

Operating Manual

OPTIMOD-Studio Chassis

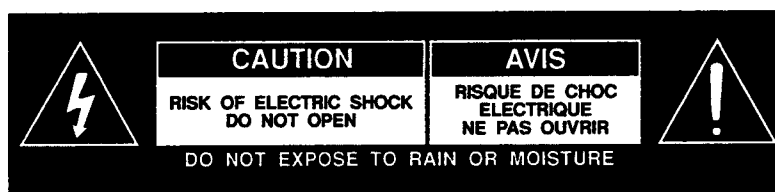
Automatic Gain Controller

8200ST

orban[®]

IMPORTANT NOTE: Refer to the unit's rear panel for your Model #.

Model Number:	Description:
8200ST/U	OPTIMOD-Studio Chassis, 2 channel, 115V
8200ST/E	OPTIMOD-Studio Chassis, 2 channel, 230V



CAUTION: TO REDUCE THE RISK OF ELECTRICAL SHOCK, DO NOT REMOVE COVER (OR BACK). NO USER SERVICEABLE PARTS INSIDE. REFER SERVICING TO QUALIFIED SERVICE PERSONNEL.

WARNING: TO REDUCE THE RISK OF FIRE OR ELECTRICAL SHOCK, DO NOT EXPOSE THIS APPLIANCE TO RAIN OR MOISTURE.



This symbol, wherever it appears, alerts you to the presence of uninsulated dangerous voltage inside the enclosure — voltage that may be sufficient to constitute a risk of shock.



This symbol, wherever it appears, alerts you to important operating and maintenance instructions in the accompanying literature. Read the manual.

IMPORTANT SAFETY INSTRUCTIONS

All the safety and operating instructions should be read before the appliance is operated.

Retain Instructions: The safety and operation instructions should be retained for future reference.

Heed Warnings: All warnings on the appliance and in the operating instructions should be adhered to.

Follow Instructions: All operation and user instructions should be followed.

Water and Moisture: The appliance should not be used near water (e.g., near a bathtub, washbowl, kitchen sink, laundry tub, in a wet basement, or near a swimming pool, etc.).

Ventilation: The appliance should be situated so that its location or position does not interfere with its proper ventilation. For example, the appliance should not be situated on a bed, sofa, rug, or similar surface that may block the ventilation openings; or, placed in a built-in installation, such as a bookcase or cabinet that may impede the flow of air through the ventilation openings.

Heat: The appliance should be situated away from heat sources such as radiators, heat registers, stoves, or other appliances (including amplifiers) that produce heat.

Power Sources: The appliance should be connected to a power supply only of the type described in the operating instructions or as marked on the appliance.

Grounding or Polarization: Precautions should be taken so that the grounding or polarization means of an appliance is not defeated.

Power-Cord Protection: Power-supply cords should be routed so that they are not likely to be walked on or pinched by items placed upon or against them, paying particular attention to cords at plugs, convenience receptacles, and the point where they exit from the appliance.

Cleaning: The appliance should be cleaned only as recommended by the manufacturer.

Non-Use Periods: The power cord of the appliance should be unplugged from the outlet when left unused for a long period of time.

Object and Liquid Entry: Care should be taken so that objects do not fall and liquids are not spilled into the enclosure through openings.

Damage Requiring Service: The appliance should be serviced by qualified service personnel when:

- The power supply cord or the plug has been damaged; or
- Objects have fallen, or liquid has been spilled into the appliance; or
- The appliance has been exposed to rain; or
- The appliance does not appear to operate normally or exhibits a marked change in performance; or
- The appliance has been dropped, or the enclosure damaged.

Servicing: The user should not attempt to service the appliance beyond that described in the operating instructions. All other servicing should be referred to qualified service personnel.

The Appliance should be used only with a cart or stand that is recommended by the manufacturer.

Safety Instructions (European)

Notice For U.K. Customers If Your Unit Is Equipped With A Power Cord.

WARNING: THIS APPLIANCE MUST BE EARTHED.

The cores in the mains lead are coloured in accordance with the following code:

GREEN and YELLOW - Earth BLUE - Neutral BROWN - Live

As colours of the cores in the mains lead of this appliance may not correspond with the coloured markings identifying the terminals in your plug, proceed as follows:

The core which is coloured green and yellow must be connected to the terminal in the plug marked with the letter E, or with the earth symbol, (\oplus), or coloured green, or green and yellow.

The core which is coloured blue must be connected to the terminal marked N or coloured black.

The core which is coloured brown must be connected to the terminal marked L or coloured red.



The power cord is terminated in a CEE7/7 plug (Continental Europe). The green/yellow wire is connected directly to the unit's chassis. If you need to change the plug and if you are qualified to do so, refer to the table below.

WARNING: If the ground is defeated, certain fault conditions in the unit or in the system to which it is connected can result in full line voltage between chassis and earth ground. Severe injury or death can then result if the chassis and earth ground are touched simultaneously.

CONDUCTOR		WIRE COLOR	
		Normal	Alt
L	LIVE	BROWN	BLACK
N	NEUTRAL	BLUE	WHITE
E	EARTH GND	GREEN-YELLOW	GREEN

AC Power Cord Color Coding

Safety Instructions (German)

Gerät nur an der am Leistungsschild vermerkten Spannung und Stromart betreiben.

Sicherungen nur durch solche, gleicher Stromstärke und gleichen Abschaltverhaltens ersetzen. Sicherungen nie überbrücken.

Jedwede Beschädigung des Netzkabels vermeiden. Netzkabel nicht knicken oder quetschen. Beim Abziehen des Netzkabels den Stecker und nicht das Kabel erfassen. Beschädigte Netzkabel sofort auswechseln.

Gerät und Netzkabel keinen übertriebenen mechanischen Beanspruchungen aussetzen.

Um Berührung gefährlicher elektrischer Spannungen zu vermeiden, darf das Gerät nicht geöffnet werden. Im Fall von Betriebsstörungen darf das Gerät nur von befugten Servicestellen instandgesetzt werden. Im Gerät befinden sich keine, durch den Benutzer reparierbare Teile.

Zur Vermeidung von elektrischen Schlägen und Feuer ist das Gerät vor Nässe zu schützen. Eindringen von Feuchtigkeit und Flüssigkeiten in das Gerät vermeiden.

Bei Betriebsstörungen bzw. nach Eindringen von Flüssigkeiten oder anderen Gegenständen, das Gerät sofort vom Netz trennen und eine qualifizierte Servicestelle kontaktieren.

Safety Instructions (French)

On s'assurera toujours que la tension et la nature du courant utilisé correspondent bien à ceux indiqués sur la plaque de l'appareil.

N'utiliser que des fusibles de même intensité et du même principe de mise hors circuit que les fusibles d'origine. Ne jamais shunter les fusibles.

Eviter tout ce qui risque d'endommager le câble seceur. On ne devra ni le plier, ni l'aplatir. Lorsqu'on débranche l'appareil, tirer la fiche et non le câble. Si un câble est endommagé, le remplacer immédiatement.

Ne jamais exposer l'appareil ou le câble à une contrainte mécanique excessive.

Pour éviter tout contact avec une tension électrique dangereuse, on n'ouvrira jamais l'appareil. En cas de dysfonctionnement, l'appareil ne peut être réparé que dans un atelier autorisé. Aucun élément de cet appareil ne peut être réparé par l'utilisateur.

Pour éviter les risques de décharge électrique et d'incendie, protéger l'appareil de l'humidité. Eviter toute pénétration d'humidité ou fr liquide dans l'appareil.

En cas de dysfonctionnement ou si un liquide ou tout autre objet a pénétré dans l'appareil couper aussitôt l'appareil de son alimentation et s'adresser à un point de service après-vente autorisé.

Safety Instructions (Spanish)

Hacer funcionar el aparato sólo con la tensión y clase de corriente señaladas en la placa indicadora de características.

Reemplazar los fusibles sólo por otros de la misma intensidad de corriente y sistema de desconexión. No poner nunca los fusibles en puente.

Proteger el cable de alimentación contra toda clase de daños. No doblar o apretar el cable. Al desenchufar, asir el enchufe y no el cable. Sustituir inmediatamente cables dañados.

No someter el aparato y el cable de alimentación a esfuerzo mecánico excesivo.

Para evitar el contacto con tensiones eléctricas peligrosas, el aparato no debe abrirse. En caso de producirse fallos de funcionamiento, debe ser reparado sólo por talleres de servicio autorizados. En el aparato no se encuentra ninguna pieza que pudiera ser reparada por el usuario.

Para evitar descargas eléctricas e incendios, el aparato debe protegerse contra la humedad, impidiendo que penetren ésta o líquidos en el mismo.

En caso de producirse fallas de funcionamiento como consecuencia de la penetración de líquidos u otros objetos en el aparato, hay que desconectarlo inmediatamente de la red y ponerse en contacto con un taller de servicio autorizado.

Safety Instructions (Italian)

Far funzionare l'apparecchio solo con la tensione e il tipo di corrente indicati sulla targa riportante i dati sulle prestazioni.

Sostituire i dispositivi di protezione (valvole, fusibili ecc.) solo con dispositivi aventi lo stesso amperaggio e lo stesso comportamento di interruzione. Non cavallottare mai i dispositivi di protezione.

Evitare qualsiasi danno al cavo di collegamento alla rete. Non piegare o schiacciare il cavo. Per staccare il cavo, tirare la presa e mai il cavo. Sostituire subito i cavi danneggiati.

Non esporre l'apparecchio e il cavo ad esagerate sollecitazioni meccaniche.

Per evitare il contatto con le tensioni elettriche pericolose, l'apparecchio non deve venir aperto. In caso di anomalie di funzionamento l'apparecchio deve venir riparato solo da centri di servizio autorizzati. Nell'apparecchio non si trovano parti che possano essere riparate dall'utente.

Per evitare scosse elettriche o incendi, l'apparecchio va protetto dall'umidità. Evitare che umidità o liquidi entrino nell'apparecchio.

In caso di anomalie di funzionamento rispettivamente dopo la penetrazione di liquidi o oggetti nell'apparecchio, staccare immediatamente l'apparecchio dalla rete e contattare un centro di servizio qualificato.

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OPTIMOD-Studio Chassis

Operating Manual

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Section 1

Introduction

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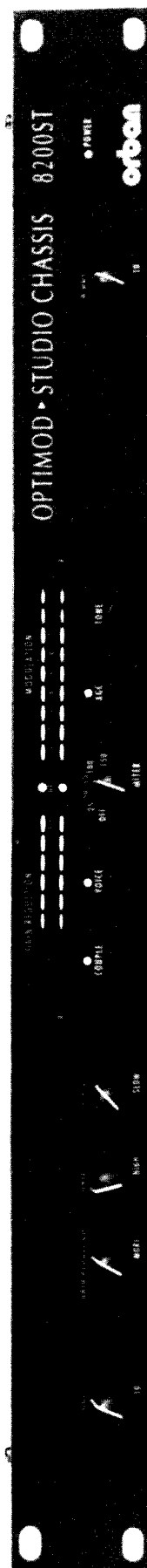
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1-3

Orban OPTIMOD-STUDIO CHASSIS 8200ST

1-2 INTRODUCTION

Orban



Orban OPTIMOD-STUDIO CHASSIS 8200ST

The 8200ST provides transparent gain riding, adjustable compression, high-frequency limiting and absolute peak control — all in a space-saving, rugged, 1-rack unit high package. The flexibility and natural sound of the 8200ST is ideally suited to many broadcast applications; in particular, protecting discrete studio-to-transmitter links when using OPTIMOD audio processing.

Barely adequate signal-to-noise ratio often makes the land line or microwave studio-to-transmitter link the weakest part of the broadcast chain. The 8200ST's transparent gain control translates to improved effective dynamic range for the link and improved signal quality at the receiver. Switch-selectable pre-emphasis limiting and peak control ensure proper matching the 8200ST to any standard transmission medium.

Features include:

- Up to 25dB of gain reduction for two channels of audio.
- Defeatable "Silence Gate" — not a conventional noise gate, but a circuit that freezes the level controller's gain when signals drop below threshold. This gate prevents rush-up of background noise during quieter passages and exaggeration of breathing during pauses in spoken voice.
- Flexible level controls: A smooth leveler, activated when the AGC button is ON, provides slow gain riding. A second, much faster level controller (one that works in conjunction with the smooth leveler) can be activated with the VOICE button.
- Five switchable HF Limiter pre-emphasis curves (25 μ s to 150 μ s): These pre-emphasis curves allow the HF limiting to complement the medium being protected.
- Built-in 400Hz line-up tone generators for easy system alignment.
- Two LED bargraphs per channel simultaneously displaying gain reduction and peak operating levels.
- Independent or stereo operation, controlled via front panel COUPLE button.
- Class-A VCAs with inherently low noise and distortion.
- Broadcast-quality interfacing with EMI-suppressed, balanced and floating inputs and outputs.
- Defeatable clipper: follows the HF limiter for absolute peak protection.

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Section 2

Installation

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2-3	Figure 2-1: AC Line Cord Wiring
2-4	Figure 2-2: Jumper Settings
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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.

Installation

Allow about 45 minutes for installation.

Installation consists of unpacking and inspecting the 8200ST, optional defeating of transmitter's pre-emphasis, optional resetting of clipper, output pre-emphasis and tone level jumpers, mounting the unit in a rack, connecting audio and power, calibrating the 8200ST's MODULATION meters and clipping level, and setting its controls for normal operation.

The 8200ST simultaneously provides level control and protects against overmodulation. When Orban's OPTIMOD-AM, OPTIMOD-HF, or OPTIMOD-FM 8200 is used at the transmitter, the 8200ST replaces the OPTIMOD's internal AGC, which should be defeated according to instructions found in the OPTIMOD manual.

For OPTIMOD-FM 8100A or 8101, and OPTIMOD-TV 8180A or 8182A, the Orban Studio Chassis designed for that model can also be used, although the high frequency limiting of the 8200ST allows better modulation control for pre-emphasized STLs.

1. Unpack and inspect.

If you note obvious physical damage, contact the carrier immediately to make a damage claim.

Packed with the 8200ST are:

AC Power Cord
Operating Manual
Warranty/Registration Card
Safety Sheet

- ☐ *Save all packing materials!* If you should ever have to ship the 8200ST (e.g., for servicing), it is best to ship it in the original packing materials because both the carton and packing material have been carefully designed to protect the unit.

- ☐ Complete the Registration Card and return it to Orban. (please)

The Registration Card enables us to inform you of new applications, performance improvements, and service aids that may be developed, and it helps us respond promptly to claims under warranty without having to request a copy of your bill of sale or other proof of purchase. Please fill in the Registration Card and send it to us today. (If it is lost, photocopy the duplicate on page 1-6). We do not sell our customer's names to anyone.



2. Check the line voltage, fuse and power cord.

- ☐ *DO NOT connect power to the unit yet!*

- ☐ Check the VOLTAGE SELECTOR. This is on the rear panel.

The 8200ST is shipped configured for either 90-130V or 180-260V, 50Hz or 60Hz operation, as indicated on the rear panel. Refer to the unit's rear

panel for your Model # and the inside of the front cover of this manual for your Model #'s line voltage setting. To change the operating voltage, set the VOLTAGE SELECTOR to 115V (for 90-130V) or 230V (for 180-260V) as appropriate.

- ☐ Check the value of the fuse and change the fuse if the value is incorrect.

Use a 1/2-amp 3AG 250V Slow-Blow for 115V operation, or 1/4-amp "T" type (250mA) Slow-Blow fuse for 230V operation.

- ☐ Check power cord.

AC power passes through an IEC-standard mains connector and an RF filter designed to meet the standards of all international safety authorities.

The power cord is terminated in a "U-ground" plug (USA standard), or CEE7/7 plug (Continental Europe), as appropriate to your 8200ST's Model #. The green/yellow wire is connected directly to the 8200ST chassis.

If you need to change the plug to meet your country's standard and you are qualified to do so, see Figure 2-1. Otherwise, purchase a new mains cord with the correct line plug attached.

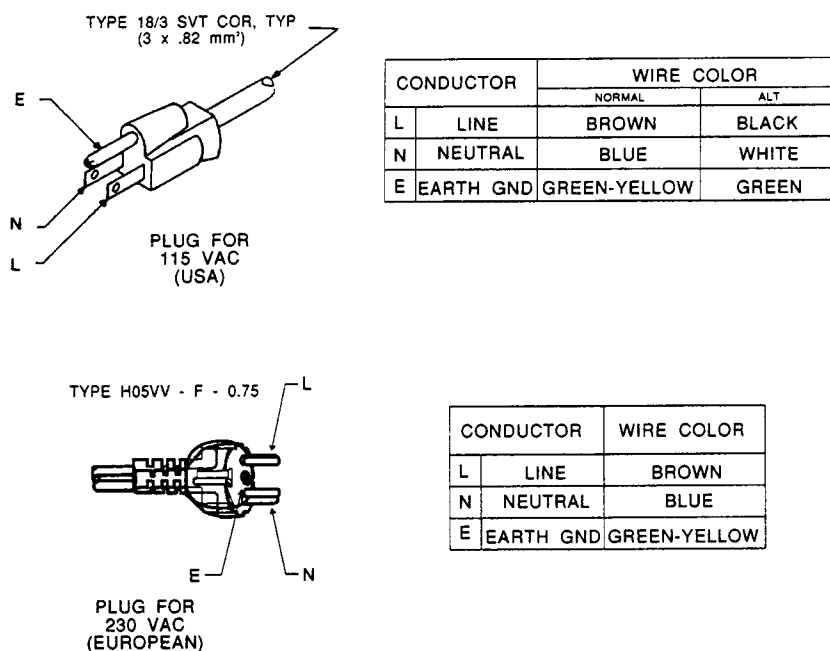
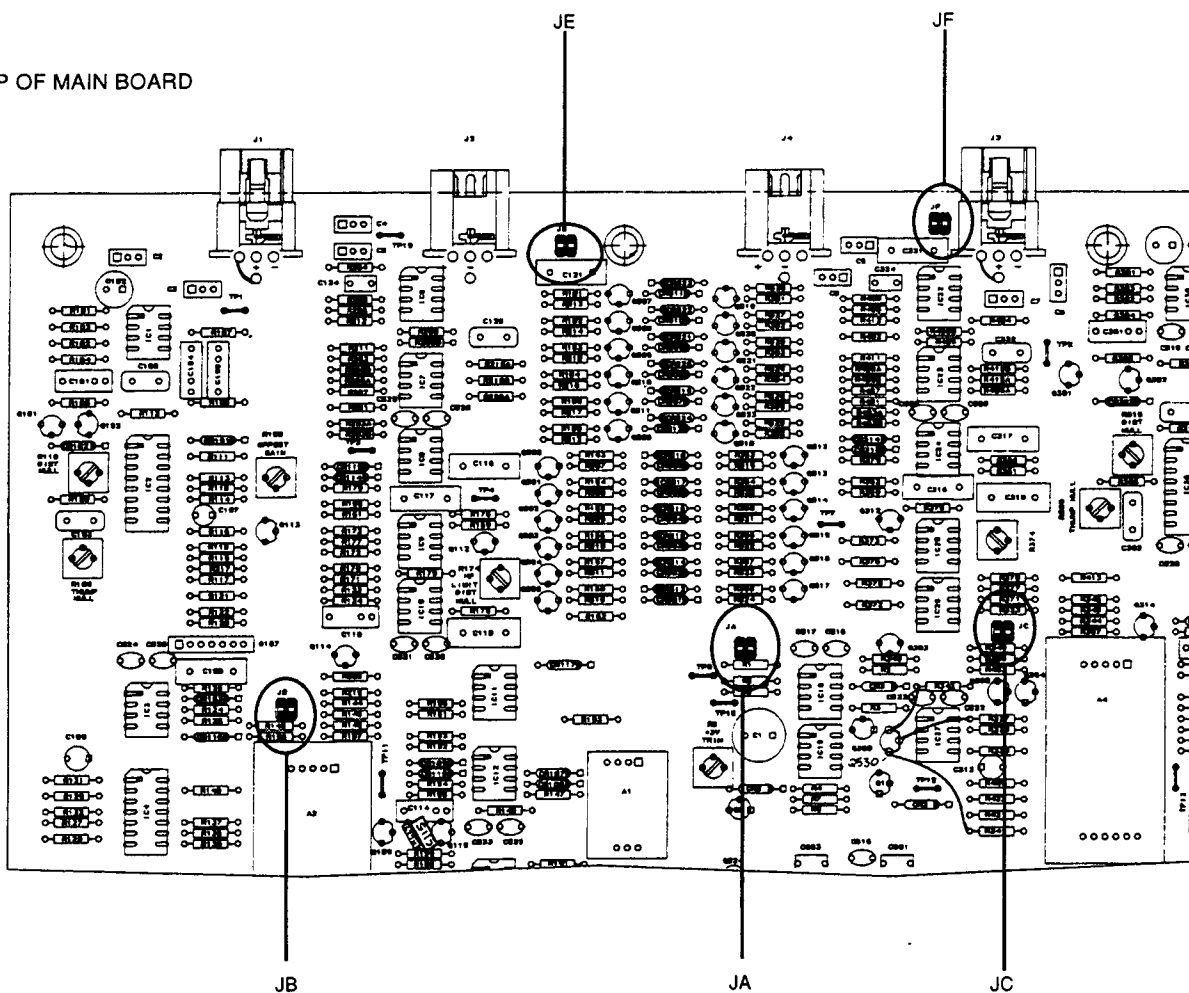


Figure 2-1: AC Line Cord Wiring

3. Defeat your STL transmitter's pre-emphasis. (optional)

The STL transmitter's pre-emphasis network may introduce overshoots that will increase peak modulation without any increase in average modulation. We therefore strongly recommend that you defeat the transmitter's pre-emphasis (freeing the transmitter from such potential overshoot), and use the 8200ST to provide the necessary pre-emphasis.

TOP OF MAIN BOARD



Clipper Jumpers

*CLIPPER ON



CLIPPER OFF



Output Pre-Emphasis Jumpers

*FLAT

LEFT
OUTPUT



RIGHT
OUTPUT



PRE-EMPHASIZED

LEFT
OUTPUT



RIGHT
OUTPUT



Line-up Level Jumpers

*PEAK

LEFT
OUTPUT



RIGHT
OUTPUT



AVG

LEFT
OUTPUT



RIGHT
OUTPUT



Figure 2-2: Jumper Settings (*Factory Configuration)

If the transmitter's pre-emphasis cannot be defeated, then configure the 8200ST for FLAT output (see step 4, below). In this case average modulation levels may have to be reduced to accommodate the overshoots, reducing the signal-to-noise ratio achieved in the link.

4. Internal jumper configuration.

For transmission applications, we recommend you reset the 8200ST's jumpers, as follows:

CLIPPER	ON*
OUTPUT PRE-EMPHASIS	PRE-EMPHASIZED (see step 3, immediately above)
TONE LEVEL	PEAK*

*As Shipped From the Factory

- ☐ To change any jumpers you must remove the top cover of the 8200ST to access the main circuit board. (Make sure power is not connected.) Remove all screws holding the cover in place, then lift it off. When replacing the cover, replace all screws snugly. (Be careful not to strip the threads by fastening the screws too tightly.)
- ☐ Refer to Figure 2-2 to find the jumpers on the main circuit board and to position them according to your application.

The following information is provided to explain each jumper and its settings in detail.

CLIPPER jumper (JA) ON; this setting enables the 8200ST's peak clippers, achieving absolute peak control prior to the 8200ST's de-emphasis.

If the 8200ST's de-emphasis is disabled, then the 8200ST's peak level will be absolutely limited. Otherwise, the maximum peak output level will approximately follow the chosen de-emphasis curve as a function of frequency.

OUTPUT PRE-EMPHASIS jumpers (JE, JF) PRE-EMPHASIZED; this setting disables the 8200ST's de-emphasis and feeds pre-emphasized audio to an STL or other broadcast device that does not have pre-emphasis.

The FLAT setting applies a de-emphasis filter (complementary to the pre-emphasis chosen with the 8200ST's front panel HF Limiter control) to the 8200ST's output to yield an overall "flat" response. Use the FLAT setting if you are feeding audio to an STL that has internal pre-emphasis.

TONE LEVEL jumpers (JB, JC) PEAK; this setting enables the 8200ST's built-in tone oscillator to produce a 400Hz peak reference level tone at 100% peak modulation.

"100% peak modulation" is the threshold of the 8200ST's peak clippers: peaks will never exceed this level when the peak clippers are activated. Use peak reference level in broadcast systems to align the 8200ST's output level to the 100% modulation level of the studio-to-transmitter link. You can also use peak reference level to align the 8200ST's output level to the maximum level of a digital link.

The peak reference level is only valid when the 8200ST's peak clippers are enabled and when the 8200ST is jumpered for pre-emphasized output. If the 8200ST's peak clippers are defeated, some peaks will exceed the peak reference level. If the output of the 8200ST is "flat," this will substantially (but inconsistently) *reduce* peak levels.

The tone level is set *before de-emphasis*. So if the 8200ST is strapped FLAT, the output will be slightly lower than 100% modulation with reference to very low frequencies unaffected by pre-emphasis. However, please note that any pre-emphasis in the equipment receiving the 8200ST's output will restore the tone to the correct level. In almost all cases, the modulation metering of such driven equipment occurs after its internal pre-emphasis, and the 8200ST's tone will therefore be at the appropriate level to set the modulation level of the driven equipment correctly.

When TONE LEVEL jumpers are set to AVERAGE, the tone level is approximately 18dB below 100% modulation. This level corresponds approximately to 0VU (when you use a VU meter to monitor line levels). We do not anticipate that many users will use the tone oscillator in this mode, but it is available for special line-up requirements.

5. Mount the 8200ST in a rack. (optional)

The 8200ST requires one standard rack unit (1 $\frac{3}{4}$ inches, 4.4 cm).

There should be a good ground connection between the rack and the 8200ST chassis — check this with an ohmmeter.

Mounting the unit near large heat-producing devices may shorten component life and is not recommended. Ambient temperature should not exceed 113°F (45°C) when equipment is powered.

6. Connect audio input and output.

See the hook-up and grounding information on the following pages.

7. Connect power cord.

Be sure you have checked the voltage setting and fuse according to step 2 above.

☐ **Connect power.**

The green power light on the lower right of the front panel should light.

Audio Input and Output Connections

Wire:

We recommend using two-conductor shielded cable (such as Belden 8451 or equivalent), because signal current flows through the two conductors only. The shield does not carry signal, is used *only* for shielding, and is ordinarily connected to ground at one end only.

Because use of single-conductor cables virtually eliminates any possibility of carefully controlling the system grounding scheme, it is NOT RECOMMENDED! Even so, it often does work adequately in low-RF environments.

Sometimes, particularly if you are using the 8200ST with musical instruments or home-type equipment, single-conductor shielded cable may be the only practical alternative. In this case, connect the inner conductors of the shielded cables to the (+) sides (pin 2) of the 8200ST input and output XLR connectors respectively. Connect the shield of the 8200ST *input* cable to pin 3 of the 8200ST's input XLR, and connect the shield of the 8200ST *output* cable to pin 3 of the 8200ST's output XLR. Internally connect pins 1 and 3 of both input and output XLRs within the connectors.

Connectors:

Input and output connectors are XLR connectors.

In the XLR connectors, pin 1 is CHASSIS GROUND, while pin 2 and pin 3 are a balanced, floating pair. This wiring scheme is compatible with *any* studio wiring standard: If one pin is considered LO, the other pin is automatically HI.

Input:

Nominal input level is between -10 and +8dBu. The absolute overload point is +26dBu.

(0dBu = 0.775V RMS; for this application, the dBm @ 600Ω scale on voltmeters can be read as if were calibrated in dBu.)

- The electronically-balanced input of each channel is compatible with most professional and semi-professional sound equipment, balanced or unbalanced, with a source impedance of 600Ω or less.
- Input connections are the same whether the driving source is balanced or unbalanced.

Audio Input and Output Connections (Continued)

Input (Continued):

- Connect the red (or white) wire to the pin on the XLR connector (#2 or #3) that is considered HI by the standards of your organization. Connect the black wire to the pin on the XLR connector (#2 or #3) that is considered LO by the standards of your organization.
- In **low RF fields** (like a studio site), do not connect the cable shield at the 8200ST input — it should be connected at the source end only. In **high RF fields** (like a transmitter site), also connect the shield to pin 1 of the male XLR connector at the 8200ST input.
- If the output of the driving unit is unbalanced and does not have separate CHASSIS GROUND and (–) (or LO) output terminals, connect both the shield and the black wire to the common (–) or ground terminal of the driving unit.

Output

The two electronically-balanced and floating outputs of each channel simulate a true transformer output. The *source* impedance is 30Ω . In addition, there is a 1000pF capacitor between each output (HI and LO) to the chassis for RFI suppression. The output is capable of driving loads of 600Ω or higher.

If an **unbalanced output** is required (to drive unbalanced inputs of other equipment), it should be taken between pin 2 and pin 3 of the XLR connector. Connect the LO pin of the XLR connector (pin 2 or 3, depending on your organization's standards) to ground, and take the HI output from the remaining pin. No special precautions are required even though one side of the output is grounded.

- Use two-conductor foil-shielded cable (Belden 8451, or equivalent).
- At the 8200ST's output (and at the output of other equipment in the system), connect the cable's shield to the CHASSIS GROUND (pin 1) on the XLR connector. Connect the red (or white) wire to the pin on the XLR connector (#2 or #3) that is considered HI by the standards of your organization. Connect the black wire to the pin on the XLR connector (#3 or #2) that is considered LO by the standards of your organization.

Grounding

Very often, grounding is approached in a “hit or miss” manner. But with care it is possible to wire an audio studio so that it is free from ground loops (which induce hum and can cause oscillation) and provides maximum protection from power faults.

- All units in the system must have *balanced inputs*. In a modern system with low output impedances and high input impedances, a balanced input will provide common-mode rejection and prevent ground loops — regardless of whether it is driven from a balanced or unbalanced source. (The 8200ST has balanced inputs.)
- All equipment *circuit grounds* must be connected to each other; all equipment *chassis grounds* must be connected together.
- In low RF fields, *cable shields* must be connected at one end only — preferably the source (output) end.
- In high RF fields (such as transmitter sites), cable shields must be connected to a solid earth ground at both ends to maximize their RF shielding. This means that all equipment in such environments must have balanced inputs to prevent the ground loops that could otherwise be introduced.

Power:

- Ground the 8200ST chassis through the third wire in the power cord. Proper grounding techniques *never* leave equipment chassis unconnected to power/earth ground. *A proper power ground is essential to safe operation.* Lifting a chassis from power ground is a safety hazard. If there is a power fault to the chassis, death could result!



Grounding (Continued)

Difficult Situations:

Because it is not always possible to determine if the equipment driving or being driven by the 8200ST has its circuit ground internally connected to its chassis ground (which is always connected to the ground prong of the AC power cord, if present), and because the use of the AC power ground often introduces noise or other imperfections such as RFI, hum, clicks, and buzzes, the wiring techniques in Fig 2-3 are not universally applicable.

If you follow Fig 2-3 and hum or noise appears, don't be afraid to experiment. If the noise sounds like a low-level crackling buzz, then probably there isn't *enough* grounding. Try connecting the LO pin on the 8200ST's XLR connector to ground and see if the buzz goes away. Either pin 3 or pin 2 will work as the LO pin; the choice depends only on your organization's standards,

A ground loop usually causes a smooth, steady hum rather than a crackly buzz. If you have a ground loop, think carefully about what is going on, and keep in mind the general principle: one and *only one* circuit ground path should exist between each piece of equipment!

When a single-conductor shielded cable is used for audio connections, the shield will ordinarily receive chassis ground from the external equipment which it is connecting to the output of the 8200ST. To minimize hum or buzz, it may be necessary to connect pins 1 and 3 of the 8200ST's input and output XLR connectors together.

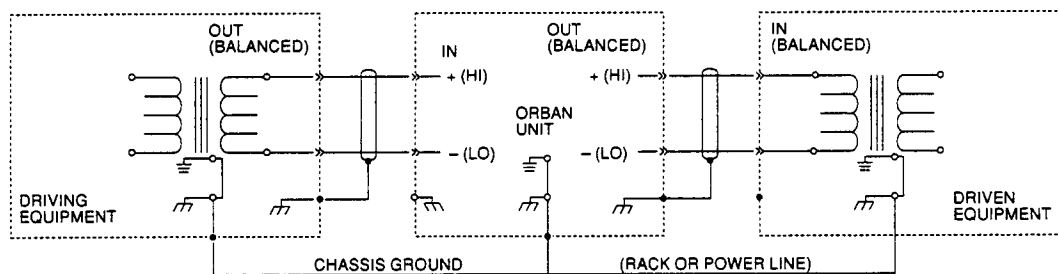


Figure 2-3: Suggested Ground Scheme

8. Calibrate MODULATION meters.

- A ☐ Press the TONE button.

The TONE lamp should light and the modulation meters should indicate "0." If they do not, restrap jumpers JB and JC to "peak." (See page 2-5.) The 8200ST is now producing a 400Hz sine wave at each output. The peak level of this tone corresponds to 100% modulation.

- B ☐ Adjust the L OUT and R OUT controls so that the transmitter or subcarrier generator is being driven to 100% modulation.

The L OUT and R OUT controls are now correctly calibrated to the transmitter. Provided that no significant overshoot occurs in the transmitter, the MODULATION meter will now give an accurate indication of peak modulation.

- C ☐ Press the TONE button to turn off the tone.

If the transmitter or subcarrier generator suffers from bounce or overshoot, you may have to reduce the L OUT and R OUT control settings to avoid peak over-modulation caused by overshoots on certain audio signals.

9. Set controls for normal operation with program material.

The following assumes that a VU meter is used to determine line drive levels with program material.

- A ☐ Set controls as follows:

HF LIMITER	Set to match the pre-emphasis of the transmission system
L OUT, R OUT	Do not change
GATE	12:00
RELEASE	12:00
VOICE	OFF
AGC	ON
COUPLE	ON

- B ☐ Feed the 8200ST either with tone at your system reference level (0VU), or with typical program material at normal levels.

- C ☐ Adjust the GAIN REDUCTION control for the desired amount of gain reduction.

We recommend 8-15dB gain reduction for most formats.

10. Set the studio chassis status on your OPTIMOD-FM 8200 to [YES].

[Skip this step if you are not using an OPTIMOD-FM 8200 with your 8200ST.]

To tell your 8200 that an Orban studio chassis is installed at your studio (feeding the STL link), set the studio chassis parameter to [YES]. This parameter can be set on the 8200's front panel SYSTEM SETUP I/O CALIB screen (see page 2-54 of the 8200 manual) or QUICK SETUP studio chassis status screen (see page 2-44 of the 8200 manual).

Installation Completed.

Section 3

Operation

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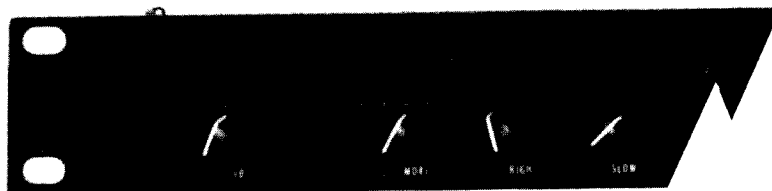
- | | |
|-----|------------------------------------|
| 3-2 | 8200ST Controls and Meters |
| 3-4 | Example Control Settings |
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Caution

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.

8200ST Controls and Meters



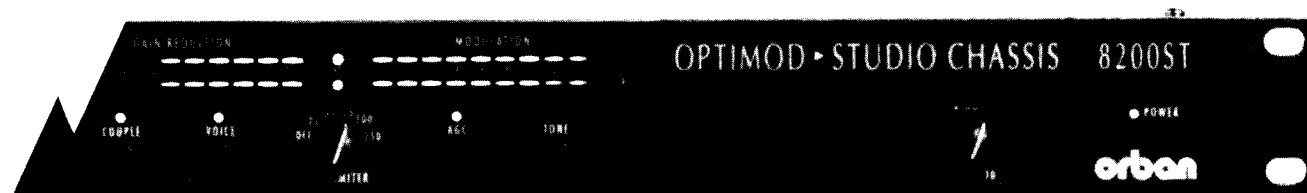
GAIN REDUCTION control simultaneously adjusts the left and right channel input drive levels for rapid, accurate stereo adjustment of gain reduction. Higher settings produce more gain reduction by increasing the signal being applied to the fixed threshold of the 8200ST's AGC/compressor circuitry. (The compression ratio of the AGC is very high, so the output level does not change significantly when you change GAIN REDUCTION.)

GATE control sets the threshold of the 8200ST's Silence Gate. The 8200ST's Silence Gate is not a conventional noise gate, but a circuit that freezes the level controller's gain when signal drops below threshold. It prevents rush-up of background noise during quiet passages and exaggeration of breathing during pauses in spoken voice. After gating, the gain moves slowly to the average amount of gain reduction over the past 30-second period.

RELEASE control speeds or slows the 8200ST's primary AGC level controller (when the AGC button is ON). When set to SLOW, the level controller acts as a slow leveler, keeping the long-term average level constant, but allowing the illusion of wide dynamics. As the control is turned toward FAST, the short-term dynamics are affected as well, resulting in a denser, punchier, more consistent sound. Quiet passages are made louder. The RELEASE control is only active when the AGC button LED is ON.

COUPLE button determines whether the gain reduction of the left and right channels is independent or coupled to preserve a balanced stereo image. When set to ON, the gain reduction of both channels is determined by the channel that requires the *most* gain reduction at any given instant. When set OFF, the two channels of the 8200ST operate independently. This is useful for correcting a poorly balanced stereo program. (The high-frequency limiters *always* operate independently, since their short release times preclude stereo imaging problems. Their operation is unaffected by the COUPLE button.)

The COUPLE mode is active when the COUPLE button LED is ON.



VOICE button turns on the 8200ST's second AGC level controller (when the AGC button is ON). The fast compression function of this controller provides faster transient overshoot protection for better control of the wide dynamics of unprocessed voice. The second controller is only activated by those transients that are too fast for the slower AGC and which would otherwise cause overload. VOICE is also useful for controlling program material that has an unusually high peak-to-average ratio or is characterized by many abrupt level changes. The VOICE control is active when the AGC and VOICE button LEDs are ON. VOICE is appropriate for voice-only applications. However, if the processed output of the 8200ST will later be processed by an Orban multiband OPTIMOD broadcast processor (OPTIMOD-AM, -FM, -TV, or -HF), the final on-air result will be smoothest if VOICE is OFF. In this case, only leave VOICE ON if the program material is mainly speech that has not been previously compressed or peak limited.

HF LIMITER switch turns the high frequency limiter ON or OFF and determines the amount of HF control. The 25 μ s setting produces the least high-frequency limiting; the 150 μ s setting produces the most. The HF LIMITER is particularly effective at de-essing excessively sibilant voices, and is more effective than traditional sibilance-detecting de-essers when used on mixed program material. As a high-frequency limiter in transmission applications, the HF LIMITER ensures that the peak output signal is perfectly controlled to not exceed the selected pre-emphasis. If the internal pre-emphasis jumper is in the PRE-EMPHASIZED output position, the switch also determines the pre-emphasis at the 8200ST's output. The OFF setting defeats the high frequency limiter.

AGC button enables or disables the 8200ST's level control functions (the slow AGC, the faster AGC compressor, the Silence Gate, and stereo coupling). The AGC button is useful when you want to use the HF LIMITER (and clipper, if activated) alone without level control before it. Simply de-activate the AGC button to disable the level control.

TONE button activates the 8200ST's built-in alignment tone generator. Extremely useful at system setup, the 400Hz tone can be internally jumpered to operate at either 100% peak modulation or nominal studio operating level (see page 2-5). When set to 100% peak modulation, the peak level of this tone is the maximum peak level that will be produced by

the 8200ST with its Clipper activated. Use this tone to quickly align the 8200ST to transmitters, subcarrier generators and digital links. When set to nominal studio operating level, the tone is useful for setting average levels with a VU meter.

L OUT and R OUT controls adjust the output level. When using the 8200ST's peak controller circuitry to protect equipment down-line, these controls are used to set the maximum output of the 8200ST to just below the overload point of the equipment being protected.

GAIN REDUCTION meters display up to 25dB of gain reduction in each channel. If the red LED at the far left of the bargraph lights, no further gain reduction is available.

MODULATION meters indicate the peak operating level of the 8200ST at the output of all processing, but before the de-emphasis (if activated), OUT controls and balanced output amplifier. "0dB" corresponds to the threshold of the internal clipper and also to the peak level of the 400Hz tone produced by the built-in alignment tone generator when strapped for peak reference level. The actual output level of the 8200ST is determined by the OUT controls, which set the reference level at the 8200ST's XLR output from less than -10dBu to +24dBu. The meter reads within 0.5dB of the true peak value of a 10-microsecond pulse. The meter is particularly useful as a peak modulation indicator for a microwave STL or FM subcarrier generator that does not have accurately calibrated peak-reading meters.

GATE indicator lights when the input levels falls below the threshold set by the GATE control.

HF indicators light when HF limiting occurs.

COUPLE, VOICE, AGC, and TONE indicators light when their respective buttons are enabled (ON).

POWER indicator lights when the power cord is connected to the rear panel and an appropriate AC power source.

Example Control Settings

NOTE: These specific application setups are intended as a starting point for integration of the 8200ST into your system. Actual setups will vary with experience and experimentation. There are also many other applications which by their nature do not lend themselves to a chart-like presentation of recommended settings. In these applications, experience and experimentation are the best guides.

Level Control Before Digital Link

OUT	match the 8200ST's internal alignment tone (strapped for PEAK reference level) to the digital clip point.
HF LIMITER	OFF (or to complement any pre-emphasis used)
GAIN REDUCTION	for 5-10dB G/R (or for amount of AGC gain reduction required)
GATE	12:00
RELEASE	12:00
VOICE	set according to program material; OFF is usually appropriate unless material will not be later processed with an OPTIMOD broadcast processor.
AGC	ON
Clipper jumper (JA)	ON

Satellite Uplink

OUT	match the 8200ST's internal alignment tone (strapped for PEAK reference level) to the transmitter 100% modulation level.
HF LIMITER	OFF (or to complement any pre-emphasis used)
GAIN REDUCTION	for 5-10dB G/R (or for amount of AGC gain reduction required)
GATE	12:00
RELEASE	12:00
VOICE	set according to program material; OFF is usually appropriate, unless material will note be later processed with an OPTIMOD broadcast processor.
AGC	ON
Clipper jumper (JA)	ON

FM Subcarrier Generators

OUT	match the 8200ST's internal alignment tone (strapped for PEAK reference level) to 100% subcarrier modulation level.
HF LIMITER	150 μ s
GAIN REDUCTION	for 5-10dB G/R (or for amount of AGC gain reduction required)
GATE	12:00
RELEASE	12:00
VOICE	set according to program material; ON is usually appropriate.
AGC	ON
Clipper jumper (JA)	ON

Discrete Analog STL

OUT	match the 8200ST's internal alignment tone (strapped for PEAK reference level) to the transmitter 100% modulation level.
HF LIMITER	OFF (or to complement any pre-emphasis used)
GAIN REDUCTION	for 5-10dB G/R (or for amount of AGC gain reduction required)
GATE	12:00
RELEASE	12:00
VOICE	set according to program material; OFF is usually appropriate, unless program material is primarily unprocessed speech.
AGC	ON
Clipper jumper (JA)	ON

15kHz Analog Phone Lines

OUT	match the 8200ST's internal alignment tone (strapped for PEAK reference level) to the maximum peak level accepted by the phone lines.
HF LIMITER	OFF
GAIN REDUCTION	for 5-10dB G/R (or for amount of AGC gain reduction required)
GATE	12:00
RELEASE	12:00
VOICE	set according to program material; OFF is usually appropriate, unless program material is primarily unprocessed speech.
AGC	ON
Clipper jumper (JA)	ON

More About 8200ST Audio Processing

Gain Reduction (Using the GAIN REDUCTION control and meters)

The GAIN REDUCTION control determines the overall amount of gain reduction by setting the input signal level going into the gain control circuitry.

Be careful not to adjust the controls to produce so much gain reduction that the red LED at the far left of each GAIN REDUCTION meter lights.

Unlike the metering in some processors, the red segments of the 8200ST's GAIN REDUCTION meters give a warning that must be heeded. When the meter is in the red, the compressor has run out of gain reduction range, and various circuits will clip, causing objectionable distortion (and various nastinesses to commence).

Leveling and Compression (Using the RELEASE and VOICE controls)

RELEASE controls the "sound texture." As you adjust the RELEASE control towards FAST, the gain reduction activity becomes faster and faster. This serves two purposes; 1) The 8200ST brings lower level signals up much faster, and 2) the sound becomes denser, louder, and more consistent with a tightly-controlled dynamic range. FAST RELEASE is useful for producing a high impact sound. (To avoid possible distortion, you should set the VOICE function ON when using very fast RELEASE settings.) Settings towards SLOW tend to retain a full sense of dynamic range and add no coloration to the sound, only controlling long term average levels.

The VOICE control complements the RELEASE control. When VOICE is active (LED on), a fast-attack limiting function is added to the slow-attack leveling function. This is useful where you want fast response to abrupt level changes. This setting is ideal for speech. When used with RELEASE set near FAST, voices have excellent consistency.

Gating (Using the GATE control)

The GATE control sets the level below which the AGC will freeze to prevent noise rush-up during pauses and low-level passages. Gating is enabled when the AGC button is ON.

The 8200ST's gating function is *not* the same as a conventional "noise gate" because it is not intended to reduce noise or other undesired sounds below the level at which they occur in the original program. Its purpose is to prevent unnatural exaggeration of such material. (If needed, a conventional noise gate can be used before the 8200ST.)

High-frequency Limiting (Using the HF LIMITER control)

The 8200ST's high-frequency limiter is essentially a variable 6dB/octave low-pass filter that adapts to the spectrum of the program material to prevent overloading pre-emphasized media following the 8200ST. In addition to general-purpose high-frequency limiting, the high-frequency limiter may be useful in de-essing vocals that have already been mixed with

other program material. It performs this task significantly more smoothly than dedicated de-essers because its threshold does not follow the average input level, and because it cannot punch “holes” in the program.

The HF LIMITER switch enables or disables the high-frequency limiter and selects the pre-emphasis for the high-frequency limiter. These are all 6dB/octave curves which are up 3dB at $1/(2\pi T)$ Hz, where T is the time constant in seconds. 25 μ s produces the least high-frequency limiting; 150 μ s produces the most. Generally, the **pre-emphasis curve** should match that of the medium being protected (see the preceding “Example Control Settings” and the following table).

Because their short release times preclude stereo imaging problems, the high-frequency limiters of each channel operate independently, regardless of the position of the COUPLE button. The high-frequency limiter is located *after* the leveler/compressor and is essentially independent of it. Ordinarily, the leveler/compressor controls the input levels to the high-frequency limiter. **To use the high-frequency limiter independently**, set the AGC button OFF. When you use the 8200ST this way, adjust the GAIN REDUCTION control with particular care to avoid over-driving the high-frequency limiter or clipping the VCAs.

Pre-Emphasis	Up 3dB at	Application
none	—	Recording tape at 30ips; PCM digital links
25 μ s	6.37kHz	Recording tape at 15ips
37.5 μ s	4.24kHz	Recording tape at 7.5ips
50 μ s	3.18kHz	FM broadcast (Europe)*; PCM digital links with EIAJ pre-emphasis (50 μ s/15 μ s)
75 μ s	2.12kHz	FM broadcast*, cassette duplication**, microwave STLs
100 μ s	1.59kHz	Cassette duplication**
150 μ s	1.06kHz	FM SCA subcarriers

* FM broadcast pre-emphasis standards vary by country.

** Depends on tape quality and whether Dolby HX Pro[®] processing is used.

(To ensure accuracy in broadcast STL or SCA applications, the pre-emphasis network in the STL or SCA generator should be defeated, and the 8200ST's jumpers should be set for pre-emphasized output — see “Installation” in Section 2.)

If you hear high-frequency distortion, try switching the HF Limiter switch to a higher setting. If you hear excessive high-frequency loss, try a lower setting.

The thresholds, time constants, and compression ratios of the high-frequency limiter have been optimized for unobtrusive processing of dynamic program material. Sine waves do not resemble real program material. Consequently, if you make swept sine wave measurements on the high-frequency limiter, the curves that are produced will not be the exact inverses of the curves selected with the HF Limiter switch. (The primary reason for this is that the threshold of the high-frequency limiter has been set several dB above the steady-state threshold of the leveling circuit to avoid having transient overshoots from the leveling circuit cause unnecessary high-frequency gain reduction.)

Stereo-Tracking and Independent Two-Channel Operation (Using the COUPLE control)

The 8200ST is a stereo device and is unsuitable for dual-channel operation with unrelated program material in each channel. Setting the COUPLE button ON (for stereo mode operation) ensures stable stereo imaging. In this mode, gain reduction of both channels will follow the channel requiring the *greater* amount of gain reduction.

When the COUPLE button is OFF, the left and right channels can take separate amounts of gain reduction. This can sometimes be beneficial in broadcast applications where poor production practices have created recorded material with significant channel imbalance. Independent operation of the 8200ST's AGC can correct such imbalance, and its operation is usually slow enough to prevent audible motion of the stereo image.

Peak Levels and the Modulation Meter (Reading the MODULATION Meters)

The MODULATION meter monitors the signal prior to de-emphasis (if used) and the OUT controls. When you use 50 μ s pre-emphasis (or above), most program material produces frequent peaks at 100% modulation and will therefore hit the peak clippers in the 8200ST. The 8200ST's MODULATION meter will show this clearly. However, clipping density is very light by comparison to clipping density in an Orban broadcast transmission processor, and the subsequent de-emphasis rolls off any clipping-induced distortion into inaudibility.

When you are operating with no pre-emphasis, peaks at 100% will occur very rarely. (Most peaks will occur from -4 to -8dB below the clipping threshold at "0" on the meter.) This is because there is no de-emphasis to roll off any distortion caused by the peak clipper, so we decided to set the levels very conservatively to prevent clipping with almost any program material. 8200ST processing is specifically *not* designed to increase short-term program density; it is designed instead to handle the audio as gently and transparently as possible. In a broadcast system, the transmission audio processor (OPTIMOD-AM, -FM, -TV, or -HF) is far better suited to increase short-term density than is the 8200ST. Further, these transmission OPTIMOD units work best when they receive the cleanest possible audio, which the 8200ST is designed to provide.

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Section 4

Maintenance

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4-3	Performance Evaluation
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4-9	Figure 4-1: Limiting Curves
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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 $+18\text{V}$ and $+26\text{V}$.
Measure the negative unregulated voltage across C501 and the positive unregulated voltage across C500.
- D ☐ Verify that the outputs of the $\pm 15\text{V}$ regulators at test points TP5 (+) and TP8 (–) are $15.00\text{V} \pm 0.75\text{V}$.
- 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 $-10.0\text{V} \pm 0.75\text{V}$.
- H ☐ Verify that the voltage at test point TP10 is $+10.0\text{V} \pm 0.75\text{V}$.
- I ☐ Place jumper JA in the ON position.
- J ☐ Verify that the voltage at TP10 is $+5.5\text{V} \pm 0.3\text{V}$.
- K ☐ Verify that the voltage at TP9 is $-5.5\text{V} \pm 0.3\text{V}$.
- L ☐ Adjust +3 VOLT trimmer R8 to produce $+3\text{V} \pm 0.1\text{V}$ 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 $+14.0\text{dBu} \pm 0.2\text{dB}$ 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 $-13\text{dBu} \pm 3.0\text{dB}$.

6. Check VCA control circuits and GAIN REDUCTION meters.

- A ☐ Set the oscillator's output level to $+5\text{dBu}$.
- 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 $3.5 \text{ seconds} \pm 2 \text{ seconds}$, 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 $24 \text{ seconds} \pm 5 \text{ seconds}$, 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 \pm 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 \pm 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 150 μ s.
- 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 (± 0.25 dB) 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.

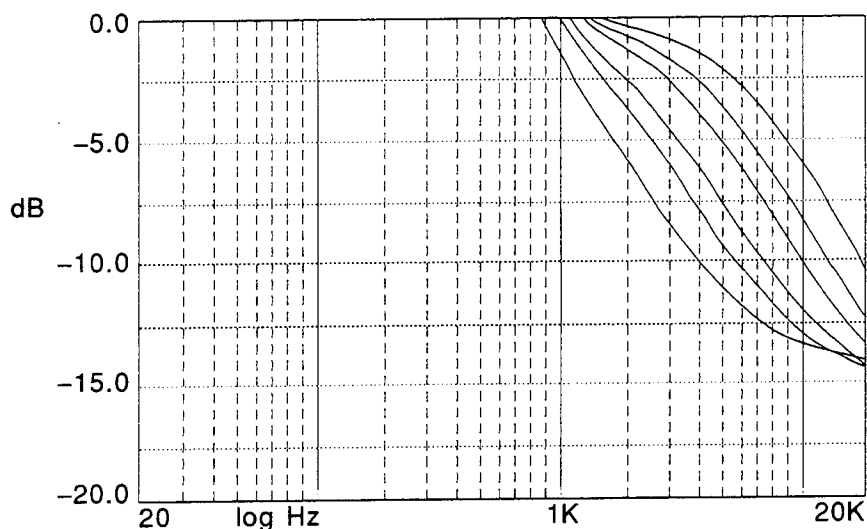


Figure 4-1: Limiting Curves

- 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 600 Ω resistor between pins 2 and 3 of the left output connector.

A 620 Ω 1/2-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 through its range. Verify that the output level varies correspondingly.

- M ☐ Remove the 600 Ω 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 $+10\text{dBu} \pm 0.5\text{dB}$ 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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5-2	Problems and Possible Causes
5-2	RFI, hum, clicks, or buzzes
5-2	Power supply problems
5-2	Poor peak control
5-3	Shrill, harsh sound
5-3	Noise pumped up during pauses
5-3	Audible distortion
5-3	COUPLE and VOICE switches do not retain their settings when 8200ST is powered-down
5-3	Levels are not correct after alignment using the 8200ST's built-in oscillator
5-4	Technical Support
5-4	Factory Service
5-5	Shipping Instructions



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 ($\pm 5.5\text{VDC}$). 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 $\pm 5.5\text{VDC}$ 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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Section 6

Technical Data

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6-2	Specifications
6-4	Circuit Description
6-14	Parts List
6-15	Obtaining Spare Parts
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6-23	Schematics, Assembly Drawings
6-33	Abbreviations

Specifications

Performance

Frequency response (20–20,000Hz): ± 0.25 dB below leveler, compressor, and high-frequency limiter thresholds.

RMS noise (20–20,000Hz): < 100 dB (103dB typical) below output clipping threshold with high-frequency limiter strapped for flat output.

Interchannel crosstalk: Better than -75 dB, 20-20kHz, typical -80 dB.

Installation

Audio Input

Impedance: $> 10k\Omega$, active balanced, EMI-suppressed.

Operating level: Usable with -10 dBu to $+8$ dBu lines.
(0dBu = 0.775V RMS; for this application, the dBm @ 600Ω scale on voltmeters can be read as if were calibrated in dBu.)

Connectors: Female XLR.

Audio Output

Impedance: 30Ω , electronically balanced and floating to simulate true transformer output. Minimum load impedance is 600Ω . Output can be unbalanced by grounding pin 2 or 3 of output XLR.

Level: Front-panel controls permit use with -10 dBm to $+8$ dBm systems. Output clipping level is $> +20$ dBm @ 600Ω (unbalanced load); $> +24$ dBm @ 600Ω (balanced load).

Connectors: Male XLR.

Physical

Buttons: Momentary with power-failure keep-alive feature to preserve COUPLE and VOICE logic settings. (Unit always powers up with AGC ON and TONE ON.)

Meters: Four 10-segment LED bargraph displays show gain reduction and modulation level for each channel.

Indicators: Three LEDs illuminate to show operation of gating and high-frequency limiting. There is also one power LED which illuminates when the unit connected to an AC source.

Dimensions: 19" (48.3 cm) wide, $9\frac{5}{8}$ " (24.5 cm) deep, $1\frac{3}{4}$ " (4.5 cm) high.

Operating temperature range: 32 – 113°F (0 – 45°C).

Power requirements: 115/230 volts AC $\pm 10\%$, 50–60Hz, 16VA. IEC-standard detachable mains cord. EMI-suppressed.

Fuse: $\frac{1}{2}$ -amp 3AG 250V Slow-Blow for 115V operation; $\frac{1}{4}$ -amp "T"-type (250mA) Slow-Blow for 230V operation.

Options

Security cover (acrylic): To prevent unauthorized adjustment of controls. Order SC1 CLEAR for a clear cover, SC1 WHITE for an opaque white cover, or SC1 BLUE for a blue cover.

Audio Processing Circuitry

AGC

Attack time: Approximately 100ms/dB (VOICE mode OFF), 2ms/dB (VOICE mode ON); program-dependent.

Release time: Adjustable between approximately 1dB/sec and 5dB/sec; program-dependent. Rate declines exponentially when less than 10dB gain reduction occurs.

Compression ratio >20:1 (static); program-dependent (dynamic).

Range of gain reduction: greater than 25dB.

Interchannel tracking: ± 0.5 dB (with COUPLE button set ON).

Total harmonic distortion (100% modulation): <0.05% at 1kHz (with RELEASE control centered and 15dB gain reduction). Typically <0.1% at 20Hz, <0.03% at 100-2,000Hz, <0.05% at 2,000-10,000Hz, and <0.1% at 10,000-20,000Hz.

SMPTE intermodulation distortion: <0.05% (60/7,000Hz 4:1 with 15dB gain reduction).

Gain reduction element: Class-A VCA.

High-frequency Limiter

Pre-emphasis: Five switch-selectable 6dB/octave pre-emphasis curves: 25, 50, 75, 100, and 150 μ s. Can be strapped for flat or pre-emphasized output. A defeatable peak clipper can enforce an absolute peak ceiling on the (pre-emphasized) output.

Response: The high-frequency limiting threshold and attack time have been set so that no audible distortion is produced with dynamic program material that has been processed by the leveler/compressor and peak clipper. Because these settings have taken into account the peak-to-average ratio of the leveler/compressor's output, it is not possible to specify the high-frequency limiter's response to test tones with simple, meaningful numbers.

Total harmonic distortion: The high-frequency limiter/clipper will add no more than 0.02% THD to sine wave test tones that have been processed by the leveler/compressor.

Release time: Approximately 30ms, program-dependent.

Interchannel coupling: Each channel's high-frequency limiter operates independently at all times (the use of fast release times precludes disturbances of the stereo image's stability).

Gain reduction element: Junction FET.

HF limiting curve: Shelving, 6dB/octave.

Warranty

One year, parts and labor: Subject to the limitations set forth in Orban's Standard Warranty Agreement.

Specifications subject to change without notice.

Circuit Description

On the following pages, a detailed description of each circuit's function is accompanied by a component-by-component description of that circuit. Keywords are highlighted throughout the circuit descriptions to help you quickly locate the information you need.

The circuitry is described in eight major blocks: input buffer, VCA (voltage-controlled amplifier), leveler/compressor control, tone oscillator, high-frequency limiter, MODULATION metering, logic, and power supply.

Whenever circuitry is duplicated for the left and right channels, only the left channel will be described. Left channel components are numbered 100 through 299; right channel components have corresponding numbers in the 300–499 range. FET switching components are numbered in the 500–599 range. Logic components (and others located on the front panel circuit board) are numbered in the 600–699 range (except for ICs, which are in the 1–99 range). Power supply and shared components are numbered 1–99.

1. Overview

The block diagram on page 6-24 illustrates the following overview of 8200ST circuitry.

The signal, which enters the 8200ST in a balanced form, receives moderate RF suppression, then is applied to a very low-noise opamp configured as an “active transformer.”

The current-controlled gain block used in the 8200ST is a low-noise class-A voltage-controlled amplifier (VCA). Any “thumps” due to control current feedthrough are eliminated by applying DC offset to the VCA's input.

The leveler/compressor is a feedback circuit: the output of the leveler/compressor is looped back to develop a gain-control signal that is applied to the VCA. This arrangement produces superior stability of characteristics with time and temperature, extremely low distortion, and optimized control-loop dynamic response.

The proprietary leveler/compressor timing module generates a control signal that enables the 8200ST to achieve natural-sounding control and very low modulation distortion. The RELEASE control allows a 15:1 variation in the basic release dynamics, which are determined by the timing module on the basis of the past history of the input. Recovery proceeds at a constant rate from 25 to 10dB gain reduction, and then progressively slows as the gain reduction approaches 0dB.

The VOICE button, when set OFF, activates a level detector that produces a gentle leveling action with slow (200ms) attack time and relatively low threshold of compression. When the VOICE button is set ON, it activates an additional level detector with higher threshold that provides a 5ms attack time for transient material too fast to be controlled by the slower level detector.

A gating detector monitors the level of the 8200ST's input signal, and activates the gate if this level drops below a threshold set with the GATE control.

The tone oscillator is a Wien bridge oscillator. It uses the limiter to set the output level and to control the oscillator loop gain to ensure reasonably low distortion.

The GAIN REDUCTION meter consists of ten comparators arranged to produce a meter with a linear scale (calibrated in dB).

High-frequency limiting is effected by applying the output of the leveler/compressor to a bandpass filter. When summed with its input, the output of this filter provides a 6dB/octave pre-emphasis up to 20kHz. The +3dB breakpoint frequency for the pre-emphasis is determined by the amount of bandpass output that is summed with the input signal — the greater the contribution from the bandpass output, the lower the breakpoint frequency.

The contribution from the bandpass output is determined by the HF LIMITER switch and by circuitry that can dynamically reduce the pre-emphasis to effect the high-frequency limiting function.

The output of the high-frequency limiter is applied to a clipper which provides absolute peak control at the 8200ST's output when the clipper is activated by jumper JA.

If the subsequent de-emphasis has been jumpered out by jumpers JE and JF (PRE-EMPHASIZED mode), the absolute peak ceiling at the 8200ST's output will be independent of frequency; if de-emphasis is applied, the peak ceiling will be frequency-dependent, falling at 6dB/octave beyond the break frequency determined by the setting of the HF LIMITER switch.

The peak-detecting MODULATION meter is an LED bargraph that monitors the output level of the 8200ST's processing circuitry just prior to the OUTPUT level control. It is calibrated so that 0 dB corresponds to the clipping level of the 8200ST's clipper circuit. The meter is driven by a peak detector capable of reading the peak level of a 10-microsecond pulse with an accuracy of 0.5dB (typical) when compared to its reading on a steady-state tone. It thus provides a true peak-reading capability, rather than a quasi-peak capability like an EBU-standard PPM (peak program meter).

The four momentary buttons on the front panel control the state of the 8200ST through CMOS logic chips, which interact with the analog circuitry mainly through JFET switches.

Unregulated voltage is supplied by two pairs of full wave diode rectifiers. Regulated voltages are supplied by a pair of overrated 500mA "three-terminal" IC regulators.

2. Input Buffer

The signal enters the 8200ST in balanced form, receives modest RF suppression, and is then applied to a very low-noise opamp configured as a differential amplifier with a 0.5 gain. When both non-inverting and inverting inputs are driven by a source impedance that is small with respect to 100k Ω (as 600 Ω or less would be), the amplifier is essentially insensitive to signal components that appear equally on the non-inverting and inverting inputs (such as

hum), and responds with full gain to the difference between the non-inverting and inverting inputs. It therefore serves as an “active transformer.”

Component-Level Description:

C2, C3 are integrated LC filters that remove most RF from the input leads to the chassis. Although this RF suppression is modest, it should be adequate for the vast majority of installations.

The filtered signal is applied to opamp IC1-A. This opamp will overload if its differential input exceeds approximately +26dBu (0dBu = 0.775V RMS; for this application, the dBm @ 600Ω scale on voltmeters can be read as if were calibrated in dBu).

3. Voltage-Controlled Amplifiers

The voltage-controlled amplifier (VCA) used in the 8200ST is a low-noise class-A device. It operates as a two-quadrant analog multiplier with gain directly proportional to the exponential of its control voltage.

Component-Level Description:

If IC2 is not perfectly balanced, “thumps” due to control current feedthrough can appear at its output. These are eliminated by applying DC offset to IC2’s input through R108 and THUMP NULL control R109.

The gain of IC2 is determined by the sum of (1) a fixed voltage produced by the GAIN REDUCTION control R118 and (2) the AGC control voltage appearing at pin 10 of the timing module. These voltages are summed through R115, R117, and Q113, and appear at pin 11 of IC2. Q113 disconnects GAIN REDUCTION control R118 from the VCA when the 8200ST is in TONE mode. This makes the gain of the VCA predictable, which is necessary because it is used as part of the amplitude-stabilizing AGC for the tone oscillator in TONE mode.

Second-harmonic distortion is canceled by applying a nulling voltage through L DIST NULL trimmer R110 and resistor R111.

C103 provides frequency-compensation to prevent the VCA from oscillating supersonically.

4. AGC Control

The AGC is a feedback circuit: the output of the AGC is used to develop a gain-control signal that is applied to the gain-control port of the VCA. This arrangement results in superior stability of characteristics with time and temperature, extremely low distortion, and optimized control-loop dynamic response.

The output opamp in the VCA is applied to two rectifiers with threshold. One serves as a slow, low-threshold leveling rectifier, and the other is a faster, higher-threshold compression rectifier.

The rectifiers feed the AGC timing module, which contains proprietary circuitry that produces a control voltage with dynamics appropriate to achieving natural-sounding control and very low modulation distortion. The output of the module can be wired in a logical "OR" circuit with other such modules to effect stereo tracking. The RELEASE control allows a 15:1 variation in the basic release dynamics, which are determined by the timing module on the basis of the past history of the input.

Recovery proceeds at a constant rate from 25 to 10dB gain reduction and then progressively slows as the gain reduction approaches 0dB.

A gating detector monitors the level of the 8200ST's input signal, and activates the gate if this level drops below a threshold set with the GATE control.

The GAIN REDUCTION meter consists of ten comparators with current regulators at their outputs. The comparators are arranged to produce a meter with a linear scale. The ten LEDs in the bargraph are connected in series.

Component-Level Description:

The output of IC1-B in the VCA is applied to two rectifiers with threshold in IC12. The two halves of IC12 are both conventional full-wave rectifiers. IC12-B is the leveling rectifier, IC12-A is the compression rectifier. Threshold currents are applied through R144, R151. Attack times are determined by R152, R153 (compression) and R145, R146 (leveling). Any DC offsets at IC1-B's output are blocked by C114, C115.

The output of the timing module is a low-impedance unidirectional voltage source with a scale factor of approximately +0.4V/dB. 0V corresponds to 0dB gain reduction. Approximately +10V corresponds to 25dB gain reduction, which is the maximum available.

IC5-A and diode-connected transistor Q108 form a precision clamp that prevents the gain control voltage from going below ground.

R138, C113 average the gain control voltage over approximately 30 seconds. IC5-B buffers this average, which appears at pin 7 in low-impedance form. Under gated conditions (when gating FET Q103 is off because the gating circuit has forced Q103's gate terminal to -15 volts), this average voltage is applied to the timing module through R139. This forces the output of the timing module to move slowly towards this average as long as Q103 remains off.

The gate is activated when the output of IC4-D is negative, and defeated when it is open (the outputs of quad comparator IC4 are open-collector). The gate circuit gets its information about the input level from the output of leveling rectifier IC12-B. Note that this level represents the input level to the 8200ST as scaled by the gain of the VCA, IC2. The output of IC12-B is summed with the output of the corresponding rectifier in the right channel through R125 and R126, and is then

applied to a one-quadrant multiplier consisting of IC3-B, matched transistor pair Q107, and associated components. R124 applies a small bias current to the multiplier, permitting the gate to be turned off by setting its threshold below this bias.

Pin 1 of Q107 is a dB-linear gain-control port for the one-quadrant multiplier. The gain increases with increasing control voltage. Q107's gain control port receives the voltage controlling the gain of VCA IC2. Because Q107's gain *increases* 1dB for every 1dB *decrease* in IC2's gain, Q107 cancels out the effect of any gain reduction that occurs in IC2 due to AGC action. Thus the input to the gate detector is always proportional to the signal level *before* IC2 (except for the effect of the GAIN REDUCTION control, which is equivalent to an input attenuator prior to the gate detector), so the amount of gain reduction in IC2 does not affect the gate threshold.

GATE control R123 scales the gain of the second transistor in Q107 in a dB-linear way, thereby adjusting the sensitivity of the gate circuit. C109 and R132 average the output current at the collector of this transistor (pin 6), and this average voltage is applied to IC4-A, a comparator with hysteresis. Voltage divider R127, R128 sets the comparator's threshold to -7.5V . R129 creates hysteresis by positive feedback. When the voltage at IC4-A's (–) input (pin 4) is more negative than the voltage at its (+) input, IC4-A's pin 2 output is pulled to $+15\text{V}$ through R130 and the gate turns on.

In TEST and TONE modes, the OP line goes to -15V , preventing pin 2 of IC4 from going high and ensuring that the gate is always OFF in these modes.

When the 8200ST is gated, IC4-D pinches off Q103 by pulling its gate to -15V . This opens the release path and permits IC5-B (pin 7) to inject a voltage into R139 that forces the output voltage of the timing module to drift towards the average of the last thirty seconds of gain control voltage.

When the 8200ST is un-gated, IC4-D's output transistor is off, Q103's gate is clamped to the same voltage as its source through R140, and Q103 becomes equivalent to a low resistance. Because Q103's source is driven from a low impedance, the effect of R139 is entirely swamped out, and RELEASE control R157 is permitted to conduct normally.

R220, R221 attenuate the dB-linear gain reduction voltage such that $+3\text{V} = 25\text{dB}$ gain reduction. The attenuated voltage is mixed with a 50 or 60Hz "dither" signal through C130, R222 (connected to the power transformer secondary), and is then applied to the input of LM3914 bargraph driver IC20.

The LM3914 bargraph consists of ten comparators with current regulators at their outputs. The comparators are arranged to produce a meter with a linear scale. The LM3914 applies current (through any one of pins 1 through 10) to the appropriate node to light the desired LEDs.

Q606 is used as a zener diode to reduce the supply voltage to the LM3914 so that it is within the chip's 25V maximum rating. R618 sets the current through the LED bargraph.

The LM3914 has an internal string of series resistors that provide reference voltages for its ten comparators. The bottom of this string is grounded at pin 4; the top of the string is provided with +3.00VDC from pin 1 of IC19-A.

C605 bypasses the LM3914 power supply to prevent the LM3914 from oscillating.

5. Tone Oscillator

The tone oscillator works by creating frequency-selective positive feedback around the VCA. The oscillator produces a tone at the frequency where the positive feedback is maximum. The amount of positive feedback is constrained by the AGC circuit to control the amplitude of the oscillation, preventing the oscillation from running away and clipping the VCA.

Component-Level Description:

The RC filter C104, C105, R106, R107 is a bandpass filter with 0 degrees of phase shift and maximum transmission at 400Hz. When the TONE logic is activated, Q101 turns off (disconnecting the input from IC2), and Q102 turns on, connecting the RC filter feedback loop. Q113 turns off, disconnecting the GAIN REDUCTION control from the VCA to ensure that the VCA has predictable quiescent gain. The gate also turns off (the OP line connected to R130 goes to ground), ensuring that the gain reduction will decrease to the point where oscillation occurs.

The $\overline{\text{OP}}$ logic line connected to R149 goes high, defeating the IC12-B rectifier. Q109 turns off and Q110 turns on, connecting the output of IC11-A to the input of the IC12-A rectifier. This rectifier produces the necessary gain reduction to control the loop gain around the oscillator. Depending on the setting on JB, either R156 or R210 apply thresholding current to the timing module, determining the level of oscillation with reference to the output of IC11-A. This point is always pre-emphasized, and if the output is strapped FLAT, the de-emphasis can reduce the output level of the 8200ST slightly below 100%. However, when the signal is again pre-emphasized in the equipment receiving the 8200ST's output, the tone will be at the correct level following such pre-emphasis.

6. High-Frequency Limiter

The output of the leveler/compressor is applied to a bandpass filter with a peak frequency of 36kHz, a "Q" of 0.77, and a peak gain of 0dB. When summed with its input, the output of this filter provides a 6dB/octave pre-emphasis up to 20kHz. The amount of bandpass output summed with the input signal determines the +3dB breakpoint frequency for the pre-emphasis — the greater the contribution from the bandpass output, the lower the breakpoint frequency.

The contribution from the bandpass output is determined by the HF LIMITER switch and by circuitry that can dynamically reduce the pre-emphasis to effect the high-frequency limiting function.

Note that swept sine wave tests of the high-frequency limiter will not yield the exact inverse of the pre-emphasis curves. This is because a high-pass filter causes the comparators to see a signal that is slightly different from the signal at the high-frequency limiter output, and because the threshold of high-frequency limiting is set above the steady-state output level of the AGC. The threshold is set this way to keep the high-frequency limiter from being activated by peak overshoots resulting from the slow attack time of the leveler when operating on program material.

The output of the high-frequency limiter is applied to a clipper that provides absolute peak control at the 8200ST's output. If the subsequent de-emphasis has been jumpered out, the absolute peak ceiling at the 8200ST's output will be independent of frequency; if de-emphasis is applied, the peak ceiling will be frequency-dependent, falling at 6dB/octave beyond the break frequency determined by the setting of the HF LIMITER switch. The high-frequency limiter is flat ± 0.1 dB to 20kHz, and falls at 12dB/octave thereafter when de-emphasis is applied.

Component-Level Description:

The bandpass filter consists of IC11-B and associated circuitry. Bandpass response can be measured at pin 7 (or at test point TP1).

The contribution from the bandpass output is determined by the gain of a voltage divider. Switching FETs Q500-Q505 and associated resistors determine this gain. The HF LIMITER switch S100 (through switching transistors Q524-Q529 and associated components) determines which of the FETs is on. The resistance of JFET Q112 further affects the contribution of the bandpass filter to the output. Q112 can dynamically reduce the pre-emphasis to effect the high-frequency limiting function.

IC9, which has a gain of 29dB, compensates for the loss in the voltage divider. The output of IC9 (representing the band-passed signal) is summed with the input signal in IC11-A to create the pre-emphasized signal.

The +3dB breakpoints that correspond to the time constant calibrations for the HF LIMITER switch are: 1.06kHz for 150 μ s, 1.59kHz for 100 μ s, 2.12kHz for 75 μ s, 3.18kHz for 50 μ s, and 6.37kHz for 25 μ s.

The two comparators in IC13 sense the positive and negative peak levels of the pre-emphasized signal. If either level exceeds the ± 3.0 V threshold voltages established by R188-R189, the appropriate comparator fires. Each comparator has an open collector NPN output stage and pulls the high-frequency limiter timing module negative through attack time resistor R191.

C122, R190 form the 6dB/octave high-pass filter that prevents the high-frequency limiter from being activated by low-frequency program material.

In the absence of high-frequency gain reduction, the output of the high-frequency limiter release time module (at pin 2) is biased at a positive voltage determined by L FET BIAS trimmer R204. This pinches off Q112.

When high-frequency gain reduction occurs, the voltages at pins 2 and 7 of the high-frequency limiter release time module goes more negative than the quiescent voltage, turning on Q112 and causing less and less pre-emphasis. Pre-emphasis decreases dynamically until comparator IC1 no longer fires, indicating that the high-frequency overload has been removed.

IC16-B drives the HF LED. IC16-B's pin 6 receives the FET control voltage; pin 5 receives the quiescent FET bias. In addition, IC16-B's pin 5 is offset by current flowing through R196, which forces IC16-B's pin 5 to be more negative than its pin 6, and which causes pin 7 of IC16-B to go low (close to ground). When the voltage on pin 6 becomes more negative than pin 5 due to high-frequency gain reduction, pin 7 goes high, lighting HF LED DS102. Q111 serves as a zener diode to ensure that the HF LED is OFF when IC16-B's pin 7 is close to ground.

The output of the high-frequency limiter is applied to clipper R179, CR114, CR115. The subsequent de-emphasis is provided by C121 and associated resistors, which are switched by FETs Q506-Q511.

The clippers are biased with temperature-compensated $\pm 5.5\text{VDC}$ source IC18 and associated components. The clippers can be defeated by forcing the $\pm 5.5\text{VDC}$ supply to move to $\pm 10\text{VDC}$.

7. MODULATION Meter

The peak-detecting MODULATION meter is an LED bargraph that monitors the output level of the 8200ST's processing circuitry just prior to the output level control. The meter is driven by a peak detector capable of reading the peak level of a 10-microsecond pulse with an accuracy of 0.5dB (typical) when compared to its reading on a steady-state tone. It thus provides a true peak-reading capability, rather than a quasi-peak capability like an EBU-standard PPM.

Component-Level Description:

Buffer amplifier IC114-A receives the output of IC8-A (pin 1). The output of IC114-A is rectified by an inverting half-wave precision rectifier IC14-B and associated components. Double the output of the rectifier is summed (through R224) with its input to create a full-wave rectified signal at the (+) input of IC15-B (pin 5). The rectifier has a voltage gain of 0.89.

IC15-B operates as a dual-time constant peak detector. A DC voltage equal to the peak value of the rectified signal at pin 5 of IC15-B is developed at the top of C131, which is charged by IC15-B's pin 7 through diode-connected transistor Q120. IC15-A buffers this voltage and provides feedback to IC15-B's pin 6, "telling" IC15-B how to charge C131, C132 so that the peak value of the waveform on IC15-B's pin 5 is accurately followed.

To achieve the very fast response desired, the peak-holding capacitors C131 and C132 are relatively small. To achieve a sufficiently slow recovery time with a practical value resistor ($R228 = 22\text{meg}$), R228 is bootstrapped to the output of IC15-A through R231. R230 introduces enough DC offset to always produce approximately 0.5V across R228. This multiplies the effective value of R228 by about 30 and slows down the recovery time as desired.

LM3916 bargraph driver IC29 receives the output of peak detector IC15-A (pin 1). Other than its providing a VU (rather than a linear) scale, IC29's operation is identical to the operation of the LM3914 used in the IC20 socket (see above).

8. Logic

Momentary buttons on the front panel activate the logic functions. There are four functions: VOICE, COUPLE, AGC, and TONE; an associated button toggles each ON and OFF, and a D-flip flop remembers the status of each. A backup power supply maintains the status of the VOICE and COUPLE functions when the 8200ST is powered down. The AGC and TONE functions are arranged so that the unit always powers up with the AGC ON and TONE OFF. Additional logic decodes the outputs of the four memory elements to drive switching FETs and other elements in the 8200ST's analog circuitry.

Component-Level Description:

All memory elements are similar; here we will consider the VOICE circuit. The VOICE button provides a +14V pulse to de-bounce network R601, R602, C601. Cascaded Schmitt triggers IC28-A, IC28-B sharpen the output of this network. The data (D) input of IC32-A receives the output of IC28-B. IC32-A is configured as a divide-by-2 flip-flop and changes state whenever it is clocked by a positive-going pulse on its D input.

Tri-state inverter IC34-A buffers the output of IC32-A. Logic circuit IC30-C, IC30-D and associated components receives the output of IC32-A and the TONE logic level. IC30 suppresses the operation of IC12-A (the compression rectifier) when IC30-C's output is high.

+14V powers IC28, IC32, and IC34 when mains power is present. +5V (from backup capacitor C1) powers IC28, IC32, and IC34 mains power is absent. Q2 is ON when mains power is present, causing zener diode CR5 to clamp the (+) terminal of C1 to +5V. C1 charges through R4 and diode-connected transistor Q1. When mains power is absent, Q2 turns off (preventing leakage through CR5), Q1 isolates the +15V rail from C1, and C1 provides +5V through R4 to preserve IC32's state.

The tri-state inverters in IC34 buffer IC32. When mains power is absent, the output of IC28-E goes high and forces all IC34 outputs to high-impedance so that the external loads on IC34 cannot discharge backup capacitor C1.

LEDs CR605-CR609 indicate logic status and whether the unit is powered. They are arranged in two "trees" so that several LEDs can use the same current,

minimizing power supply current drain. When transistors Q601-Q604 turn on, they turn off their associated LEDs by diverting current around the LEDs.

IC30-A and IC30-B decode the outputs of the AGC and TONE flip-flops to provide OPerate and TEST logic levels that drive the analog circuitry. Inverters IC21-E and IC21-F provide the complements to these levels.

Power-up circuit R617, C609 SETS IC33-A on power up, ensuring that the logic will always come up with AGC ON. R622, C620 ensures that TONE will always be OFF on power-up.

9. Power Supply

Two pairs of full-wave diode rectifiers supply unregulated voltage. The nominal unregulated voltage is ± 22 volts DC at rated line voltage. This will vary widely with line voltage variations. Regulator dropout will occur if the unregulated voltage falls below about ± 17.8 volts.

A pair of overrated 500mA “three-terminal” IC regulators supply regulated voltages. Because they are operated conservatively, the regulators can be expected to be extremely reliable.

Component-Level Description:

The two pairs of full-wave diode rectifiers that supply unregulated voltage are located in package CR4. The rectifier pairs drive energy storage capacitors C500 and C501. The power transformer can be strapped for either 115-volt or 230-volt operation (the two sections of the primary are paralleled for 115-volt operation and connected in series for 230-volt operation).

The pair of ICs that supply regulated voltages are “three-terminal” IC regulators IC44, IC43. IC44 and IC43 are frequency-compensated by C502, C503 at their outputs to prevent high-frequency oscillations. Small 0.1 μ F/25V ceramic capacitors bypass the power busses to ground locally throughout the board to prevent signal-carrying ICs from oscillating due to excessive power-lead inductance.

(Replace C502 and C503 with low-inductance aluminum electrolytic capacitors *only* — see “Power supply problems” on page 5-2.)

Parts List

Parts are listed by ASSEMBLY, then by TYPE, then by REFERENCE DESIGNATOR. Widely used common parts are not listed; such parts are described generally below (examine the part to determine exact value). See the following assembly drawings for locations of components.

SIGNAL DIODES, if not listed by reference designator in the following parts list, are:

Orban part number 22101-000, Fairchild (FSC) part number 1N4148, also available from many other vendors. This is a silicon, small-signal diode with ultra-fast recovery and high conductance. It may be replaced with 1N914 (BAY-61 in Europe).

(BV: 75V min. @ $I_r = 5\mu A$; I_r : 25nA max. @ $V_r = 20V$; V_f : 1.0V max. @ $I_f = 100mA$; t_{rr} : 4ns max.) See Miscellaneous list for ZENER DIODES (reference designator VRxx).

RESISTORS should only be replaced with the same style and with the exact value marked on the resistor body. If the value marking is not legible, consult the schematic or the factory. Performance and stability will be compromised if you do not use exact replacements.

Unless listed by reference designator in the following parts list, you can verify resistors by their physical appearance:

Metal film resistors have conformally-coated bodies, and are identified by five color bands or a printed value. They are rated at $\frac{1}{8}$ watt @ $70^\circ C$, $\pm 1\%$, with a temperature coefficient of 100 PPM/ $^\circ C$. Orban part numbers 20038-xxx through 20045-xxx, USA Military Specification MIL-R-10509 Style RN55D. Manufactured by R-Ohm (CRB-1/4FX), TRW/IRC, Beyschlag, Dale, Corning, and Matsushita.

Carbon film resistors have conformally-coated bodies, and are identified by four color bands. They are rated at $\frac{1}{4}$ watt @ $70^\circ C$, $\pm 5\%$. Orban part numbers 20001-xxx, Manufactured by R-Ohm (R-25), Piher, Beyschlag, Dale, Phillips, Spectrol, and Matsushita.

Carbon composition resistors have molded phenolic bodies, and are identified by four color bands. The 0.090 x 0.250 inch (2.3 x 6.4 mm) size is rated at $\frac{1}{4}$ watt, and the 0.140 x 0.375 inch (3.6 x 9.5 mm) size is rated at $\frac{1}{2}$ watt, both $\pm 5\%$ t numbers 2001x-xxx, USA Military Specification MIL-R-11 Style RC-07 ($\frac{1}{4}$ watt) or RC-20 ($\frac{1}{2}$ watt). Manufactured by Allen-Bradley, TRW/IRC, and Matsushita.

Cermet trimmer resistors have $\frac{3}{8}$ -inch (9 mm) square bodies, and are identified by printing on their sides. They are rated at $\frac{1}{2}$ watt @ $70^\circ C$, $\pm 10\%$, with a temperature coefficient of 100 PPM/ $^\circ C$. Orban part numbers 20510-xxx and 20511-xxx. Manufactured by Beckman (72P, 68W- series), Spectrol, and Matsushita.

Obtaining Spare Parts

Special or subtle characteristics of certain components are exploited to produce an elegant design at a reasonable cost. It is therefore unwise to make substitutions for listed parts. Consult the factory if the listing of a part includes the note "selected" or "realignment required."

Orban normally maintains an inventory of tested, exact replacement parts that can be supplied quickly at nominal cost. Standardized spare parts kits are also available. When ordering parts from the factory, please have available the following information about the parts you want:

- Orban part number
- Reference designator (e.g., C3, R78, IC14)
- Brief description of part
- Model, serial, and "M" (if any) number of unit — see rear-panel label

To facilitate future maintenance, parts for this unit have been chosen from the catalogs of well-known manufacturers whenever possible. Most of these manufacturers have extensive worldwide distribution and may be contacted through their local offices. Addresses for each manufacturer's USA headquarters are given on page 6-22.

REF DES	DESCRIPTION	ORBAN P/N	VEN (1)	VENDOR P/N	ALTERNATE VENDORS (1)	NOTES
<u>CHASSIS ASSEMBLY</u>						
<u>Miscellaneous</u>						
None	Line Cord, CEE	28102-002	BEL	17500	MANY	
<u>FINAL ASSEMBLY</u>						
<u>Miscellaneous</u>						
None	Transformer, Power	55019-000	ORB			
<u>PCB DISPLAY ASSEMBLY</u>						
<u>Capacitors</u>						
C614,615	Monolithic Ceramic, 50V, 20%; 0.1uF	21123-410	SPR	1C25 Z5U104M050B	KEM	
C618,619	Mica, 500V, +1/2pF -1/2pF; 5pF	21017-005	CD	CD15-CD050D03	SAN	
<u>Diodes</u>						
CR601	LED Array, 9-Yellow, 1-Red	25152-000	ORB			
CR602	LED Array, 9-Green, 1-Yellow	25154-000	ORB			
CR603	LED Array, 9-Yellow, 1-Red	25152-000	ORB			
CR604	LED Array, 9-Green, 1-Yellow	25154-000	ORB			
CR605-609	LED, Green	25107-002	MAT	LN322GP		
CR610,611	LED, Amber LN422YP	25107-003	MAT	N422-YP		
CR704	LED, Green	25107-002	MAT	LN322GP		
<u>Integrated Circuits</u>						
IC612,613	Linear, Single Opamp	24013-202	TI	TL071CP		
<u>Transistors</u>						
Q601-604	Transistor, Signal, NPN	23202-101	MOT	2N4400	FSC	
Q606-609	Transistor, Signal, NPN	23202-101	MOT	2N4400	FSC	
<u>Resistors</u>						
R714	Pot, Single; 10K, (5050)	20768-000	ORB			Linear
R718	Pot, Single; 10K, (5050)	20768-000	ORB			Linear
R738	Pot, Dual; 1M/1M (5020)	20770-000	ORB			20% CW Log
R799	Pot, Single; 100K (5020)	20769-000	ORB			20% CW Log
R899	Pot, Single; 100K (5020)	20769-000	ORB			20% CW Log
FOOTNOTES: (1) See page 6-22 for Vendor abbreviations (2) No Alternate Vendors known at publication (3) Actual part is specially selected from part listed, consult Factory (4) Realignment may be required if replaced, see Circuit Description and/or Alignment Instructions						SPECIFICATIONS AND SOURCES FOR REPLACEMENT PARTS Orban Model 8200 Chassis Assembly - Capacitors. Final Assembly - Miscellaneous. PCB Display Assembly - Capacitors, Diodes, Integrated Circuits. Transistors, Resistors.

REF DES	DESCRIPTION	ORBAN P/N	VEN (1)	VENDOR P/N	ALTERNATE VENDORS (1)	NOTES
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Switches

S100	Switch, Rotary, 1P6T	26206-000	ORB			
S601-604	Switch, MOM., AKG Gray; SPST	26301-016	ORB			

PCB MAIN ASSEMBLYCapacitors

C1	Alum., Radial, 5.5V, -20% +80%; .1F	21336-003	PAN	EEC-F5R5V104		
C101	Met. Polyester, 100V, 10%; 0.1uF	21441-410	WIM	MKS-4100V5.0.1	WES,SIE	
C102	Alum., Radial, 16V, -20% +100%; 47uF	21205-647	SPR	502D 476G016BB1C		
C103	Mica, 500V, +1/2pF -1/2pF; 47pF	21017-047	CD	CD15-CD470D03	SAN	
C104,105	Met. Polyester, 100V, 10%; 0.068uF	21441-368	WES	160C 683K250	SIE,WIM	
C106	Mica, 500V, +1/2pF -1/2pF; 10pF	21017-010	CD	CD15-CD100D03	SAN	
C107	Alum., Radial, 63V, -20% +100%; 1uF	21209-510	SPR	502D 105G063BB1C	PAN	
C108	Mica, 500V, 5%; 1000pF	21024-210	CD	CD19-FD102J03	SAN	
C109	Tantalum, 35V, 10%; 0.1uF	21307-410	SPR	196D 104X9035HA1	MANY	
C110	Met. Polyester, 100V, 5%; 0.047uF	21440-347	WES	160C 473J250	SIE,WIM	
C113	Tantalum, 35V, 10%; 1uF	21307-510	SPR	196D 105X9035HA1	MANY	
C114	Met. Polyester, 100V, 10%; 0.047uF	21441-347	WES	160C 473K250	SIE	
C115	Met. Polyester, 100V, 10%; 0.082uF	21441-382	WES	160C 823K250	SIE	
C116,117	Mica, 500V, 1%; 1000pF	21022-210	CD	CD19-FD102F03	SAN	
C118	Mica, 500V, 5%; 1800pF	21024-218	CD	CD19-FD182J03	SAN	
C121,122	Mica, 500V, 1%; 1000pF	21022-210	CD	CD19-FD102F03	SAN	
C124	Met. Polyester, 63V, 5%; 0.1uF	21442-410	MAL	168104J63A	WIM	
C125	Mica, 500V, +1/2pF -1/2pF; 10pF	21017-010	CD	CD15-CD100D03	SAN	
C130-133	Met. Polyester, 100V, 10%; 0.01uF	21441-310	WES	160C 103K630	SIE,WIM	
C2-9	Filter, EMI, W/BEAD, 50V,1000PF	29508-210	TAI	STB102KB		
C301	Met. Polyester, 100V, 10%; 0.1uF	21441-410	WIM	MKS-4100V5.0.1	WES,SIE	
C302	Alum., Radial, 16V, -20% +100%; 47uF	21205-647	SPR	502D 476G016BB1C		
C303	Mica, 500V, +1/2pF -1/2pF; 47pF	21017-047	CD	CD15-CD470D03	SAN	
C304,305	Met. Polyester, 100V, 10%; 0.068uF	21441-368	WES	160C 683K250	SIE,WIM	
C306	Mica, 500V, +1/2pF -1/2pF; 10pF	21017-010	CD	CD15-CD100D03	SAN	
C307	Alum., Radial, 63V, -20% +100%; 1uF	21209-510	SPR	502D 105G063BB1C	PAN	
C310	Met. Polyester, 100V, 5%; 0.047uF	21440-347	WES	160C 473J250	SIE,WIM	
C313	Tantalum, 35V, 10%; 1uF	21307-510	SPR	196D 105X9035HA1	MANY	
C314	Met. Polyester, 100V, 10%; 0.047uF	21441-347	WES	160C 473K250	SIE	

FOOTNOTES:

- (1) See page 6-22 for Vendor abbreviations
- (2) No Alternate Vendors known at publication
- (3) Actual part is specially selected from part listed, consult Factory

- (4) Realignment may be required if replaced, see Circuit Description and/or Alignment Instructions

SPECIFICATIONS AND SOURCES FOR
REPLACEMENT PARTS

OPTIMOD-STUDIO CHASSIS 8200ST
PCB Display Assembly - Switches.
PCB Main Assembly - Capacitors.

REF DES	DESCRIPTION	ORBAN P/N	VEN (1)	VENDOR P/N	ALTERNATE VENDORS (1)	NOTES
Capacitors (continued)						
C315	Met. Polyester, 100V, 10%; 0.082uF	21441-382	WES	160C 823K250	SIE	
C316,317	Mica, 500V, 1%; 1000pF	21022-210	CD	CD19-FD102F03	SAN	
C318	Mica, 500V, 5%; 1800pF	21024-218	CD	CD19-FD182J03	SAN	
C321,322	Mica, 500V, 1%; 1000pF	21022-210	CD	CD19-FD102F03	SAN	
C324	Met. Polyester, 63V, 5%; 0.1uF	21442-410	MAL	168104J63A	WIM	
C325	Mica, 500V, +1/2pF -1/2pF; 10pF	21017-010	CD	CD15-CD100D03	SAN	
C330-333	Met. Polyester, 100V, 10%; 0.01uF	21441-310	WES	160C 103K630	SIE,WIM	
C500,501	Alum., Axial, 40V, -10% +100%; 1000uF	21224-810	SIE	B41010-1000-40	PAN	
C502,503	Alum., Radial, 25V, -20% +100%; 100uF	21206-710	PAN	ECE-A1EV101S		
C506-509	Monolythic Ceramic, 50V, 20%; 0.1uF	21123-410	SPR	1C25 Z5U104M050B	KEM	
C514-537	Monolythic Ceramic, 50V, 20%; 0.1uF	21123-410	SPR	1C25 Z5U104M050B	KEM	
C601-604	Ceramic Disc, 50V, 20%; 0.01uF	21107-310	CRL	UK50-103	MUR	
C605-608	Alum., Radial, 63V, -20% +100%; 2.2uF	21209-522	SPR	502D 225G063BB1C	PAN	
C609	Ceramic Disc, 25V, 20%; 0.1uF	21106-410	CRL	UK25-104	MUR	
C610,611	Monolythic Ceramic, 50V, 20%; 0.1uF	21123-410	SPR	1C25 Z5U104M050B	KEM	
C616,617	Monolythic Ceramic, 50V, 20%; 0.1uF	21123-410	SPR	1C25 Z5U104M050B	KEM	
C620	Ceramic Disc, 25V, 20%; 0.1uF	21106-410	CRL	UK25-104	MUR	
Diodes						
CR114,115	Diode, Signal, Hot Carrier	22102-001	HP	HP5082-2800	MANY	
CR3	Diode, Signal, Hot Carrier	22102-001	HP	HP5082-2800	MANY	
CR314,315	Diode, Signal, Hot Carrier	22102-001	HP	HP5082-2800	MANY	
CR4	Diode, Bridge, 200V, 1A	22301-000	VARO	VE-27	GI	
CR5	Diode, Zener, 1W; 4.7V	22003-047	MOT	1N4732	MANY	
Inductors						
LF1	Filter, Line	28012-000	DEL	03ME1		
Integrated Circuits						
IC1	Linear, Dual Opamp	24207-202	SIG	NE5532N	TI,EXR	
IC10	Linear, Single Opamp	24017-202	NAT	LF411CN		
IC11,12	Linear, Dual Opamp	24206-202	TI	TL072CP	MOT	
IC13	Quad Comparator	24710-302	NAT	LM339		
IC14,15	Linear, Dual Opamp	24209-202	NAT	LF412CN		
IC16	Linear, Dual Opamp	24203-202	MOT	MC1458CP1	TI,RCA	
IC17	Digital, Display Driver	24712-302	NAT	LM3914		
FOOTNOTES:			SPECIFICATIONS AND SOURCES FOR REPLACEMENT PARTS			
(1) See page 6-22 for Vendor abbreviations		(4) Realignment may be required if replaced, see Circuit Description and/or Alignment Instructions		OPTIMOD-STUDIO CHASSIS 8200ST PCB Main Assembly - Capacitors, Diodes, Inductors, Integrated Circuits.		
(2) No Alternate Vendors known at publication						
(3) Actual part is specially selected from part listed, consult Factory						

REF DES	DESCRIPTION	ORBAN P/N	VEN (1)	VENDOR P/N	ALTERNATE VENDORS (1)	NOTES
<u>Integrated Circuits (continued)</u>						
IC18,19	Linear, Dual Opamp	24202-202	RAY	RC4558NB	MOT,FSC	
IC2	Digital, Amp/OVCE	24729-000	PMI	SSM2018P		
IC20	Digital, Display Driver	24712-302	NAT	LM3914		
IC21	Digital, Hex Schmitt Trigger	24527-302	NAT	CD40106	RCA	
IC22	Linear, Single Opamp	24017-202	NAT	LF411CN		
IC23	Linear, Dual Opamp	24207-202	SIG	NE5532N	TI,EXR	
IC24	Linear, Dual Opamp	24206-202	TI	TL072CP	MOT	
IC25	Linear, Single Opamp	24022-000	LT	LT1028C		
IC26	Linear, Dual Opamp	24206-202	TI	TL072CP	MOT	
IC27	Linear, Dual Opamp	24209-202	NAT	LF412CN		
IC28	Digital, Hex Schmitt Trigger	24527-302	NAT	CD40106	RCA	
IC29	Digital, Display Driver	24713-302	NAT	LM3916		
IC3	Linear, Dual Opamp	24209-202	NAT	LF412CN		
IC30	Digital, NAND Gate	24501-302	RCA	CD4011BE	MOT	
IC31	Digital, Display Driver	24713-302	NAT	LM3916		
IC32,33	Digital, Dual Flip-Flop	24502-302	RCA	CD4013BE		
IC34	Digital, Hex Inverter	24621-000	MOT	MC14502BCP		
IC35	Linear, Dual Opamp	24207-202	SIG	NE5532N	TI,EXR	
IC36	Digital, Amp/OVCE	24729-000	PMI	SSM2018P		
IC37	Linear, Single Opamp	24017-202	NAT	LF411CN		
IC38	Linear, Dual Opamp	24206-202	TI	TL072CP	MOT	
IC39	Quad Comparator	24710-302	NAT	LM339		
IC4	Quad Comparator	24710-302	NAT	LM339		
IC40,41	Linear, Dual Opamp	24209-202	NAT	LF412CN		
IC42	Linear, Dual Opamp	24203-202	MOT	MC1458CP1	TI,RCA	
IC43	D.C. Regulator, 15V Negative	24303-901	NAT	LM79M15AUC	TI,MOT	
IC44	D.C. Regulator, 15V Positive	24304-901	NAT	LM78M15UC	TI,MOT	
IC5	Linear, Dual Opamp	24209-202	NAT	LF412CN		
IC6	Linear, Single Opamp	24017-202	NAT	LF411CN		
IC7	Linear, Dual Opamp	24207-202	SIG	NE5532N	TI,EXR	
IC8	Linear, Dual Opamp	24206-202	TI	TL072CP	MOT	
IC9	Linear, Single Opamp	24022-000	LT	LT1028C		

FOOTNOTES:

- (1) See page 6-22 for Vendor abbreviations
 (2) No Alternate Vendors known at publication
 (3) Actual part is specially selected from part listed, consult Factory

- (4) Realignment may be required if replaced, see Circuit Description and/or Alignment Instructions

SPECIFICATIONS AND SOURCES FOR REPLACEMENT PARTS

OPTIMOD-STUDIO CHASSIS 8200ST
 PCB Main Assembly - Integrated Circuits.

REF DES	DESCRIPTION	ORBAN P/N	VEN (1)	VENDOR P/N	ALTERNATE VENDORS (1)	NOTES
<u>Miscellaneous</u>						
	FUSEHOLDER ASSY,DOM, PC MOUNT	28112-001				
F1	Fuse, 3AG, Slo-Blo, 1/4A	28004-125	LFE	313.250	BUS	
J1	Connector ,XLR, PC Mount, Female	27054-003	NEU	NC 3 FD-H		
J2	Connector, XLR, PC Mount, Male	27053-003	NEU	NC 3 MD-H		
J3	Connector ,XLR, PC Mount, Female	27054-003	NEU	NC 3 FD-H		
J4	Connector, XLR, PC Mount, Male	27053-003	NEU	NC 3 MD-H		
<u>Modules</u>						
A1	Module Assy, H-F Limiter Release Time	30465-000-xx*	ORB			*Add suffix printed on part
A2	Module Assy, Timing	30995-000-xx*	ORB			*Add suffix printed on part
A3	Module Assy, H-F Limiter Release Time	30465-000-xx*	ORB			*Add suffix printed on part
A4	Module Assy, Timing	30995-000-xx*	ORB			*Add suffix printed on part
<u>Transistors</u>						
Q1,2	Transistor, Signal, NPN	23202-101	MOT	2N4400	FSC	
Q101,102	Transistor, JFET/P	23408-101	NAT	J176	MANY	
Q103	Transistor, JFET/N	23405-101	NAT	J114		
Q104	Transistor, Signal, NPN	23202-101	MOT	2N4400	FSC	
Q105,106	Transistor, JFET/P	23408-101	NAT	J176	MANY	
Q107	Transistor, Signal, PNP Twin	23006-000	NEC	uPA75HAF		
Q108	Transistor, Signal, NPN	23202-101	MOT	2N4400	FSC	
Q109,110	Transistor, JFET/N	23406-101	NAT	J113	SIL	
Q111	Transistor, Signal, NPN	23202-101	MOT	2N4400	FSC	
Q112	Transistor, JFET/P	23407-101	NAT	J174	SIL	
Q113	Transistor, JFET/P	23408-101	NAT	J176	MANY	
Q114	Transistor, JFET/N	23406-101	NAT	J113	SIL	
Q120	Transistor, Signal, NPN	23202-101	MOT	2N4400	FSC	
Q301,302	Transistor, JFET/P	23408-101	NAT	J176	MANY	
Q303	Transistor, JFET/N	23405-101	NAT	J114		
Q304	Transistor, Signal, NPN	23202-101	MOT	2N4400	FSC	
Q305	Transistor, JFET/P	23408-101	NAT	J176	MANY	
Q308	Transistor, Signal, NPN	23202-101	MOT	2N4400	FSC	
Q309,310	Transistor, JFET/N	23406-101	NAT	J113	SIL	
Q311	Transistor, Signal, NPN	23202-101	MOT	2N4400	FSC	
Q312	Transistor, JFET/P	23407-101	NAT	J174	SIL	

FOOTNOTES:

- (1) See page 6-22 for Vendor abbreviations
 (2) No Alternate Vendors known at publication
 (3) Actual part is specially selected from part listed, consult Factory

- (4) Realignment may be required if replaced, see Circuit Description and/or Alignment Instructions

SPECIFICATIONS AND SOURCES FOR REPLACEMENT PARTS

OPTIMOD-STUDIO CHASSIS 8200ST
 PCB Main Assembly - Miscellaneous, Modules, Transistors.

REF DES	DESCRIPTION	ORBAN P/N	VEN (1)	VENDOR P/N	ALTERNATE VENDORS (1)	NOTES
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Transistors (continued)

Q313	Transistor, JFET/P	23408-101	NAT	J176	MANY	
Q314	Transistor, JFET/N	23406-101	NAT	J113	SIL	
Q320	Transistor, Signal, NPN	23202-101	MOT	2N4400	FSC	
Q500-505	Transistor, JFET/N	23402-101	NAT	J108		
Q506-511	Transistor, JFET/N	23406-101	NAT	J113	SIL	
Q512-517	Transistor, JFET/N	23402-101	NAT	J108		
Q518-523	Transistor, JFET/N	23406-101	NAT	J113	SIL	
Q524-529	Transistor, Signal, NPN	23202-101	MOT	2N4400	FSC	
Q530,531	Transistor, JFET/P	23408-101	NAT	J176	MANY	

Resistors

R200a,b	Resistor Set, MF; 13.3K/10.2K	28522-003	ORB			3
R203a,b	Resistor Set, MF; 4.64K/4.53K	28522-005	ORB			3
R208a,b	Resistor Set, MF; 4.53K/3.01K	28522-004	ORB			3
R210a,b	Resistor Set, MF; 13.3K/10.2K	28522-003	ORB			3
R400a,b	Resistor Set, MF; 13.3K/10.2K	28522-003	ORB			3
R403a,b	Resistor Set, MF; 4.64K/4.53K	28522-005	ORB			3
R408a,b	Resistor Set, MF; 4.53K/3.01K	28522-004	ORB			3
R410a,b	Resistor Set, MF; 13.3K/10.2K	28522-003	ORB			3

Switches

S1	Switch, Slide, Mains voltage selector	26143-000	SW	EPS2-PC3		
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FOOTNOTES:

- (1) See page 6-22 for Vendor abbreviations
 (2) No Alternate Vendors known at publication
 (3) Actual part is specially selected from part listed, consult Factory

- (4) Realignment may be required if replaced, see Circuit Description and/or Alignment Instructions

SPECIFICATIONS AND SOURCES FOR REPLACEMENT PARTS

OPTIMOD-STUDIO CHASSIS 8200ST
 PCB Main Assembly - Transistors, Resistors, Switches.

6-22 TECHNICAL DATA

Vendor Codes

AB	Allen-Bradley Co., Inc. 1201-T South Second Street Milwaukee, WI 53204	DUR	Duracell, Inc. Berkshire Industrial Park Bethel, CT 06801	LT	Linear Technology Corp. 1630 McCarthy Blvd. Milpitas, CA 95035	ORB	Orban A division of AKG Acoustics, Inc. 1525 Alvarado Street San Leandro, CA 94577	TAI	Taiyo America, Inc. 700 Frontier Way Bensenville, IL 60106
AD	Analog Devices, Inc. One Technology Way PO Box 9106 Norwood, MA 02062-9105	ELSW	Electro Switch 77 King Avenue Weymouth, MA 02188	LUMX	Lumex Opto/Components Inc. 292 E. Hellen Road Palatine, IL 60067	PAN	Panasonic Industrial Company Two Panasonic Way 7E-2T Secaucus, NJ 07094	TDK	TDK Electronics Corporation 12 Harbor Park Port Washington, NY 11050
AKG	AKG Acoustics, Inc. 1525 Alvarado Street San Leandro, CA 94577	EMI	Emico Inc. 123 Main Street Dublin, PA 18917	MAL	Mallory Capacitor Co. Emhart Electrical/Electronic Gr. 4760 Kentucky Ave Indianapolis, IN 46241	QT	Quality Technologies, Inc. 610 North Mary Ave. Sunnyvale, CA 94086	TI	Texas Instruments, Inc. PO Box 225012 Dallas, TX 75265
AM	Amphenol Corporation 358 Hall Avenue Wallingford, CT 06492	EXR	Exar Corporation 2222 Qume Dr. PO Box 49007 San Jose, CA 95161-9007	MAR	Marquardt Switches, Inc. 2711-TR Route 20 East Cazenovia, NY 13035	RAL	Raltron Electronics Corp. 9550 Warner Ave. Fountain Valley, CA 92708	TOS	Toshiba America, Inc. 9740 Irvine Blvd. Irvine, CA 92718
BEK	Beckman Industrial Corporation 4141 Palm Street Fullerton, CA 92635-1025	FR	Fair-Rite Products Corp. PO Box J Wallkill, NY 12589	MAT	Matsushita Electric Corp of America One Panasonic Way Secaucus, NJ 07094	RAY	Raytheon Company Semiconductor Division 350 Ellis Street Mountain View, CA 94039	TRW	TRW Electronics Components Connector Division 1501 Morse Avenue Elk Grove Village, IL 60007
BEL	Belden Electronic Wire & Cable PO Box 1980 Richmond, IN 47374	FSC	Fairchild Camera & Instr. Corp. See National Semiconductor	ME	Mecopul/Centralab A North American Phillips Corp. 11468 Sorrento Valley Road San Diego, CA 92121	RCA	RCA Solid State See Harris Semiconductor	VARO	Varo Semiconductor, Inc. PO Box 469013 Garland, TX 75046-9013
BRN	Bourns, Inc. Resistive Components Group 1200 Columbia Avenue Riverside, CA 92507	GI	General Instruments Optoelectronics Division See Quality Technologies	MID	Hollingsworth/Wearnes Hollingsworth Solderless Terminal Div. 357 Beloit Street Burlington, WI 53105	ROHM	Rohm Corporation 8 Whatney Irvine, CA 92718	WES	Westlake See Mallory Capacitor Co.
BUS	Bussmann Division Cooper Industries PO Box 14460 St. Louis, MO 63178	HA	Harris Semiconductor 2460 N 1st Street Suite 200 San Jose, CA 95131-0124	MIL	J.W. Miller Division Bell Industries 306 E. Alondra Gardena, CA 90247	SAE	Stanford Applied Engineering, Inc. 340 Martin Avenue Santa Clara, CA 95050	WIM	The Inter-Technical Group Inc. Wima Division PO Box 23 Irvington, NY 10533
CD	Cornell-Dubilier Elec. 1700 Rte. 23 North Wayne, NJ 07470	HO	Hoyt Elect. Inst. Works 19 Linden St. Penacook, NH 03303	MOT	Motorola Semiconductor PO Box 20912 Phoenix, AZ 85036	SAN	Sangamo Weston Inc. Capacitor Division See Cornell-Dubilier	ZI	ZILOG Inc. 210 Hacienda Ave. Campbell, CA 95008
CRL	Mecopul/Centralab See Mecopul	HP	Hewlett-Packard Co. Components Group 640 Page Mill Road Palo Alto, CA 94304	MUR	Murata Erie North America 2200 Lake Park Drive Smyrna, GA 30080	SCH	ITT Schadow, Inc. 8081 Wallace Road Eden Prairie, MN 55344		
CSC	Crystal Semiconductor Corporation 4210-T. South Industrial Dr. Austin, TX 78744	INS	Intersil, Inc. See Harris Semiconductor	NAT	National Semiconductor Corp. 2900 Semiconductor Drive PO Box 58090 Santa Clara, CA 95051	SIE	Siemens Components Inc. Heimann Systems Div. 186 Wood Avenue South Iselin, NJ 08830		
CTS	CTS Corporation 907 North West Blvd. Elkhart, IN 46514	ITW	ITW Switches An Illinois Tool Works Co. 6615 W. Irving Park Rd. Dept. T Chicago, IL 60634	NEL	NEL Frequency Controls, Inc. 357 Beloit Street Burlington, WI 53105	SIG	Philips Components - Signetics North American Phillips Corp. 811 E. Arques Sunnyvale, CA 94088		
CW	CW Industries 130 James Way Southampton, PA 18966	KEM	KEMET Electronics Corporation Post Office Box 5928 Greenville, South Carolina 29606	NOB	Noble U.S.A., Incorporated 5450 Meadowbrook Industrial Ct. Rolling Meadows, IL 60008	SPR	Sprague Electric Co. 41 Hampden Road PO Box 9102 Mansfield, MA 02048-9102		
DBX	dbx A division of AKG Acoustics, Inc. 1525 Alvarado Street San Leandro, CA 94577	KEY	Keystone Electronics Corp. 31-07 20th Rd. Astoria, NY 11105	OKI	OKI Semiconductor 785 N. Mary Ave. Sunnyvale, CA 94086-2909	SW	Switchcraft A Raytheon Company 5555 N. Elston Avenue Chicago, IL 60630		
DEL	Delta Products Corp 361 Fairview Way Milpitas, CA 95035	LFE	Littlefuse A Subsidiary of Tracor, Inc. 800 E. Northwest Hwy Des Plaines, IL 60016	OHM	Ohmite Manufacturing Company 3601 Howard Street Skokie, IL 60076				

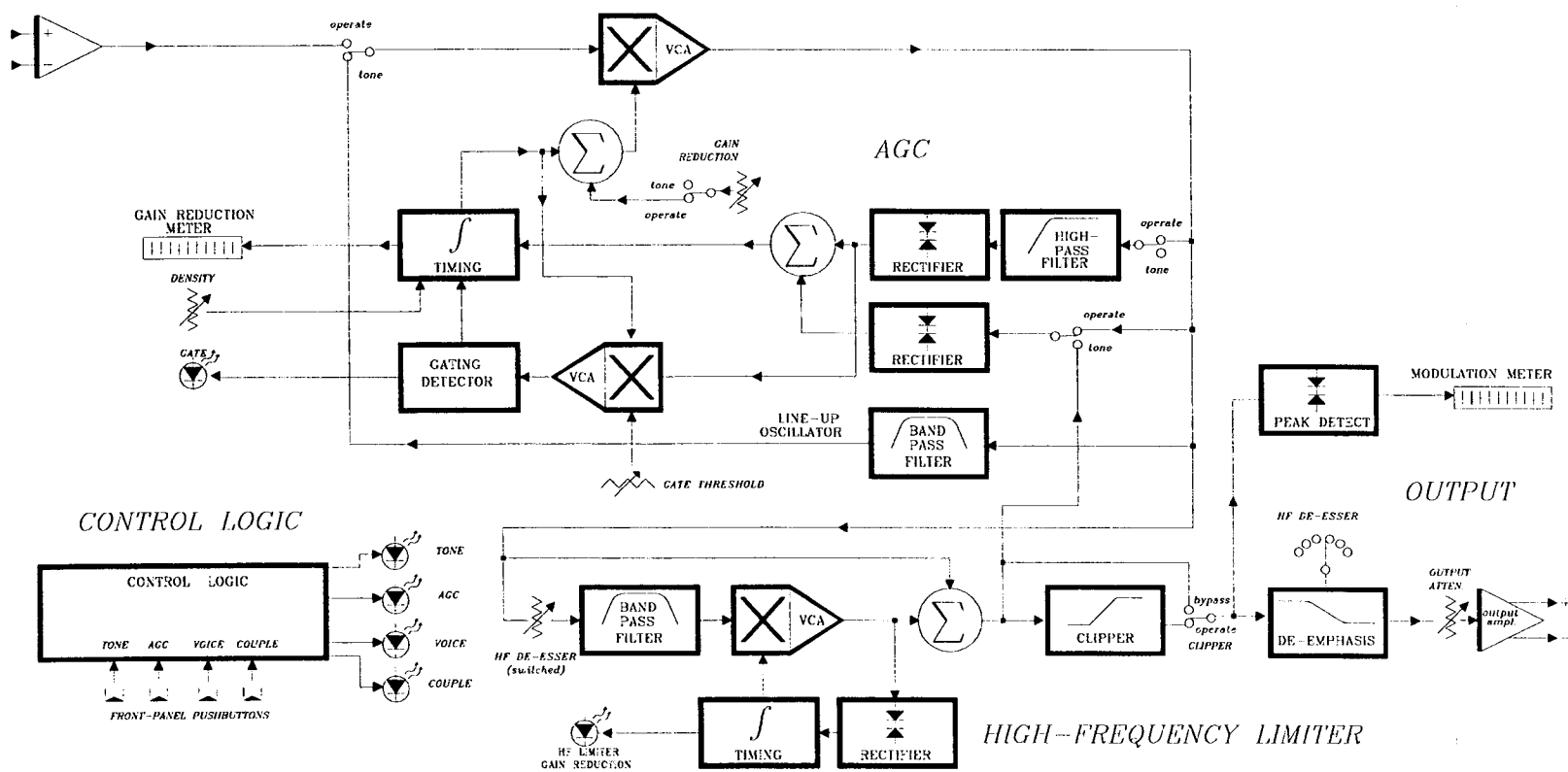
Schematics, Assembly Drawings

The following drawings are included in this manual:

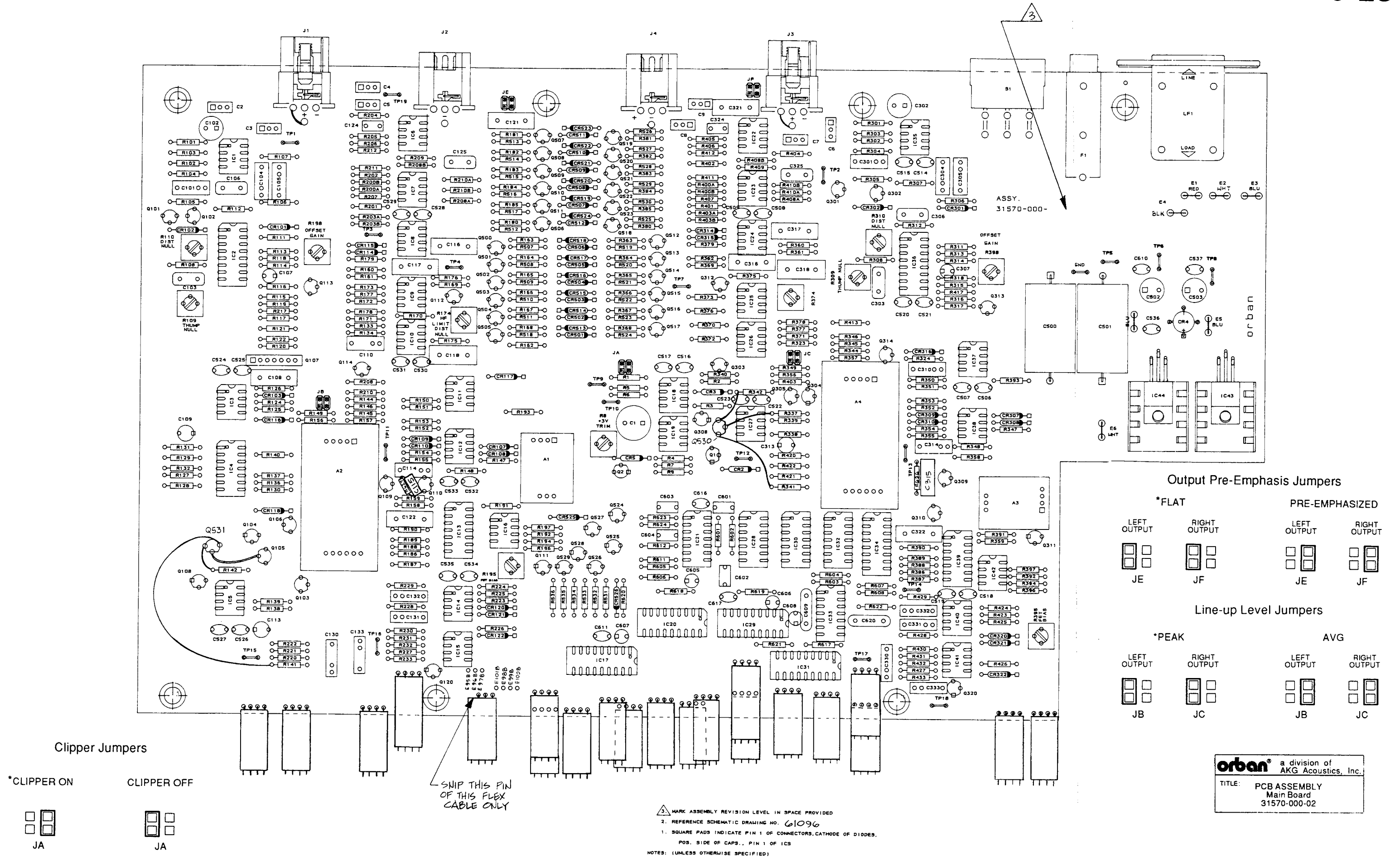
Page	Function	Circuit Board	Drawing
6-24	Block Diagram		Assembly Drawing
6-25	Audio Processing	Main	Assembly Drawing
6-26	Channel A	Main	Schematic, 1 of 6
6-27	Channel B	Main	Schematic, 2 of 6
6-28	Display	Main, Display	Schematic, 3 of 6
6-29	Power Supply	Main	Schematic, 4 of 6
6-30	Pre-Emphasis Switch	Main	Schematic, 5 of 6
6-31	Display, Controls	Main, Display	Schematic, 6 of 6
6-32	Displays, Controls	Display	Assembly Drawing

These drawings reflect the actual construction of your unit as accurately as possible. Differences between the drawings and your unit are almost undoubtedly due to product improvements or production changes which have not yet found their way into this manual. Such changes are included during periodic updates of this manual.

If you intend to replace parts, please see page 6-14.



ORBAN OPTIMOD STUDIO CHASSIS 8200ST
(Block Diagram: Single Channel only)



*CLIPPER ON CLIPPER OFF

JA JA

MARK ASSEMBLY REVISION LEVEL IN SPACE PROVIDED
2. REFERENCE SCHEMATIC DRAWING NO. 61096
1. SQUARE PADS INDICATE PIN 1 OF CONNECTORS, CATHODE OF DIODES.
POS. SIDE OF CAPS., PIN 1 OF ICs
NOTES: (UNLESS OTHERWISE SPECIFIED)

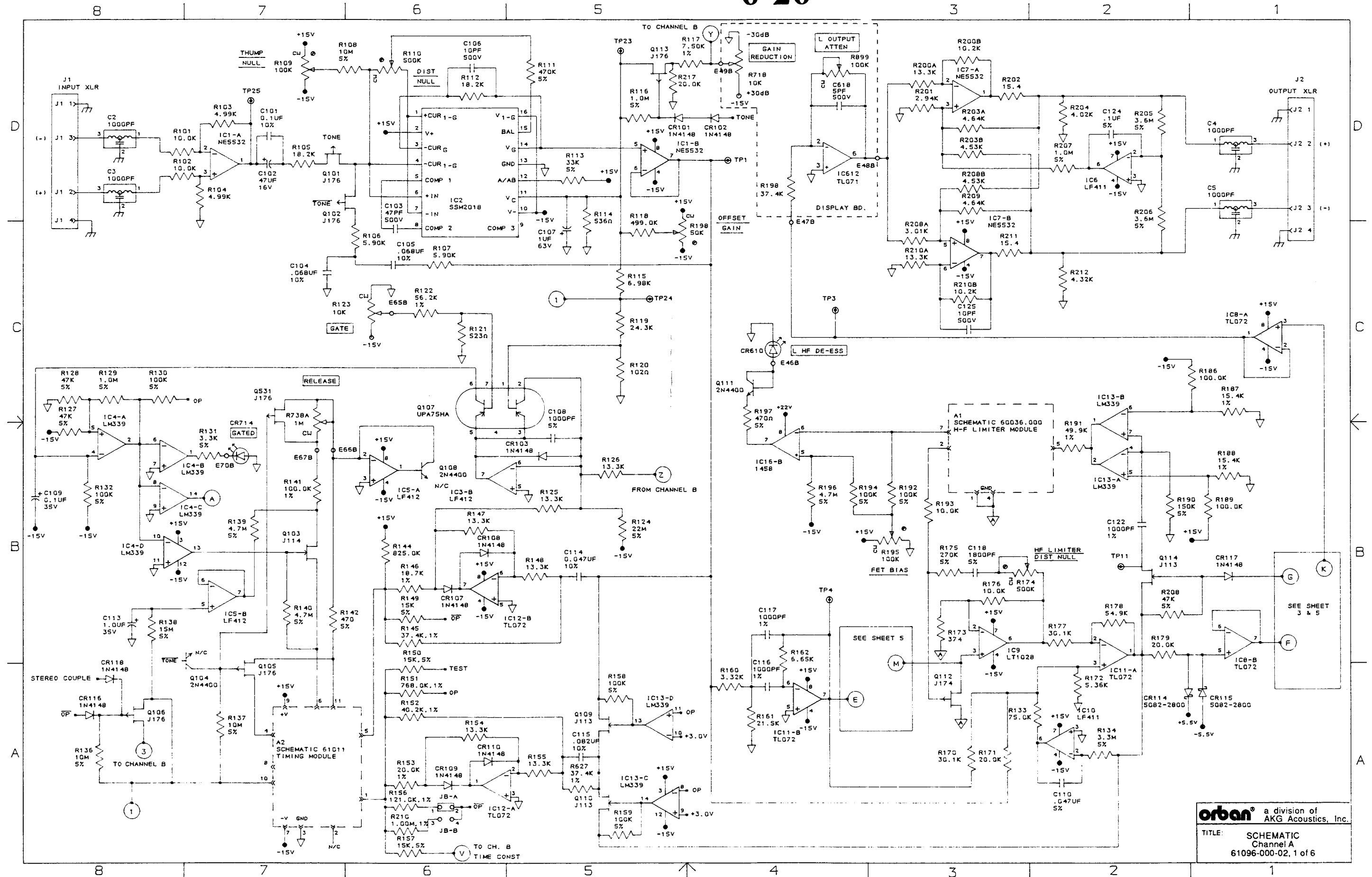
Output Pre-Emphasis Jumpers

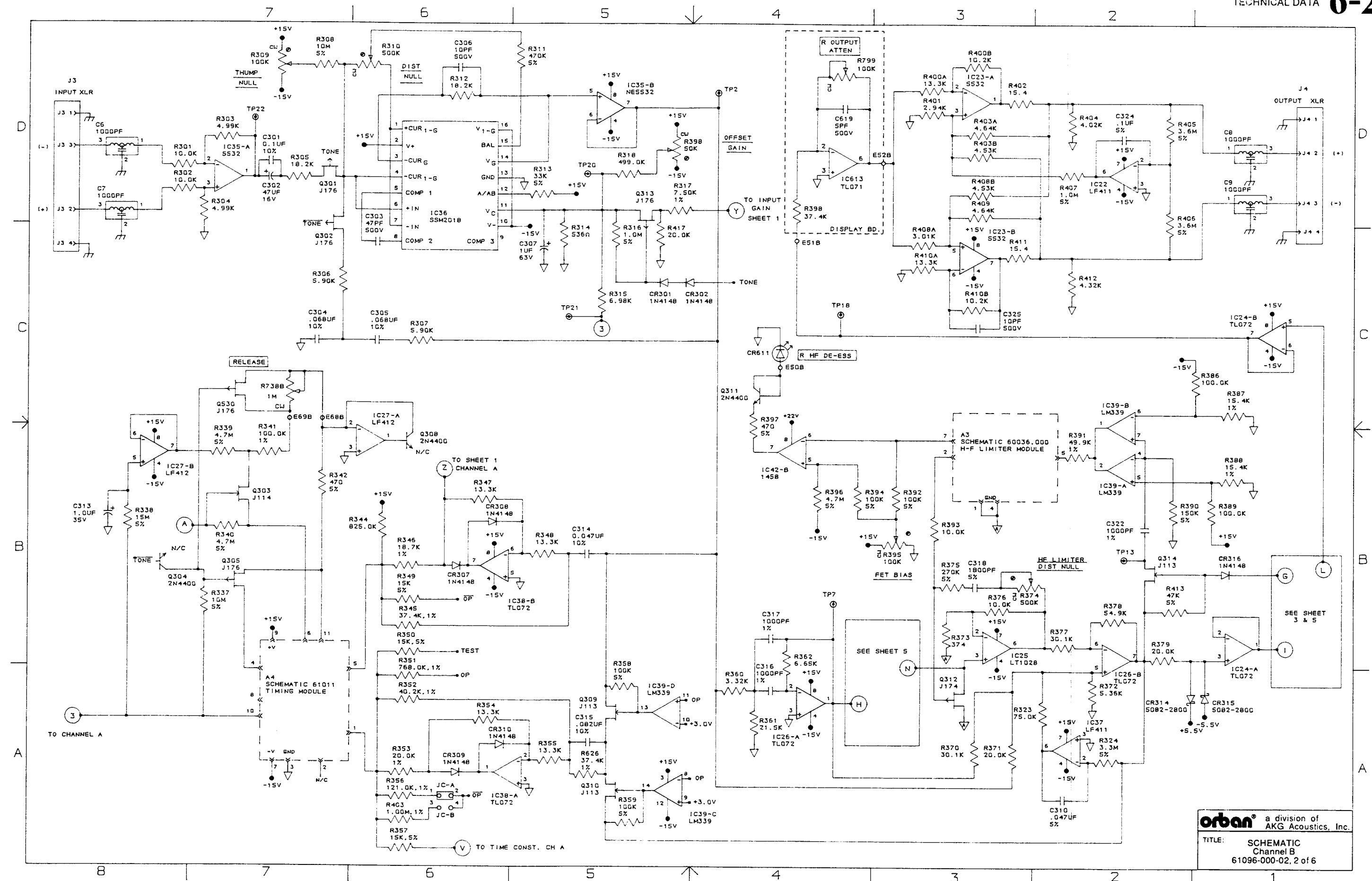
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LEFT OUTPUT	RIGHT OUTPUT	LEFT OUTPUT	RIGHT OUTPUT
JE	JF	JE	JF

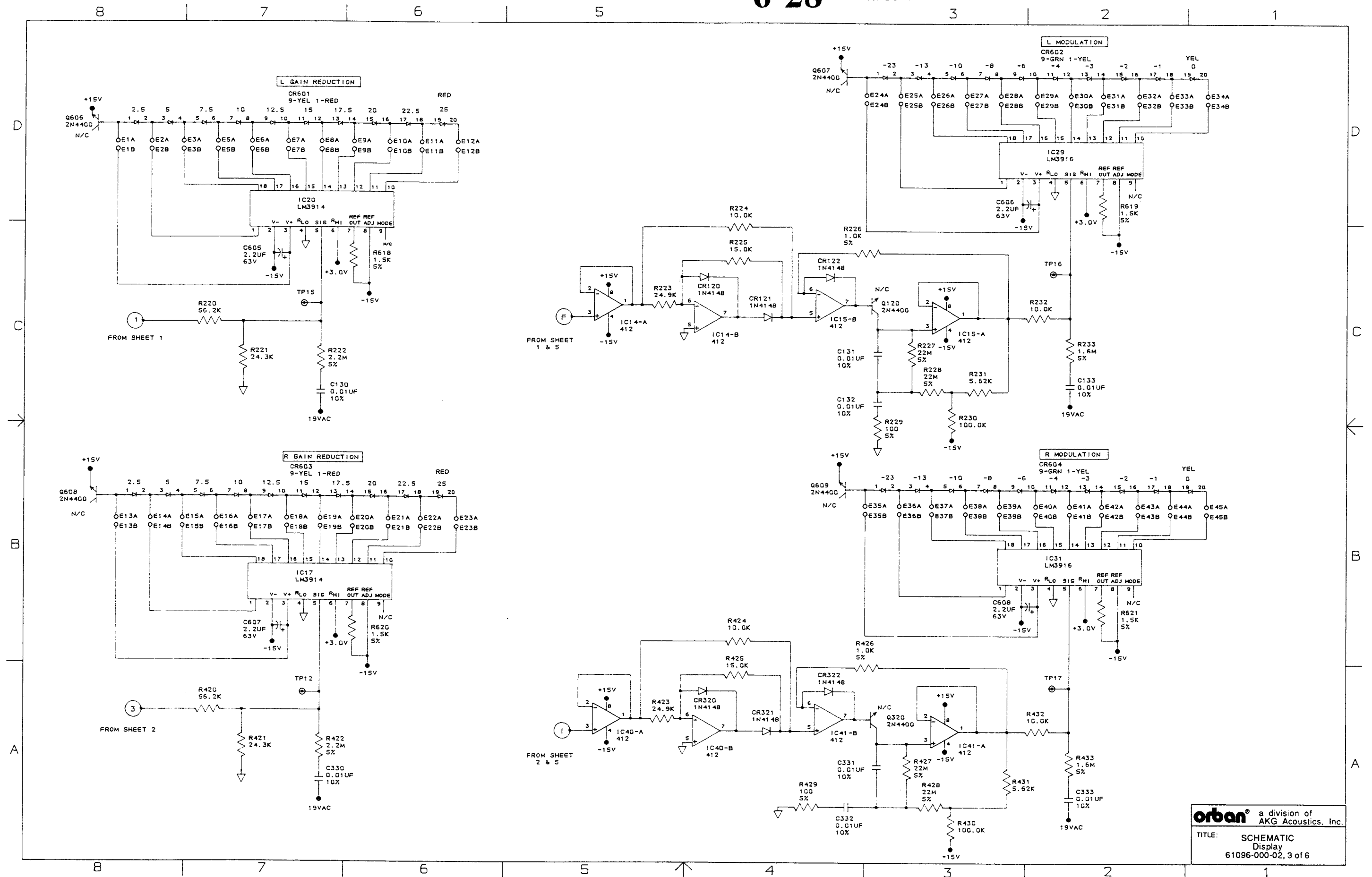
Line-up Level Jumpers

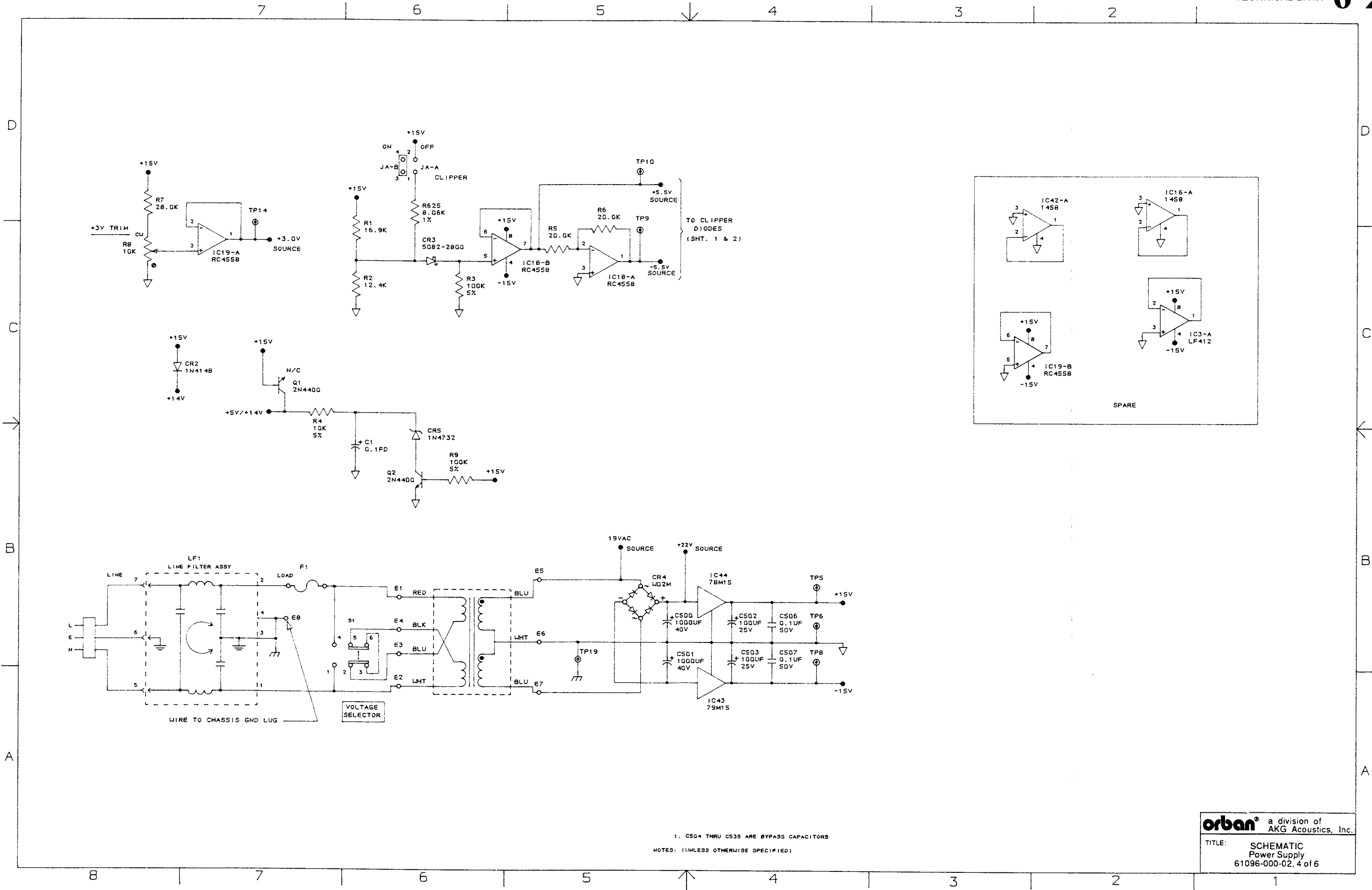
*PEAK		AVG	
LEFT OUTPUT	RIGHT OUTPUT	LEFT OUTPUT	RIGHT OUTPUT
JB	JC	JB	JC

orban a division of
AKG Acoustics, Inc.
TITLE: PCB ASSEMBLY
Main Board
31570-000-02

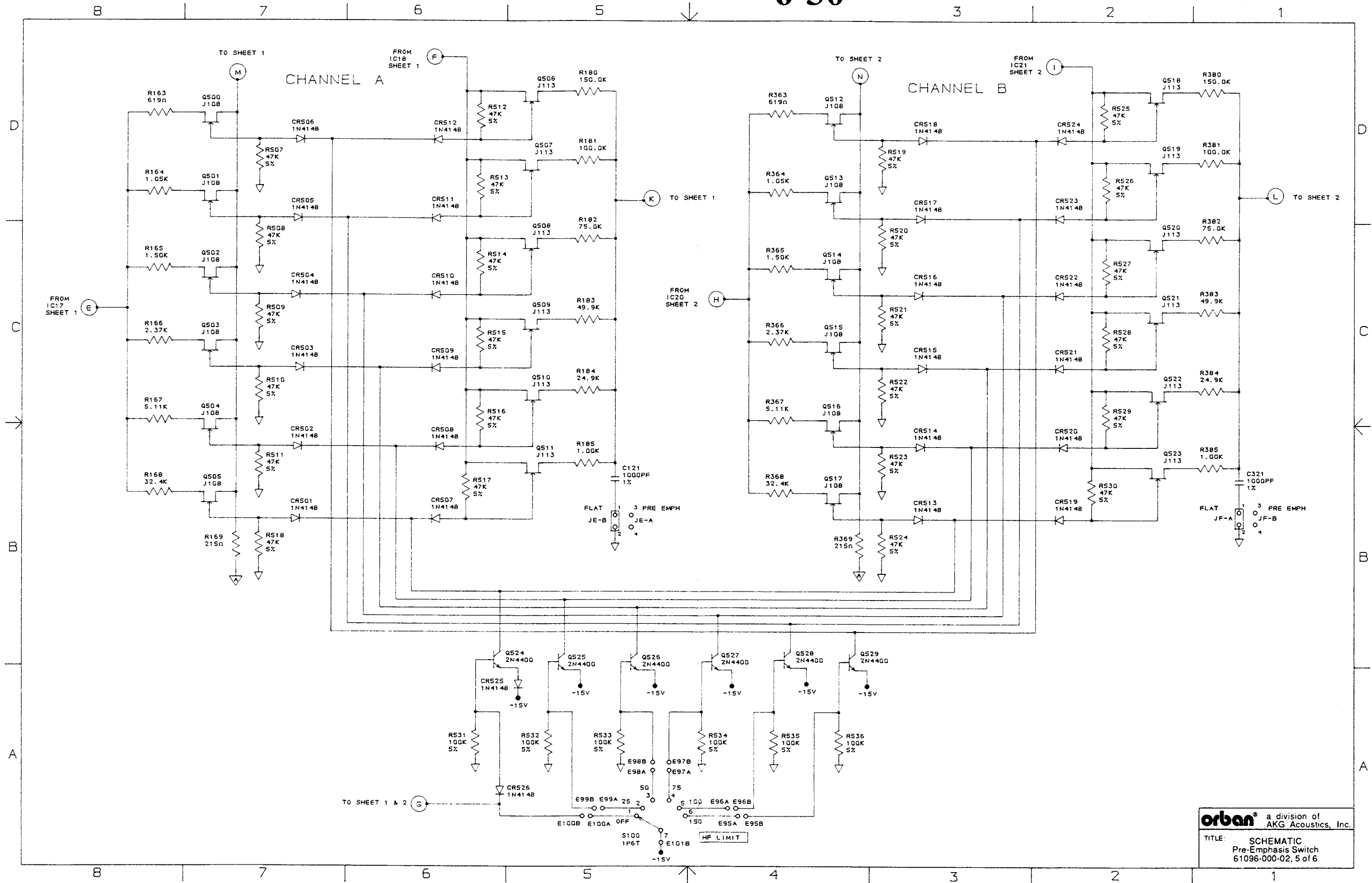


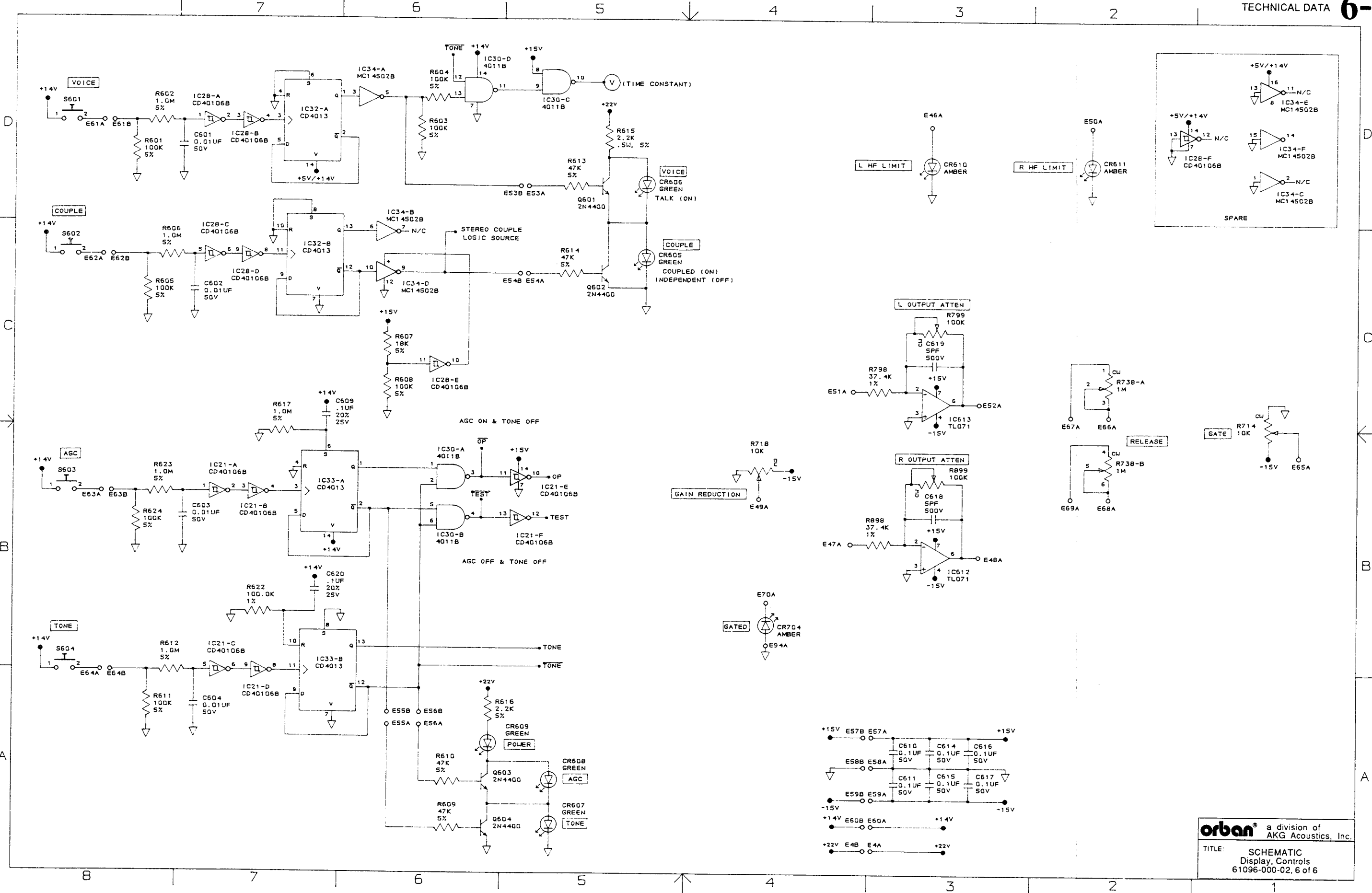


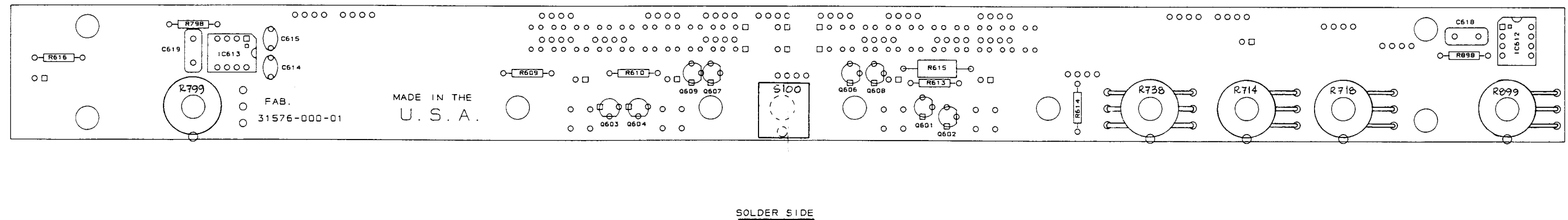
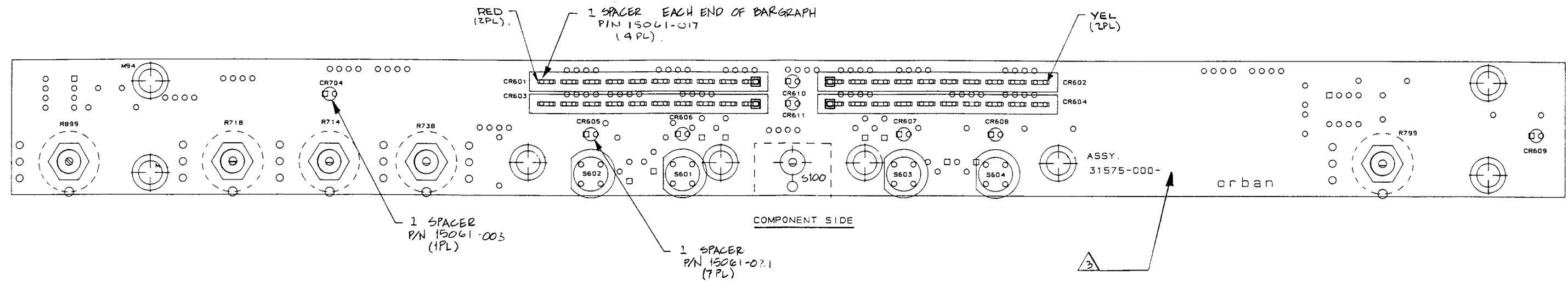




1. C504 THRU C535 ARE BYPASS CAPACITORS
NOTES: (UNLESS OTHERWISE SPECIFIED)







- △ MARK ASSEMBLY REVISION LEVEL IN SPACE PROVIDED.
2. REFERENCE SCHEMATIC DWG. № 61096
1. SQUARE PADS INDICATE PIN #1 OF CONNECTORS, CATHODE OF DIODES,
POS. SIDE OF CAPS, PIN #1 OF IC'S.
- NOTES: (UNLESS OTHERWISE SPECIFIED)

Abbreviations

Some of the abbreviations used in this manual may not be familiar to all readers:

AGC	automatic gain control
ATR	audio tape recorder
dBu	0dBu = 0.775V RMS. For this application, the dBm @ 600Ω scale on voltmeters can be read as if were calibrated in dBu.
EBU	European Broadcasting Union
EIAJ	Electronics Industries Association of Japan
EMI	electromagnetic interference
FET	field effect transistor
G/R	gain reduction
HF	high-frequency
IC	integrated circuit
IM	intermodulation (or "intermodulation distortion")
JFET	junction field effect transistor
LED	light-emitting diode
LF	low-frequency
ND	noise and distortion
PA	public address system
PPM	peak program meter
RF	radio frequency
RFI	radio-frequency interference
RMS	root-mean-square
SCA	subsidiary communications authorization (USA)
SPL	sound pressure level
STL	studio-transmitter link
TRS	tip-ring-sleeve (stereo phone jack)
THD	total harmonic distortion
VCA	voltage-controlled amplifier
VHF	very high frequency
VTR	video tape recorder
XLR	a common style of 3-conductor audio connector

