Section 6
Technical Data

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Specifications

Performance

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

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

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

Installation

Audio Input

Impedance: >10kΩ, active balanced, EMI-suppressed.

Operating level: Usable with −10dBu to +8dBu 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 –10dBm to +8dBm systems. Output clipping level is >+20dBm @ 600Ω (unbalanced load); >+24dBm @ 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, 9⅝" (24.5 cm) deep, 1¾" (4.5 cm) high.

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

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

Fuse: ½-amp 3AG 250V Slow-Blow for 115V operation; ¼-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: ±0.5dB (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 150µs. 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 100kΩ (as 600Ω 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 +15V 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 +3V = 25dB 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 ±0.1dB 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 150µs, 1.59kHz for 100µs, 2.12kHz for 75µs, 3.18kHz for 50µs, and 6.37kHz for 25µs.

The two comparators in IC13 sense the positive and negative peak levels of the pre-emphasized signal. If either level exceeds the ±3.0V 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 ±5.5VDC source IC18 and associated components. The clippers can be defeated by forcing the ±5.5VDC supply to move to ±10VDC.

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 = 22meg), 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 $\overline{\text{OPerate}}$ and $\overline{\text{TEST}}$ 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 0.1μF/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. @ Ir = 5μA; Ir: 25nA max. @ Vr = 20V; Vf: 1.0V max. @ If = 100mA; trr: 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 ⅛ watt @ 70°C, ±1%, with a temperature coefficient of 100 PPM/°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 ¼ watt @ 70°C, ±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 ¼ watt, and the 0.140 x 0.375 inch (3.6 x 9.5 mm) size is rated at ½ watt, both ±5% t numbers 2001x-xxx, USA Military Specification MIL-R-11 Style RC-07 (¼ watt) or RC-20 (½ watt). Manufactured by Allen-Bradley, TRW/IRC, and Matsushita.

Cermet trimmer resistors have ⅜-inch (9 mm) square bodies, and are identified by printing on their sides. They are rated at ½ watt @ 70°C, = ±10%, with a temperature coefficient of 100 PPM/°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
CHASSIS ASSEMBLY						
Miscellaneous						
None	Line Cord, CEE	28102-002	BEL	17500	MANY	
FINAL ASSEMBLY						
Miscellaneous						
None	Transformer, Power	55019-000	ORB			
PCB DISPLAY ASSEMBLY						
Capacitors						
C614,615	Monolythic 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	
Diodes						
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		
Integrated Circuits						
IC612,613	Linear, Single Opamp	24013-202	TI	TL071CP		
Transistors						
Q601-604	Transistor, Signal, NPN	23202-101	MOT	2N4400	FSC	
Q606-609	Transistor, Signal, NPN	23202-101	MOT	2N4400	FSC	
Resistors						
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
Switches						
S100	Switch, Rotary, 1P6T	26206-000	ORB			
S601-604	Switch, MOM., AKG Gray; SPST	26301-016	ORB			
PCB MAIN ASSEMBLY						
Capacitors						
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 105G063BBIC	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 105G063BBIC	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:
(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 - Capacitors, Diodes, Inductors, Integrated Circuits.

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

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.

Vendor Codes

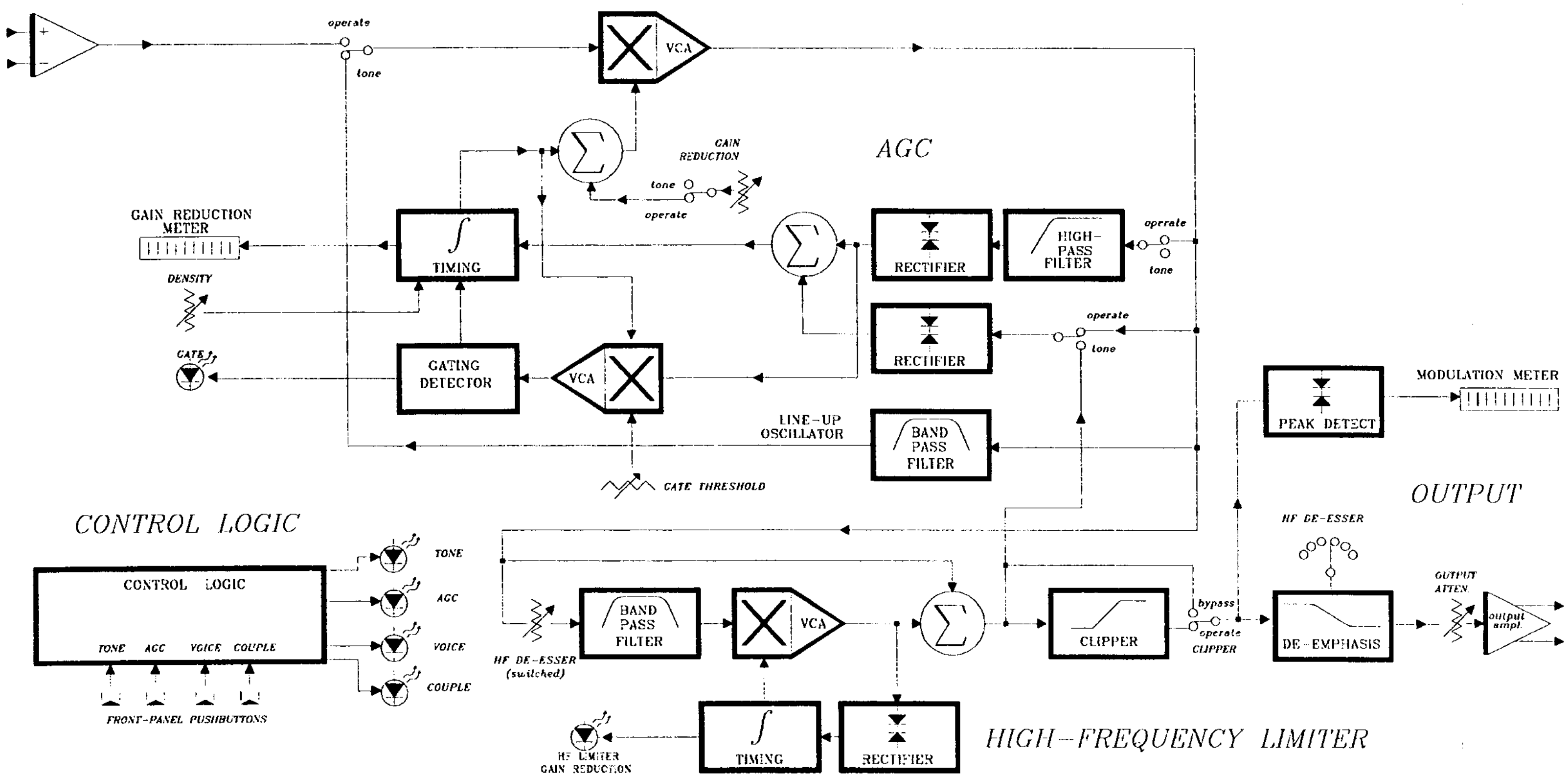
AB	Allen-Bradley Co., Inc. 1201-T South Second Street Milwaukee, WI 53204
AD	Analog Devices, Inc. One Technology Way PO Box 9106 Norwood, MA 02062-9106
AKG	AKG Acoustics, Inc. 1525 Alvarado Street San Leandro, CA 94577
AM	Amphenol Corporation 358 Hall Avenue Wallingford, CT 06492
BEK	Beckman Industrial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

Schematics, Assembly Drawings

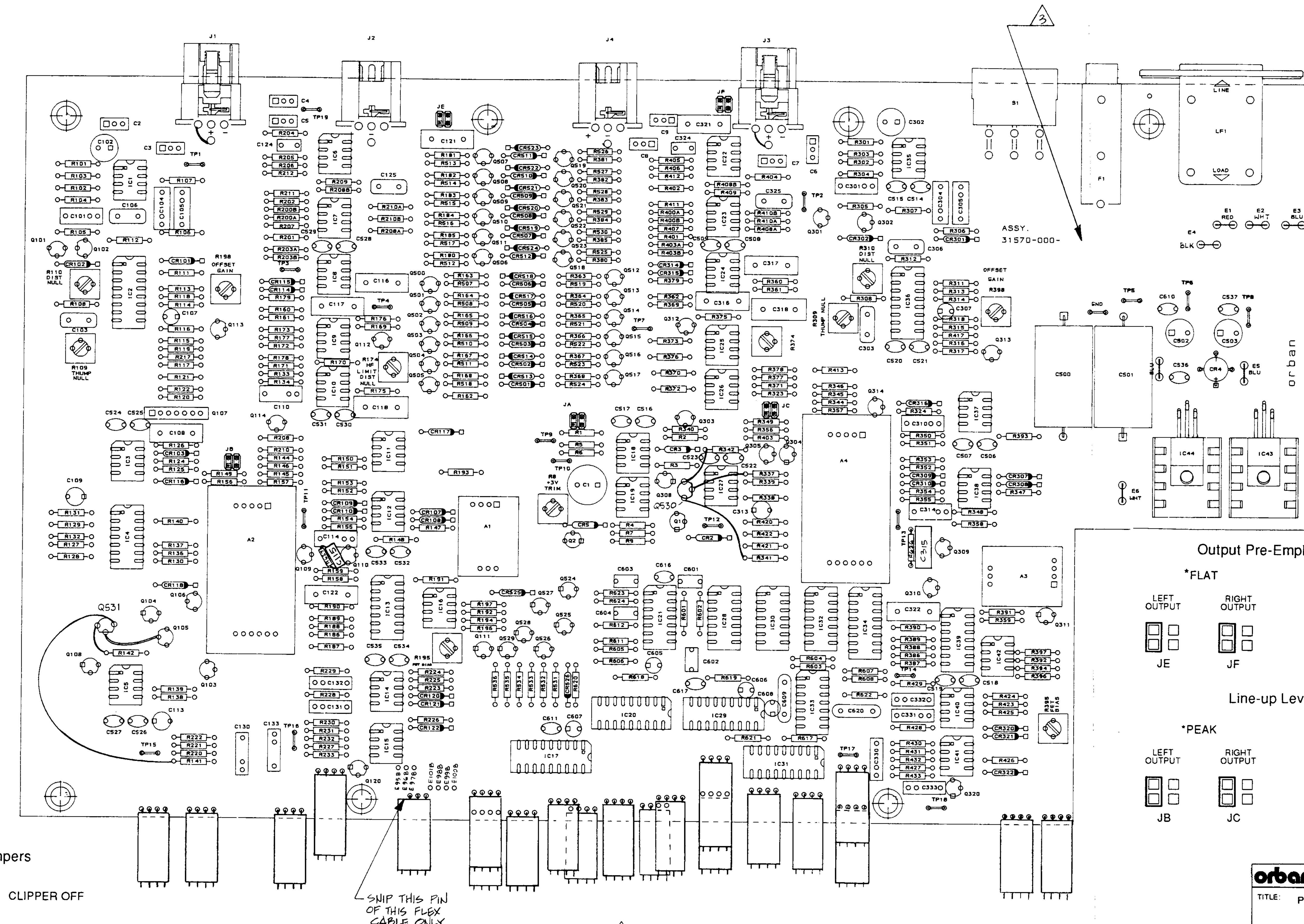
The following drawings are included in this manual:

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)



Output Pre-Emphasis Jumpers

*FLAT: LEFT OUTPUT JE, RIGHT OUTPUT JF

PRE-EMPHASIZED: LEFT OUTPUT JE, RIGHT OUTPUT JF

Line-up Level Jumpers

*PEAK: LEFT OUTPUT JB, RIGHT OUTPUT JC

AVG: LEFT OUTPUT JB, RIGHT OUTPUT JC

Clipper Jumpers

*CLIPPER ON: JA

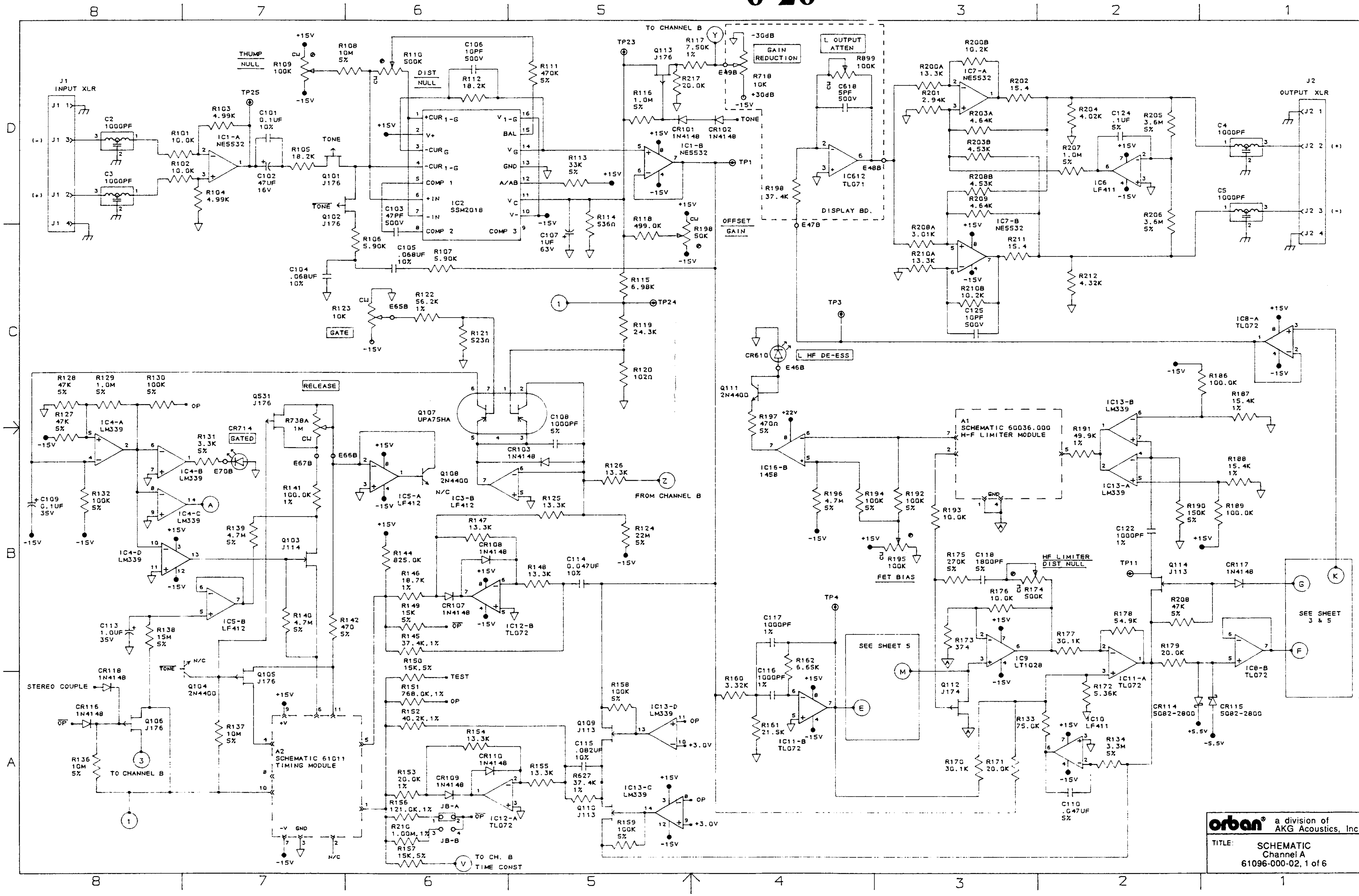
CLIPPER OFF: JA

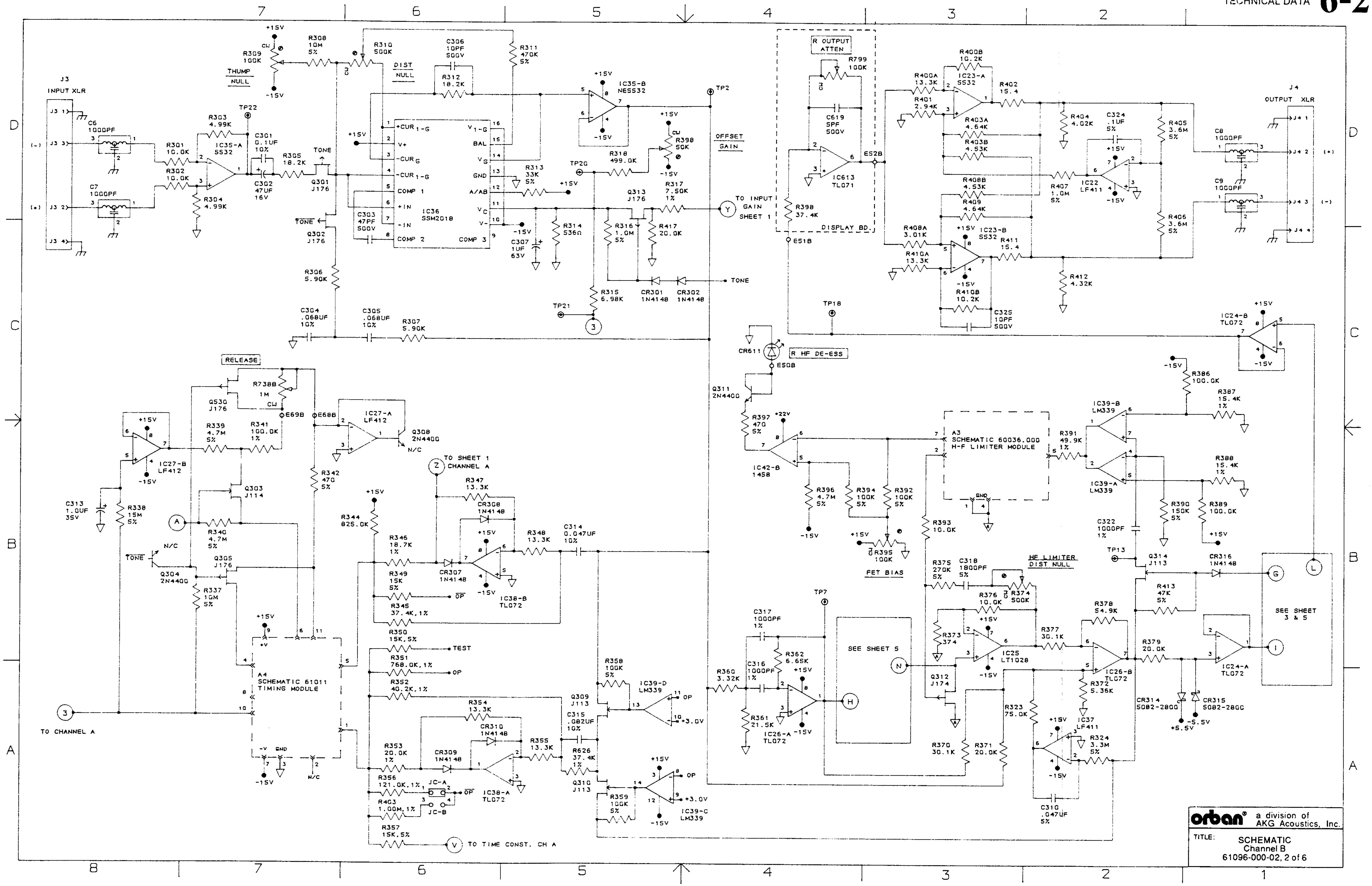
NOTES: (UNLESS OTHERWISE SPECIFIED)

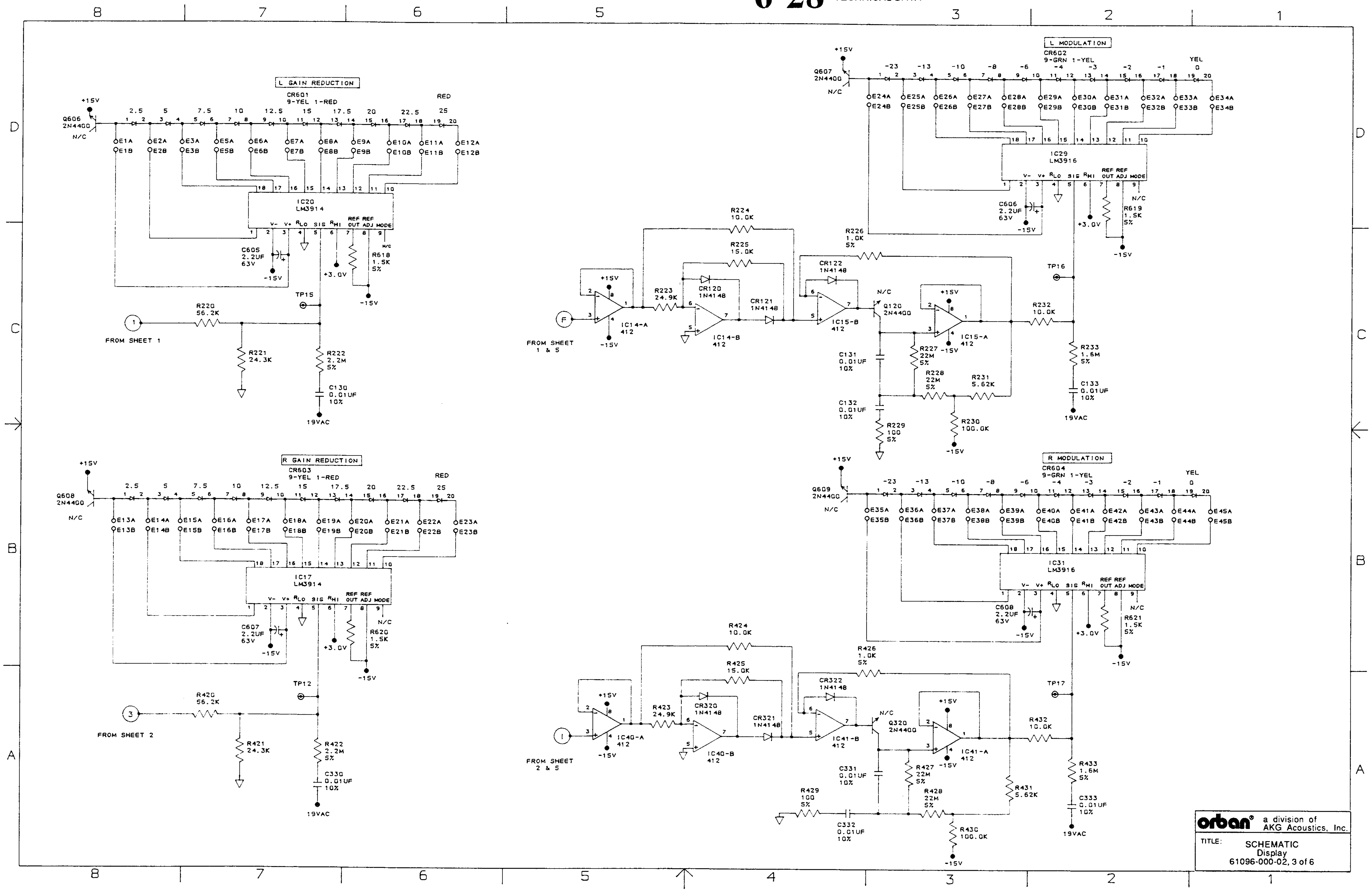
1. SQUARE PADS INDICATE PIN 1 OF CONNECTORS, CATHODE OF DIODES, POS. SIDE OF CAPS., PIN 1 OF ICS
2. REFERENCE SCHEMATIC DRAWING NO. 61096
3. MARK ASSEMBLY REVISION LEVEL IN SPACE PROVIDED

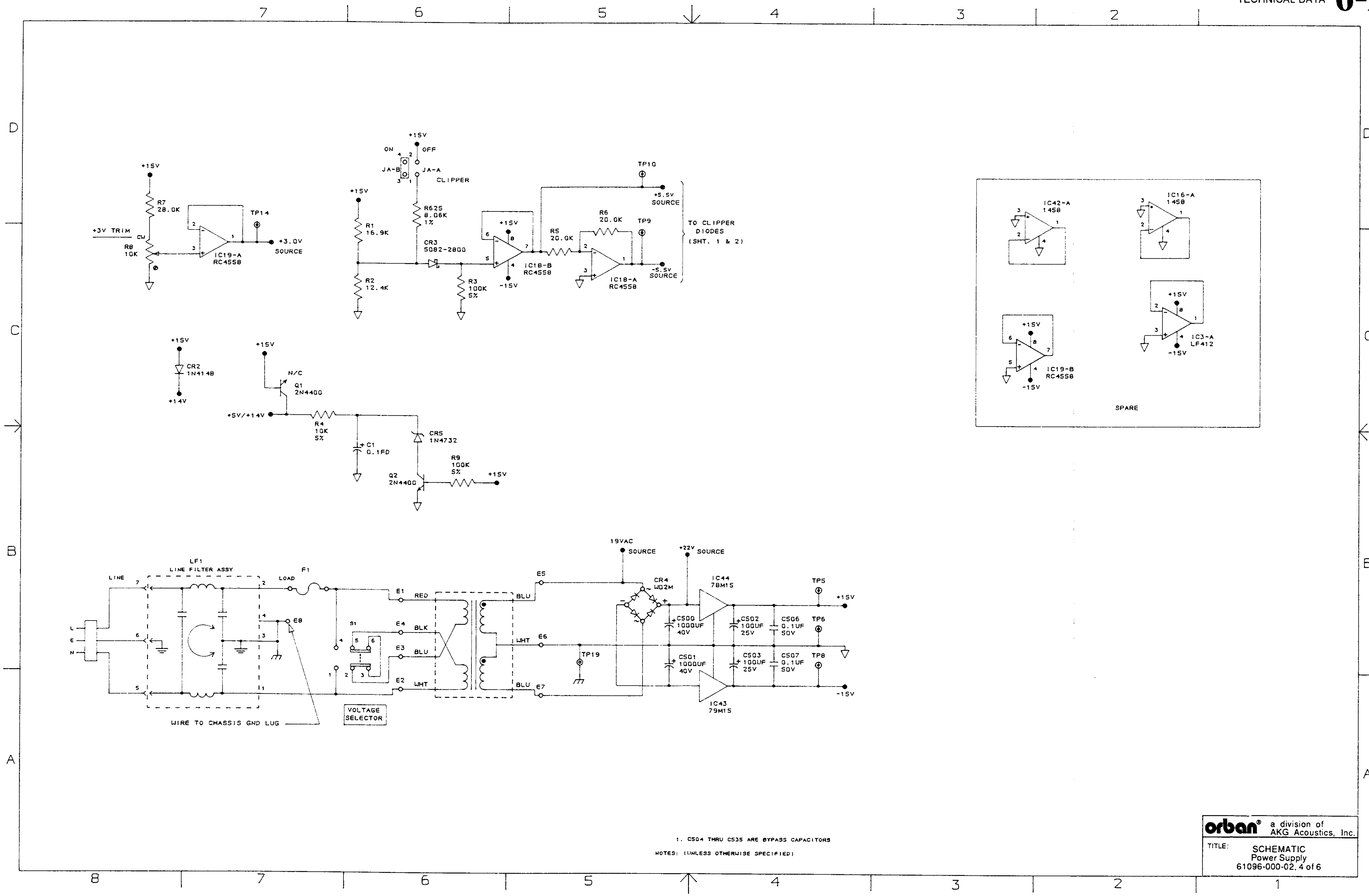
orban® a division of AKG Acoustics, Inc.

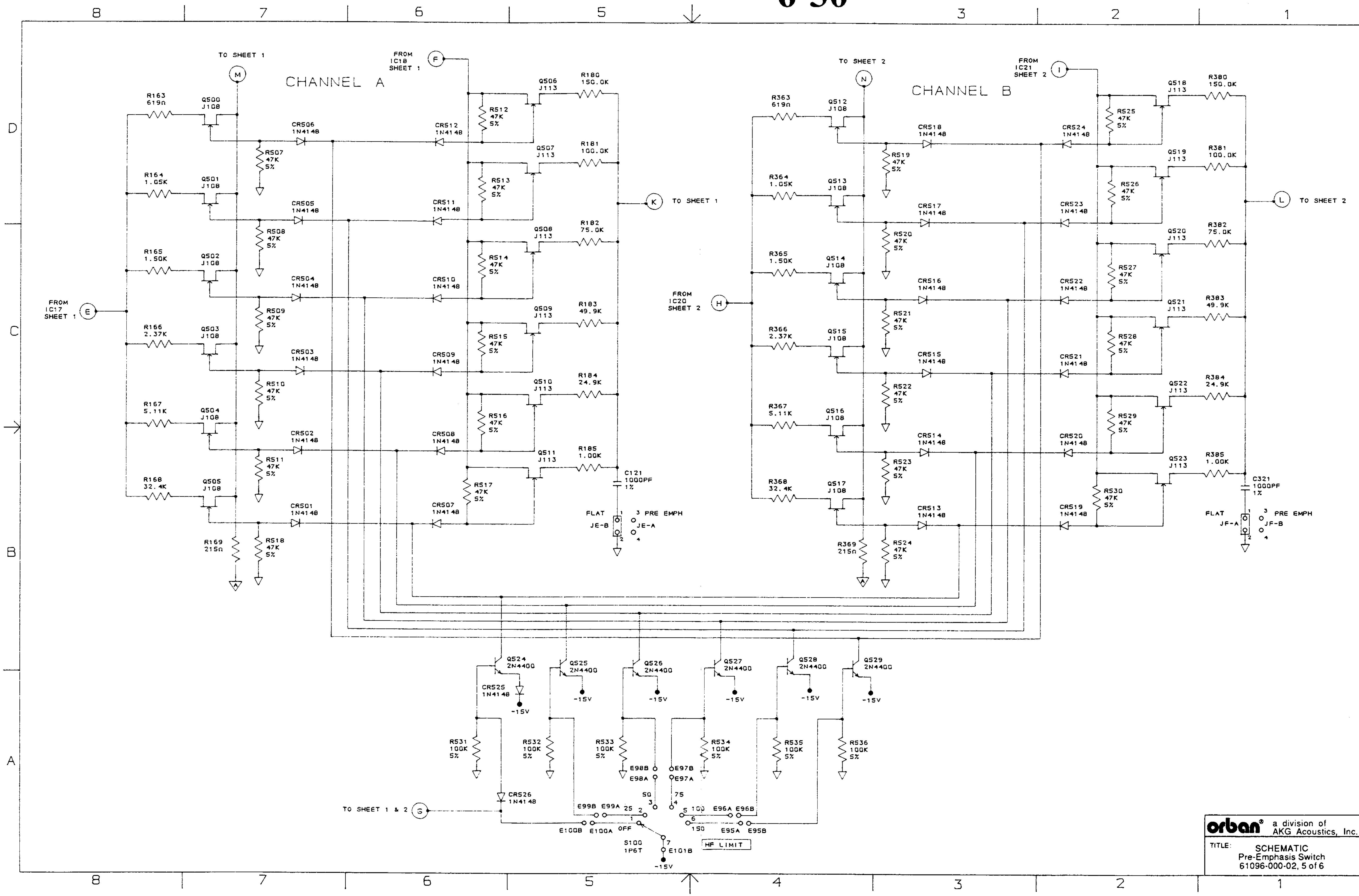
TITLE: PCB ASSEMBLY
Main Board
31570-000-02

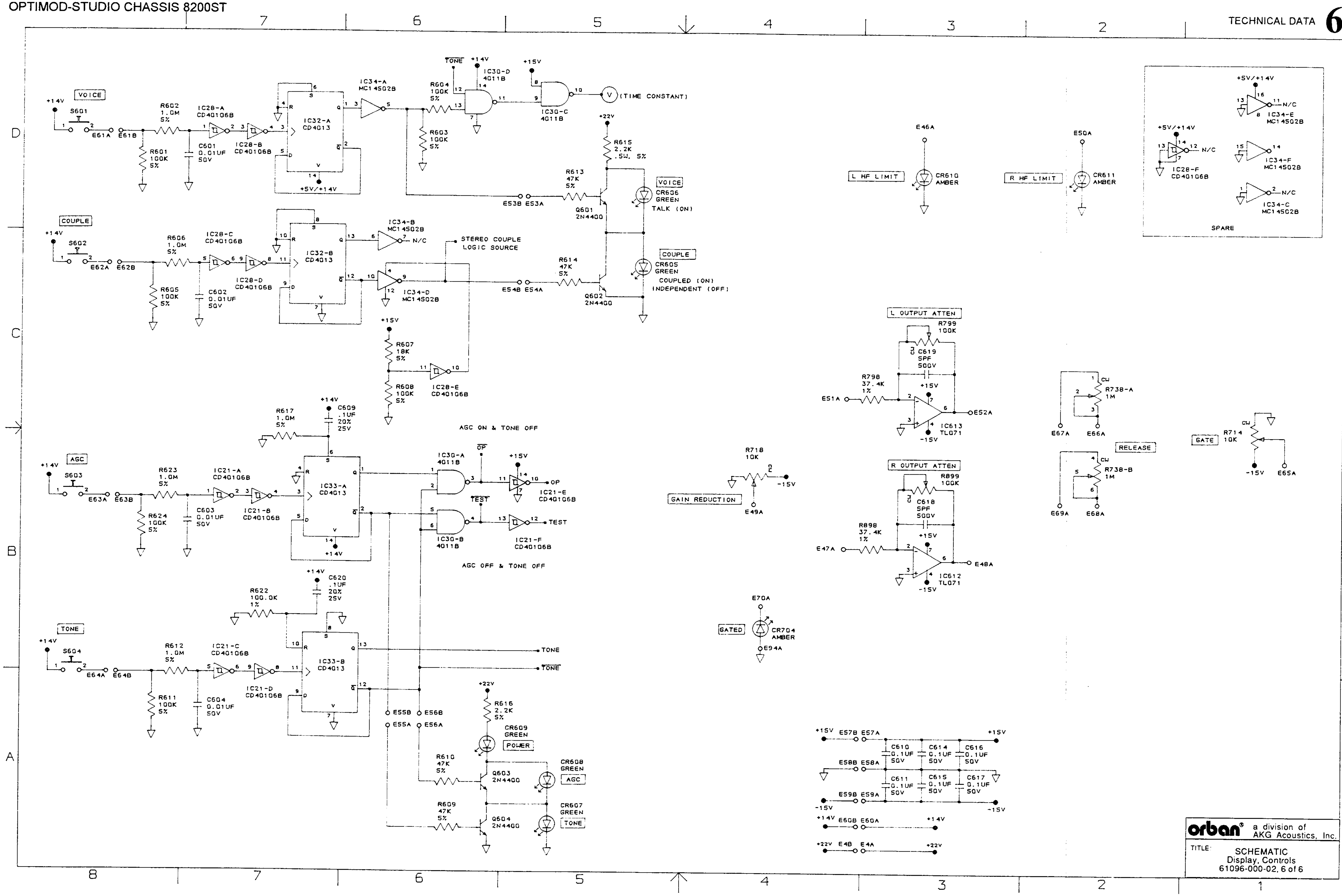

J1 INPUT XLR
J2 OUTPUT XLR
IC2 SSM2018
Q107 UPA75HA
A1 SCHEMATIC 60036.000 H-F LIMITER MODULE
A2 SCHEMATIC 61011 TIMING MODULE
DISPLAY BD.
GAIN REDUCTION
OUTPUT ATTEN
THUMP NULL
DIST NULL
GATE
RELEASE
GATED
OFFSET GAIN
HF DE-ESS
FET BIAS
HF LIMITER DIST NULL
SEE SHEET 5
SEE SHEET 3 & 5
TO CHANNEL B
FROM CHANNEL B
STEREO COUPLE
TO CH. B TIME CONST
orban a division of AKG Acoustics, Inc.
TITLE: SCHEMATIC Channel A 61096-000-02, 1 of 6

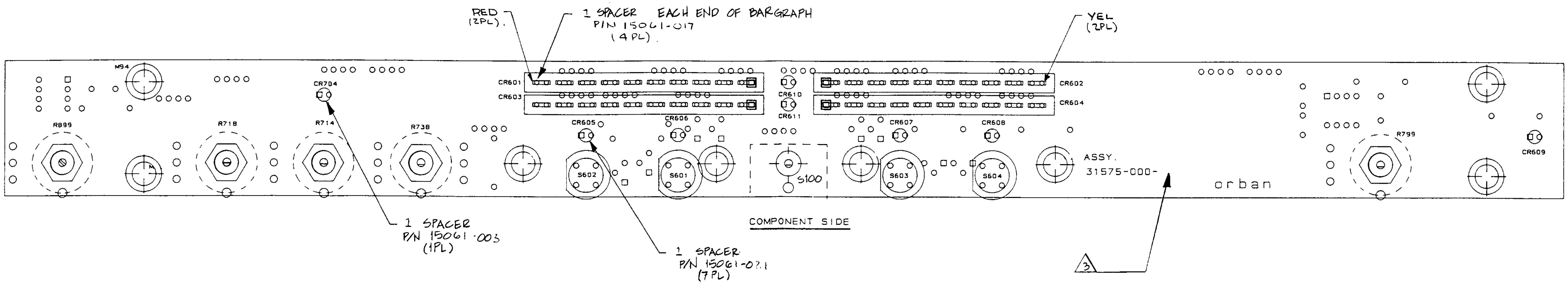

J3 INPUT XLR
THUMP NULL
DIST NULL
OFFSET GAIN
R OUTPUT ATTEN
DISPLAY BD.
J4 OUTPUT XLR
RELEASE
TO INPUT GAIN SHEET 1
R HF DE-ESS
A3 SCHEMATIC 60036.000 H-F LIMITER MODULE
FET BIAS
HF LIMITER DIST NULL
TO SHEET 1 CHANNEL A
A4 SCHEMATIC 61011 TIMING MODULE
TO CHANNEL A
SEE SHEET 5
SEE SHEET 3 & 5
TO TIME CONST. CH A
IC36 SSM2018
orban a division of AKG Acoustics, Inc.
TITLE: SCHEMATIC Channel B 61096-000-02, 2 of 6

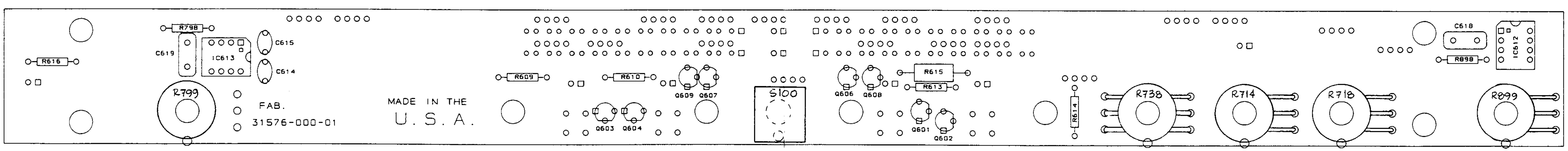

L GAIN REDUCTION
R GAIN REDUCTION
L MODULATION
R MODULATION
FROM SHEET 1
FROM SHEET 2
FROM SHEET 1 & 5
FROM SHEET 2 & 5
orban® a division of AKG Acoustics, Inc.
TITLE: SCHEMATIC
Display
61096-000-02, 3 of 6


+15V
R7
28.0K
+3V TRIM
CW
R8
10K
TP14
IC19-A
RC4558
+3.0V
SOURCE
+15V
ON
OFF
JA-B
JA-A
CLIPPER
R625
8.06K
1%
R1
15.9K
R2
12.4K
CR3
5082-2800
R3
100K
5%
+15V
-15V
IC18-B
RC4558
TP10
+5.5V
SOURCE
R6
20.0K
TP9
R5
20.0K
IC18-A
RC4558
-5.5V
SOURCE
TO CLIPPER
DIODES
(SHT. 1 & 2)
IC42-A
1458
IC16-A
1458
IC3-A
LF412
IC19-B
RC4558
SPARE
+15V
CR2
1N4148
+14V
N/C
Q1
2N4400
+5V/+14V
R4
10K
5%
C1
0.1FD
CR5
1N4732
R9
100K
5%
Q2
2N4400
19VAC
SOURCE
+22V
SOURCE
LF1
LINE FILTER ASSY
LINE
LOAD
F1
E8
E1
RED
E4
BLK
E3
BLU
E2
WHT
S1
BLU
E5
WHT
E6
TP19
BLU
E7
CR4
W02M
C500
1000UF
40V
C501
1000UF
40V
IC44
78M15
IC43
79M15
C502
100UF
25V
C503
100UF
25V
C506
0.1UF
50V
C507
0.1UF
50V
TP5
TP6
TP8
+15V
-15V
WIRE TO CHASSIS GND LUG
VOLTAGE
SELECTOR
1. C504 THRU C535 ARE BYPASS CAPACITORS
NOTES: (UNLESS OTHERWISE SPECIFIED)
orban® a division of AKG Acoustics, Inc.
TITLE:
SCHEMATIC
Power Supply
61096-000-02, 4 of 6


CHANNEL A
CHANNEL B
TO SHEET 1
TO SHEET 2
FROM IC18 SHEET 1
FROM IC21 SHEET 2
FROM IC17 SHEET 1
FROM IC20 SHEET 2
TO SHEET 1 & 2
R163 619Ω
R164 1.05K
R165 1.50K
R166 2.37K
R167 5.11K
R168 32.4K
R169 215Ω
R363 619Ω
R364 1.05K
R365 1.50K
R366 2.37K
R367 5.11K
R368 32.4K
R369 215Ω
R180 150.0K
R181 100.0K
R182 75.0K
R183 49.9K
R184 24.9K
R185 1.00K
R380 150.0K
R381 100.0K
R382 75.0K
R383 49.9K
R384 24.9K
R385 1.00K
C121 1000PF 1%
C321 1000PF 1%
FLAT
PRE EMPH
JE-B
JE-A
JF-A
JF-B
Q524 2N4400
Q525 2N4400
Q526 2N4400
Q527 2N4400
Q528 2N4400
Q529 2N4400
-15V
R531 100K 5%
R532 100K 5%
R533 100K 5%
R534 100K 5%
R535 100K 5%
R536 100K 5%
CR525 1N4148
CR526 1N4148
S100 1P6T
HF LIMIT
OFF
E101B
orban a division of AKG Acoustics, Inc.
TITLE: SCHEMATIC Pre-Emphasis Switch 61096-000-02, 5 of 6


VOICE
COUPLE
AGC
TONE
S601
S602
S603
S604
IC32-A CD4013
IC32-B CD4013
IC33-A CD4013
IC33-B CD4013
IC34-A MC14502B
IC34-B MC14502B
IC34-D MC14502B
IC30-D 4011B
IC30-C 4011B
IC30-A 4011B
IC30-B 4011B
(TIME CONSTANT)
STEREO COUPLE LOGIC SOURCE
CR606 GREEN TALK (ON)
CR605 GREEN COUPLED (ON) INDEPENDENT (OFF)
Q601 2N4400
Q602 2N4400
AGC ON & TONE OFF
AGC OFF & TONE OFF
OP
TEST
TONE
CR609 GREEN
POWER
CR608 GREEN
CR607 GREEN
Q603 2N4400
Q604 2N4400
L HF LIMIT
CR610 AMBER
R HF LIMIT
CR611 AMBER
SPARE
L OUTPUT ATTEN
R OUTPUT ATTEN
IC613 TL071
IC612 TL071
GAIN REDUCTION
GATED
CR704 AMBER
RELEASE
R738-A 1M
R738-B 1M
GATE
R714 10K
orban a division of AKG Acoustics, Inc.
TITLE: SCHEMATIC
Display, Controls
61096-000-02, 6 of 6





SOLDER SIDE

3 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)

orban®	a division of AKG Acoustics, Inc.
TITLE:	PCB ASSEMBLY Display, Controls 31575-000-01

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
N D	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