEST PROCEDURE

The following procedure will aid in troubleshooting the unit. To do the following tests you will need a MIDI cable, a Dual Foot Switch (model SW-5/10), and a Control Voltage Pedal (model CVP-1). The TS should be connected to a sound system in stereo.

1. Setup
   a) Plug in audio cables on the rear panel. Turn on the unit.
   b) **Save the customer's sounds, presets, and sequences** (see Disk Storage).
   b) While holding down **Presets**, press the top left soft button. The display shows ERASE MEMORY AND REINITIALIZE?
   c) Select *YES* and wait for the unit to reinitialize.

2. MIDI Test
   a) Connect MIDI In to MIDI Out with a MIDI cable.
   b) Hold down a few keys.
   c) Disconnect one end of the MIDI cable.
   d) When you release the keys, the notes should sustain.
   e) Play twenty or more keys simultaneously to reinitialize the voices.
   * **If it fails, check the following:** MIDI cable connection and jack board to digital board cable.

3. Analog Controller Tests
   a) While holding down **Presets**, press **Compare**. The display should show ANALOG TESTS
   b) Move each of the following analog controller inputs fully up and down and check the screen for the proper values. Move smoothly and check for jitter.

Controller	Down Value	Up Value
PITCH WHEEL	PTCH=000	PTCH=127
MOD WHEEL	MOD=000	MOD=127
VOLUME SLIDER	VOL=000	VOL=127
DATA ENTRY SLIDER	KNOB=000	KNOB=255
TS-12 ONLY		
KEY PRESSURE	PRS=127	PRS=000

   c) Check that the display shows: REF=rrr (rrr must be between 180 up to 220).
   d) Check that the display shows: BAT=bbb (bbb must be **LESS** than 010).
   e) Check that the display shows: PED=127.
   f) Plug in the CV PEDAL and move it. Check the display for: PED=000 when fully UP and PED=127 when fully depressed.
   g) **TS-12 ONLY:** Check keyboard pressure using white AND black keys at each end of the keyboard.
   * **If any one fails, check** connections to the appropriate module. If they all fail, the digital board is possibly at fault.

4. Audio Quality / ROM Tests
   a) Press **Sounds, 0.** Press **BankSet** until the display shows: R2-0 in the upper left corner.
   b) Select and test the following sounds for sound quality, clicks and distortion. Press the number and then press the soft button. Use the wheels and patch selects. Be sure to listen to the sound fade before changing sounds.

#	TS-10 pre 2.0 Sound	TS-12/TS-10 post 2.0 Sound	Effect
0	GRAND-PIANO	BABY-GRAND	28 HALL REVERB 2
3	JAZZ-RHODES	JAZZ-RHODES	02 EQ--DDL+CHORUS+REV
6	PURE-ORGAN	OCTAVE-ORG	60 ROTARY SPEAKER+REV
8	3-WAY-SYNTH	3-WAY-SYNTH	44 EIGHT VOICE CHORUS

5. Disk Drive Test
   a) Insert a TS formatted disk into the disk drive.
   b) Press **Storage.** Select DISK, then SAVE. The display should show SAVE FILE TYPE= .
   c) If you need to, move the data entry slider until TYPE=1-PROGRAM. Select YES.
   d) The display shows SAVE FILE NAME=<filename>. Select YES. The unit will save the last program that was selected.
   e) Eject the disk and reinsert it.
   f) Select YES, then YES again. Make sure that the display briefly shows DISK HAS BEEN CHANGED, then DELETE OLD VERSION?
   g) Select NO to return to the DISK page.
   f) Select LOAD. The display should show LOAD FILE=<filename>.
   h) While holding down **0,** select the sound that you just saved by pressing its soft button then releasing both buttons.
   i) Select YES. This loads the sound you just saved into the edit buffer. The display shows WRITE EDIT PROGRAM.
   j) While holding down **0,** press the upper left soft button. This will write the program into location U0-0.
   k) Play the sound briefly to make sure that it sounds O.K.
   l) Eject the disk, write protect it (by opening the window) and reinsert it.
   m) Press **Storage.** Select DISK, then SAVE.
   n) Select YES, then YES again. The display should show: DELETE OLD VERSION?
   o) Select YES. Make sure display briefly shows: DISK WRITE PROTECTED.
   * **If there is a failure, check the components in the following order:** 1) disk; 2) disk drive cables; 3) disk drive; and 4) digital board. Not recognizing write protect is usually a bad drive. Not recognizing a disk is usually a bad disk drive ribbon cable.

6. Battery Test
   a) Turn the unit OFF and ON five times. Listen for excessive noises.
   b) Turn the unit OFF and LEAVE IT OFF for at least 10 seconds.
   c) Turn the unit on, and verify that the sound that you loaded into location U0-0 in the disk drive test is still there.
   * **If there is a failure,** go to the battery section of this manual.

7. Pressure Test
   a) Press **Sounds**.
   b) While holding down **BankSet**, press **2**.
   c) Press **8** so that its LED turns on.
   d) Select BIG-ANNA by pressing the upper left soft button.
   e) Press each key of the keyboard down only until normal key travel ends. Do not press into pressure zone. Verify that no pressure effect occurs.
   f) Press each key into the pressure zone and verify that pressure adds vibrato.
   * **Failure indicates a keyboard problem.**

8. **TS-12** Keyboard Test
   a) Press **Sounds**.
   b) While holding down **BankSet**, press **2**.
   c) Press **0** so that its LED turns on.
   a) Select the sound in location one of this page by pressing the upper left soft button.
   c. Play briefly to verify sound quality.
   d. Verify that the sound gets louder with higher key velocity.
   e. Verify that all keys function and that velocity response is uniform across the keyboard.
   * **Failure indicates a keyboard cable, keyboard, keyboard processor board or digital board problem. Be on the lookout for erratic keys, which cause multiple key triggers when the key is pressed or released, and keys with dramatically different velocity response (such as keys that always play with full velocity or low velocity no matter how the key is played).**

9. Patch Select Test
   a) Press **Sounds**.
   c) Select a sound on the page by pressing one of the soft buttons.
   b) Press **Select Voice**. The display should show: "00" in the lower left corner of the display.
   c) Press the left patch select button, verify the display shows: "*0".
   d) Press the right patch select button, verify the display shows: "0*".
   e) Press both patch select buttons, verify the display shows: "**".
   * **If the display doesn't change, check** the cable from the patch select board to the digital board.

10. SIMMs Check
    a) Press **Sounds**.
    b) While holding down **BankSet**, press **8**. The display should show S8- in the upper left corner.
    e) If there are two 1Meg SIMMs installed, holding down **BankSet** and pressing **9** will have no effect. If there are two 4Meg SIMMs installed, the display will show S9- in the upper left corner.

11. Reload Customer's Sounds and Sequences
    a) While holding down **Presets**, press the upper left soft button. Select *YES*, and wait for the unit to reinitialize.
    b) Reload the data that you saved in step 1.

TS-10 ONLY SECTION

Contents: page

Base
Panel

SIMMs

A Digital
Board

J Transformer

D Power
Supply
Board

M SCSI
Board

C Jack
Board

B Analog
Board

endcap

Keyboard
Mounting
Bracket

K Line
Filter

G Disk
Drive

F Keypad/
Display
Board

Patch Select/
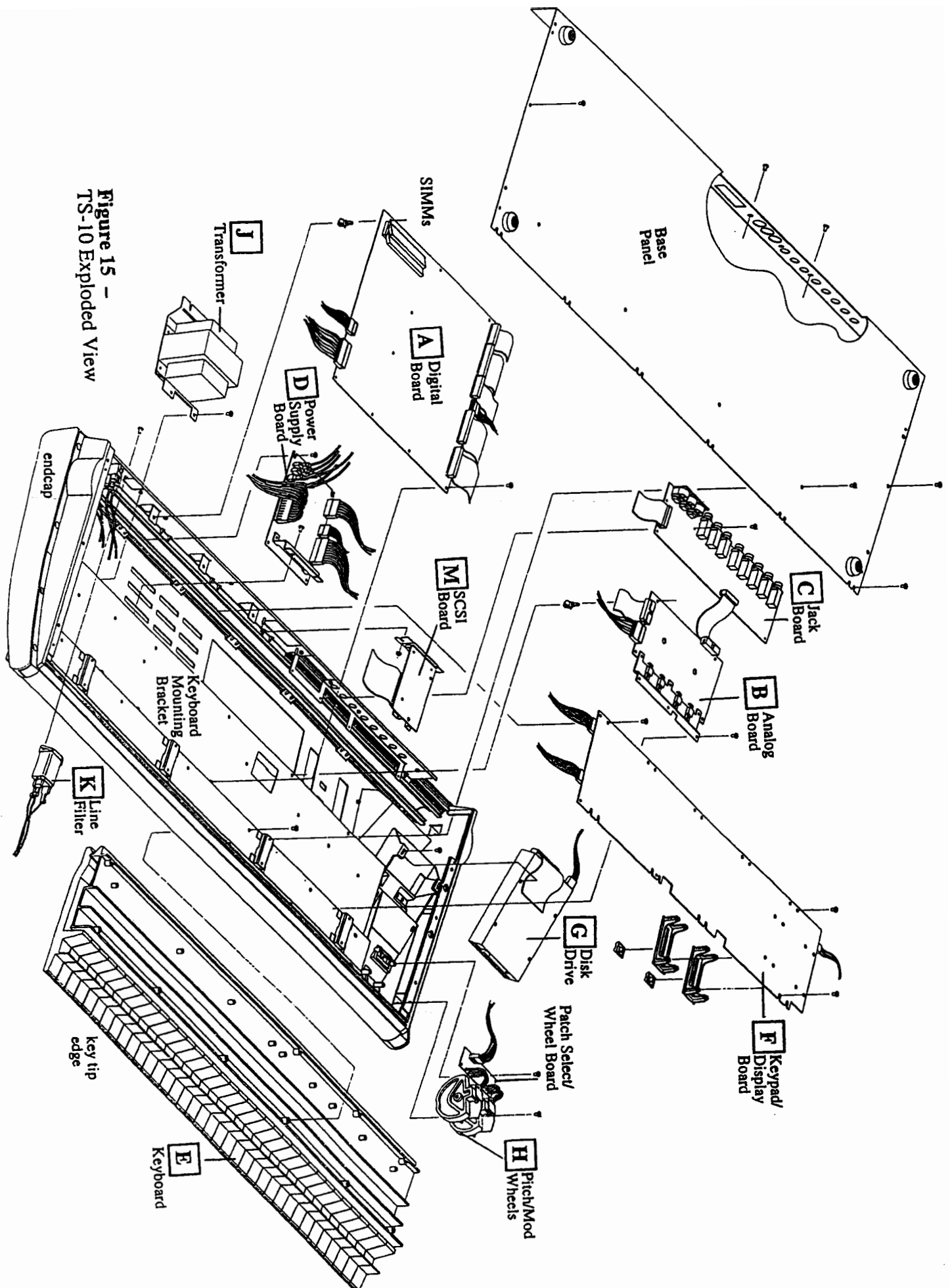Wheel Board

H Pitch/Mod
Wheels

key tip
edge

E Keyboard

Figure 15 –
TS-10 Exploded View

For all of these procedures, follow precautions to safeguard against static discharge.

SECTION

A

Replacing the Digital Board

Removing
1. Remove all cables connected to the TS-10, including the power cord.
2. Turn the unit upsidedown and remove all the screws from the base and rear panel. **Note** that six (6) screws along key tip edge are self-tapping.
3. Using a scribe, disconnect all of the cables from the digital board:
   a) J10 - 20-pin ribbon cable to the analog board (4090020301),
   b) J8 - 34-pin ribbon cable to the disk drive,
   c) J2 - 6-pin cable to the patch select/wheel board (4090017801),
   d) J4 - 20-pin ribbon cable to the keyboard,
   e) if present, J9 - 34-pin ribbon cable to the SCSI board (4090020601),
   f) J1 - 20-pin ribbon cable to the jack board (4090020201),
   g) J5 - 9-pin cable to the power supply board (4090020401), and
   h) J3 - 7-pin cable to the keypad/display board (4090020101).
4. Remove the four (4) screws that hold the digital board to the keyboard bracket, see Figure 16.
5. Pop the digital board off the five (5) standoffs by squeezing the standoffs with needlenose pliers:
   a) three (3) on back of digital board to I/O bracket
   b) two (2) in the middle of the digital board.

Installing
6. Install the four (4) screws into the digital board.
7. Pop the digital board onto the five (5) standoffs (see step 5).
8. Reconnect all the cables to the digital board (see step 3).
9. **If there are 4 Meg SIMMs installed in the old board:**
   a) Remove 4 Meg SIMMs from removed board (see Information about SIMMs),
   b) Remove the 1 Meg SIMMs from the new board, and
   c) Install the 4 Meg SIMMs into the new board and the 1 Meg SIMMs into the removed board.
10. Power on and test the unit.
11. Replace all the screws in the base and rear panels. **Note** that six (6) screws along key tip edge are self-tapping.
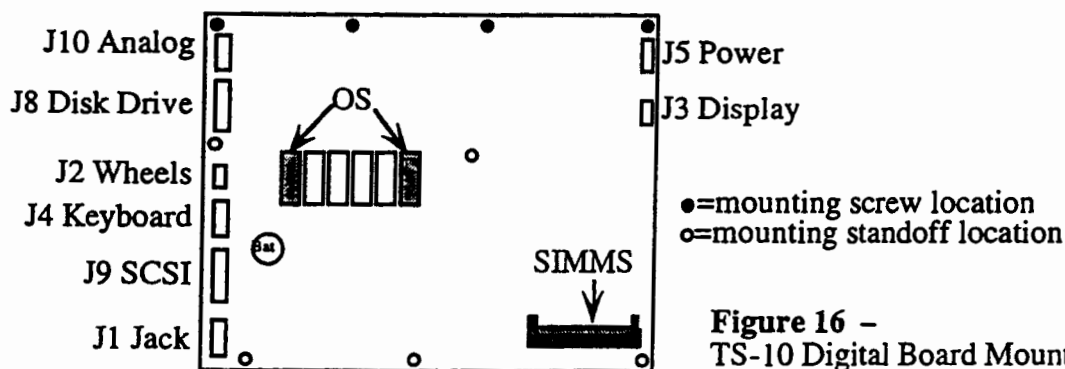
J10 Analog
J8 Disk Drive
J2 Wheels
J4 Keyboard
J9 SCSI
J1 Jack

OS

J5 Power
J3 Display

●=mounting screw location
o=mounting standoff location

SIMMS

Figure 16 –
TS-10 Digital Board Mounting

SECTION	**Replacing the Analog Board**
B	

Removing
1. Remove all cables connected to the TS-10, including the power cord.
2. Turn the unit upsidedown and remove all the screws from the base and rear panel. **Note** that six (6) screws along key tip edge are self-tapping.
3. Remove all cables connected to the analog board (4090020301):
   a) J1 - 6-pin cable to the power supply board (4090020401),
   b) J2 - 20-pin ribbon cable to the digital board (4090020001 or 4090020503), and
   c) J3 - 20-pin ribbon cable to the jack board (4090020201).
4. Remove the three (3) 6-32 SEMs screws (screws with washers attached) from the analog board heat sink to keyboard bracket.
5. Pop the analog board off the two (2) plastic standoffs by squeezing standoffs with needlenose pliers and remove the board from the unit.

Installing
6. Pop the replacement board onto the two standoffs.
7. Install the three (3) SEMs into the replacement board.
8. Connect all the cables (see step 3).
9. Place the bottom panel in place.
10. Power up, test the unit.
11. Install all the screws into the base and rear panels. **Note** that six (6) screws along key tip edge are self-tapping.
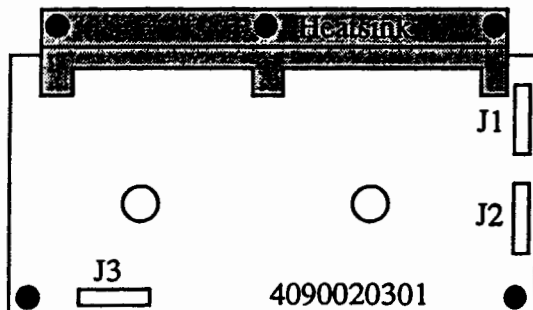
●=mounting screw location
●=mounting standoff location

Figure 17 –
TS Analog Board

J1
J2
J3
4090020301

SECTION C

Replacing the Jack Board

Removing
1. Remove all cables connected to the TS-10, including the power cord.
2. Turn the unit upsidedown and remove all the screws from the base and rear panel. **Note** that six (6) screws along key tip edge are self-tapping.
3. Using a scribe, disconnect the following cables:
   a) J10 - 20-pin ribbon cable from the jack board to digital board, and
   b) J9 - 20-pin ribbon cable from jack board to analog board.
4. Remove the four (4) screws that hold the jack board to the I/O bracket and remove the board from the unit.

Installing
5. Insert jacks of the replacement board into the I/O bracket.
6. Install the four (4) screws that hold the jack board to the I/O bracket.
7. Reconnect the cables to J9 and J10 connectors on the jack board.
8. Power on and test the unit.
9. Replace all the screws in the base and rear panels. **Note** that six (6) screws along key tip edge are self-tapping.

SECTION D

Replacing the Power Supply Board

Removing
1. Remove all cables connected to the TS-10, including the power cord.
2. Turn the unit upsidedown and remove all the screws from the base and rear panel. **Note** that six (6) screws along key tip edge are self-tapping.
3. Remove the digital board (see Section A).
4. Remove the two (2) screws from the line filter.
5. Pull the line filter through its hole in the I/O bracket to the outside of the unit. Let it hang by the wires. You should now be able to reach the power supply screws.
6. Using a scribe, disconnect cables and wires from the power supply board:
   a) J2 - 9-pin cable to the digital board (4090020001 or 4090020503),
   b) J4 - 6-pin cable to the keypad/display board (4090020101),
   c) J3 - 6-pin cable to the analog board (4090020301),
   d) J1 - 9-pin cable to the transformer,
   e) X3 and X6 - green transformer wires,
   f) wires to the power switch: X5 = orange, X4 = white, X1 = blue, and
   g) X2 - red wire to the line filter.

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!

7. Remove the five (5) screws that hold the power supply board to the unit:
   a) two (2) SEMs from heatsink to keyboard bracket (you may need an extra long screwdriver to reach the screws through the I/O bracket), and
   b) three (3) #8 screws into the back extrusion.

Installing
8. Install the five (5) screws into the replacement power supply board (see step 7).
9. Reattach all cables and wires (see step 6).
10. Install screws into line filter.
12. Install the digital board (see Section A).
13. Power on and test the unit.
14. Replace all the screws in the base and rear panels. **Note** that six (6) screws along key tip edge are self-tapping.

SECTION E

Replacing the Keyboard

Removing
1. Remove all cables connected to the TS-10, including the power cord.
2. Turn the unit upsidedown and remove all the screws from the base and rear panel. **Note** that six (6) screws along key tip edge are self-tapping.
3. Remove the digital board (see Section A).
4. Disconnect the 20-pin ribbon cable from the keyboard.
5. Remove the thirteen (13) screws that hold the keyboard to the keyboard mounting bracket (see Figure 18):
   a) Six (6) M3.5x19 in the front part (key tips side) of the keyboard mounting bracket, and
   b) Seven (7) M3.5x7.5 screws from the back (spring side) of the keyboard mounting bracket. **Note** that two (2) M3x7.5 screws are reached through holes in the analog board.
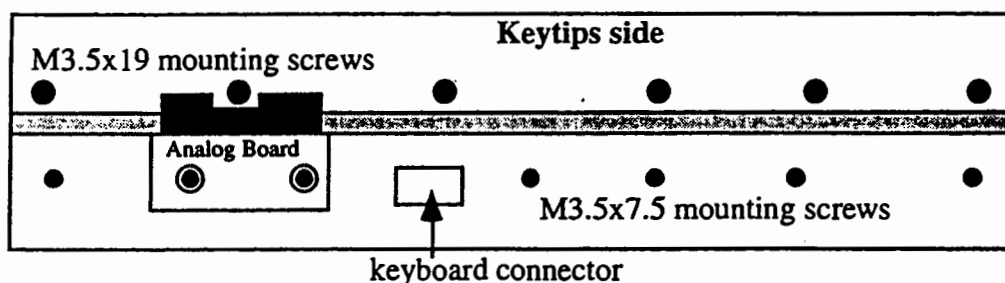
Figure 18 – TS-10 Keyboard Mounting Bracket

6. Turn the unit rightsideup with the keyboard closest to you.
7. Lift the front of the white keys until they rest on the front extrusion.
8. Slide the keyboard toward you.

Installing
9. Slide the keyboard (springs first) into the unit. Gently push the white keys down behind the front extrusion.
10. Carefully turn the unit upsidedown, jack side closest to you.
11. Starting at the right corner away from you, install the six (6) M3.5x19 screws.
12. Install the seven (7) M3.5x7.5 screws into the other row of holes.

---

13. Connect the 20-pin cable to the keyboard with the stripe on pin 1 of the connector (stripe closest to the digital board).
14. Install the digital board (see Section A).
15. Power on and test the unit.
16. Replace all the screws in the base and rear panels. Note that six (6) screws along key tip edge are self-tapping.

SECTION F

Replacing the Keypad/Display Board

Removing
1. Remove all cables connected to the TS-10, including the power cord.
2. Remove the volume and data entry knobs.
3. Turn the unit upsidedown and remove all the screws from the base and rear panel. **Note** that six (6) screws along key tip edge are self-tapping.
4. Remove the digital board (4090020001 or 4090020503), see Section A.
5. Remove the jack board (4090020201), see Section C.
6. If installed, remove the SCSI board (4090020601), see Section M.
7. Using a scribe, disconnect cables from the keypad/display board:
    a) J4, 4-pin disk drive cable on disk drive side of keypad/display board,
    b) J2, 6-pin cable to the power supply board (4090020401), and
    c) J1, 7-pin cable to the digital board.

NOTE: To make sure that units don't have stuck buttons, an M4x10mm hex head set screw is used to locate the keypad/display board properly. **Don't remove the hex head set screw.**

8. Remove the #8 phillips screws that hold the keypad/display board to the unit.
9. Remove the keypad/display board from the unit.
Installing
10. Make sure the lens and display are clean.
11. Transfer the slider buckets and knobs from the old board to the replacement board. Make sure that the slider bucket legs (for the volume and data entry pots) are through the holes in the keypad/display board.
12. Make sure that the six (6) soft buttons are in place. Place the keypad/display board into the unit. Verify that none of the buttons are stuck.
13. Starting with the non-slotted holes closest to the I/O bracket, install the nine (9) #8 screws that hold the keypad/display board to the front panel.
14. Connect all cables to the keypad/display board (see step 7).

USING NO MORE THAN 8 INCH POUNDS!

15. Install the jack board, see Section C.
16. Install the digital board, see Section A.
17. Power on and test the unit.
18. Replace all the screws in the base and rear panels. Note that six (6) screws along key tip edge are self-tapping.

SECTION
G

Replacing the Disk Drive

Removing
1. Remove all cables connected to the TS-10, including the power cord.
2. Turn the unit upside down and remove all the screws from the base and rear panel. **Note** that six (6) screws along key tip edge are self-tapping.
3. Disconnect the 34-pin ribbon cable and the 4-pin (3-wire) power cable from the disk drive.
4. Remove the four (4) screws that hold the disk drive to the plastic wheel cover.

NOTE: On early units, you may break the disk drive bezel when removing the disk drive from the unit. The wheel cover was modified on later units to prevent this.

5. Carefully slide the disk drive toward the jack side of the unit.

Installing
6. Make sure the disk drive switches or jumpers are set properly (**see Disk Drives**, beginning of this manual).
7. Slide the disk drive into the wheel cover until the mounting holes line up.
8. Install the four screws that hold the disk drive to the wheel cover.
9. Connect the 34-pin ribbon cable and the 4-pin (3-wire) power cable to the disk drive.
10. Power on and test the unit.
11. Replace all the screws in the base and rear panels. **Note** that six (6) screws along key tip edge are self-tapping.

SECTION
H

Replacing the Pitch/Mod Wheels

Removing
1. Remove all cables connected to the TS-10, including the power cord.
2. Turn the unit upsidedown and remove all the screws from the base and rear panel. **Note** that six (6) screws along key tip edge are self-tapping.
3. Disconnect the 6-pin cable from the patch select/wheel board (small board near the wheels).
4. Remove the four (4) screws from the wheel brackets (2 from each bracket).

NOTE: If the mounting posts for the wheel brackets are broken, call ENSONIQ for a new wheel cover that has the posts reinforced.

5. Remove the three (3) screws from the patch select/wheel board.

Installing
6. Install the new patch select/wheel board using the three (3) screws (make sure the underlay and patch select buttons are in place).
7. Using two screws, install the new pitch wheel (with spring) into the slot closest to the endcap.
8. Using two screws, install the new mod wheel (no spring) into the other slot.
9. Connect the 6-pin cable to the patch select/wheel board.
11. Replace all the screws in the base and rear panels. **Note** that six (6) screws along key tip edge are self-tapping.

<table>
<tr><td>

SECTION

J

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Replacing the Transformer and its Bracket

</td></tr>
</table>

Removing

1. Remove all cables connected to the TS-10, including the power cord.
2. Turn the unit upsidedown and remove all the screws from the base and rear panel. **Note** that six (6) screws along key tip edge are self-tapping.
3. Using a scribe, disconnect transformer cables and wires from the power supply board:
   a) J1 - 9-pin cable to the transformer, and
   b) X3 and X6 - green transformer wires,
4. Remove the plastic endcap from the transformer side of the unit (see Figure 19):
   a) four (4) #8 x 3/8 screws from bottom endcap, then lift it up and out, and
   b) three (3) #8 x 3/8 screws from the top endcap, then pull it out to the side.

right top endcap

right bottom endcap
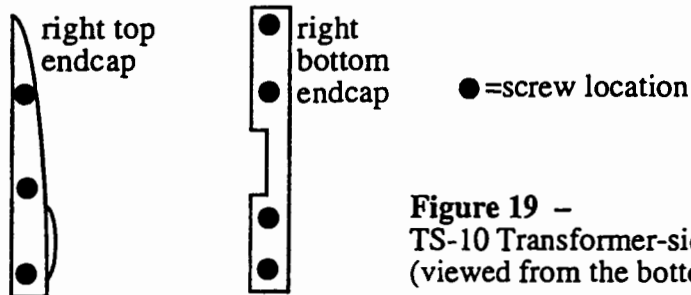
● =screw location

Figure 19 –
TS-10 Transformer-side Endcap Screw Locations
(viewed from the bottom of the unit)

5. Remove the six (6) #6 x 5/16 screws that fasten the side plate to the extrusions.
6. Remove the four (4) #8 screws that hold the transformer bracket to the unit.
7. Remove the transformer and transformer bracket from the unit.

Installing

8. With the slotted holes of the transformer bracket toward the switch and line filter, install the transformer and bracket into the unit.
9. Install two screws into the holes closest to the keyboard first. Then install the other two screws that fasten the transformer bracket to the unit.
10. Reconnect the wires and cables to the power supply board (see step 3).

IMPORTANT! To keep from stripping out any screws, use no more than 8 inch/lbs when installing them.

11. Install the end plate. Note that there are pins on the back and middle extrusions that locate the endplate. Attach the endplate using the six screws.
12. Install the top half of the endcap (from the side): slide the tabs into the slots on the endplate. Attach the top of the endcap using the three screws.
13. Slide the bottom endcap onto the unit (from the top): tabs in front and middle, slot in back. Attach the bottom endcap using the four screws.
14. Turn the unit rightsideup. Power on and test the unit.
15. Turn the unit off. Turn the unit upsidedown and install all the screws into the base and rear panels. **Note** that six (6) screws along key tip edge are self-tapping.

SECTION

K

Replacing the Line Filter

Removing
1. Remove all cables connected to the TS-10, including the power cord.
2. Turn the unit upsidedown and remove all the screws from the base and rear panel. **Note** that six (6) screws along key tip edge are self-tapping.
3. Remove the three (3) wires connected to the back of the Filter, paying particular attention to the polarity (Black to N, Red to L, Green/Yellow to ground).
4. Remove the two (2) screws that secure the Filter to the I/O bracket.

Installing
5. Install the new Line Filter from outside the case using the two screws.
6. Reconnect the three wires to the Filter, again noting the proper polarity: Black to N, Red to L, Green/Yellow to ground.

IMPORTANT! Failure to connect the wires to their proper posts can lead to a potential shock hazard (see Figure 6).

7. Power on and test the unit.
8. Replace all the screws in the base and rear panels. **Note** that six (6) screws along key tip edge are self-tapping.

Replacing the O.S. EPROMs

The TS-10 operating system can be updated by replacing the O.S. EPROMs. Each TS-10 has two Operating System EPROMs located on the middle of the digital board.

Updating a TS-10 to Version 3 requires making one cut, adding one jumper, and moving one zero ohm resistor on the digital board. See the instruction in the EPROM Update Kit for more information.

Removing

Installing

1. Save all Sound, Preset and Sequence data (see the Disk Storage section).
2. Remove all cables connected to the TS-10, including the power cord.
3. Turn the unit upsidedown and remove all the screws from the base and rear panel. **Note** that six (6) screws along key tip edge are self-tapping.
4. The two Operating System EPROMs, LOWER (U5) and UPPER (U6), are located in the center of the digital board (see Figure 16). Carefully remove the two EPROMs and insert the replacement EPROMs into their respective sockets. Be sure the notch in each EPROM is facing away from the SIMM sockets.

IMPORTANT! Make sure all audio cables are unplugged BEFORE turning the unit on. The first time you turn on the TS-10 after updating the software, the unit may make a pop.

5. Turn the unit right side up and turn it on.
6. **Reinitialize** by holding down the **Presets** button and pressing the upper left black soft button. Then answer YES by pressing the upper right soft button.
7. Check the software version by holding down **Presets** and pressing **System**.
8. The second line of the display briefly shows ROM V X.XX. The version number (X.XX) should be the same as that printed on the label of the newly installed EPROMs.
9. Turn the unit off and turn it upside down.

USE NO MORE THAN 8 INCH POUNDS WHEN INSTALLING SCREWS!

10. Replace all the screws in the bottom plate and rear panel. **Note** that six (6) screws along key tip edge are self-tapping.
11. Load in the Sounds, Presets and Sequences that you saved in step 1 (see Disk Storage section).

SECTION
M

Installing the SCSI Board

IMPORTANT! The TS-10 must have O.S. version 2.0 or higher for SCSI to work.

Installing
1. Remove all cables connected to the TS-10, including the power cord.
2. Turn the unit upsidedown and remove all the screws from the base and rear panel. **Note** that six (6) screws along key tip edge are self-tapping.
3. Using a scribe, disconnect the 34-pin ribbon cable from J9 of the digital board.
4. Remove the two (2) KEPs nuts (nuts with star washers) that hold the SCSI bracket to the I/O bracket.
5. Using needlenose pliers, remove the hex screws that hold the 26-pin SCSI connector to the SCSI bracket.
6. Detach the SCSI board from the SCSI bracket.
7. Disconnect the 34-pin ribbon cable from the SCSI board.

Installing
8. Connect the 34-pin ribbon cable to the replacement board, making sure that the striped end of the cable is on pin 1 of the connector.
9. Attach the replacement board to the SCSI bracket using the hex screws and lock washers. The lock washers should be on the outside (black side) of the bracket.
10. Install the SCSI board, component side down, between the jack board (4090020201) and the digital board. Attach SCSI bracket to the I/O bracket using the two (2) KEPs nuts.
11. Connect the 34-pin ribbon cable from the SCSI board to J9 of the digital board.
12. Place the basepan on, but don't install any screws yet.
13. Turn the unit right side up. Turn it on.
14. Press **Storage**. Verify that the display shows SCSI on the left side of the bottom line of the display. If it doesn't, check the connection of the 34-pin cable and the O.S version.
15. Turn the unit off and turn it up side down again.
10. Replace all the screws in the base and rear panels. **Note** that six (6) screws along key tip edge are self-tapping.

TS-12 ONLY SECTION

Contents:

Figure 20 – TS-12 Exploded View

Base Panel

SIMs

A Digital Board

C Jack Board

B Analog Board

Bracket over keyboard processor board

analog board bracket

N Keyboard Processor Board

mono pressure strip guide

E Keyboard

small keyboard bracket

I/O Bracket

D Power Supply Board

J Transformer

F Keypad/ Display Board

Wheel Cover

G Disk Drive

H Pitch/Mod Wheels

Patch Select/ Wheel Board

K Line Filter

M SCSI Board

For all of these procedures, follow precautions to safeguard against static discharge.

SECTION

A | Replacing the Digital Board

Removing
1. Remove all cables connected to the TS-12, including the power cord.
2. Turn the unit upsidedown and remove the screws from the base and rear panels as shown in Figure 21.
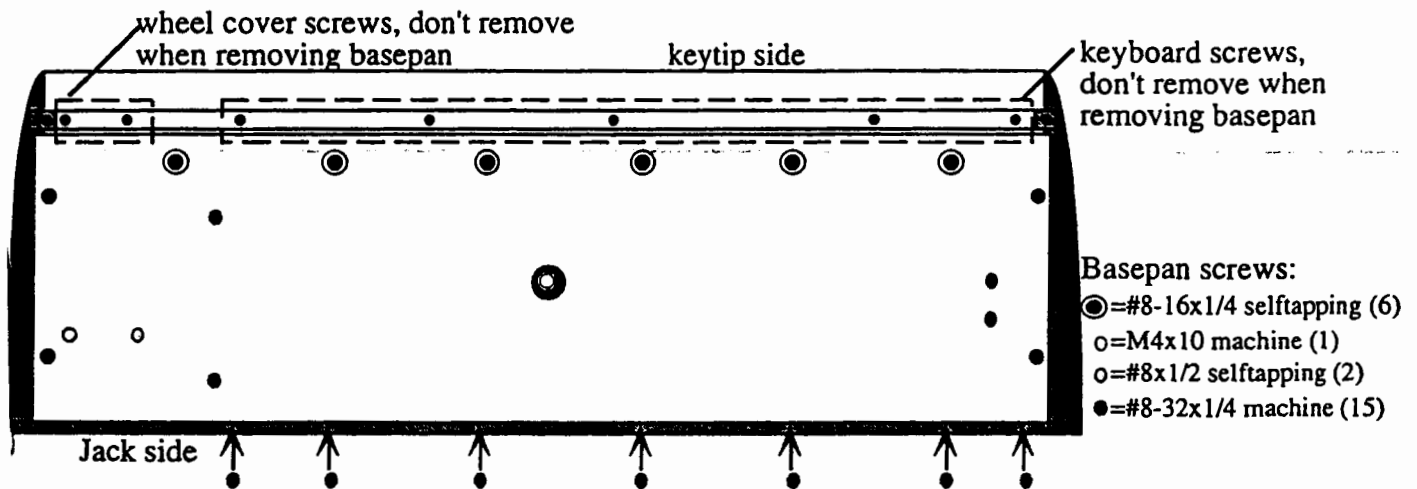
wheel cover screws, don't remove
when removing basepan   keytip side   keyboard screws,
                                                                               don't remove when
                                                                               removing basepan

Jack side

Basepan screws:
◉=#8-16x1/4 selftapping (6)
○=M4x10 machine (1)
o=#8x1/2 selftapping (2)
●=#8-32x1/4 machine (15)

Figure 21 – Bottom View of TS-12

3. Using a scribe, disconnect all of the cables from the digital board:
   a) J10 - 20-pin ribbon cable to the analog board (4090020301)
   b) J8 - 34-pin ribbon cable to the disk drive,
   c) J2 - 6-pin cable to the patch select/wheel board (4090017801),
   d) J4 - 20-pin ribbon cable to the keyboard processor board (4090020801),
   e) if present, J9 - 34-pin ribbon cable to the SCSI board (4090020601),
   f) J1 - 20-pin ribbon cable to the jack board (4090020201),
   g) J5 - 9-pin cable to the power supply board (4090020401), and
   h) J3 - 7-pin cable to the keypad/display board (4090020101).
4. Remove the four (4) screws from the digital board, see Figure 22.
5. Pop the digital board off the three (3) standoffs holding the digital board to the I/O bracket by squeezing the standoffs with needlenose pliers.

Installing
6. Pop the digital board onto the three (3) standoffs.
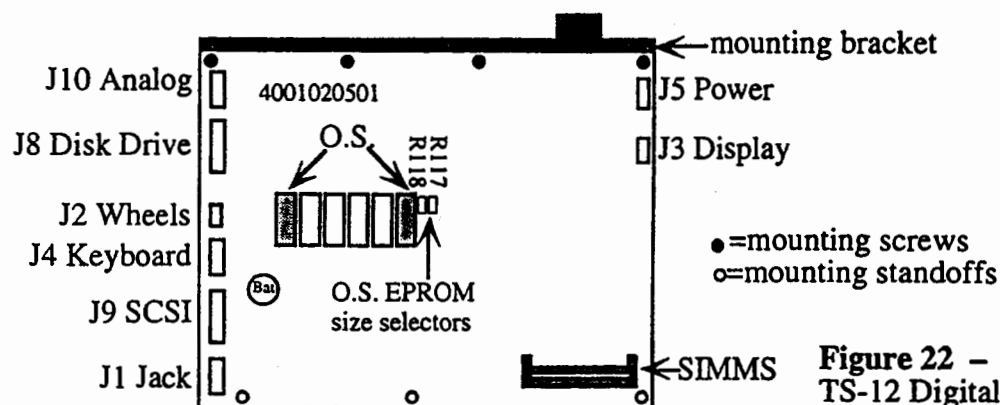7. Install the four (4) screws into the digital board to bracket.

Figure 22 –
TS-12 Digital Board Mounting

8. While supporting the solder side of the board, reconnect all the cables to the digital board, see step 3.
9. **If there are 4 Meg SIMMs installed in the old board:**
   a) Remove 4 Meg SIMMs from removed board (see Information about SIMMs),
   b) Remove the 1 Meg SIMMs from the new board, and
   c) Install the 4 Meg SIMMs into the new board and the 1 Meg SIMMs into the removed board.
10. Power on and test the unit.
11. Replace all the screws in the base and rear panels. **Note** some screws are self-tapping and some are machine screws. See Figure 21 for location.

SECTION B

Replacing the Analog Board

Removing
1. Remove all cables connected to the TS-12, including the power cord.
2. Turn the unit upsidedown and remove the screws from the base and rear panels as shown in Figure 21.
3. Using a scribe, disconnect all cables from the analog board (409020301):
   a) J1 - 6-pin cable to the power supply board (409020402),
   b) J2 - 20-pin ribbon cable to the digital board (409020501), and
   c) J3 - 20-pin ribbon cable to the jack board (409020201),
4. Remove the three (3) 6-32 SEMs screws (screws with washers attached) from the analog board heat sink to analog board bracket, see Figure 23.
5. Pop analog board off two (2) standoffs by squeezing standoffs with needlenose pliers and remove the board from the unit.

Installing
6. Pop the replacement board onto the two standoffs.
7. Install the three (3) SEMs into the replacement board.
8. Connect all the cables, see step 3.
9. Place the bottom panel in place.
10. Power up, test the unit.
11. Install all the screws into the base and rear panels. **Note** some screws are self-tapping and some are machine screws. See Figure 21 for location.

SECTION
C

Replacing the Jack Board

Removing

1. Remove all cables connected to the TS-12, including the power cord.
2. Turn the unit upsidedown and remove the screws from the base and rear panels as shown in Figure 21.
3. Using a scribe, disconnect the following cables:
   a) J10 - 20-pin ribbon cable from the jack board to digital board, and
   b) J9 - 20-pin ribbon cable from jack board to analog board.
4. Remove the four (4) screws that hold the jack board to the I/O bracket and remove the board from the unit.

Installing

5. Insert jacks of the replacement board into the I/O bracket.
6. Install the four (4) screws that hold the jack board to the I/O bracket.
7. Reconnect the cables to the J9 and J10 connectors on the jack board.
8. Power on and test the unit.
9. Replace all the screws in the base and rear panels. **Note** some screws are self-tapping and some are machine screws. See Figure 21 for location.

SECTION
D

Replacing the Power Supply Board

Removing

1. Remove all cables connected to the TS-12, including the power cord.
2. Turn the unit upsidedown and remove the screws from the base and rear panels as shown in Figure 21.
3. Remove the digital board, see Section A.
4. Using a scribe, disconnect all cables and wires from the power supply board:
   a) J2 - 9-pin cable to the digital board (4090020501),
   b) J4 - 6-pin cable to the keypad/display board (4090020101),
   c) J3 - 6-pin cable to the analog board (4090020301),
   d) J1 - 9-pin cable to the transformer,
   e) X3 and X6 - green transformer wires,
   f) wires to the power switch: X5 = orange, X4 = white, X1 = blue, and
   g) X2 - red wire to the line filter.

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!

5. Remove the two (2) screws that hold the power supply board heatsink to the rear extrusion.
6. Pop power supply board off the two (2) plastic standoffs by squeezing standoffs with needlenose pliers and remove the board from the unit.
7. Slide the power supply board toward the transformer and lift up and out.

Installing   8. Pop the replacement power supply board onto the two plastic standoffs.

9. Install the two (2) screws into the replacement power supply board (see step 5).

10. Reattach all cables and wires, see step 4.

11. Install the digital board, see Section A.

12. Power on and test the unit.

13. Replace all the screws in the base and rear panels. **Note** some screws are self-tapping and some are machine screws. See Figure 21 for location.

SECTION E

Replacing the Keyboard

Removing   1. Remove all cables connected to the TS-12, including the power cord.

2. Turn the unit upsidedown and remove the screws from the base and rear panels as shown in Figure 21.

3. Remove the digital board (see Section A).

4. Using a scribe, disconnect the three cables from the analog board.

4. Remove four (4) screws that hold the analog board bracket (with the analog board still attached) to the unit. See Figure 23.
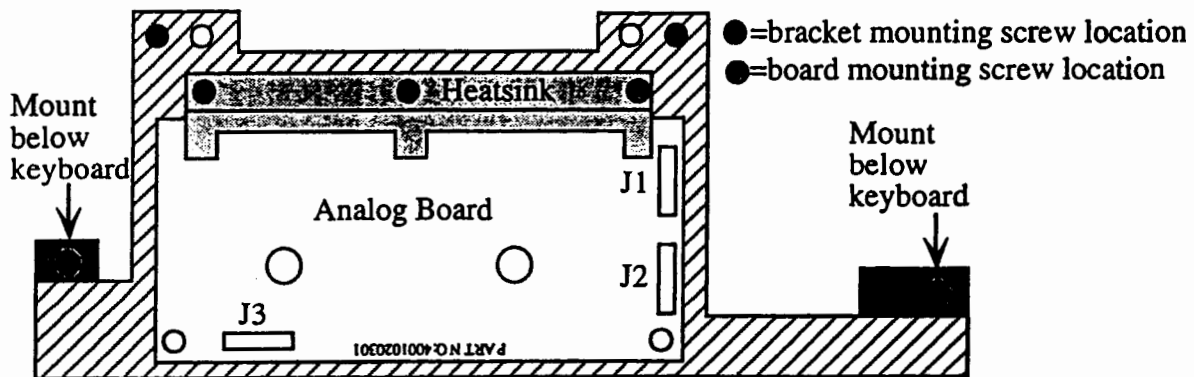

●=bracket mounting screw location
●=board mounting screw location

Mount below keyboard

Mount below keyboard

Heatsink

Analog Board

J1

J2

J3

PART NO.4001020301

Figure 23 – TS-12 Analog Board Bracket

5. Remove the six (6) screws that hold the bracket that is over the keyboard processor board to the unit.

6. Remove the two (2) screws that hold the small keyboard bracket near the transformer and slide the bracket out of the metal endplate.

7. Remove the wheel cover, see Section H.

8. Remove the five (5) M4 x 10 screws that hold the keyboard to the front extrusion. See Figure 21.

9. Lift the back (spring side) of the keyboard up and out.

10. **Remove the plastic guard from the keyboard and install it onto the replacement keyboard in the same location.**

Installing   10. Slide the keyboard (keys first) into the unit.

11. Install the five (5) M4 x 10 screws into the keyboard, see Figure 21.

12. Install the wheel cover, see Section H.

---

13. Slide the small keyboard bracket into the end cap over the transformer and fasten it with the two screws (see step 6).
14. Install the other keyboard bracket over the keyboard processor board and fasten it with the six (6) screws.
15. Install the analog board and bracket, see Figure 23.
16. Install the digital board, see Section A.
17. Power on and test the unit.
18. Replace all the screws in the base and rear panels. **Note** some screws are self-tapping and some are machine screws. See Figure 21 for location.

SECTION

F

Replacing the Keypad/Display Board

Removing
1. Remove all cables connected to the TS-12, including the power cord.
2. Turn the unit upsidedown and remove the screws from the base and rear panels as shown in Figure 21.
3. Remove the keyboard, see Section E.
4. Using a scribe, disconnect cables from the keypad/display board:
   a) J4, 4-pin (3-wire) disk drive cable on disk drive side of keypad/display board,
   b) J2, 6-pin cable to the power supply board (4090020402), and
   c) J1, 7-pin cable to the digital board (4090020501).

NOTE: To make sure that units don't have stuck buttons, an M4 x 10mm hex head set screw was added to locate the keypad/display board properly. **Don't remove the hex head set screw.**

5. Remove #8 screws that hold the keypad/display board to the front panel.
6. Remove the keypad/display board from the unit.
7. Transfer the slider buckets and knobs from the old board to the replacement board. Make sure that the slider bucket legs (for the volume and data entry pots) are through the holes in the keypad/display board.

Installing
8. Make sure the lens and display are clean.
9. Make sure that the six (6) soft buttons are in place. Place the keypad/display board into the unit. Verify that none of the buttons are stuck.

USE NO MORE THAN 8 INCH POUNDS WHEN INSTALLING SCREWS!

10. Starting with the non-slotted holes closest to the I/O bracket, install the #8 phillips screws that hold the keypad/display board to the unit.
11. Connect all cables to the keypad/display board, see step 4.
12. Install the keyboard, see Section E.
13. Power on and test the unit.
14. Replace all the screws in the base and rear panels. **Note** some screws are self-tapping and some are machine screws. See Figure 21 for location.

SECTION G

Replacing the Disk Drive

Removing
1. Remove all cables connected to the TS-12, including the power cord.
2. Turn the unit upsidedown and remove the screws from the base and rear panels as shown in Figure 21.
3. Disconnect the 34-pin ribbon cable and the 4-pin (3-wire) power cable from the disk drive.
4. Remove the four (4) screws that hold the disk drive to the plastic wheel cover.
5. Carefully slide the disk drive toward the rear (jack side) of the unit.

Installing
6. Make sure the disk drive switches or jumpers are set properly (see **Disk Drives**, beginning of this manual).
7. Slide the disk drive into the wheel cover until the mounting holes line up.
8. Install the four screws that hold the disk drive to the wheel cover.
9. Connect the 34-pin ribbon cable and the 4-pin (3-wire) power cable to the disk drive.
9. Power on and test the unit.
10. Replace all the screws in the base and rear panels. **Note** some screws are self-tapping and some are machine screws. See Figure 21 for location.

SECTION H

Replacing the Wheel Assembly

Removing
1. Remove all cables connected to the TS-12, including the power cord.
2. Turn the unit upsidedown and remove the screws from the base and rear panels as shown in Figure 21.
3. Remove the disk drive, see Section G.
3. Disconnect the 6-pin cable from the patch select/wheel board (small board near the wheels).
5. Remove the two (2) self-tapping screws that were under the disk drive.
6. Remove the two (2) self-tapping screws from the front extrusion.
7. With one hand, **hold the plastic guide that holds the mono pressure strips in place**. Lift the end of the wheel cover that is closest to the jack side of the keyboard and feed the wheel cover down and out the front of the unit.
8. If you need to replace the wheels:
   a) Remove the four (4) screws from the wheel brackets (2 on each bracket).
   b) Remove the three (3) screws from the patch select/wheel board.
   c) Install the new patch select/wheel board using the three (3) screws (make sure the underlay and patch select buttons are in place).
   d) Using two screws, install the new pitch wheel (with spring) into the slot closest to the endcap.
   e) Using two screws, install the new mod wheel (no spring) into the other slot.

Installing   9. With one hand, **hold onto the plastic guide that holds the mono pressure strips in place**. Install the wheel cover from the under side, feed the rear part of the wheel cover through the hole first. Check the control panel side of the unit to make sure that the wheel cover is in the right location.
10. Install the two (2) pointed self-tapping screws into the front extrusion.
11. Install the two (2) self-tapping screws that are under the disk drive.
12. Install the disk drive, see Section G.
13. Connect the 6-pin cable to the patch select/wheel board.
14. Power on and test the unit.
15. Replace all the screws in the base and rear panels. **Note** some screws are self-tapping and some are machine screws. See Figure 21 for location.

SECTION
J

Replacing the Transformer and it's Bracket

Removing   1. Remove all cables connected to the TS-12, including the power cord.
2. Turn the unit upsidedown and remove the screws from the base and rear panels as shown in Figure 21.
3. Remove the keyboard, see Section E.
4. Remove the power supply, see Section D.
5. Remove the five (5) #8 screws that hold the transformer bracket to the unit.
6. Remove the transformer and transformer bracket from the unit.

Installing   7. Place the new transformer and bracket into the unit with the three holes in the transformer bracket toward the keyboard opening. Move the transformer bracket flat against the end plate.
8. Install the two (2) screws into the transformer bracket that are closest to the switch and line filter.
9. Install the remaining three (3) screws into the transformer bracket.
10. Install the power supply board, see Section D.
11. Install the keyboard, see Section E.
12. Reconnect the wires and cables to the power supply board, see step 4.

IMPORTANT!   To keep from stripping out any screws, use no more than 8 inch/lbs when installing them.
13. Power on and test the unit.
14. Replace all the screws in the base and rear panels. **Note** some screws are self-tapping and some are machine screws. See Figure 21 for location.

SECTION K

Replacing the Line Filter

Installing
1. Remove all cables connected to the TS-12, including the power cord.
2. Turn the unit upsidedown and remove the screws from the base and rear panels as shown in Figure 21.
3. Remove the three (3) wires connected to the back of the Filter, paying particular attention to the polarity (Black to N, Red to L, Green/Yellow to ground).
4. Remove the two (2) screws that secure the Filter to the I/O bracket.

Installing
5. Install the new Line Filter from outside the case using the two screws.
6. Reconnect the three wires to the Filter, again noting the proper polarity: Black to N, Red to L, Green/Yellow to ground.

IMPORTANT! Failure to connect the wires to their proper posts can lead to a potential shock hazard, see Figure 6.

7. Power on and test the unit.
8. Replace all the screws in the base and rear panels. **Note** some screws are self-tapping and some are machine screws. See Figure 21 for location.

SECTION L

Replacing the O.S. EPROMs

The TS-12 operating system can be updated by replacing the O.S. EPROMs. Each TS-12 has two Operating System EPROMs located on the middle of the digital board.

Updating a TS-12 to Version 3 requires making one cut, adding one jumper, and moving one zero ohm resistor on the digital board. See the instruction in the EPROM Update Kit for more information.

1. Save all Sound, Preset and Sequence data (see the Disk Storage section).
Removing
2. Remove all cables connected to the TS-12, including the power cord.
3. Turn the unit upsidedown and remove the screws from the base and rear panels as shown in Figure 21.

Installing
4. The two Operating System EPROMs, LOWER (U5) and UPPER (U6), are located in the center of the digital board, see Figure 22. Carefully remove the two EPROMs and insert the replacement EPROMs into their respective sockets. Be sure the notch in each EPROM is facing away from the SIMM sockets.

IMPORTANT! **Make sure all audio cables are unplugged BEFORE turning the unit on. The first time you turn on the TS-12 after updating the software, the unit may make a pop.**

5.   Turn the unit right side up and turn it on.
6.   **Reinitialize** by holding down the **Presets** button and pressing the upper left black soft button. Then answer YES by pressing the upper right soft button.
7.   Check the software version by holding down **Presets** and pressing **System**.
8.   The second line of the display briefly shows ROM V X.XX. The version number (X.XX) should be the same as that printed on the label of the newly installed EPROMs.
9.   Turn the unit off and turn it upside down.

USE NO MORE THAN 8 INCH POUNDS WHEN INSTALLING SCREWS!

10. Replace all the screws in the base and rear panels. **Note** some screws are self-tapping and some are machine screws. See Figure 21 for location.
11. Load in the Sounds, Presets and Sequences that you saved in step 1, see Disk Storage section.

SECTION
M

Replacing the SCSI Board

Removing
1.   Remove all cables connected to the TS-12, including the power cord.
2.   Turn the unit upsidedown and remove the screws from the base and rear panels as shown in Figure 21.
3.   Using a scribe, disconnect the 34-pin ribbon cable from J9 of the digital board.
4.   Remove the two (2) KEPs nuts (nuts with star washers) that hold the SCSI bracket to the I/O bracket.
5.   Using needlenose pliers, remove the hex screws that hold the 26-pin SCSI connector to the SCSI bracket.
6.   Detach the SCSI board from the SCSI bracket.
7.   Using a scribe, disconnect the 34-pin ribbon cable from the SCSI board.

Installing
8.   Connect the 34-pin ribbon cable to the replacement board, making sure that the striped end of the cable is on pin 1 of the connector.
9.   Attach the replacement board to the SCSI bracket using the hex screws and lock washers. The lock washers should be on the outside (black side) of the bracket.
10. Install the SCSI board, component side down, between the jack board (4090020201) and the digital board (4090020501). Attach SCSI bracket to the I/O bracket using the two (2) KEPs nuts.
11. Connect the 34-pin ribbon cable from the SCSI board to J9 of the digital board.
12. Place the basepan on, but don't install any screws yet.
13. Turn the unit right side up. Turn it on.
14. Press **Storage**. Verify that the display shows SCSI on the left side of the bottom line of the display. If it doesn't, check the connection of the 34-pin cable.
15. Turn the unit off and turn it up side down again.
16. Replace all the screws in the base and rear panels. **Note** some screws are self-tapping and some are machine screws. See Figure 21 for location.

SECTION
N

Replacing the Keyboard Processor Board

Removing

1. Remove all cables connected to the TS-12, including the power cord.
2. Turn the unit upsidedown and remove the screws from the base and rear panels as shown in Figure 21
3. Remove the six (6) screws that hold the bracket over the keyboard processor board to the unit.
4. Using a scribe, disconnect the following cables from the keyboard processor board:
   a) J2 - 4-pin white keys pressure strip,
   b) J3 - 4-pin black keys pressure strip,
   c) J4 - 20-pin ribbon cable to digital board (4090020501),
   d) J7 - 20-pin ribbon cable to keyboard, and
   e) J8 - 16-pin ribbon cable to keyboard.
5. **Make sure that the pressure strips remain in the guide!**
6. Remove the four (4) self-tapping screws that hold the keyboard processor board to the keyboard's key contact PCB.
7. **Hold the mono pressure strip guide in place with one hand** and slide the keyboard processor board toward the analog board bracket and out of the clips of the guide. Remove the keyboard processor board from the unit.
8. Using needlenose pliers, remove the four plastic standoffs from the keyboard processor board and install them into the mounting holes of the replacement board.
9. To install the replacement board into the unit, make sure that the corner of the board with J1 and J2 is closest to the wheels.
10. **Hold the mono pressure strip guide in place with one hand** and slide the keyboard processor board into the guide clips. The clips should fit into the holes on the keyboard processor board. See Figure 24.
11. Line up the mounting holes with the holes in the keyboard key contact PCB.
12. Install the four (4) screws through the keyboard processor board and plastic standoffs into the keyboard key contact PCB (see step 6).
13. Reconnect the cables to the keyboard processor board, see step 4.
14. Install the other keyboard bracket over the keyboard processor board and fasten it with the six (6) screws.
15. Power on and test the unit.
16. Replace all the screws in the base and rear panels. **Note** some screws are self-tapping and some are machine screws. See Figure 21 for location.
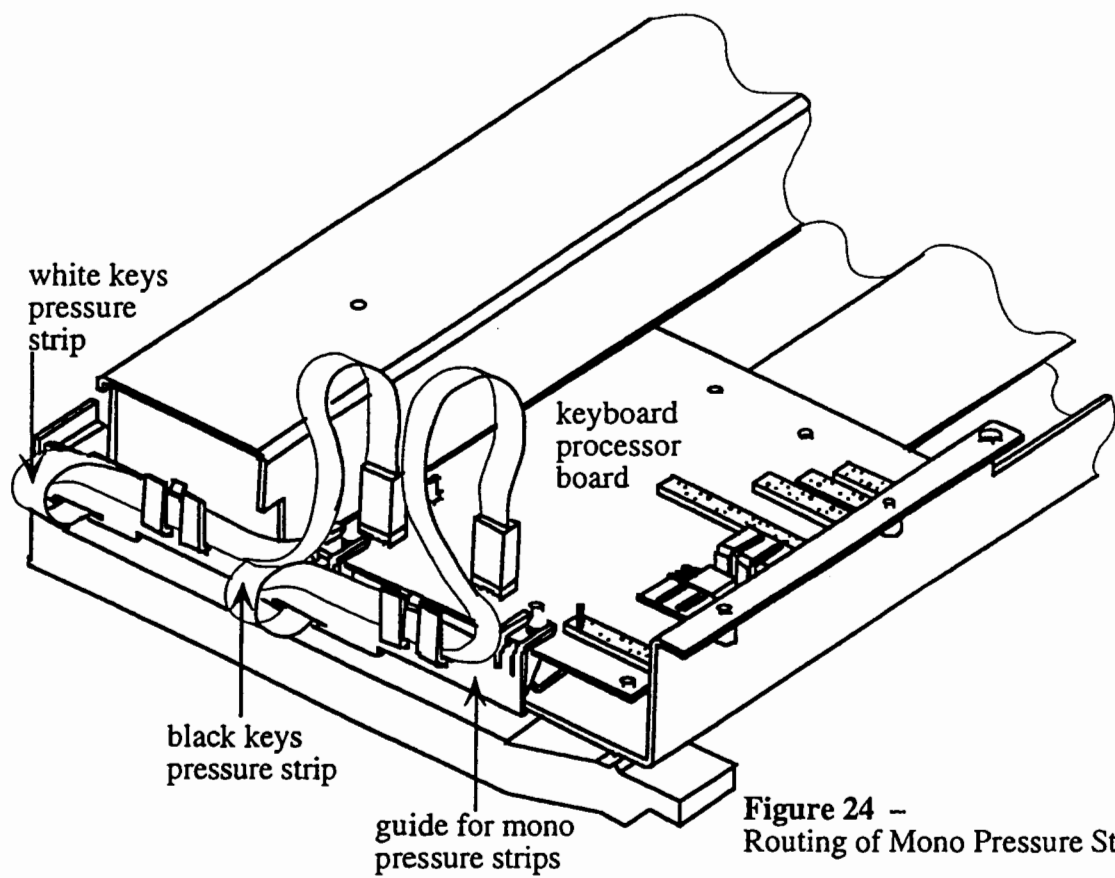
white keys
pressure
strip

keyboard
processor
board

black keys
pressure strip

guide for mono
pressure strips

Figure 24 –
Routing of Mono Pressure Strips

SECTION
O

Replacing Key Contact PCBs & Bubble Strips

Removing
1. Remove all cables connected to the TS-12, including the power cord.
2. Turn the unit upsidedown and remove the screws from the base and rear panels as shown in Figure 21.
2. Remove the keyboard from the unit, see Section E.
3. Place the keyboard keys down on a soft surface that will not scratch the keys.
4. Remove the four (4) screws that hold the keyboard processor board to the key contact PCB.
5. Remove the forty-one (41) screws that secure the two (2) key contact PC boards to the keyboard (a #1 Phillips screwdriver works best).
6. Lift the key contact PC boards from the keyboard and note the orientation of the key contact bubble strips.

IMPORTANT: You must replace the bubble strips in the same orientation they were removed from for velocity sensing to work!

7. Gently peel each key contact bubble strip from the two key contact PC boards. They should peel off with very little force. There are five strips of twelve bubble contacts, two strips of eight bubble contacts, see Figure 25.
8. Perform any necessary maintenance as described on pp. 15-18.

Installing
9. Place each key contact bubble strip in its proper location and orientation. It is VERY IMPORTANT to orient the stops properly for velocity sensing to work.

Deeper hole closest to the spring end of the key

Bubble

| 8 | 12 | 12 | 12 | 12 | 12 | 8 |

Figure 25 – Bubble strip lengths

10. Align the rubber posts on the contact strip with the appropriate holes on the key contact PC board.
11. Using a thin blunt instrument (a solder tinned end of a straightened paper clip or a miniature screwdriver such as Xcelite MN-01 works well), gently push each rubber post through the appropriate hole on the key contact PC board. It **does not** take much force to push the post through, if you use too much force, you can tear the contact strip or cause damage to the PC board.
12. After all bubble strips are replaced, install the key contact PC boards onto the keyboard using the 41 screws. The shorter board goes on the lower half of the keyboard. The connectors should be near the center of the keyboard.
13. Install the keyboard processor board using the four screws. See Figure 24 for the routing of the mono pressure strips.
14. Reinstall the keyboard, see Section E.
15. Replace all the screws in the base and rear panels. **Note** some screws are self-tapping and some are machine screws. See Figure 21 for location.

Important Information about SIMMs

If you are unfamiliar with installing SIMMs, we recommend reading all the SIMM information here before attempting to install SIMMs in a TS.

An Important Note About ElectroStatic Discharge

SIMMs are susceptible to ElectroStatic Discharge (ESD) commonly known as "static." ElectroStatic Discharge can destroy or damage SIMMs. To minimize the possibility of causing ESD damage:
1) Before installing SIMMs, you should be grounded by using a ground strap to discharge any static electric charge built up on your body. The ground strap attaches to your wrist and a ground source allowing your hands to be free to work.
2) Avoid any unnecessary movement, such as scuffing your feet when handling SIMMs, since most movement can generate additional charges of static electricity.
3) Minimize the handling of the SIMMs. Keep them in their static free packages until needed. Only transport or store the SIMMs in their protective packages.
4) Avoid touching the connector pins of the SIMMs. Handle the SIMMs by the edges only.

What is a SIMM?

SIMM is an acronym which stands for Single In-line Memory Module. SIMMs have become the industry standard used by most computers (both IBM and Macintosh compatible) to expand the computer's memory. Because of this, SIMMs are readily available in most computer software stores, and from mail order organizations. In the TS, SIMMs are used to access Sample Sounds.
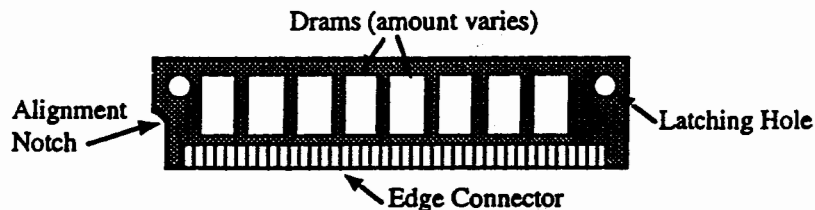
What SIMMs to Use

Here is some important information you should know about the *proper* SIMMs:
- The TS was designed to use 30-pin DRAM 1Meg x 8 or 4Meg x 8 (Macintosh) non-parity SIMMs (not 1Meg x 9 or 4Meg x 9 parity SIMMs). We highly recommend using this type of SIMMs.
- We do not recommend using parity SIMMs (designed for IBM PC compatibles). These SIMMs may not operate properly, and may cause damage to the TS.
- We recommend using SIMMs with an access speed of 100 nanoseconds or faster.

About SIMMs and Sampled Sounds

The TS SIMMs allow you to load EPS/EPS-16 PLUS/ASR-10 Sampled Sound files into the Sampled Sound locations, with all settings intact. When EPS-16 PLUS/ASR-10 Sampled Sound files are loaded, the TS chooses the closest match for the effect algorithm and parameter settings, and installs this effect as the Sampled Sound Bank Effect. Polyphony is reduced to 31 voices when Sampled Sounds are loaded into Dynamic RAM (1 voice is used for DRAM refresh).

What Size SIMMs?

The TS offers two options for SIMMs:

- The TS is shipped from the factory with two 1Meg x 8 (Macintosh) non-parity SIMMs — 1 BankSet (S8) is available (1 BankSet consists of 10 Sampled Sound Banks). The Sampled Sound BankSet will hold 1MWord of Sampled Sound information, equivalent to 4018 blocks of memory.
- With two 4Meg x 8 non-parity SIMMs installed — 2 BankSets (S8 and S9) of 10 Sampled Sound Banks each are available. Each Sampled Sound BankSet will hold 2MWords of Sampled Sound information, for a total of 4 MWords, offering 8114 blocks of memory for BankSet S8, and 8191 blocks for BankSet S9. The maximum size for a Sampled Sound is 4 Megabytes/2 MWords.

Accessing SIMMs

To access the SIMMs in a TS, make sure all cables, **especially** the power cable, are unplugged from the TS. Turn the unit upside down on a soft surface with the keys facing away from you. Remove the basepan from the unit (see Figure 21 for TS-12). The SIMMs are located on a corner of the digital board.

About the SIMM Socket

The SIMM socket uses the pins on the end of the latching posts to hold the SIMM in place. The alignment notch on the SIMM prevents it from being installed backward. Once installed, the retaining posts hold the SIMM in place securely, prevent it from dropping out of the socket inside the TS.

TS SIMM Socket

Retaining Post → ← Latching Posts → ← Retaining Post
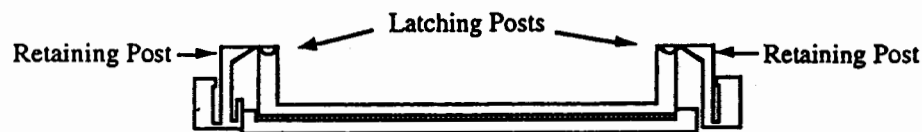
To Remove a SIMM from a SIMM Socket

Bend the two retaining posts out of the way...   just far enough to remove the SIMM

- *Carefully* spread open the retaining posts found on each end of the SIMM. Only spread the posts as far apart as needed to clear the board; these posts can easily break if too much force is applied. If broken, it will be very difficult to secure a new SIMM back into that socket. We suggest spreading one post at a time; that way it's easier to control the amount of pressure being applied to remove the SIMM.
- Once the retaining posts are out of the way, tilt the SIMM toward you, and lift up and out of the socket.

**To Install a
SIMM into a
SIMM Socket:**

Push

Press until SIMM
locks into position

Side View

Step 1   Step 2
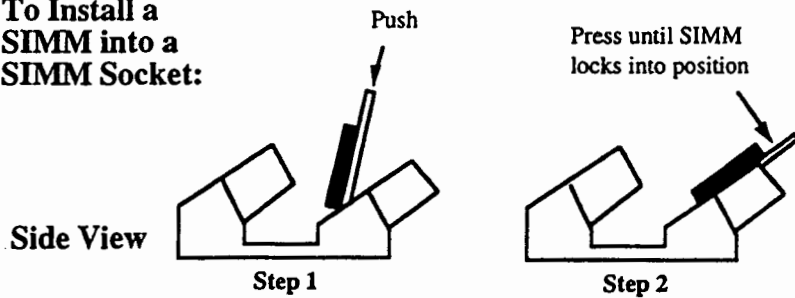
- Place the connector edge of the SIMM into the SIMM Socket, pressing down slightly. The latching holes on each end of the SIMM will line up with the latching posts when the SIMM is seated properly.
- Tilt the SIMM back into the socket until the retaining posts snap in front of the SIMM. A properly installed SIMM should look like this:

**Proper SIMM
Installation** — Retaining Post → ◄— Retaining Post
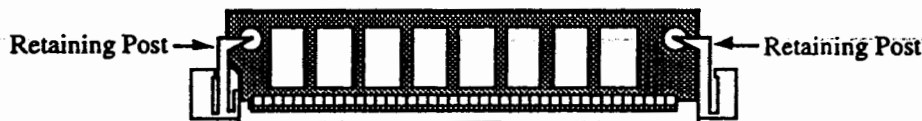
- To verify that you've expanded your memory correctly, after powering up the TS, press **Sounds**, then while holding down **BankSet** press **9**. The display in the top left corner should show S9.

More Important Information about SIMMs
- When adding memory, only install D-RAM SIMMs in the expansion slots. The TS will **not** accept static RAM or ROMs.
- Any configuration that does not use two of the same size SIMMs will not work.
- 1Meg x 9 or 4Meg x 9 parity SIMMs (for IBM PC compatibles) **should not be used**. Only 1Meg x 8 or 4Meg x 8 (Macintosh-type) SIMMs should be used.

SQX-70 Sequencer Expansion
The SQX-70 sequencer expansion requires adding chips to locations U1 and U2 on the digital board. The SQX-70 increases the memory of the TS from 30,000 notes to 97,000 notes. The installation instructions are included in the SQX-70 kit.

SCSI Information

SCSI Cables
There are cheap and expensive ($12 up to $50) cables available in computer stores. Usually the cheap cables cut corners on materials and they may become unreliable. It is worth the extra money to purchase a good SCSI cable. Most SCSI drives come with a 25-pin to 50-pin cable.

Cramolin
We recommend using Cramolin Red on SCSI cable connections. It is a continuity enhancer that makes connections more reliable. It costs about $20 for a 2 oz. bottle, but it's worth it!

Termination — A SCSI drive must supply its own termination power.

Termination is a very important factor especially when you consider all the different units in your SCSI setup with different power supply sources. Macintosh computers that don't have hard drives also don't have termination. Hard drive and computer power supplies introduce noise into a system and this noise confuses the SCSI software. The SCSI software gets confused because it can't tell what's noise, what is a "1" or what is a "0". Termination filters out this noise so the software can do its job.

SCSI Terminators

The SCSI terminator is simply a resistor network on each SCSI signal on the SCSI bus. The terminator prevents reflection or ringing on the signal lines, allowing reliable high speed data transfers.

Warning!   A system configuration (two or more SCSI storage devices) must have two terminators. Damage will result if more than two terminators are present.

The terminator is either external or internal. The external terminator resembles two 50-pin SCSI connectors mounted back to back and encased in plastic. It is plugged into the SCSI connector of the device and then the SCSI cable is plugged into the terminator. The internal terminator is simply the resistor network, typically as resistor packs on the SCSI device controller circuit board. The documentation that accompanies the SCSI device usually describes the procedures required for installation and removal of terminators. The SCSI installed TS-12SR (or the SP-4 SCSI Kit for all other TS units) contains internal termination via removable resistor packs (do not remove the resistor packs unless directed by the ENSONIQ Customer Service). Note that the TS supplies power to its own terminator only. Therefore, any SCSI storage devices used with the TS must supply power to the SCSI bus.

Other SCSI Information

The main problems that you are likely to encounter are the SCSI Storage Device problems and cable problems. These are some additional recommendations that we can make to eliminate many problems:

* Use the shortest cable possible when connecting SCSI Storage Devices.
* Be sure to use proper termination. Refer to the SCSI Terminators section of this manual.
* If you need to use an extension cable between your TS and your SCSI Storage Device(s), use high quality shielded SCSI extension cables only (do not use printer cables). You should be careful to avoid running SCSI cables across power cables and other sources of powerful electromagnetic fields.
* It is required that the SCSI Storage Device supply power to the SCSI bus. Check your SCSI Storage Device manual for further information.
* Some SCSI Storage Devices may have their SCSI Device ID number set internally. Refer to the SCSI Storage Device's manual or manufacturer for more information.
* If you use an Apple computer in your setup, be sure to use a short (18" or shorter) Apple-brand SCSI cable between the computer and the first connected SCSI Storage Device.

Remember, most of the SCSI problems we encounter are with cabling or with systems that are not terminated properly. If you encounter a problem, make sure you have checked these things carefully before assuming that your TS, SP-4 or your SCSI Storage Device are at fault.

Approved SCSI Storage Devices for the TS

Hard Drives — Fixed and Removable

There are two basic types of hard drives, fixed and removable. A fixed hard drive stores all data internally, without the need for cartridges (or other storage sources). A removable drive allows you to remove the cartridge (or other storage source) from the hard drive for archival purposes. The largest amount of Sampled Sound data that can be stored on a hard drive is 4 GigaBytes. The following lists models of hard drives that we have tested and have found to work with the TS and ASR-10 equipped with SCSI, as of November 1993 (see NOTES below).

Manufacturer	Phone	Model(s)
DynaTek Automation Systems	416-636-3000	all models
Frontera	800-845-0756	all models
Mass Microsystems	800-522-7979	Datapack45
Microtech International	800-325-1895	R45, N20, N40, N80, N100, N150
PLI	415-657-2211	45 MB Removable
	800-288-8754	
PS Systems	619-578-1118	all models

NOTES:

1. The ASR-10 requires parity disabled on it's hard drive (drives with Seagate mechanisms sometimes have parity enabled). Most hard drives have this as a jumper option and disabling parity usually requires a jumper to be removed.
2. Any drive that uses a Fujitsu, Conner Peripherals, or Seagate (see note above) mechanism should work.
3. Any removable drive that uses the Syquest 44 MegaByte, 88 MegaByte, or the 105M 3.5 mechanism should work.
4. Quantum Pro series drives will work with the ASR-10.
5. Any drive that uses a Bernoulli 150MegaByte removable mechanism should work.

Magneto-Optical (MO) Drives

An MO drive is a rewritable type of storage device that uses optical means to read and write data. Data can be written and rewritten up to one million times, as easily as with conventional magnetic storage media such as floppies and hard drives. There are two basic types of MO Drives:

- 3.5 MO drives use 3.5" single-sided ISO standard cartridges; a storage capacity of 128 MegaBytes per cartridge.
- 5.25 MO drives use 5.5" double-sided ISO standard cartridges; a storage capacity of 650 MegaBytes per cartridge, with 325 MegaBytes accessible at a time (per side).
- In general, any MO Drive that uses a Sony mechanism should work with your ENSONIQ product.

CD-ROM Drives
A CD-ROM Drive is a read-only storage device that allows you to access files stored on a CD. CD-ROM disks can store up to 600 MegaBytes of information.

Manufacturer	Phone	Model(s)
DynaTek Automation Systems	416-636-3000	all models
Frontera	800-845-0756	all models
Chinon America, Inc.	310-533-0274	435
	800-441-0222	535

• In general, any CD-ROM that uses a Sony or Toshiba mechanism should work.

25-pin SCSI External Terminator
ENSONIQ Corp	610-647-3930	SPT-1

This information is subject to change without notice.

Disk Storage

Formatting a TS Disk
- Insert a disk into the disk drive (double density or high density)
- Press Storage.
- Select DISK.
- Select *FORMAT*. The display shows DISK NAME=TSD-ØØØ.
- Use the **Up/Down Arrow** buttons to change the character, then use the soft buttons below LEFT and RIGHT to move the cursor (underline) to the next character.
- Select *FORMAT* to proceed (or *EXIT* to leave this page with no harm done). The display shows FORMAT DISK ALL DISK FILES WILL BE ERASED. Press *YES* to proceed, or *NO * to abort the command.
- While the unit is formatting the disk the display reads FORMATTING DISK PLEASE WAIT.. The formatting process takes about 80 seconds.
- When the formatting is done, the display reads DISK COMMAND COMPLETED, and then you are returned to the Storage page.

Saving TS Data to a Disk
You will be saving four (4) different files: 60-SEQ/SONGS with 120 programs; 120-PRESETS; SYSTEM-SETUP; and SAMPLE-BANKS.
- Insert a formatted disk into the disk drive.
- Press **Storage**.
- Select DISK.
- Select SAVE.
- Move the **Data Entry Slider** (or use the **Up/Down Arrow** buttons) until the display shows FILE TYPE=60-SEQ/SONGS.
- Select *YES*. The display shows SAVE NO PROGRAMS IN SEQ FILE.
- Move the **Data Entry Slider** to change NO to 120.
- Select *YES*. The display shows SAVE FILE NAME=60-SEQ/SONGS.
- Use the **Up/Down Arrow** buttons to change the character, then use the soft buttons below LEFT and RIGHT to move the cursor (underline) to the next character.
- Select *YES*.
- After the unit is done saving, it returns to the SAVE FILE page.
- Move the **Data Entry Slider** (or use the **Up/Down Arrow** buttons) until the display shows TYPE=120-PRESETS.
- Select *YES*. The display shows SAVE FILE NAME=120-PST-FILE.
- Use the **Up/Down Arrow** buttons to change the character, then use the soft buttons below LEFT and RIGHT to move the cursor (underline) to the next character.
- Select *YES*.
- After the unit is done saving, it returns to the SAVE FILE page.
- Move the **Data Entry Slider** (or use the **Up/Down Arrow** buttons) until the display shows TYPE=SYSTEM-SETUP.
- Select *YES*. The display shows SAVE FILE NAME=CONFIG-FILE.
- Use the **Up/Down Arrow** buttons to change the character, then use the soft buttons below LEFT and RIGHT to move the cursor (underline) to the next character.

- Select *YES*.
- After the unit is done saving, it returns to the SAVE FILE page.
- Move the **Data Entry Slider** (or use the **Up/Down Arrow** buttons) until the display shows TYPE=SAMPLE-BANKS.
- Select *YES*. The display shows SAVE FILE NAME=SAMPLE-BNKS.
- Use the **Up/Down Arrow** buttons to change the character, then use the soft buttons below LEFT and RIGHT to move the cursor (underline) to the next character.
- Select *YES*.

Loading TS Data from a Disk

- Insert the disk containing the file data into the disk drive.
- Press **Storage** to go to the Storage Page.
- Press DISK. The Disk Storage menu appears.
- Press LOAD. The Load File display appears as shown above. The file type is underlined.
- Using the **Data Entry Slider** (or the **Up/Down Arrow** buttons) scroll until the display shows TYPE=60-SEQ/SONGS.

Tip: Press the **Storage** button twice to get to the Load File display quickly.

- Press the soft button above the file name and use the data entry controls to find your file.
- Press *YES*. The display reads LOADING FILE... while the data is being loaded. Or press *NO* to cancel the procedure for any reason.
- After the file is loaded, the TS returns to the Load File page.
- Using the **Data Entry Slider** (or the **Up/Down Arrow** buttons) scroll until the display shows TYPE=120-PRESETS.
- Press the soft button above the file name and use the data entry controls to find your file.
- Press *YES*. The display reads LOADING FILE... while the data is being loaded.
- After the file is loaded, the TS returns to the Load File page.
- Using the **Data Entry Slider** (or the **Up/Down Arrow** buttons) scroll until the display shows TYPE=SYSTEM-SETUP.
- Press the soft button above the file name and use the data entry controls to find your file.
- Press *YES*. The display reads LOADING FILE... while the data is being loaded.
- After the file is loaded, the TS returns to the Load File page.
- Using the **Data Entry Slider** (or the **Up/Down Arrow** buttons) scroll until the display shows TYPE=SAMPLE-BANKS.
- Press the soft button above the file name and use the data entry controls to find your file.
- Press *YES*. The display reads LOADING FILE... while the data is being loaded.
- After the file is loaded, the TS returns to the Load File page.

GLOSSARY

Composite SIMMS	SIMMs that contain more than one *size* of RAM chip. These SIMMs may also contain GALs or PALs. Don't use these SIMMS in a TS.
GAL	gate array logic chip
KEPs	nuts with star washers attached
Nylock screw	a screw that has a patch of nylon on the threads for greater holding power
PAL	programmable array logic chip
PEMs	threaded mounting standoff for screws
Scribe	an angled tool that allows you to disconnect cables without damaging them (see p. 4).
SCSI	small computer system interface
SEMs	screws with star washers attached
SIMMs	single inline memory module
Termination	Termination filters out noise introduced by hard drives or computer power supplies from a system so that the noise can't confuse the SCSI software.

Circuit Boards	TS-10	TS-12
digital board	4090020001/20503	4090020501
analog board	4090020301	4090020301
jack board	4090020201	4090020201
power supply board	4090020401	4090020402
keypad/display board	4090020101	4090020101
patch select/wheel board	4090017801	4090017801
SCSI board	4090020601	4090020601

ENSONIQ Customer Service

Hours: Monday through Friday 9:30 AM to 6:30 PM Eastern Time
                                                Closed for lunch 12:15 PM to 1:15 PM

Parts ordering: U.S.☎ 800-441-1003   Canada ☎ 514-633-8877

Customer Tech Support: 610-647-3930

ENSONIQ Fax: 610-647-8908

When contacting ENSONIQ Customer Service, please have the following information ready:

- ☞ Model Number,
- ☞ Serial Number,
- ☞ Operation System Version,
- ☞ Warranty Status, and
- ☞ Your Purchase Order Number when ordering parts.