Section 4 Maintenance

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Caution

The installation and servicing instructions in this manual are for use by qualified personnel only. To avoid electric shock do not perform any servicing other than that contained in the Operating Instructions unless you are qualified to do so. Refer all servicing to qualified service personnel.

Getting Inside the Chassis

The 8200ST has two circuit boards: a main board containing almost all audio circuitry and the power supply, and a vertical board behind the front panel containing the display circuitry and the amplifiers that provide the output attenuation function for each channel.

To access the circuit boards, remove all screws holding the appropriate cover in place, then lift that cover off.

Remove the *top cover* for access to all integrated circuits, the component side of the front-panel circuit board, or the jumpers on the component side of the main circuit board.

Remove the *bottom cover* for access to the solder side of the main circuit board. To remove the bottom cover, you must first remove all the power transformer leads from their push-on terminals, noting where they go so you can reassemble the unit correctly later. You can then remove the bottom cover and power transformer, which is mounted by four screws to the bottom cover. It is not necessary to remove the transformer from the bottom cover.

When replacing the covers, replace all screws snugly (be careful not to strip the threads by fastening the screws too tightly).

To access the solder side of the front-panel circuit board, remove the top cover, remove the six screws that attach the board to the front panel standoffs, then carefully tilt the board back and down. DO NOT attempt to remove the front-panel board from the chassis — it is hard-wired to the main circuit board.

Performance Evaluation

These are instructions for thoroughly checking the performance of the 8200ST. The evaluation includes checks of the power supplies, input stages, VCAs, gate control circuit, VCA control circuits, meters, high-frequency limiters, output stages, and overall performance.

This procedure is useful in detecting and diagnosing problems, and for checking routine performance.

See assembly drawings in Section 6 for locations of components, jumpers, and test points. *All jumpers and test points are located on the main circuit board.*

Perform procedures in order without skipping steps.

Equipment Required:

Oscilloscope

DC-coupled, with at least 5MHz vertical bandwidth.

Digital voltmeter

Accurate to 0.1%.

Audio voltmeter

Accurate to 2%. Audio Precision System 1, Sound Technology 1710B (or equivalent) preferred.

Low-distortion audio oscillator

With verified residual distortion below 0.003%. Sound Technology 1710B or equivalent preferred.

THD analyzer

With verified residual distortion below 0.003%. Sound Technology 1710B or equivalent preferred.

Spectrum analyzer with tracking generator

Tektronix 5L4N plug-in with 5111 bistable storage mainframe, or equivalent. *Alternatively*, a sweep generator with 50-20,000Hz logarithmic sweep can be used with an oscilloscope in X/Y mode.

1. Remove the top cover.

Remove the eight screws that hold the top cover in place, then lift off the top cover.

2. Record all control and internal jumper settings.

3. Check power supplies.

A☐ Verify the following resistances:

Between:	And:	Resistance:
Power cord ground pin	Chassis	short circuit
Each of the power cord blades	Chassis	open circuit
One power cord blade	The other blade	40Ω (for a 115V unit) 140Ω (for a 230V unit)

B☐ Power the unit.

C☐ Verify that the negative unregulated power rail is between −18V and −26V, and that the positive unregulated power rail is between +18V and +26V.

Measure the negative unregulated voltage across C501 and the positive unregulated voltage across C500.

D☐ Verify that the outputs of the ±15V regulators at test points TP5 (+) and TP8 (−) are 15.00V ±0.75V.

E☐ Verify with an oscilloscope that the noise and ripple on the regulated power supply rails (TP5 and TP8) is below 4mV peak.

F☐ Place jumper JA in the OFF position.

G☐ With a digital voltmeter, verify that the voltage at test point TP9 is −10.0V ±0.75V.

H☐ Verify that the voltage at test point TP10 is +10.0V ±0.75V.

I ☐ Place jumper JA in the ON position.

J☐ Verify that the voltage at TP10 is +5.5V ±0.3V.

K☐ Verify that the voltage at TP9 is −5.5V ±0.3V.

L☐ Adjust +3 VOLT trimmer R8 to produce +3V ±0.1V at test point TP14.

4. Check VCA stages.

A☐ Connect an audio oscillator between pins 2 and 3 of the left input connector.

If the oscillator output is unbalanced, connect the grounded side of the oscillator output to ground pin 3.

B☐ Set the oscillator's frequency to 1kHz and its output level to 0dBu.

0dBu = 0.775V RMS. The dBm/600Ω scale commonly found on test instruments can be read as dBu for this application.

C☐ Connect a THD analyzer, audio voltmeter, and oscilloscope to test point TP1.

D☐ Set the AGC button to OFF.

E☐ Center L DISTORTION NULL trimmer R110 and L THUMP NULL trimmer R109.

F☐ Adjust the GAIN REDUCTION control to produce a +14.0dBu ±0.2dB level at TP1. Verify that the signal at TP1 is a sine wave of normal appearance.

G☐ Adjust L DIST NULL trimmer R110 for minimum THD at TP1. Verify that THD is below 0.01% in a 20-20,000Hz bandwidth.

H☐ Increase the audio oscillator's output level until you observe clipping at TP1. Verify that the oscillator's output level is at least +20dBu when you first see clipping.

I ☐ Mute the audio oscillator and verify that there is no "popcorn" noise or oscillation.

J ☐ Disconnect the audio oscillator from pin 2 of the left input connector and connect it to TP23.

K☐ Set the oscillator's frequency to 1kHz and its output level to −30dBu.

L☐ Adjust L THUMP NULL trimmer R109 to minimize 1kHz feedthrough (at TP1).

You can do this conveniently by observing the distortion residual on the oscilloscope.

M☐ Press the TONE button, and wait for tone to appear.

N☐ Connect the DVM to TP24.

O☐ Adjust R198 (OFFSET GAIN) to make the DVM indicate +0.1VDC.

P☐ Press the TONE button to turn the tone OFF.

Q☐ Check the right channel VCA stage by repeating the above for the right channel.

Use the right channel controls, XLR connectors, and trimmers instead of the left. Substitute TP2 for TP1, TP20 for TP23 and TP21 for TP24.

R☐ Disconnect the THD analyzer, the audio voltmeter, and the oscilloscope from the 8200ST.

5. Check gate control circuits.

A☐ Connect the audio oscillator between pins 2 and 3 of the left input connector.

B☐ Set the oscillator's frequency to 1kHz and its output level to −6dBu.

C☐ Set the COUPLE button to OFF.

D☐ Set the AGC button to ON.

E☐ Turn the GATE and GAIN REDUCTION controls straight up (12:00).

F☐ Verify that the GATE indicator (the LED next to the GATE control) is off.

G☐ Mute the oscillator. Verify that the GATE indicator turns on.

H☐ Restore the oscillator's output and adjust its output level until the GATE indicator goes out. Verify that this occurs when the level at test point TP1 is −13dBu ±3.0dB.

6. Check VCA control circuits and GAIN REDUCTION meters.

A☐ Set the oscillator's output level to +5dBu.

B☐ Set the controls as follows:

GAIN REDUCTION	fully clockwise
GATE	fully counterclockwise
RELEASE	fully counterclockwise
AGC	ON
COUPLE	OFF

C☐ Verify that all LED segments of the L GAIN REDUCTION meter light.

D☐ Mute the oscillator, verify that the L GAIN REDUCTION meter reading decays to "0dB" in 3.5 seconds ±2 seconds, then restore the signal.

E☐ Turn the RELEASE control fully clockwise.

F☐ Mute the oscillator, verify that the L GAIN REDUCTION meter reading decays to "0" in 24 seconds ±5 seconds, then restore the signal.

G☐ Turn the RELEASE control fully counterclockwise, and set the COUPLE button to ON.

H☐ Mute the oscillator, verify that *both* GAIN REDUCTION meters' readings decay, and that the meters track each other closely. Restore the signal.

I ☐ Set the COUPLE button to OFF.

J ☐ Set the audio oscillator's output level to −10dBu.

K☐ Adjust the GAIN REDUCTION control until the second (5dB) LED segment of the L GAIN REDUCTION meter just lights. Connect the audio voltmeter to test point TP1, and observe the level at TP1.

L ☐ Increase the audio oscillator's output level to 10dBu.

M☐ Verify that the L GAIN REDUCTION meter indicates 25dB gain reduction, and that the level at TP1 is no more than 1.0dB greater than that observed before increasing the oscillator's output level.

N☐ Set the VOICE button to ON.

O☐ Mute the oscillator and let the GAIN REDUCTION meter reading decay to "0."

P☐ Restore the oscillator and watch the behavior of the GAIN REDUCTION meter as a function of time. It should jump immediately to 25dB gain reduction.

Q☐ Set the VOICE button to OFF.

R☐ Mute the oscillator and let the GAIN REDUCTION meter reading decay to "0."

S☐ Restore the signal, verify that the L GAIN REDUCTION meter indicates 22 to 25dB gain reduction in 2 seconds ±1 second.

T☐ Mute the oscillator. When the gain reduction begins to diminish, turn the GATE control fully clockwise, and verify that the L GAIN REDUCTION meter "freezes" when the GATE indicator lights.

U☐ Turn the GATE control counterclockwise, and verify that the L GAIN REDUCTION meter reading begins to decrease when the GATE indicator goes out.

V☐ Check the right channel VCA control circuit and GAIN REDUCTION meter by repeating steps 6-A thru 6-U for right channel.

Use the right channel XLR and meter instead of the left, and substitute TP2 for TP1.

7. Check high-frequency limiters and MODULATION meters. (part 1)

A☐ Connect the audio oscillator to pin 2 of the left input connector, and ground pin 3 of the left input connector.

B☐ Set the oscillator's frequency to 1kHz and its output level to 0dBu.

C☐ Set controls, trimmers, and jumpers as follows:

HF LIMITER	150
HF LIMITER DIST NULL	
Trimmer R174	center
FET BIAS Trimmer R195	fully clockwise
Jumper JE	FLAT
AGC	OFF

D☐ Connect a THD analyzer, audio voltmeter, and oscilloscope to test point TP3.

E☐ Adjust the GAIN REDUCTION control to produce a level of 0.0dBu ±0.5dB at TP3. Verify that the signal at TP3 is a sine wave of normal appearance.

F☐ Mute the oscillator, verify that there is no "popcorn" noise or oscillation, then restore the signal.

G☐ Slowly turn L FET BIAS trimmer R195 counterclockwise until the level at TP3 begins to decrease. Then turn R195 clockwise until the level at TP3 stops increasing. Turn R195 clockwise about $\frac{1}{10}$-turn further.

H☐ Set the oscillator's frequency to 5kHz and its output level to 0dBu.

I ☐ Adjust left HF LIMITER DIST NULL trimmer R174 for minimum THD. Verify that THD does not exceed 0.05% in a 20-20,000Hz bandwidth at TP3.

J ☐ Set the oscillator's frequency to 1kHz, and verify that the left HF indicator does not light.

K ☐ Set the oscillator's frequency to 10kHz, and verify that the left HF indicator lights.

L ☐ Set the HF LIMITER switch to OFF, and verify that the left HF indicator goes out.

M ☐ Set the HF LIMITER switch to 150µs.

N ☐ Observe the level at TP3, then set the audio oscillator's frequency to 1kHz, and verify that the level at TP3 increases by about 10dB.

8. Check high-frequency limiters and MODULATION meters. (part 2)

A ☐ Place jumper JA in the ON position, and place jumper JE in the PRE-EMPHASIZED position.

B ☐ Set the HF LIMITER switch OFF.

C ☐ Set the oscillator's frequency to 1kHz and its output level to +10dBu.

D ☐ Slowly turn the GAIN REDUCTION control clockwise until clipping just commences. Verify (on the oscilloscope) that the clipping is symmetrical, and that it occurs at 5.5V peak.

5.5V peak is equal to 3.9V RMS or +14dBu.

E ☐ Slightly adjust R8 (+3V trimmer) so that the yellow ("0") segment of the MODULATION meter lights fully, but that levels more than 1dB below the clipping level do not light the yellow segment.

F ☐ Set the GAIN REDUCTION control so that you can see slight clipping on the scope. Place jumper JA in the OFF position, and verify that the clipping disappears.

G ☐ Turn the GAIN REDUCTION control fully clockwise, and set the HF LIMITER switch to 150.

H ☐ Place jumper JE in the FLAT position.

I ☐ Disconnect the audio oscillator from the 8200ST.

J ☐ Connect the tracking generator output of the spectrum analyzer between pins 2 and 3 of the left input connector. Set the spectrum analyzer for a 20-20,000Hz log sweep and a 2dB/division display. Adjust the generator's output level until the left HF indicator does not light.

K ☐ Connect the spectrum analyzer's input to TP3. Verify a flat response (±0.25dB) for each position of the HF LIMITER switch.

L ☐ Set the HF LIMITER switch to 25.

M☐ Slowly increase the tracking generator's output level until limiting action is clearly visible.

N☐ Verify that the limiting action is as shown in Figure 4-1 for each position of the HF LIMITER switch.

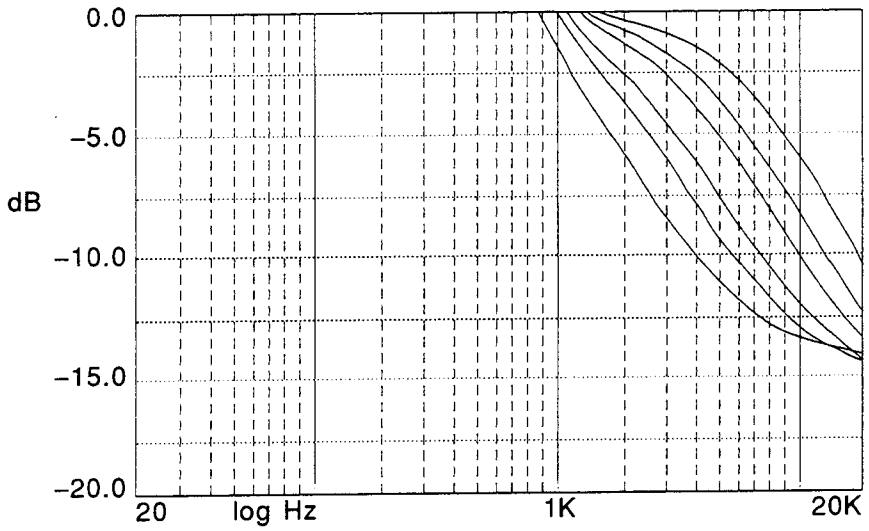

Figure 4-1: Limiting Curves

o☐ Check the right channel high-frequency limiter by repeating steps 7-A thru 7-N and steps 8-A thru 8-N for the right channel.

Use the right channel XLR, LED, trimmers, and meter instead of the left, and substitute TP18 for TP3, TP2 for TP1, and jumper JF for jumper JE. Do not readjust R8.

P☐ Disconnect the spectrum analyzer from the 8200ST.

9. Check the output stages.

A☐ Turn the L OUT control fully clockwise, and set the HF LIMITER to OFF.

B☐ Verify that the DC offset between pin 2 of the left output connector and pin 1 of the left output connector is less than 15mV.

C☐ Verify that the DC offset between pin 3 of the left output connector and pin 1 of the left output connector is less than 15mV.

There should be no signal applied to the inputs.

D☐ Verify (with the oscilloscope) that both pin 2 of the left output connector and pin 3 of the left output connector are free of "popcorn" noise or oscillation when observed against ground.

E☐ Connect the audio oscillator between pins 2 and 3 of the left input connector.

F☐ Set the oscillator's frequency to 1kHz and its output level to +10dBu.

G☐ Set the AGC button to OFF.

H☐ Connect a 600Ω resistor between pins 2 and 3 of the left output connector.

A 620Ω ½-watt resistor will do.

I ☐ Connect the audio voltmeter between pins 2 and 3 of the left output connector.

The audio voltmeter must have a balanced input.

J ☐ Connect the oscilloscope between pins 2 and 3 of the left output connector.

K☐ Advance the GAIN REDUCTION until you see light clipping, then disconnect the oscilloscope. Verify that the output level is at least +24dBu.

If the audio voltmeter has a unbalanced input (which grounds one side of the 8200ST's output), the clipping level you observe must be greater than +20dBu.

L☐ Rotate the L OUT control though its range. Verify that the output level varies correspondingly.

M☐ Remove the 600Ω resistor from the left output connector. Check the right channel output stage by repeating the above for the right channel.

Use the right channel controls, connectors, and meter instead of the left.

N☐ Disconnect the audio oscillator, audio voltmeter, and oscilloscope from the 8200ST.

10. Check system noise and distortion.

A☐ Center the GAIN REDUCTION control and left OUT control, turn the GATE control fully counterclockwise, and set the HF LIMITER switch to 75.

B☐ Short pins 2 and 3 of the left input connector.

C☐ Connect the audio voltmeter between pins 2 and 3 of the left output connector.

D☐ Press the TONE button. Set the left OUT control so that the tone is at +10dBu. Press the TONE button again to turn off the tone.

E☐ Verify that the residual noise at the left output connector is below −91dBu in a 20-20,000Hz bandwidth.

F☐ Remove the jumper(s) between pin 2 and pin 3 of the left input connector and ground.

G☐ Be sure that the AGC button is OFF.

H☐ Connect the audio oscillator between pins 2 and 3 of the left input connector.

I ☐ Set the oscillator's frequency to 1kHz and its output level to 0dBu.

J☐ Adjust the GAIN REDUCTION control to produce a +10dBu ±0.5dB level between pins 2 and 3 of the left output connector.

K☐ Connect the THD analyzer between pins 2 and 3 of the left output connector.

L☐ Verify that the THD is below 0.05% in a 20-20,000Hz bandwidth.

M☐ Set the AGC button to ON, the HF LIMITER switch to 75, and the RELEASE control to 5.

N☐ Adjust the GAIN REDUCTION control to produce 10dB gain reduction.

O☐ Verify that THD is below 0.05% in a 20-20,000Hz bandwidth with the audio oscillator set to 35Hz, 2kHz, and 15kHz.

P☐ Check the overall performance of the right channel by repeating the above for the right channel.

Use the right channel controls and connectors instead of the left.

Q☐ Disconnect all test instruments from the 8200ST.

11. Restore controls and internal jumpers.

Return all controls and jumpers to the positions recorded in step 2.

12. Replace the top cover.

Replace the six screws that hold it in place.

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Section 5
Troubleshooting

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Caution

The installation and servicing instructions in this manual are for use by qualified personnel only. To avoid electric shock do not perform any servicing other than that contained in the Operating Instructions unless you are qualified to do so. Refer all servicing to qualified service personnel.

Problems and Possible Causes

Always verify that the problem is not in the source material being fed to the 8200ST, or in other parts of the system.

RFI, hum, clicks, or buzzes

Check grounding. (Review the information on grounding in Section 2.)

The 8200ST's moderate RF suppression should suffice in most installations. However, installation next to a high-power transmitter might still cause problems. Additional RF suppression, careful examination of the grounding scheme, and other techniques familiar to the broadcast engineer may be required.

Power supply problems

The voltage regulators are operated conservatively and can be expected to be extremely reliable. Before replacing the regulators, check to see whether other abnormalities in the circuitry (such as a shorted IC) have caused excessive current demand which is in turn causing the regulator ICs to either current limit or go into thermal shutdown (the two built-in protective modes). If it becomes necessary to replace a regulator, be sure to replace its heat sink properly.

Regulators IC44 and IC43 are frequency-compensated by C502, C503 at their outputs to prevent high-frequency oscillations. If C502 or C503 is ever replaced, be sure to use a low-inductance aluminum electrolytic. (A tantalum can fail because the current-delivering capacity of the power supply can cause a runaway condition if the dielectric is punctured momentarily; a high-inductance aluminum can fail to prevent a regulator from oscillating.) Check for oscillation on the power bus with an oscilloscope if C502 or C503 is replaced.

Poor peak control

Check that the peak clippers are enabled: Jumper JA on the main circuit board should be in the ON position (see Figure 2-2). The device that the 8200ST is driving can cause peak control problems. A digital link, FM subcarrier generator or FM transmitter, for example, could introduce overshoot and ringing. A device with poor frequency response might cause "tilt" with low-frequency material. To prevent measurement error, be sure that the instrument used to measure the peak output of the 8200ST (or the device it is driving) has accurate transient response and no significant low-frequency tilt.

Shrill, harsh sound

This could be caused by the 8200ST's supplying pre-emphasis to a device that doesn't need it. If the device driven by the 8200ST does not require pre-emphasis, place jumpers JE and JF on the main circuit board in the "FLAT" position (see Figure 2-2).

Noise pumped up during pauses

The GATE control is probably set too low. See "Example Control Settings" (page 3-4).

Audible distortion

First make sure that the program material presented to the 8200ST's inputs is clean and distortion-free.

If the GAIN REDUCTION meters' red segments are lighting, reduce the amount of gain reduction. See Section 3, especially the discussion of "Leveling and Compression" on page 3-7.

If you can still hear distortion, check if the clipping bias is correct (±5.5VDC). Measure the clipping bias at test points TP2 (–) and TP3 (+) with jumper JA in the ON position. (See assembly drawing in Section 6 for locations of components).

We believe that ±5.5VDC is a very conservative setting that will not cause audible distortion even with very critical program material like solo piano. However, there is always a possibility that certain program material that we have not tested could cause problems. If you have discovered any such material, please let us know.

COUPLE and VOICE switches do not retain their settings when 8200ST is powered-down

These switches control memory elements that are kept alive by a large back-up reservoir capacitor when mains power is off. It should have sufficient capacity to hold the logic settings for greater than one week. If the settings do not hold for this period, suspect either the hold capacitor C1 or CMOS logic chips IC28, IC32, and IC34, which may have developed enough leakage to prematurely discharge C1.

Levels are not correct after alignment using the 8200ST's built-in oscillator

The oscillator level is probably incorrect. See page 2-6.

Technical Support

If you need technical support, contact Orban Customer Service. Be prepared to accurately describe the problem. Know the serial number of your unit — this is printed on its rear panel.

Telephone: (1) 510/351-3500 or Write: Customer Service
Orban
or Fax: (1) 510/351-1001 a division of AKG Acoustics, Inc.
1525 Alvarado Street
San Leandro, CA 94577 USA

Factory Service

Before you return a product to the factory for service, we recommend that you refer to this manual. Make sure you have correctly followed installation steps and operation procedures. If you are still unable to solve a problem, contact our Customer Service for consultation. Often, a problem is relatively simple and can be quickly fixed after telephone consultation.

If you have to return a product to the factory for service, we recommend you include a letter describing the problem. Refer to the following page for shipping instructions.

Please refer to the terms of your Limited One-Year Standard Warranty, which extends to the first end-user. After expiration of the warranty, a reasonable charge will be made for parts, labor, and packing if you choose to use the factory service facility. Returned units will be returned C.O.D. if the unit is not under warranty. Orban will pay return shipping if the unit is still under warranty. In all cases, transportation charges to the factory (which are usually quite nominal) are paid by the customer.

Shipping Instructions

Use the original packing material if it is available. If it is not, use a sturdy, double-wall carton no smaller than 22" x 12" x 5" (56cm x 30cm x 13cm) with a minimum bursting test rating of 200 pounds. Place the chassis in a plastic bag (or wrap it in plastic) to protect the finish, then pack it in the carton with at least 1.5" (4cm) of cushioning on all sides of the unit. "Bubble" packing sheets, foam "popcorn," thick fiber blankets, and the like are acceptable cushioning materials; folded newspaper is not. Wrap cushioning materials tightly around the unit and tape them in place to prevent the unit from shifting out of its packing. Close the carton without sealing it and shake it vigorously. If you can hear or feel the unit move, use more packing. Seal the carton with 3" (8cm) reinforced fiberglass or polyester sealing tape, top and bottom in an "H" pattern. Narrower or parcel-post type tapes will not withstand the stresses applied to commercial shipments.

Mark the package with the name of the shipper, and with these words in red:

DELICATE INSTRUMENT, FRAGILE!

Insure the package properly. Ship prepaid, not collect. Do not ship parcel post.

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