Section 6
Technical Data

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Specifications

It is impossible to characterize the listening quality of even the simplest limiter or compressor on the basis of the usual specifications, because such specifications cannot adequately describe the crucial dynamic processes that occur under program conditions. Therefore, the only way to meaningfully evaluate the sound of an audio processor is by subjective listening tests.

Certain specifications are presented here to assure the engineer that they are reasonable, to help plan the installation, and to help make certain comparisons with other processing equipment. Some specifications are for features that are only available on the 9200.

Installation

Analog Audio Input

Configuration: One monophonic input.

Impedance: Electronically balanced 600Ω or >3.6kΩ load impedance, jumper-selectable.

Dynamic Range: >90dB.

Common Mode Rejection: ≥70dB at 50-60Hz. ≥45dB at 60Hz-9.5kHz.

Sensitivity: –20dBu to +20dBu to produce 10dB gain reduction at 1kHz, software- and jumper-adjustable.

Maximum Input Level: +27dBu.

Connector: XLR-type, female, EMI-suppressed. Pin 1 Chassis Ground, Pins 2 (+) and 3 electronically balanced, floating and symmetrical.

A/D Conversion: 18-bit.

Filtering: RFI-filtered.

Analog Audio Output

Configuration: Two monaural outputs for use with two transmitters, with separate level control and output amplifiers.

Source Impedance: 365Ω, ±5%, electronically balanced to ground.

Load Impedance: 600Ω or greater, balanced or unbalanced. Termination not required.

Output Level (100% peak modulation): Adjustable from 0dBu to +20dBu into 600Ω or greater load, with front-panel independent multi-turn potentiometers.

Output Noise Level: <–75dB (Bypass mode, referenced to 100% modulation).

Distortion: ≤0.05% THD (Bypass mode).

Connector: XLR-type, male, EMI-suppressed. Pin 1 Chassis Ground, Pins 2 and 3 electronically balanced. Positive voltage on Pin 2 correlates to positive modulation.

D/A Conversion: 18-bit.

Filtering: RFI-filtered.

Digital Audio Input (Digital I/O option installed)

Configuration: Two-channel per AES/EBU-standard. 20-bit resolution. Software selection of left, right, or sum as input source.

Sample rate: 32, 44.1 or 48kH, automatically-selected.

Connector: XLR-type, female, EMI-suppressed. Pin 1 Chassis Ground, Pins 2 and 3 transformer balanced and floating.

Input Reference Level: Software-adjustable from –30dBFS to –20dBFS.

J.17 De-emphasis: Software-selectable.

Digital Audio Output (Digital I/O option installed)

Configuration: Two-channel AES/EBU-standard. 20-bit resolution. Both channels carry the same audio data. Status bits per AES3-1992 standard “single-channel mode. ”

Sample rate: 32kHz, 44.1kHz, or 48kHz, software-selectable.

Sync: Software-selectable for internal or external. In external, digital output is synchronous with digital input.

Connector: XLR-type, male, EMI-suppressed. Pin 1 Chassis Ground, Pins 2 and 3 transformer balanced and floating.

Output Level (100% peak modulation) 0dBFS to –20dBFS, software-adjustable.

Remote Control Interface

Configuration: Eight opto-isolated inputs.

Voltage: 6-24V AC or DC, momentary or continuous, optically-isolated. 9VDC provided to facilitate use with contact closure.

Connector: DB-25 male. EMI-suppressed.

Control: User-programmable, for any eight of User Presets, Factory Presets, Day, Night, Bypass, Sine, Wave Test, Analog Input, Digital Input (if Digital I/O Option installed).

Power

Voltage: 90-120VAC, 100-132VAC or 200-264VAC, 50-60Hz; 40VA.

Connector: IEC; detachable 3-wire power cord supplied. AC is EMI-suppressed.

Ground: Circuit ground is independent of chassis ground; can be isolated or connected with a rear panel switch.

Safety Standards: UL, CE, CSA.

Environmental

Operating Temperature Range: 32° to 122°F/0° to 50°C at nominal operating voltages.

Humidity: 0-95% RH, non-condensing.

Dimensions (W x H x D): 19“ x 3.5” x 14.25“/48.3cm x 8.9cm x 36.2cm. Two rack units high.

Weight: 14 lbs/6.4kg.

Shipping Weight: 18.5 lbs/8.4kg.

Warranty

One Year, Parts and Labor: Subject to the limitations set forth in Orban’s Standard Warranty Agreement.

Specifications are subject to change without notice.

Circuit Description

This section provides a detailed description of circuits used in the 9200. It starts with an overview of the 9200 system, identifying circuit sections and describing their purpose. Then each section is treated in detail by first giving an overview of the circuits followed by a component-by-component description. Keywords are highlighted throughout the circuit descriptions to help you quickly locate the information you need.

Overview

The block diagram on page 6-29 illustrates the following overview of 9200 circuit sections.

The 16.384MHz Oscillator and System Clocking section provides the various clocks needed by the control, I/O and DSP circuits to carry out their functions.

The Control Circuits administrate control of the 9200 system.

The User Control Interface and LED Display Circuits section includes the connector, RF-filtering, and circuitry for the remote control inputs and RS-232 interface. It also includes circuitry for the front panel pushbutton switches, LED control status indicators, and LED Meters. The LED Meters measure various 9200 signal levels and display the results on nine front panel 10-segment LED meters.

The Input Circuits include the connectors and RF-filtering for the analog and digital audio inputs, and the circuitry to interface these inputs to the digital processing.

The Output Circuits include the connectors and RF-filtering for the analog and digital audio outputs, and the circuitry to interface the digital processing to these outputs.

The DSP Circuits implement the bypass, test tone, and audio processing using digital signal processing.

The Power Supply provides power for all 9200 circuit sections.

16.384MHz Oscillator and System Clocking

A synchronous clocking scheme is used on the 9200 to eliminate any asynchronous clocks operating in the sensitive regions of the input A/D converter. A single 16.384MHz crystal oscillator provides the timing reference for all system digital clock signals. The only clocks that run asynchronous to this clock are the AES/EBU digital audio input related clocks and the 11.2896MHz free running crystal clock oscillator providing the 44.1kHz AES/EBU output sample rate (this does not fall within a sensitive region of the A/D). Synchronous counters are used to divide the 16.384MHz clock to produce the various clock signals for the system. A PLL circuit is used to synthesize an 18.432MHz clock for operating the host microprocessor and, for the digital I/O option board, a 6.144MHz clock for providing the 48kHz AES/EBU output sample rate clock in addition to providing the AES/EBU input receiver with the ability to measure the input sample rate.

Component-Level Description:

The 16.384MHz digital output from crystal oscillator Y602 is buffered by IC606-D, which feeds the master clock (MCLK) inputs of both the input and the output SRC chips IC603 and IC615 (on digital I/O option board). The 16.384MHz clock also feeds flip-flop IC604, which divides by two to produce an 8.192MHz clock. The 8.192MHz clock is buffered by IC606-C, which feeds digital multiplexer chip IC610, which in turn routes the 8.192MHz to AES/EBU digital audio transmitter chip IC616 when an internally generated 32kHz output sample rate is selected. The 8.192MHz clock is also sent to an 8-bit synchronous counter implemented in programmable logic array (PLA) IC613.

This counter divides down to obtain the lower frequency system clocks. All outputs of the PLA have their transitions coincident with the rising edge of the 8.192MHz clock. The 8.192MHz clock is inverted by buffers IC605-A, -B to provide clocks $\overline{\text{8.192MHZA}}$ and $\overline{\text{8.192MHZB}}$ that have falling edges coincident with the transitions of the lower frequency clocks. $\overline{\text{8.192MHZA}}$ feeds the bit clock of the inter-DSP communication links following buffers IC710-B, -D. $\overline{\text{8.192MHZB}}$ feeds the A/D input clock (256 x sample rate), and the output D/A master clock.

The 2.048MHz clock output from IC613 feeds the PLL circuit made up of PLA IC618, 74HC4046 phase detector/VCO IC619 and associated components. The PLA first buffers the 2.048MHz signal, providing a clean 2.048MHz output at pin 12 used as the reference input to the PLL phase detector (IC619 pin 14). Of the three detectors included in the 74HC4046, the phase frequency detector (PFD) is used by the 9200. The output of the phase detector (pin 13) feeds the loop filter made up of resistors R607, R608 and capacitor C605 that provide a single pole low-pass filter forming a second order loop. Pin 9 of IC619 is the input control voltage to the VCO. Resistor R614 eliminates subharmonic frequency modulation of the VCO caused by parasitic capacitance. Resistors R605 and R606 set the PLL's lock-in frequency range. A divide-by-nine counter is placed between the VCO output and the phase detector comparator input. This places the VCO output at 18.432MHz. The divide-by-nine is implemented by the PLA IC618 between pins 2 and 15. A 6.144MHz clock is derived at the counter's divide-by-three point and is provided at pin 17 of the PLA. The PLA provides a buffered 18.432MHz output at pin 14 which feeds Z-180 microprocessor IC100.

Inverter IC605-C provides the $\overline{\text{2.048MHZD}}$ bit clock for the output D/A and, via buffer IC606-B, the $\overline{\text{2.048MHZC}}$ bit clock for the output SRC, IC615.

IC614-A, -D provide buffered clocks 2.048MHZA and 2.048MHZB for driving the EXTAL inputs (pin 27) of the DSP chips. Each buffer drives four DSP chips.

The 128kHz clock output of IC613 (pin 14) is used for the inter-DSP word clock. The 128kHz, 64kHz and 32kHz clocks are all used in the LCD backlight drive circuit. The 32kHz clock is also used for the input word clock of both the output sample-rate converter (SRC) and the output D/A. The 32kHz clock is used to generate DSP interrupt request signals (IRQBA, IRQBB) required for process timing and interchip synchronization. The circuit consisting of flip-flop IC612 and IC614-B, -C is required to ensure that the first falling edges of all IRQB signals are coincident. This synchronization occurs every time the unit is powered up and when there is a processing algorithm change. It is controlled by the Z-180 via pin 2 of latch IC611. The 32kHz clock is also used, along with IC313, in the A/D clock synchronizing circuit. This circuit makes the IRQB and the L/R clocks, both operating at 32kHz, phase synchronous. This ensures that the process-to-output buffer transfer internal to the DSP doesn't overlap the output buffer-to-peripheral transfer. The $\overline{\text{8.192MHZB}}$ clock that feeds the A/D input clock (IC312 pin 19) is internally divided down to produce a 32kHz word clock at IC312 pin 13 and a 2.048MHz bit clock at pin 14. These clocks are used to control the A/D-to-DSP serial interface and the input SRC-to-DSP serial interface.

AC terminations are used on various clocks throughout the board to improve signal integrity for sensitive devices.

Control Circuits

The control circuits process and execute user-initiated requests to the system. The source of these requests is the front panel buttons, the rear panel RS-232 port, and the remote contact closures. These changes affect hardware function and/or DSP processing. The control circuits also send information to the LCD display, LED status, and LED meter circuits. A RAM chip stores code segments. For quick access, an EEPROM chip stores dynamic system state information. A ROM chip contains the executable form of 9200 DSP and Control software.

1. Microprocessor and Power Monitoring Circuit

A Z-180 microprocessor executes software code required to control the functionality of the 9200. The EXTAL pin of the Z-180 receives an 18.432MHz clock signal from the clock divider/PLL circuit and is internally divided down to 9.216MHz to provide the Z-180 system clock frequency. ROM contains control software for the Z-180. User system setup and other dynamic system state information that must survive power down is stored in non-volatile EEPROM. Power monitoring circuitry prevents data corruption by placing and holding the Z-180 in reset if AC mains power is insufficient.

The Z-180 communicates to the DSP through the synchronous serial data host port. When the DSP requires executable code, the Z-180 reads it from the ROM and sends it to the DSP. The Z-180 sends parameter control data to the DSP and receives status data from the DSP. If status from DSP is irregular, the Z-180 will place the 9200 hardware and DSP in a reset state and execute initialization procedures.

Component-Level Description:

The Z-180 is IC100. Watchdog timer/voltage monitor IC122 provides the system reset function. IC122 pin 7 monitors pulses generated every 1 second by the Z-180. If the Z-180 is not operating correctly to provide the pulses, IC122 will reset the Z-180. IC122 also monitors the voltage on the +5V source that supplies power to the 9200 digital electronics. When the +5V line is above the minimum operating voltage of +4.75V, R103 will pull $\overline{\text{RESET}}$ high which allows the Z-180 to exit the reset condition. When the +5V line is below the minimum operating voltage, the open-collector output of IC122 pulls Z-180's $\overline{\text{RESET}}$ low which puts the Z-180 into the reset condition, thereby preventing the Z-180 and the 9200 electronics from executing incorrectly due to low +5V line voltage.

Z-180 IC100 pins 55, 56, and 57 comprise the host serial data communication port. The Z-180 uses this port to communicate with the DSP IC700-IC707 via host port interface pins 26, 35, and 41; and with EEPROM IC107 via pins 2, 5, and 6. Communication is SPI type with Z-180 as master and DSP as slave.

2. RAM, ROM and EEPROM

A RAM chip provides temporary storage for Z-180 data and program code segments. A ROM chip provides permanent storage of the executable control software and the executable DSP software. System state information that must be maintained while the 9200 is powered down is stored in a EEPROM. The EEPROM does not lose data when the 9200 is powered down.

Component-Level Description:

IC104 decodes Z-180 memory addresses to access instructions to execute from ROM IC105 and to read or write data from 32KB RAM IC106. EEPROM IC107 is selected by latch IC611 pin 6.

3. Data Latches, Tri-State Data Buffers and Address Decoders

Digital logic decodes Z-180 I/O addresses, allowing the Z-180 to access RAM, ROM and EEPROM. The logic provides Z-180 data bus allocation by using latches and tri-state data buffers to allow other 9200 hardware to communicate to the Z-180. To control other hardware, the Z-180's data bus state is latched at the appropriate time, and the latched control signals are provided to other hardware. For the Z-180 to read information from other hardware, the Z-180's data bus is connected at appropriate times to other hardware's source signals through tri-state data buffers (e.g. IC120).

Component-Level Description:

Decoder IC104 allows the Z-180 to access ROM IC105 and RAM IC106. Decoders IC101, IC102, and IC103 allow the Z-180 to access all other 9200 hardware. The decoded outputs from IC101, IC102, and IC103 are used to latch the state of the Z-180 data bus at appropriate times with data latches IC1, IC2, IC3 IC4, IC5, IC6, IC303, IC609, IC611, IC708, and IC709, and to allocate the Z-180 data bus at appropriate times to various peripherals via tri-state data buffers IC120, IC8, and IC601. IC120 buffers or tri-states status information from the remote contact closure circuitry onto the Z-180 data bus. IC8 buffers or tri-states information from the user control interface onto the Z-180 data bus. IC601 (on digital I/O option board) buffers or tri-states status information from AES/EBU Receiver IC600 onto the Z-180 data bus.

User Control Interface and LED Display Circuits

The user control interface enables the user to control the functionality of the 9200 unit. A rear panel remote interface connector enables remote control of certain functions. Front panel pushbutton switches select between various operational modes and functions. Data latches detect and store the commands entered with these switches. Front panel status LEDs indicate the control status of the unit, and meter LEDs indicate signal levels and processing activity within the unit.

1. Remote and RS-232 Interfaces

A remote interface connector and circuitry enables remote control of certain operating modes; the 9200 has eight remote contact closure inputs.

A valid remote signal is a momentary pulse of current flowing through the particular remote signal pins. Current must flow consistently for 50msec for the signal to be interpreted as valid. Generally, the 9200 will respond to the most recent control operation whether it came from the front panel, remote interface, or RS-232.

Component-Level Description:

J101 is a 25-pin D-connector that connects the remote control input signals. The connector incorporates a ferrite block to filter out RFI from the signals. The associated opto-isolators (e.g. IC110) isolate the inputs from the detector circuitry on the 9200. The associated diodes (e.g. CR102) prevent the opto-isolators from breaking down under a reverse bias. The outputs of the opto-isolators are inverted and buffered (e.g. by IC118-A) and latched by tri-state data buffer IC120. When $\overline{\text{REMOTE}}$ signal provided to IC120 pin 19 is brought low, IC120 places remote signals on the Z-180 data bus. The RS-232 interface is comprised of J100, IC121 and IC123. J100 is a 9-pin D-connector. IC121 and IC123 interface the RS-232 signals with the Z-180 microprocessor.

2. Switch Matrix and LED Indicators

Eleven front panel pushbutton switches are arranged in a matrix, configured as three columns and four rows. These switches are the primary element of the physical user interface to the 9200 control software. The host microprocessor controls the system setup and function of the DSP according to the switch/rotary encoder entered commands, the AES Status bits from the Digital Input signal, the RS-232, and the remote control interface status; and updates the LED control status indicators accordingly.

Component-Level Description:

S1-S11 are the front panel pushbutton switches. CR11-CR15 are the front panel LED control status indicators. Via decoder IC102, the host microprocessor Z-180 periodically selects data latch IC3 (on the display board) to drive one of the three columns in the switch matrix low, then commands tri-state data buffer IC8 (also on the display board) to read its inputs to determine if any new information is being received from one or more of the switches in that column. If no switches are closed, pull-up resistors R25-R28 pull the buffer inputs to +5V. The buffer, in turn, de-bounces the signals and places the appropriate word on the data bus for the Z-180 to read. The Z-180 transmits the updated information to data latch IC3 which directly drives the LED Control Status Indicators.

3. LED Meter Circuits

The meter LEDs are arranged in a 6x16 matrix, in rows and columns. Each row of LEDs in the matrix has a 1/6 duty cycle ON time. The rows are multiplexed at a fast rate so that the meters appear continuously illuminated. Via the serial port, the DSP sends meter data values to the Z-180, which sends the appropriate LED control words (8 bits at a time) to the data latches that drive the LEDs directly.

Component-Level Description:

The meter LED matrix consists of nine 10-segment LED bargraph assemblies (CR1-CR9) and one discrete LED (CR10). Row selector latches IC4, IC5, and IC6 are controlled by the Z-180, and alternately sink current through the LEDs selected by column selector latches IC1 and IC2, which are also controlled by the Z-180. IC1 and IC2 drive the selected row of LEDs through current limiting resistor packs RP1 and RP2.

Input Circuits

This circuitry interfaces the analog and digital audio to the DSP. The analog input stages scale and buffer the input audio level to match it to the analog-to-digital (A/D) converter. The A/D converts the analog input audio to digital audio. The digital input receiver accepts AES/EBU-format digital audio signals from the digital input connector, and transmits them to the input sample rate converter (SRC). The digital audio from the A/D and SRC is transmitted to the DSP.

1. Analog Input Stages

The RF-filtered analog input signal is applied to a resistor load and a resistor pad. The pad and load are enabled or disabled by jumpers that are positioned by hand. The loaded and padded signal is applied to a floating-balanced amplifier that has an adjustable (digitally-controlled) gain. The gain is set by FET transistors and analog switches. The state of the FETs and switches is set by the outputs of a latch. The control circuits control the gain according to what the user specifies from the front panel controls by writing data to the latch. The gain amplifier output feeds a circuit that scales, balances, and removes DC from the signal. This circuit feeds an RC low-pass filter which applies the balanced signal to the analog-to-digital (A/D) converter.

Component-Level Description:

The balanced audio input signal is applied to the filter/load/pad network made up of L300, L301, L302, L303, R300-R305, R316-R319, and C323-C326. J301 is a jumper that removes or inserts the optional 600Ω termination load (R300) on the input signal. J302 and J303 are the jumpers that remove or insert the resistive divider (R301-R303) that pads the input signal before it is applied to IC300, a differential amplifier. R306, R307, R310-R313, FETs Q300-Q301, and quad analog switch IC307 make up the circuit that sets the gain of IC300. The FETs, along with IC307, are used as switches to change the resistive paths in the circuit. The state of the FET switches is set by the outputs of digital latch IC303. The latch outputs feed IC306, a quad comparator, which outputs 0V to turn on a FET and −15V to turn off a FET. The control circuit writes directly to IC307 to control the state of the switches on IC307. IC300 feeds IC302 and associated components. This stage balances the signal to drive the analog-to-digital (A/D) converter. IC301-B and associated components comprise a servo amp to prevent DC from passing to the DSP. R334, R337, C302, and C303 make a simple RC filter necessary to filter high frequency energy that would otherwise cause aliasing distortion in the A/D converter.

2. Analog-to-Digital (A/D) Converter

The A/D is an 18-bit sigma-delta converter, implemented on a dual-chip integrated circuit. The A/D oversamples the audio at 2.048MHz. It applies noise shaping, then it filters and decimates to a 32kHz sample rate. The samples are output in two's complement, 32-bit word, two-word frame serial format, MSbit first, and transmitted to the DSP. The 32kHz frame clock and 2.048MHz bit clock from the A/D function as master clocks for the 9200 input to the DSP. For more information on 9200 input clocking, please refer to "16.384MHz Oscillator and System Clocking."

Component-Level Description:

The balanced analog input is applied to pins 3(+) and 4(–), and also to pins 26(+) and 25(–) of the A/D (IC312). The maximum differential signal that the A/D can accept is ±7.36Vpeak. The A/D samples these inputs simultaneously at 64 times the 9200 sample rate of 32kHz. ICLKD, the master clock input of the A/D (pin 19), is fed an 8.192MHz clock providing the 2.048MHz input sample rate required. The bit clock SCLK (pin 14) of the A/D is inverted by IC605-F. This signal, along with the data SDATA (pin 15) and word clock L/$\overline{R}$ (pin 13), are buffered by IC314-A, -B, -C, and -D, and fed to the serial port of the first DSP chip (IC700). IC314 reduces the drive requirement of the on-board drivers on the A/D and ensures that there are no overshoots or undershoots as a result of transmission line reflections that may degrade the performance of the A/D.

3. Digital Input Receiver and Sample Rate Converter (SRC)

The digital input receiver (on digital I/O option board) accepts digital audio signals using the AES/EBU interface format (AES3-1992). The receiver and input sample rate converter (SRC) together will accept and sample-rate convert any of the "standard" 32kHz, 44.1kHz, 48kHz rates in addition to any digital audio sample rate within the range of 25kHz and 55kHz. The audio signal received is decoded by the AES receiver and sent to the SRC. The SRC converts the input sample rate to the 32kHz 9200-D system sample rate. Via a synchronous serial interface, the SRC sends the 32kHz sample rate audio to the DSP for processing.

Component-Level Description:

The differential digital input signal is received through a shielded 1:1 pulse transformer (T600). T600 has very low inter-winding capacitance, providing a high level of isolation for high frequency common mode interference. IC600 is a dedicated AES/EBU digital audio receiver integrated circuit. It contains a phase locked loop that recovers the clock and the synchronization information present in the AES/EBU signal. A Schmitt trigger at the input provides 50mV of hysteresis for added noise immunity. R600 provides a 110Ω input impedance per the AES/EBU specification.

The Z-180 provides the active high reset signal (AES_RST) to IC600 mode control pins 17, 18, 23 and 24, via latch IC609 pin 6. This is used when the 9200-D is asked to respond to analog audio input. When in the reset state, the receiver holds all outputs inactive (except MCK pin 19).

IC600 pins 2 through 6 and pin 27 are an output latch that provides AES/EBU status information, selected by the STATSEL line. The information on this latch is provided to the Z-180 data bus via tri-state data buffer IC601. STATSEL signal from IC609 pin 12 is applied to IC600 pin 16. When STATSEL is high, pins 2 through 6 and pin 27 contain information about the channel status bits. When STATSEL is low, pins 2 through 6 and pin 27 contain input sample rate and error information. The Z-180 reads these to determine if a valid AES/EBU signal and sample rate is present. CHSEL is used to select whether channel A or channel B status bits are present on IC600's output latch. When STATSEL is low, channel A status is made available, and when STATSEL is high, channel B is made available.

Received AES audio is transmitted from the AES receiver to the input sample rate converter (SRC IC603). The AES receiver is master and the SRC is slave. The AES receiver outputs data on pin 26, the bit clock on pin 12, and the frame clock on pin 11. These signals are sent to the SRC serial input interface pins 3, 4, and 6 respectively.

The MCK clock output at pin 19 of the AES receiver chip has a frequency 256 times the input sample rate of the received signal. This is used to drive the output AES/EBU transmitter when an output sample rate that is synchronous to the input sample rate (external sync) is required.

The crystal oscillator (Y602) provides the SRC a master clock of 16.384MHz on pin 2. This MCLK frequency allows the input SRC to operate with input sample rates in the range of 8.192kHz (MCLK/2000) to 57kHz (MCLK/286). SRC_RST is an active low reset signal tied to pin 13 of the SRC. This signal is controlled by the Z-180 via pin 2 of latch IC609.

The MSDLY_I, BKPOL_I, and TRGLR_I pins of the SRC chip configure the chip to interface with the AES/EBU receiver chip. Pin 1 of the SRC (GPDLYS) is tied high to minimize the chip's group delay to approximately 700µs as opposed to approximately 3ms, giving up some tolerance to variations in sample rates. Pin 28 (SETLSLW) is tied high to cause the SRC to settle slowly to changes in sample rates, resulting in the best rejection of sample rate jitter.

The sample rate converted output of the input SRC feeds the first DSP chip (IC700). The SRC output port and the DSP input port are both slaves, with clocks supplied by the input A/D converter (IC312). The SRC generates DIG_IN (data) on pin 23, and receives the bit clock and the word clock on pins 26 and 24 respectively.

Output Circuits

This circuitry interfaces the DSP to the analog and digital audio outputs. The digital audio from the DSP is transmitted to the digital-to-analog converter (D/A) and output sample rate converter (SRC). The digital-to-analog (D/A) converter converts the digital audio words generated by the DSP to analog output audio. The analog output stages scale and buffer the D/A output signal to drive the analog output XLR connectors with a low impedance balanced output. The digital output transmitter accepts the digital audio words from the output sample rate converter (SRC) and transmits them in AES/EBU-format digital audio signals on the digital output connector.

1. Digital-to-Analog (D/A) Converter

The D/A is a single chip, two-channel, 18-bit delta-sigma converter.

For information on 9200 system clocking, please refer to “16.384MHz Oscillator and System Clocking.”

Component-Level Description:

IC400 is the digital-to-analog (D/A) converter for the two analog output signals. The synchronous serial input interface consists of the bit clock, data and latch enable pins that are configured for the interface to DSP IC-707 via DIF0 and DIF1 pins. The processed digital output (ANLG_OUT) is provided by DSP IC707 on its SAI output port SDO2 (pin 45), and is received by the D/A on pin 18.

A 2.048MHz bit clock is provided from the system clock circuitry to both the final DSP and the D/A chips. The DSP output data format is 32 bits per word, two words per frame. DSP chip IC707 receives a 32kHz frame clock at its WST input (pin 50) that sets the word transfer rate to two words per 32kHz period. The D/A receives a 32kHz clock at its LRCK input (pin 20). LRCK delineates the two samples per frame that are fed to the D/A to create the 9200’s two independent analog output signals. The DSP output samples are formatted to ensure that the D/A uses samples that represent the simultaneously sampled analog input.

2. Analog Output Stages

The two analog signals emerging from the digital-to-analog (D/A) converter are each RC low-pass filtered and applied to an attenuator/gain amplifier, which is adjusted via front panel potentiometers. The balanced line driver outputs are applied to the RF-filtered analog output connectors.

Component-Level Description:

The signal emerging from the digital-to-analog (D/A) converter pin 2 is RC low-pass filtered by R402 and C407 to remove high frequency images. It is then applied to an attenuator/gain amplifier formed by VR500, IC403 and associated components. This stage is a balanced line driver.

IC402-A, R430, R435 and C423 comprise a servo amplifier which centers around ground the DC level at output connector J400.

The balanced audio output signal is applied to the RF filter network made up of R409-R414, C411, C412, C420, C421, L400, L401, L402, and L403, and then to XLR connector J400.

The circuitry corresponding to the second output channel is functionally identical to that just described.

3. Digital Sample Rate Converter (SRC) and Output Transmitter

An output sample rate converter (SRC) chip (on digital I/O option board) is used to convert the 32kHz 9200-D system sample rate to any of the standard 32kHz, 44.1kHz or 48kHz rates. A digital audio interface transmitter chip is used to encode digital audio signals using the AES/EBU interface format (AES3-1992). A synchronous serial interface is used for all inter-chip communication.

Component-Level Description:

The processed digital output (DIG_OUT) provided at the SAI output port SDO0 (pin 47) of DSP IC707 is received by asynchronous sample rate converter (SRC) IC615 pin 3. A 2.048MHz bit clock is provided from the system clock circuitry to both the final DSP and the SRC chips. DSP chip IC707 receives a 32kHz frame clock at its WST input (pin 50) that sets the word transfer rate to two words per 32kHz period. The SRC receives a 32kHz clock at its L/$\overline{R}$_I input (pin 6). L/$\overline{R}$_I delineates the samples of the two channels used by the SRC (both channels receive the same signal). The DSP output samples are formatted to ensure that the SRC uses samples that represent the simultaneously sampled analog input.

The crystal oscillator (Y602) provides the SRC a master clock of 16.384MHz on pin 2. This MCLK frequency allows the output SRC to operate with an output sample rate in the range between 30kHz and 57kHz. SRC_RST is an active low reset signal tied to pin 13 of the SRC. This signal comes from multiplexer chip IC610 and is controlled by the Z-180 via either pin 2 of latch IC609 or pin 8 of IC605-D.

The MSDLY_I, BKPOL_I, and TRGLR_I pins of the SRC chip configure the chip for to interface with the last DSP chip (IC707). Pin 1 of the SRC (GPDLYS) is tied high to minimize the chip's group delay to approximately 700µs as opposed to approximately 3ms, giving up some tolerance to variations in sample rates. Pin 28 (SETLSLW) is tied high to cause the OSRC to settle slowly to changes in sample rates, resulting in the best rejection of sample rate jitter.

The output side of the sample rate converter is tied directly to IC616, an AES/EBU digital audio transmitter integrated circuit. This interface uses the AES transmitter chip as master. The transmitter chip encodes the audio data it receives to the AES/EBU interface standard, and transmits it.

The SRC output sample rate and the sample rate that the AES/EBU transmitter transmits with is based on the MCK clock provided to pin 5 of IC616. This clock is received via digital multiplexer chip IC610 which is used to select one of four available clocks. Three free running clocks provide the standard sample rates of 32kHz, 44.1kHz and 48kHz when an internal sync is requested. These clocks run at a frequency that is 128 or 256 times the sample rate they represent. They have a frequency stability of ±100PPM. The fourth clock is the EXTMCK clock that is recovered from the AES/EBU receiver chip. This clock has a frequency of 256 times the input sample rate of the received signal. This is used to drive the output AES/EBU transmitter when an output sample rate is required that is synchronous to the input sample rate (external sync).

The inter-chip serial data format, the input MCK multiplication factor, and the output channel status data are controlled by the Z-180 via internal control registers and data memory accessed through the parallel port made up of the 5-bit address bus (pins 9-13), the 8-bit data bus (pins 1-4, 21-24) and the $\overline{\text{CS}}$ and RD/$\overline{\text{WR}}$ control pins (pins 14 and 16) of IC616.

The on-chip RS422 line driver provided by IC616 is a low skew, low impedance, differential output capable of driving a 110Ω transmission line with a 4Vp-p signal. Shielded 1:1 pulse transformer T601 transmits the differential digital output signal to XLR connector J601. T601 has very low inter-winding capacitance, providing a high level of isolation from high frequency common mode interference.

DSP Circuits

The DSP circuits consist of eight general purpose DSP chips that execute DSP software code to implement digital signal processing algorithms. The algorithms filter, compress, and limit the audio signal. The eight DSP chips, operating at 25 million instructions per second (MIPS) for a total of 200MIPS, provide the necessary signal processing. A 32kHz sampling rate is used. Two of the on-board serial audio interface (SAI) peripherals on each DSP chip are used to transfer data chip-to-chip at a 16.384Mbit/s rate maintaining a 24-bit word length. The DSP chips are cascaded, processing the audio serially. The first chip receives the analog input via the A/D chip and the digital input via the SRC chip. Input source selection is performed seamlessly, internal to the DSP chip.

During system initialization (which normally occurs when power is first applied to the 9200), and when processing algorithms are changed, the Z-180 downloads the DSP executable code stored in the ROM, via the serial host interface (SHI) port of each DSP chip. Once a DSP chip begins executing its program, execution is continuous. The Z-180 provides the DSP program with parameter data, and extracts the front panel metering data from the DSP chips via this same SHI port.

The “analog” and digital outputs are sent to the D/A and the output SRC chips via the SAI port of the last DSP chip, IC707.

Component-Level Description:

IC700 thru IC707 are the DSP chips. Do not attempt to remove these chips from the PCB. These chips should be removed only by the Orban service department. A chip can be ruined by static discharge or by damage to its delicate pins.

The EXTAL pin of each DSP chip receives a 2.048MHz clock. All DSP chips use their internal PLL to multiply this by 24 to operate the chip’s internal oscillator (Fosc) at 49.152MHz. Each DSP chip is reset by the Z-180 via latch IC709. DSP mode configuration is controlled by the state of the MODA, MODB and MODC (pins 37, 38, 39) on each chip as the chip is brought out of reset. All DSP chips are configured to bootstrap via the SHI port. The MODB pin, which also serves as the IRQB input after leaving the reset state, is forced low prior to bringing the DSP chips out of reset.

Pins 26, 35, 41 and 42 comprise the DSP host port. Host port communication conforms to the SPI format with the Z-180 set-up as the master and the DSPs as slaves. The Z-180 generates the HOSTCK clock signal and provides it to SCK (pin 26) of each DSP. The Z-180 provides the data on the HOSTTX line tied to pin 41 of each DSP. The data output (pins 35) of each DSP have tri-state outputs that are wire-ORed to provide the data on the HOSTRX line sent to the Z-180. The Z-180 controls the slave select ($\overline{\text{SS}}$) (pin 42) of each DSP via latch IC708. The $\overline{\text{SS}}$ pin is used to enable each of the slaved DSP SPI ports for transfer.

DSP IC700 pins 56 and 57 receive serial audio from the digital and analog inputs. These are the two input ports of the synchronous serial audio interface (SAI) receiver internal to the DSP. The two serial audio streams are received simultaneously. Both inputs share the same frame clock, $\overline{\text{L}}$/R (32kHz) provided to DSP IC700 pin 55 and the same bit clock, SCK (2.048MHz) provided to DSP IC700 pin 51.

Communication between DSP chips IC700 (first) thru IC707 (last) is one-way, in series from the first to the last. Two of the on-board SAI peripherals on each DSP are used to transfer 8 words each per frame chip-to-chip. The I2S communication protocol (two 32-bit words per cycle of the word clock) is used with the DSPs as slaves, and the 9200 system clocking as master. Data is sent from the two transmit data port pins 46 and 47 of one chip to the next chip’s receive data port pins 56 and 57. A 128kHz word clock is provided to the transmit pin 50 and the receive pin 55. An 8.192MHz bit clock is provided to the transmit pin 49 and the receive pin 51. The SAI links between DSPs are synchronized to each other (to align the SAI time slots) by making the first occurrence of all IRQBs coincident, (controlled by Z180 and external hardware) and having all DSPs initialize their SAI ports on the first reception of IRQB.

The “analog” and digital outputs are transferred respectively to the D/A and the output SRC from the last DSP chip (IC707). (“Analog” refers to DSP signal that ultimately gets converted to analog.)

Power Supply

The power supply converts an AC line voltage input to various power sources used by the 9200. Five linear regulators provide ±15VDC and ±5VDC for the analog circuits and +5VDC for the digital circuits. An unregulated voltage powers the LED backlight on the LCD display.

Component-Level Description:

L1 is a power line filter that filters out RFI. F1 is a ½-amp “Slo-Blo” fuse. T1 is a dual-primary dual-secondary power transformer used to step down the input voltage for the ±15VDC analog and +5VDC digital supply regulators. Each primary winding has a Metal-Oxide Varistor (V1, V2) connected in parallel to suppress high-voltage spikes across the AC line. Rear panel switch S1 configures the primary windings either in parallel (for 115V ±15% line voltages) or series (for 230V ±15% line voltages).

T1 has three secondary windings for stepping down the AC line voltage. The lower voltage winding feeds storage capacitors C15 and C19 through full-wave bridged rectifier diodes CR13, CR14, CR15, CR17 and CR18. C15 filters the rectified voltage for input to low-dropout linear voltage regulator IC5, which provides the +5VDC source used to power all of the digital circuits in the 9200. C19 filters the rectified voltage to power the LED backlight on the LCD display. Components Q1, Q2, R3-R7, and CR20 form a pulsed current source to illuminate the 25x2 LED array (the backlight on the LCD display). The signal LEDPULSE, a 32kHz pulse at ⅛ duty cycle, feeds the base of high-current Darlington transistor Q1. The feedback circuit consisting of Q2, CR20 and R3-R7 controls the magnitude of the signal LEDPULSE so as to limit Q1’s current pulses to about 1.5A (1/8 duty cycle). These current pulses illuminate the 25 x 2 LED array via keyed header J201, which attaches the LED array between the collector of Q1 and supply cap C19. The signal LEDPULSE is gated on for approximately one hour after the 9200 has last been powered up or a front panel button has last been pressed; otherwise, it is gated off. This drastically increases the lifetime of the LCD display and saves power. The LED meter circuits are described in “User Control Interface and LED Display Circuits.”

The higher voltage pair of transformer secondary windings is configured in series to form a single center-tapped winding. This winding is connected to rectifier diodes CR1-CR4 in a full-wave center tap configuration. C1 and C2 filter the rectified voltage for input to the voltage regulators IC1 and IC2. These regulators provide the +15VDC and –15VDC sources used to power most of the analog circuits in the 9200. They also serve as the respective inputs to the voltage regulators IC3 and IC4. These regulators provide the +5VDC and –5VDC analog supplies for the converter chips, which draw only a modest amount of current.

Test points and supply bypass capacitors are placed throughout the PC board. S2 is the ground lift switch used to connect or lift 9200 circuit ground from chassis ground.

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.

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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 6-27.

Ref Des	Description	Orban P/N	Ven	Vendor P/N	Alternate Vendors	Notes

MAIN BOARD

Capacitors

C11-43	Ceramic, 50V, 20%; 1uF	21131-410	MUR	GRM42-6Z5U104M50BD		
C45-51	Ceramic, 50V, 20%; 1uF	21131-410	MUR	GRM42-6Z5U104M50BD		
C53	Ceramic, 50V, 20%; 1uF	21131-410	MUR	GRM42-6Z5U104M50BD		
C54	Ceramic, Axial, 100V, 5%; 1000pF	21127-210	KEM	C410C102J1G5CA		
C55-60	Ceramic, 50V, 20%; 1uF	21131-410	MUR	GRM42-6Z5U104M50BD		
C67-71	Ceramic, 50V, 20%; 1uF	21131-410	MUR	GRM42-6Z5U104M50BD		
C74-78	Ceramic, 50V, 20%; 1uF	21131-410	MUR	GRM42-6Z5U104M50BD		
C82-84	Alum., Radial, 25V, 10%; 10uF	21263-610	NIC	UKLIE101KPAANA		
C85-90	Ceramic, 50V, 20%; 1uF	21131-410	MUR	GRM42-6Z5U104M50BD		
C91-92	Alum., Radial, 25V, 10%; 10uF	21263-610	NIC	UKLIE101KPAANA		
C100	Ceramic, Axial, 100V, 5%; 1000pF	21127-210	KEM	C410C102J1G5CA		
C102	Alum, Radial, 63V, -20% +100%; 2.2Uf	21209-522	SPR	502D 225G063BB1C	PAN	
C103	Ceramic Disc, 100V, 5%; 33pF	21127-033	KEM	C410C330JIG5CA		
C104-5	Ceramic, 50V, 20%; 1uF	21131-410	MUR	GRM42-6Z5U104M50BD		
C200	Ceramic, 50V, 20%; 1uF	21131-410	MUR	GRM42-6Z5U104M50BD		
C201	Met. Polyester, 50V, 5%; 0.1uF	21445-410	PAN	ECQ-V1H104JZ		
C300	Met. Polyester, 50V, 5%; 0.1uF	21445-410	PAN	ECQ-V1H104JZ		
C302-3	Met. Polyester, 50V, 5%; .0047uF	21445-247	PAN	ECQ-B1H472 F1		
C306-7	Ceramic, 50V, 20%; 1uF	21131-410	MUR	GRM42-6Z5U104M50BD		
C308	Tantalum, 10V, 10%; 100uF	21303-710	SPR	196D 107X9010PE4	MANY	
C309-10	Met. Polyester, 50V, 5%; 0.22uF	21445-422	PAN	ECQ-V1H224JZ		
C311	Ceramic, 50V, 20%; 1uF	21131-410	MUR	GRM42-6Z5U104M50BD		
C312	Tantalum, 35V, 10%; 1uF	21307-510	SPR	196D 105X9035HA1	MANY	
C313-14	Ceramic, 50V, 20%; 1uF	21131-410	MUR	GRM42-6Z5U104M50BD		
C315	Tantalum, 35V, 10%; 1uF	21307-510	SPR	196D 105X9035HA1	MANY	
C316-19	Ceramic, 50V, 20%; 1uF	21131-410	MUR	GRM42-6Z5U104M50BD		
C320	Tantalum, 20V, 10%; 10uF	21305-610	SPR	196D 106X9020JA1	MANY	
C321-22	Ceramic, 50V, 20%; 1uF	21131-410	MUR	GRM42-6Z5U104M50BD		
C323-24	CAP,0.0082uF,1KV,10%,CER DISC	21112.282.01				
C325-26	CAP,0.0030uF,1KV,10%,CER DISC	21112.230.01				
C400	Tantalum, 35V, 10%; 1uF	21307-510	SPR	196D 105X9035HA1	MANY	
C401	Ceramic, 50V, 20%; 1uF	21131-410	MUR	GRM42-6Z5U104M50BD		
C402	Ceramic, 50V, 20%; 1uF	21131-410	MUR	GRM42-6Z5U104M50BD		
C403	Tantalum, 35V, 10%; 1uF	21307-510	SPR	196D 105X9035HA1	MANY	
C404-5	Ceramic, 50V, 20%; 1uF	21131-410	MUR	GRM42-6Z5U104M50BD		
C406	Tantalum, 20V, 10%; 10uF	21305-610	SPR	196D 106X9020JA1	MANY	
C407-8	Met. Polyester, 50V, 5%; 0.01uF	21445-310	PAN	ECQ-V1H103JZ		
C411	Ceramic, Axial, 100V, 5%; 1000pF	21127-210	KEM	C410C102J1G5CA		
C412	Ceramic Disc, 1kV, 10%; 0.0015uF	21112-215	CRL	DD-152 MUR		
C413	Ceramic, 50V, 20%; 1uF	21131-410	MUR	GRM42-6Z5U104M50BD		
C414	Tantalum, 35V, 10%; 1uF	21307-510	SPR	196D 105X9035HA1	MANY	
C415	Ceramic Disc, 100V, 5%; 33pF	21127-033	KEM	C410C330JIG5CA		
C416	Ceramic, Axial, 100V, 5%; 1000pF	21127-210	KEM	C410C102J1G5CA		
C417-18	Ceramic Disc, 1kV, 10%; 0.0015uF	21112-215	CRL	DD-152 MUR		
C419	Ceramic, Axial, 100V, 5%; 1000pF	21127-210	KEM	C410C102J1G5CA		
C420	Ceramic Disc, 1kV, 10%; 0.0015uF	21112-215	CRL	DD-152 MUR		
C421	Ceramic, Axial, 100V, 5%; 1000pF	21127-210	KEM	C410C102J1G5CA		
C422	Ceramic Disc, 100V, 5%; 33pF	21127-033	KEM	C410C330JIG5CA		
C423	Met. Polyester, 50V, 5%; 0.1uF	21445-410	PAN	ECQ-V1H104JZ		
C424-25	Ceramic Disc, 100V, 5%; 33pF	21127-033	KEM	C410C330JIG5CA		
C426	Met. Polyester, 50V, 5%; 0.1uF	21445-410	PAN	ECQ-V1H104JZ		
C604	Ceramic Disc, 100V, 5%; 150pF	21127-115	KEM	C410C151JIG5CA		
C605	Met. Polyester, 50V, 5%; 1.0uF	21445-510	PAN	ECQ-V1H105JZ		
C606	Ceramic, 50V, 20%; 1uF	21131-410	MUR	GRM42-6Z5U104M50BD		
C607	Alum., Radial, 25V, 10%; 100uF	21263-710	NIC	UKLIE101KPAANA		
C800	CAP,M/P,50V,5%,.018uF	21445.318.01				
C801	Ceramic, 50V, 20%; 1uF	21131-410	MUR	GRM42-6Z5U104M50BD		
C802	CAP,M/P,50V,5%,.018uF	21445.318.01				
C803	Ceramic, 50V, 20%; 1uF	21131-410	MUR	GRM42-6Z5U104M50BD		
C804	CAP,M/P,50V,5%,.018uF	21445.318.01				
C805	Ceramic, 50V, 20%; 1uF	21131-410	MUR	GRM42-6Z5U104M50BD		
C806	CAP,M/P,50V,5%,.018uF	21445.318.01				

Ref Des	Description	Orban P/N	Ven	Vendor P/N	Alternate Vendors	Notes
	Capacitors (continued)					
C807	Ceramic, 50V, 20%; 1uF	21131-410	MUR	GRM42-6Z5U104M50BD		
C808	CAP,M/P,50V,5%,.018uF	21445.318.01				
C809	Ceramic, 50V, 20%; 1uF	21131-410	MUR	GRM42-6Z5U104M50BD		
C810	CAP,M/P,50V,5%,.018uF	21445.318.01				
C811	Ceramic, 50V, 20%; 1uF	21131-410	MUR	GRM42-6Z5U104M50BD		
C812	CAP,M/P,50V,5%,.018uF	21445.318.01				
C813	Ceramic, 50V, 20%; 1uF	21131-410	MUR	GRM42-6Z5U104M50BD		
C814	CAP,M/P,50V,5%,.018uF	21445.318.01				
C815	Ceramic, 50V, 20%; 1uF	21131-410	MUR	GRM42-6Z5U104M50BD		
	Diodes					
CR100-1	DIO,ZNR,1W,5%,12V	22004.120.01				
CR102-9	Diode, Rectifier, 400V, 1A	22201-400	MOT	1N4004	MANY	
CR200-3	Diode, Zener, 1W; 9.1V	22003-091	MOT	1N4739	MANY	
CR300-3	Diode, Signal, Hot Carrier	22102-001	HP	HP5082-2800	MANY	
	Inductors					
L100	Inductor, RF Choke; 7uH	29501-004	OHM	Z-50		
L300	Filter, EMI, W/BEAD, 50V,1000PF	29508-210	TAI	STB102KB		
L301	IND,8.2MH,73F823AF (MILLER)	29503.822.01				
L302	Filter, EMI, W/BEAD, 50V,1000PF	29508-210	TAI	STB102KB		
L303	IND,8.2MH,73F823AF (MILLER)	29503.822.01				
L310	INDUCTOR 2A 2.2UH	240-003				
L400-1	Inductor, RF Choke; 1.2mH	29503-000	MIL	73F123AF		
L402	Filter, EMI, W/BEAD, 50V,1000PF	29508-210	TAI	STB102KB		
L403	Filter, EMI, W/BEAD, 50V,1000PF	29508-210	TAI	STB102KB		
L404-5	Inductor, RF Choke; 1.2mH	29503-000	MIL	73F123AF		
L406	Filter, EMI, W/BEAD, 50V,1000PF	29508-210	TAI	STB102KB		
L407	Filter, EMI, W/BEAD, 50V,1000PF	29508-210	TAI	STB102KB		
	Integrated Circuits					
IC100	Digital, Microprocessor	24822-000	ZI	Z8018010VSC		
IC101-4	Address Decoder	24899-000	MOT	MC74AC138D		
IC105	ASSY,EPROM,9200 MAIN BD	44063.000				
IC106	Digital, SRAM	24817-000	TOS	TC55257CPL-10		
IC107	EEPROM,2Kx8BIT,5V,8LEAD	24904.000.01				
IC109	Digital, Inverter	24900-000	TI	SN74HC14AD		
IC110-17	Optoisolator, NPN	25003-000	SIE	SFH-601-1		
IC118-19	Digital, Inverter	24900-000	TI	SN74HC14AD		
IC120	Digital, Transceiver	24851-000	SIG	74HC245D		
IC121	Digital, Quad Line Driver	24661-302	NAT	DS14C88N		
IC122	Power Monitor/Watchdog	24872-000	MAX	1232CPA		
IC123	Digital, Quad Line Receiver	24662-302	NAT	DS14C89A		
IC201	Digital, AND Gate	24850-000	MOT	MC74HC08AD		
IC300	Audio Preamp	24727-402	AD	SSM-2017P		
IC301	Linear, Dual Opamp	24209-202	NAT	LF412CN		
IC302	Linear, Dual Opamp	24207-202	SIG	NE5532N TI,EXR		
IC303	Digital, Latch	24857-000	MOT	MC74HC374ADW		
IC306	Quad Comparator	24710-302	NAT	LM339		
IC307	Quad SPST Switches	24728-302	AD	ADG222		
IC312	20-BIT A/D,DIP/28	24933.000.01	CSC	CS5390KP		
IC312	Digital, A/D Converter	24643-000	CSC	CS5389KP-EP		
IC313	Digital, Flip-Flop	24858-000	TI	SN74HC74D		
IC314	Digital, AND Gate	24850-000	MOT	MC74HC08AD		
IC400	Digital, Stereo D/A Converter	24821-000	CSC	CS4328KP		
IC402	Linear, Dual Opamp	24209-202	NAT	LF412CN		
IC403	Linear, Dual Opamp	24207-202	SIG	NE5532N TI,EXR		
IC406	Linear, Dual Opamp	24207-202	SIG	NE5532N TI,EXR		
IC604	Digital, Flip-Flop	24858-000	TI	SN74HC74D		
IC605	Digital, Inverter	24900-000	TI	SN74HC14AD		
IC606	Digital, AND Gate	24850-000	MOT	MC74HC08AD		
IC607	Digital, AND Gate	24850-000	MOT	MC74HC08AD		
IC611	Digital, Latch	24857-000	MOT	MC74HC374ADW		
IC612	Digital, Flip-Flop	24858-000	TI	SN74HC74D		
IC613	PAL	44032-100	ORB			

Ref Des	Description	Orban P/N	Ven	Vendor P/N	Alternate Vendors	Notes
	Integrated Circuits (continued)					
IC614	Digital, AND Gate	24850-000	MOT	MC74HC08AD		
IC618	PAL	44031-100	ORB			
IC619	Digital, PLL	24901-000	SIG	74HC4046AD		
IC700-7	Digital, DSP	24897-000	MOT	DSP56004FJ50		
IC708-9	Digital, Latch	24857-000	MOT	MC74HC374ADW		
IC710	Digital, AND Gate	24850-000	MOT	MC74HC08AD		
	Resistors					
R100	Resistor, 1/4W; 0 OHM (Jumper)	20020-025	ROHM	JPW-02A		
R101-5	RES,10K,1/8W,1%,TF,SMD1206	20124.100.01				
R106	Resistor Network, SIP; 100K	20221-101	BEK	L10-1C104		
R107	RES,10K,1/8W,1%,TF,SMD1206	20124.100.01				
R124	Resistor Network, SIP; 100K	20221-101	BEK	L10-1C104		
R126	RES,100K,1/8W,1%,TF,SMD1206	20125.100.01				
R127	RES,MF,1/2W,1%,301Ω	20080.301.01				
R128	RES,10K,1/8W,1%,TF,SMD1206	20124.100.01				
R129	RES,110Ω,1/8W,1%,TF,SMD1206	20122.110.01				
R131-32	Resistor, 1/4W; 0 OHM (Jumper)	20020-025	ROHM	JPW-02A		
R216	RES,2K,1/8W,1%,TF,SMD1206	20123.200.01				
R301-2	RES,4.99K,1/8W,1%,TF,SMD1206	20123.499.01				
R303	RES,845Ω,1/8W,1%,TF,SMD1206	20122.845.01				
R304-5	RES,100K,1/8W,1%,TF,SMD1206	20125.100.01				
R306	RES,249Ω,1/8W,1%,TF,SMD1206	20122.249.01				
R307	RES,511Ω,1/8W,1%,TF,SMD1206	20122.511.01				
R308	RES,47.5K,1/8W,1%,TF,SMD1206	20124.475.01				
R309	RES,47.5K,1/8W,1%,TF,SMD1206	20124.475.01				
R310	RES,1.05K,1/8W,1%,TF,SMD1206	20123.105.01				
R311	RES,1.82K,1/8W,1%,TF,SMD1206	20123.182.01				
R312	RES,3.92K,1/8W,1%,TF,SMD1206	20123.392.01				
R313	RES,6.34K,1/8W,1%,TF,SMD1206	20123.634.01				
R314-15	RES,10K,1/8W,1%,TF,SMD1206	20124.100.01				
R330	RES,13.3K,1/8W,1%,TF,SMD1206	20124.133.01				
R331	RES,6.65K,1/8W,1%,TF,SMD1206	20123.665.01				
R332	RES,69.8K,1/8W,1%,TF,SMD1206	20124.698.01				
R333	RES,1.00M,1/8W,1%,TF,SMD1206	20126.100.01				
R334	RES,39.2Ω,1/8W,1%,TF,SMD1206	20121.392.01				
R335	RES,4.99K,1/8W,1%,TF,SMD1206	20123.499.01				
R336	RES,4.99K,1/8W,1%,TF,SMD1206	20123.499.01				
R337	RES,39.2Ω,1/8W,1%,TF,SMD1206	20121.392.01				
R338	RES,2.49K,1/8W,1%,TF,SMD1206	20123.249.01				
R348	RES,51.1Ω,1/8W,1%,TF,SMD1206	20121.511.01				
R349	Resistor, 1/4W; 0 OHM (Jumper)	20020-025	ROHM	JPW-02A		
R402-3	RES,51.1Ω,1/8W,1%,TF,SMD1206	20121.511.01				
R407	RES,845Ω,1/8W,1%,TF,SMD1206	20122.845.01				
R408	RES,20.0K,1/8W,1%,TF,SMD1206	20124.200.01				
R415-16	RES,10K,1/8W,1%,TF,SMD1206	20124.100.01				
R417	RES,845Ω,1/8W,1%,TF,SMD1206	20122.845.01				
R418	RES,20.0K,1/8W,1%,TF,SMD1206	20124.200.01				
R424	RES,324K,1/8W,1%,TF,SMD1206	20125.324.01				
R425	RES,20.0K,1/8W,1%,TF,SMD1206	20124.200.01				
R428-29	RES,10K,1/8W,1%,TF,SMD1206	20124.100.01				
R430	RES,1.00M,1/8W,1%,TF,SMD1206	20126.100.01				
R431	RES,324K,1/8W,1%,TF,SMD1206	20125.324.01				
R432	RES,20.0K,1/8W,1%,TF,SMD1206	20124.200.01				
R433	RES,1.00M,1/8W,1%,TF,SMD1206	20126.100.01				
R434	RES,4.99K,1/8W,1%,TF,SMD1206	20123.499.01				
R435	RES,1.00M,1/8W,1%,TF,SMD1206	20126.100.01				
R436	RES,4.99K,1/8W,1%,TF,SMD1206	20123.499.01				
R437	RES,1.00M,1/8W,1%,TF,SMD1206	20126.100.01				
R339	RES,1.00M,1/8W,1%,TF,SMD1206	20126.100.01				
R600	RES,3.01K,1/8W,1%,TF,SMD1206	20123.301.01				
R601	RES,10K,1/8W,1%,TF,SMD1206	20124.100.01				
R602	RES,15K,1/8W,1%,TF,SMD1206	20124.150.01				
R603	RES,432Ω,1/8W,1%,TF,SMD1206	20122.432.01				

Ref Des	Description	Orban P/N	Ven	Vendor P/N	Alternate Vendors	Notes
	Resistors (continued)					
R605	RES,13.3K,1/8W,1%,TF,SMD1206	20124.133.01				
R606	RES,3.01K,1/8W,1%,TF,SMD1206	20123.301.01				
R607	RES,3.16K,1/8W,1%,TF,SMD1206	20123.316.01				
R608	RES,2.15K,1/8W,1%,TF,SMD1206	20123.215.01				
R611	RES,10Ω,1/8W,1%,TF,SMD1206	20121.100.01				
R614	RES,75.0K,1/8W,1%,TF,SMD1206	20124.750.01				
R700-32	RES,100K,1/8W,1%,TF,SMD1206	20125.100.01				
VR500	Trimpot, Cermet, 20 Turn; 1K	20512-210	BEK	89PR1K	BRN	
VR501	Trimpot, Cermet, 20 Turn; 1K	20512-210	BEK	89PR1K	BRN	
	Switches					
Q300-1	Transistor, JFET/N	23402-101	NAT	J108		
	Miscellaneous					
J100	CONN,"D",R-ANG,PCMOUNT;9P	27017.009.01				
J101	Connector, D Type, 25-pin	27017-025	AD	JMDF-25S		
J300	Connector, XLR, PC Mount, Female	27054-003	NEU	NC 3 FD-H		
J301-3						
J308	CONN,JUMPER RECEPTACLE,MINI;BLK	27401.000.01				
J400-1	Connector, XLR, PC Mount, Male	27053-003	NEU	NC 3 MD-H		
Y602	Oscillator; 16.384MHz	28074-001	ORB			
	ASSY,EPROM,9200 MAIN BD,V1.01	44063.101				
DISPLAY BOARD						
	Capacitors					
C1	Cap,6.8uF,25V,10%, Tantalum Chip SMT	21313.568.01				
C2-10	Ceramic, 50V, 20%; 1uF	21131-410	MUR	GRM42-6Z5U104M50BD		
	Diodes					
CR1-6	LED ARRAY, 9-YEL, 1-RED	25168.000.01				
CR7	LED ARRAY, 1-RED,1-YEL, 8-GRN	25167.000.01				
CR8	LED ARRAY, 1RED, 6YEL, 3GRN	25170.000.01				
CR9	LED ARRAY, 10POS, 1RED,9GREEN	25169.000.01				
CR10	LED, Red	25106-003	HP	HLMP-1300	GI	
CR11-13	LED, Yellow	25106-001	HP	HLMP-1400	GI	
CR14-15	LED, Yellow	25106-001	HP	HLMP-1400	GI	
	Integrated Circuits					
IC1-2	DATA LATCH,SMT	24908.000.01	SIG	74AC574		
IC3	Digital, Latch	24857-000	MOT	MC74HC374ADW		
IC4-6	DATA LATCH	24905.000.01	SIG	74FCT574SO		
IC7	Digital, Inverter	24900-000	TI	SN74HC14AD		
IC8	Digital, Transceiver	24851-000	SIG	74HC245D		
	Resistors					
	RES,274Ω,1/8W,1%,TF,SMD1206	20122.274.01				
	RES,NET,DIL,2%,100Ω,SMT,Isolated Res	20226.000.01				
R17-24	RES,110Ω,1/8W,1%,TF,SMD1206	20122.110.01				
R17-24	RES,274Ω,1/8W,1%,TF,SMD1206	20122.274.01				
R25-28	RES,100K,1/8W,1%,TF,SMD1206	20125.100.01				
R29-30	RES,10K,1/8W,1%,TF,SMD1206	20124.100.01				
RP1-2	RES,NET,DIL,2%,100Ω,SMT,Isolated Res	20226.000.01				

Ref Des	Description	Orban P/N	Ven	Vendor P/N	Alternate Vendors	Notes
POWER SUPPLY						
Capacitors						
C1-2	Alum. Radial, 35V; 1000uF	21256-000	PAN	ECEA1VGE102		
C3-4	Ceramic, Axial, 50V, 20%; 0.1uF	21129-410	KEM	C410C104M5UCA		
C5-6	Alum., Radial, 25V, 10%; 100uF	21263-710	NIC	UKLIE101KPAANA		
C7-10	Ceramic, Axial, 50V, 20%; 0.1uF	21129-410	KEM	C410C104M5UCA		
C11	Alum., Radial, 25V, 10%; 100uF	21263-710	NIC	UKLIE101KPAANA		
C12-13	Ceramic, Axial, 50V, 20%; 0.1uF	21129-410	KEM	C410C104M5UCA		
C14	Alum., Radial, 25V, 10%; 100uF	21263-710	NIC	UKLIE101KPAANA		
C15	Alum. Radial, 16V; 6800uF	21255-000	PAN	ECOS1CA682AA		
C16-17	Ceramic, Axial, 50V, 20%; 0.1uF	21129-410	KEM	C410C104M5UCA		
C18	Alum. Radial, 25V; 47uF	21206-747	PAN	ECEAIEU471		
C19	Alum. Radial, 35V; 1000uF	21256-000	PAN	ECEA1VGE102		
C20	Ceramic, Axial, 50V, 20%; 0.1uF	21129-410	KEM	C410C104M5UCA		
Diodes						
CR1-CR9	Diode, Rectifier, 400V, 1A	22201-400	MOT	1N4004	MANY	
CR10	Diode, Zener, 1W, 5%; 5.6V	22004-056	MOT	1N4734A		
CR11	Diode, Rectifier, 400V, 1A	22201-400	MOT	1N4004	MANY	
CR12	Diode, Zener, 1W, 5%; 5.6V	22004-056	MOT	1N4734A		
CR13-15	Diode, Rectifier	22015-000	TAT	SBL-1630CT		
CR16	Diode, Zener, 1W, 5%; 5.6V	22004-056	MOT	1N4734A		
CR17-19	Diode, Rectifier, 400V, 1A	22201-400	MOT	1N4004	MANY	
CR20	Diode, Signal	22101-000	FSC	1N4148	MANY	
Integrated Circuits						
IC1-2	TRANSISTOR MTG. KIT;TO-220	15025.000.01				
IC1	D.C. Regulator, 15V Positive	24304-901	NAT	LM78M15UC	TI,MOT	
IC2	D.C. Regulator, 15V Negative	24303-901	NAT	LM79M15AUC	TI,MOT	
IC3-4	HEATSINK,TO-220	16013.000.01				
IC4	D.C. Regulator, 5V Negative	24308-901	NAT	LM79M05C	TI,MOT	
IC5	Regulator, 5V	24321-000	LT	LT1086CK-5		
IC13	D.C. Regulator, 5V Positive	24307-901	NAT	LM78M05C	TI,MOT	
Q1	HEATSINK,TO-220	16013.000.01				
Resistors						
R3-6	Resistor, CF, 1/2W, 5%; 2.0Ω	20021-920	ORB			
	RES,MO,1W,5%,120Ω	20140.120.01				
V1,V2	Varistor	22500-271	PAN	ERZ-C10DK271U		
Switches						
S1	Switch, Slide, Mains voltage selector	26143-000	SW	EPS2-PC3		
S2	Switch, Slide, SPDT	26146-000	ECG	SSP1-S1-M7-Q-E-A		
Transistors						
Q1	Transistor, Power, NPN	23606-201	TI	TIP120		
Q2	Transistor, Signal, NPN	23202-101	MOT	2N4400	FSC	
Miscellaneous						
F1	Fuse, 3AG, Slo-Blo, 1/2A	28004-150	LFE	313.500	BUS	
F1	Fuseholder, PC Mount	28112-001	LFE	345-101-01		
L1	Filter, Line	28012-000	DEL	03ME1		

Ref Des	Description	Orban P/N	Ven	Vendor P/N	Alternate Vendors	Notes
FINAL ASSEMBLY						
	Miscellaneous					
	ASSY,CABLE,ROTARY,SIGNAL,9200	43026.006				
	LCD,GRB,BCKLGHT,GRY FLUID	25404.001.01				
	PCA NRSC MON.ROLL.FILTR; 9100B	31020.000				
	RECEPTACLE,2.8MMX0.5MM TAB	27746.001.01				
	SW,ROTARY ENCODER,VERT MNT,2-BIT,NON-DE1	26085.000.01				
	Switch, Slide; DPDT (Gold)	26106-000	CW	GF326-0149		
	XFMR, TOROID, 100V	55036.000.03				JPN
	XFMR,TOROID,115/230V	55035.000.03				USA/ EU

Vendor Codes

AB	Rockwell Allen-Bradley 625 Liberty Ave Pittsburgh, PA 15222-3123
AD	Analog Devices, Inc. One Technology Way PO Box 9106 Norwood, MA 02062-9106
AKG	AKG Acoustics, Inc. See Orban
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 Electronics 1700 Rte. 23 North Wayne, NJ 07470
CRL	Mepcopal/Centralab See Mepcopal
CRY	Crystal Semiconductor Corp 4210S Industrial Drive Austin, TX 78744
CSC	Crystal Semiconductor Corp. 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
DAL	Dale 1122 23rd St Columbus, NE 68601-3647
DBX	dbx A Harman International Company 8760 South Sandy Parkway Sandy, UT 84107
DEL	Delta Products Corp 3225 Laurel View Ct. Fremont, CA 94538
DUR	Duracell, Inc. Berkshire Industrial Park Bethel, CT 06801
ELSW	Electro Switch 77 King Avenue Weymouth, MA 02188
EMI	Crompton Modutec 920 Candia Rd. Manchester, NH 03109
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 1301 Woody Burke Rd. Melbourne, FL 32901
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. 7545 Rockville Rd. PO Box 1284 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 1601 N. Powerline Rd. Pampano, FL 33069
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	Crystal Biotech 75 South Street Hopkinton, MA 01748
NIC	Nichicon 927 East State Parkway Schaumburg, Ill 60713
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 Manufactoring Company 3601 Howard Street Skokie, IL 60076
ORB	Orban A Harman International Company 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. 2315 NW 107th Ave. Miami, FL 33172
RAY	Raytheon Company Semiconductor Division 350 Ellis Street Mountain View, CA 94039
RCA	RCA Solid State See Harris Semiconductor
ROHM	Rohm Electronics 3034 Owens Dr. Antioch, TENN 37013
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 Manifold, MA 02048-9102
S.W.	Seitchcraft A Raytheon Company 5555 N. Elation Avenue Chicago, IL 60630
AT	Taiga 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 655012 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	Micro Quality Semiconductor, Inc. PO Box 469013 Garland, TX 75046-9013
WES	Westlake See Mallory Capacitor Co.
WIM	Wima Division 2269 Saw Mill Rd. Building 4C PO Box 217 Elmsford, NY 10533
ZI	ZILOG Inc. 210 Hacienda Ave. Campbell, CA 95008

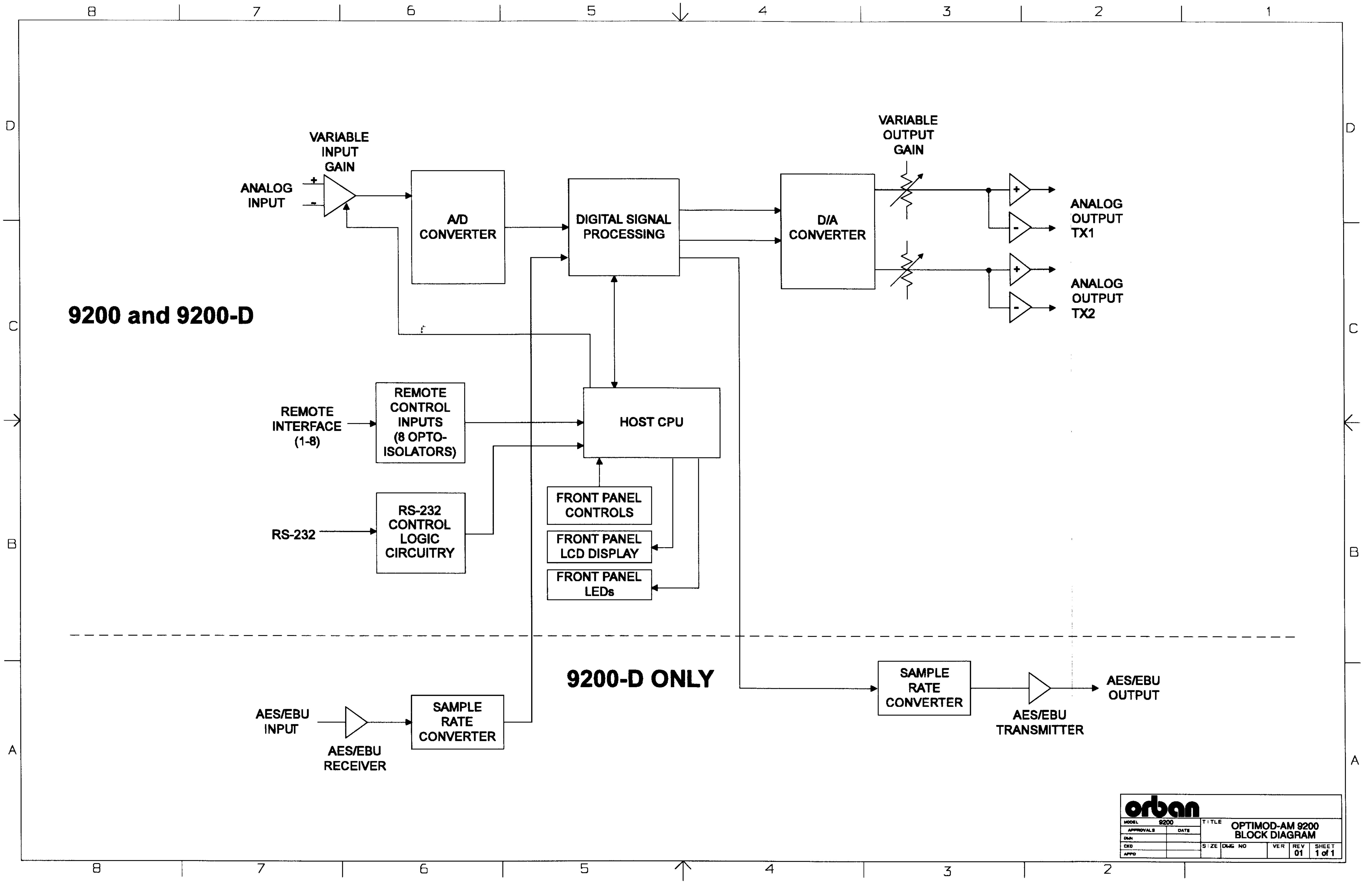
Schematics, Assembly Drawings

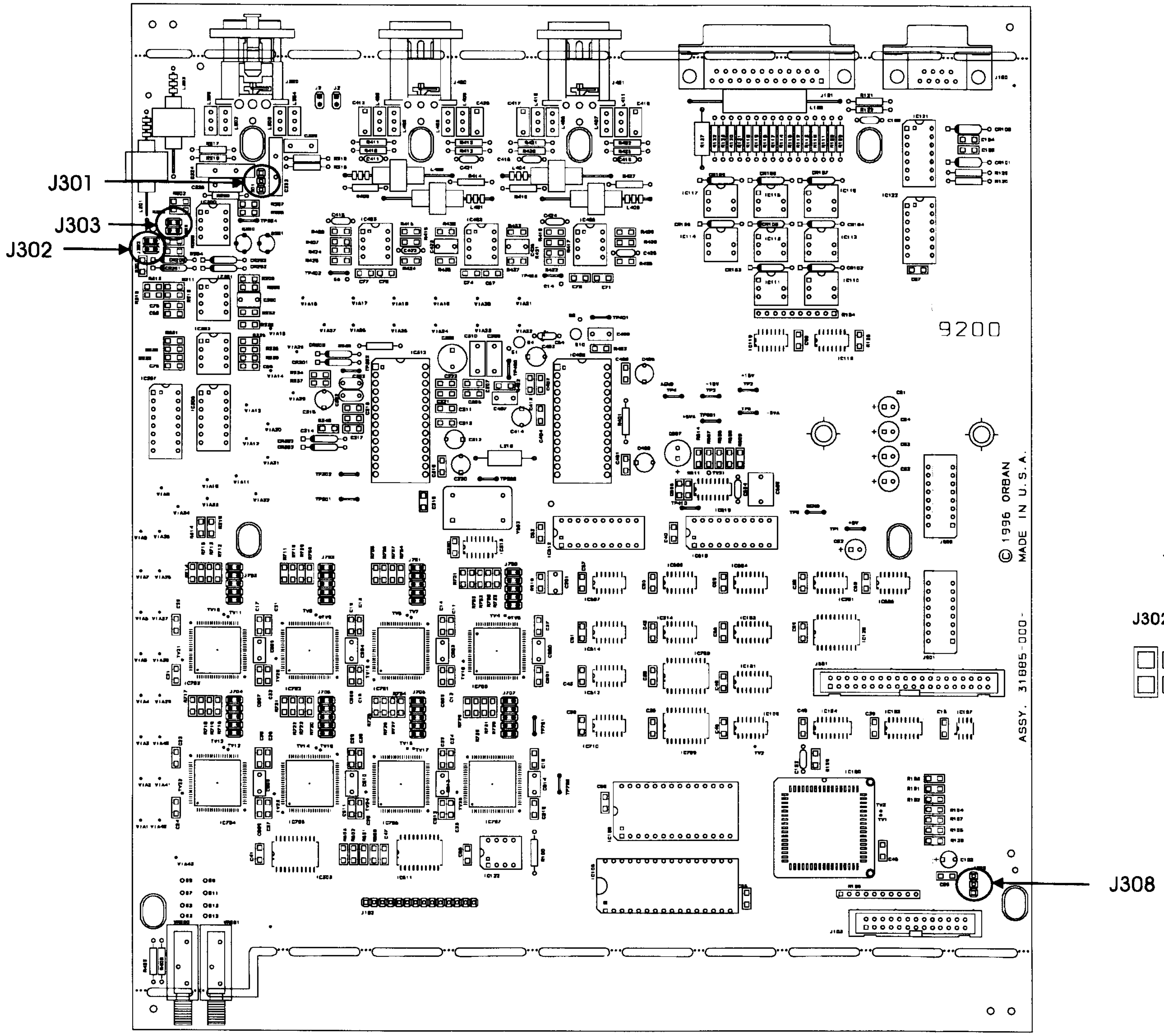
The following drawings are included in this manual:

Page	Function	Circuit Board	Drawing
6-29	Block Diagram		
6-30	Audio Processing	Main	Assembly Drawing
6-31	CPU/Remote/232		Schematic 1 of 7
6-32	Analog Input		2 of 7
6-33	Analog Output		3 of 7
6-34	Clock Circuits		4 of 7
6-35	DSP 1		5 of 7
6-36	DSP 2		6 of 7
6-37	Power Distribution		7 of 7
6-38	Display, Controls	Display	Assembly Drawing
6-39	Display, Controls		Schematic 1 of 1
6-40	Digital I/O Board	Digital I/O	Assembly Drawing
6-41	Digital I/O Board		Schematic 1 of 1
6-42	Power Supply	Power Supply (A)	Assembly Drawing
6-43	Power Supply		Schematic 1 of 1
6-44	Power Supply	Power Supply (B)	Assembly Drawing
6-45	Power Supply		Schematic 1 of 1

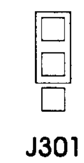
These drawings reflect the actual construction of your unit as accurately as possible. Any differences between the drawings and your unit are almost undoubtedly due to product improvements or production changes since the publication of this manual.

If you intend to replace parts, please read page 6-19

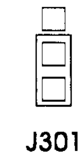

9200 and 9200-D
VARIABLE INPUT GAIN
ANALOG INPUT
+
-
A/D CONVERTER
DIGITAL SIGNAL PROCESSING
D/A CONVERTER
VARIABLE OUTPUT GAIN
ANALOG OUTPUT TX1
ANALOG OUTPUT TX2
REMOTE INTERFACE (1-8)
REMOTE CONTROL INPUTS (8 OPTO-ISOLATORS)
HOST CPU
RS-232
RS-232 CONTROL LOGIC CIRCUITRY
FRONT PANEL CONTROLS
FRONT PANEL LCD DISPLAY
FRONT PANEL LEDs
9200-D ONLY
AES/EBU INPUT
AES/EBU RECEIVER
SAMPLE RATE CONVERTER
SAMPLE RATE CONVERTER
AES/EBU TRANSMITTER
AES/EBU OUTPUT
orban
MODEL 9200
TITLE OPTIMOD-AM 9200 BLOCK DIAGRAM
REV 01
SHEET 1 of 1



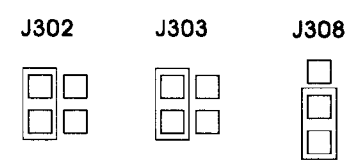
Jumper Settings
3.6kΩ Balanced Bridging
(as shipped)



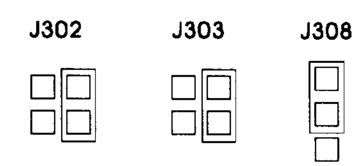
Jumper Settings
600Ω Terminate



Jumper Settings
+27 To +5dBu Peak
(as shipped)

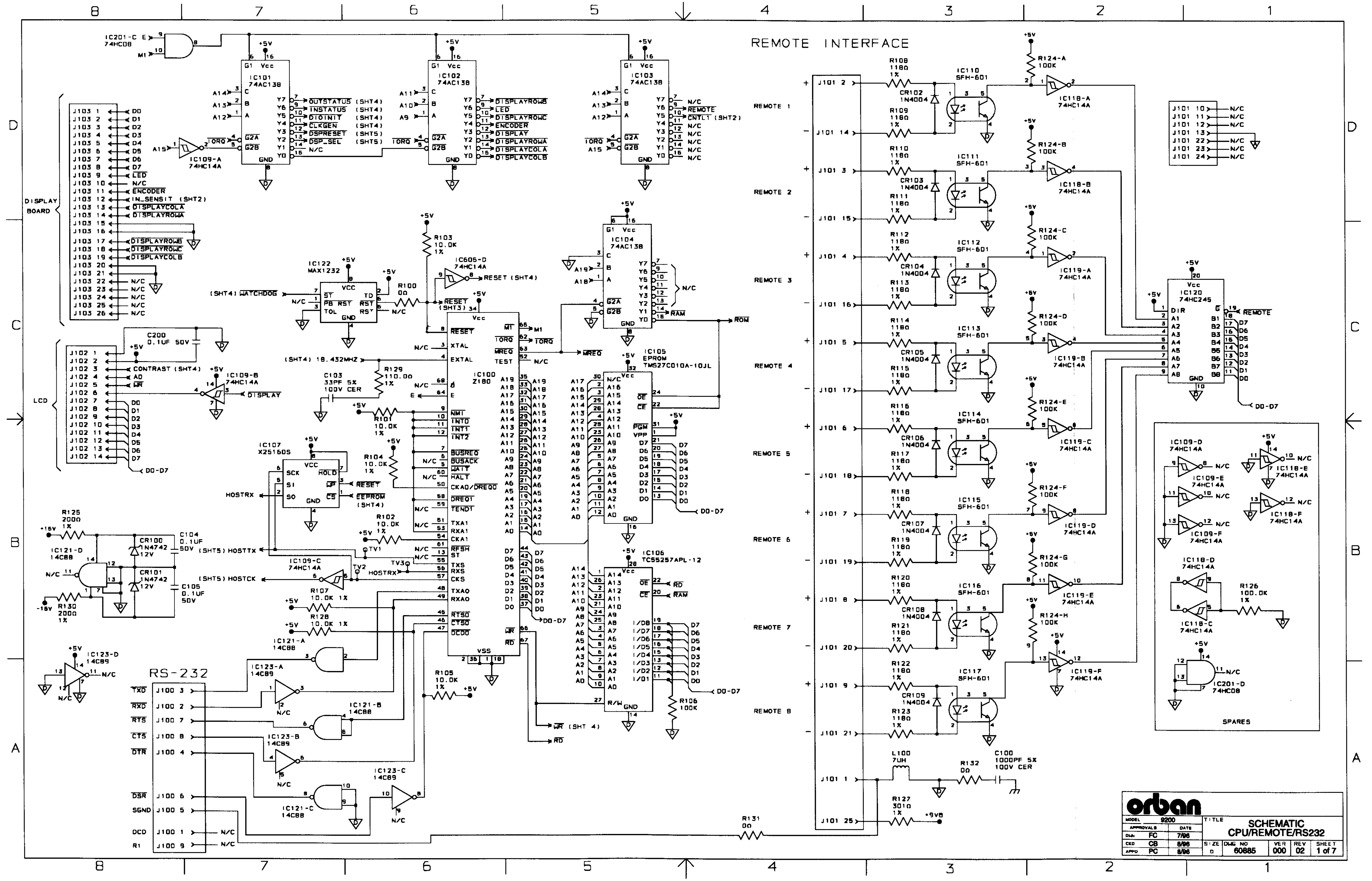


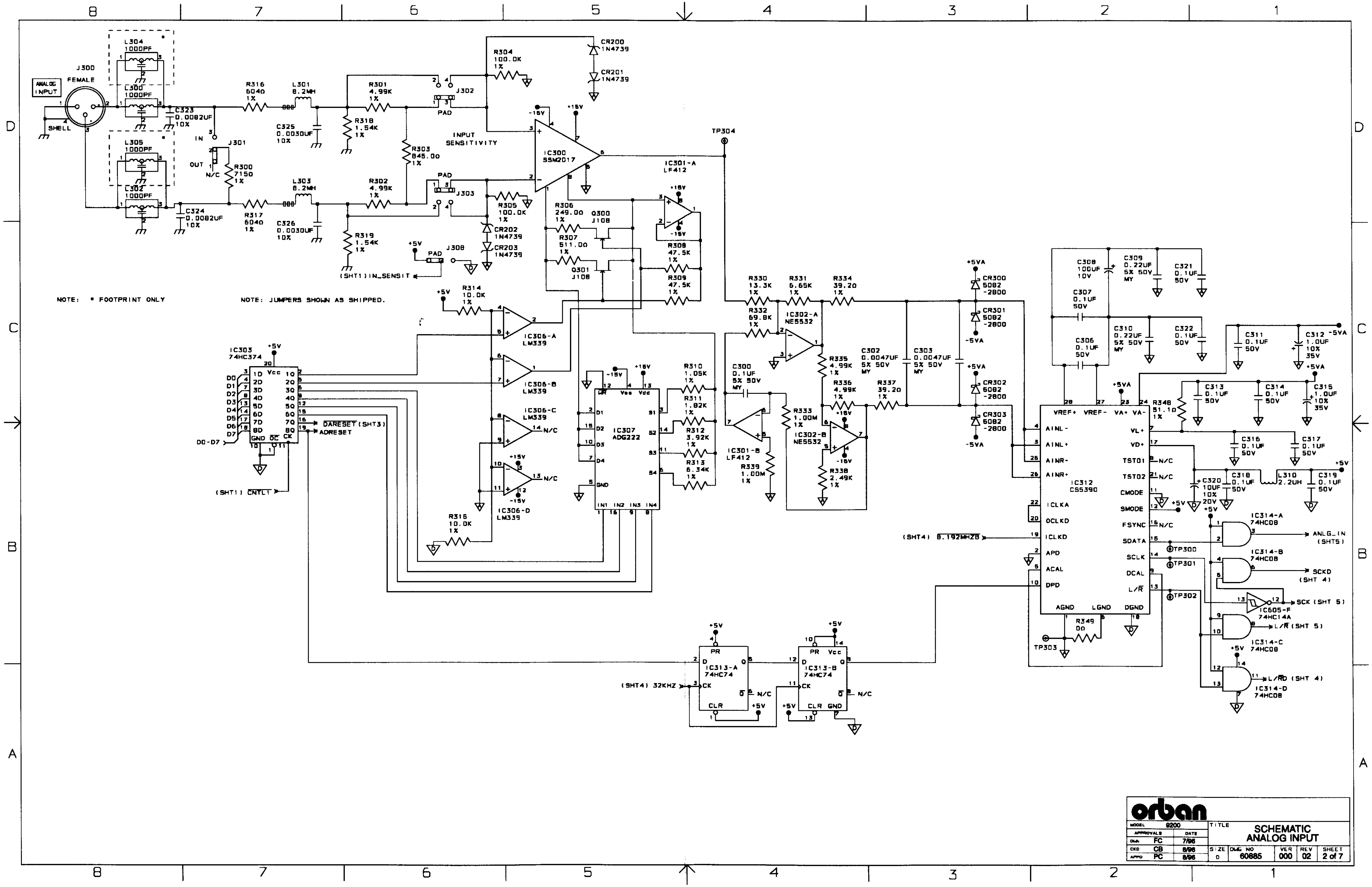
Jumper Settings
+5 To −17dBu Peak

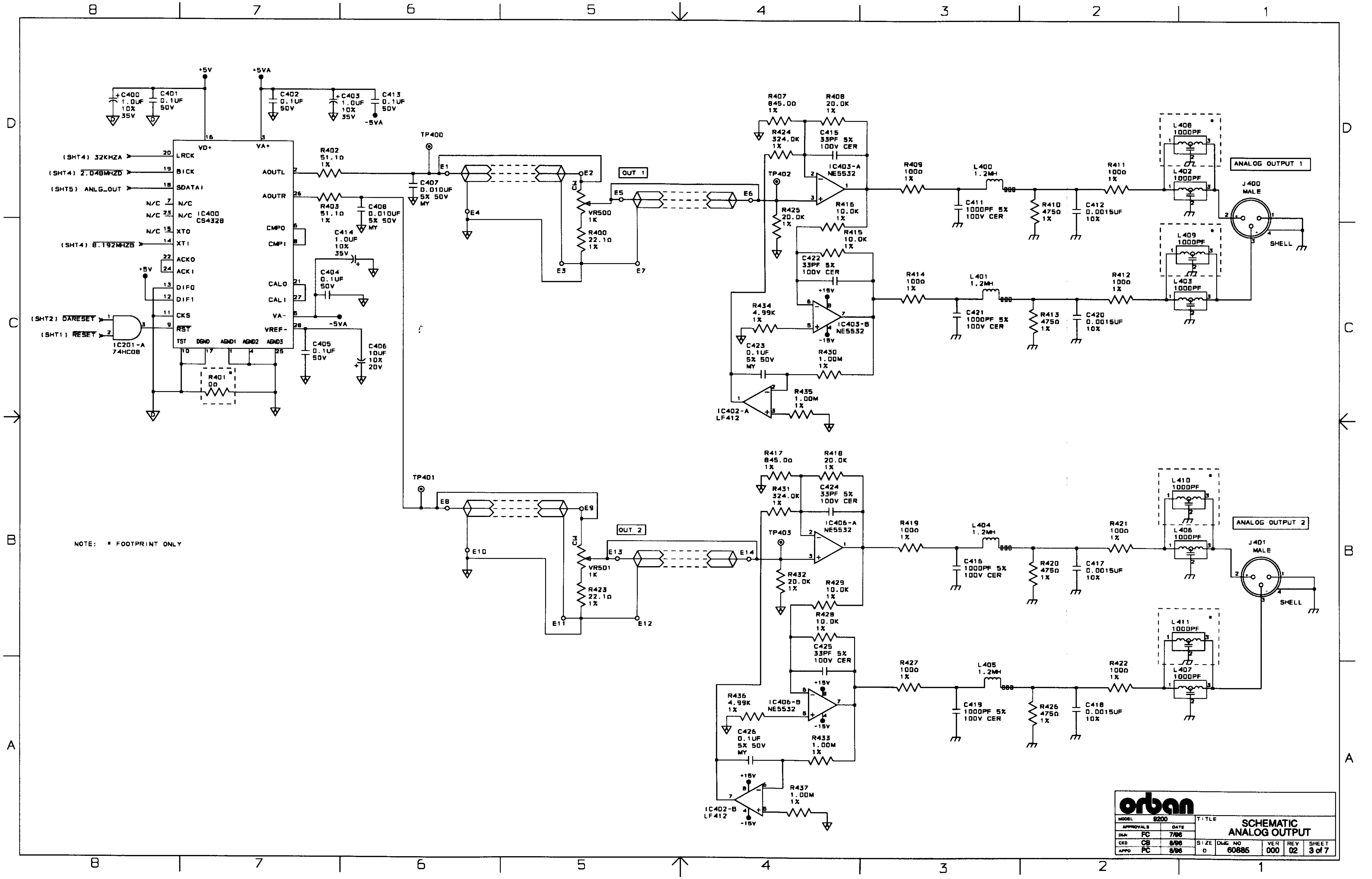


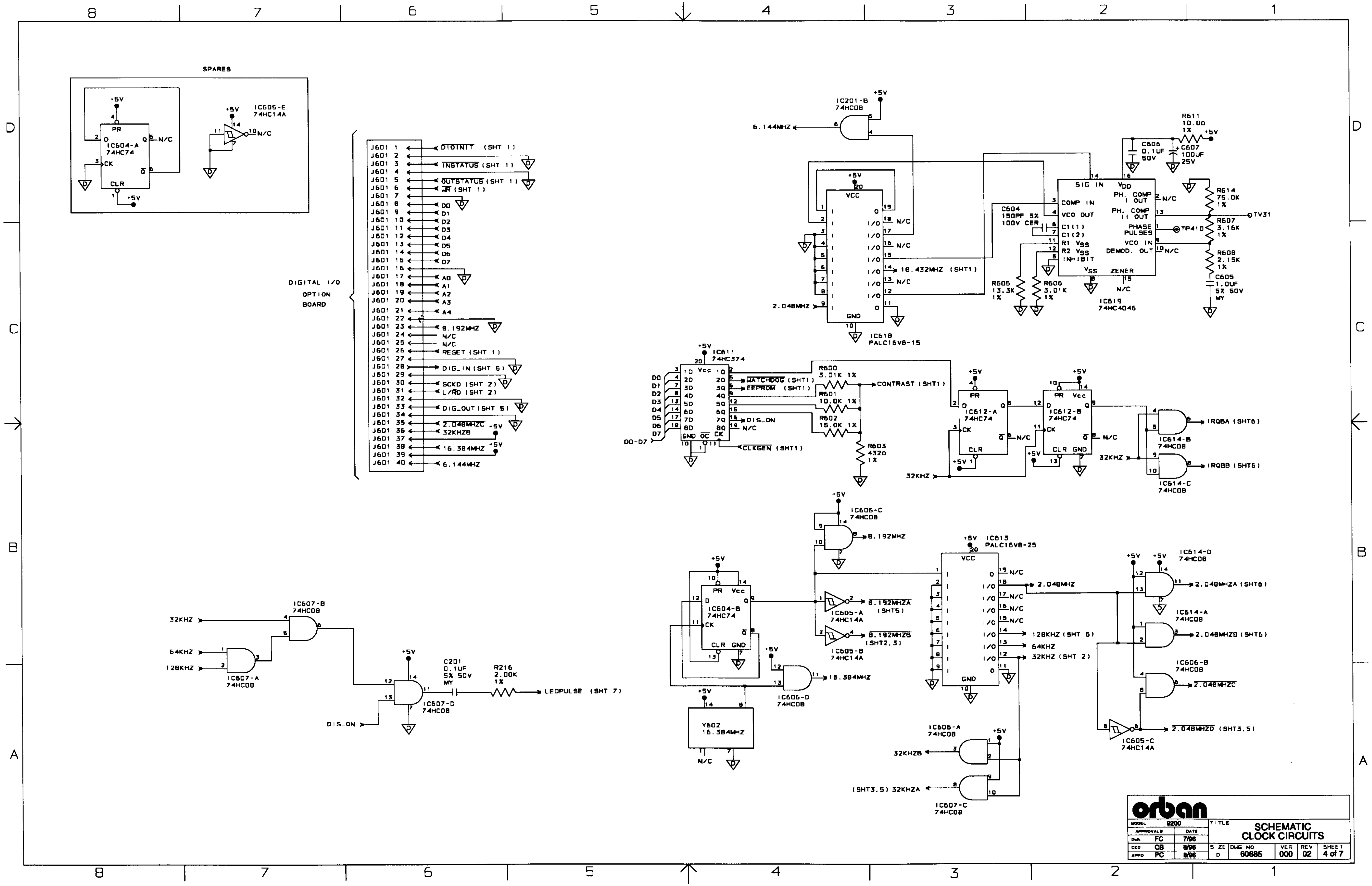
orban

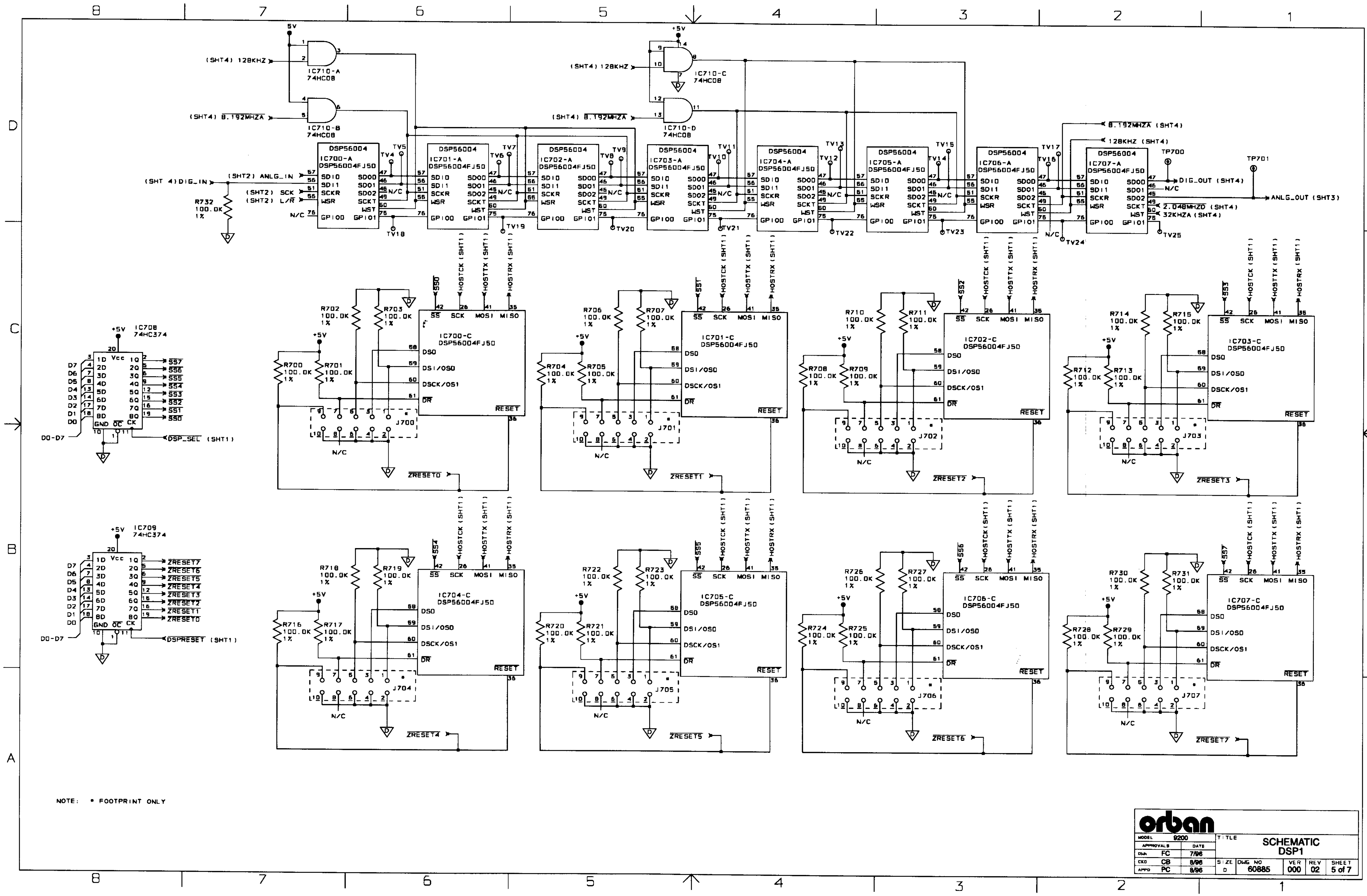
MODEL	9200	TITLE	PCB ASSEMBLY MAIN		
APPROVALS	DATE				
DWN FC	7/96				
CKD CB	8/96	SIZE D	DWG NO 31885	VER 000	REV 05
APPD PC	8/96				SHEET 1 of 1


REMOTE INTERFACE
REMOTE 1
REMOTE 2
REMOTE 3
REMOTE 4
REMOTE 5
REMOTE 6
REMOTE 7
REMOTE 8
RS-232
DISPLAY BOARD
LCD
SPARES
IC100 Z180
IC101 74AC138
IC102 74AC138
IC103 74AC138
IC104 74AC138
IC105 EPROM TMS27C010A-10JL
IC106 TC55257APL-12
IC107 X25160S
IC122 MAX1232
IC120 74HC245
orban
MODEL 9200
TITLE SCHEMATIC CPU/REMOTE/RS232
DWG NO 60685
VER 000
REV 02
SHEET 1 of 7


ANALOG INPUT
J300 FEMALE
SHELL
NOTE: * FOOTPRINT ONLY
NOTE: JUMPERS SHOWN AS SHIPPED.
INPUT SENSITIVITY
PAD
IN
OUT
N/C
IC300 SSM2017
IC301-A LF412
IC301-B LF412
IC302-A NE5532
IC302-B NE5532
IC303 74HC374
IC306-A LM339
IC306-B LM339
IC306-C LM339
IC306-D LM339
IC307 ADG222
IC312 CS5390
IC313-A 74HC74
IC313-B 74HC74
IC314-A 74HC08
IC314-B 74HC08
IC314-C 74HC08
IC314-D 74HC08
IC605-F 74HC14A
TP300
TP301
TP302
TP303
TP304
(SHT1) IN_SENSIT
(SHT1) CNTL1
DARESET (SHT3)
ADRESET
D0-D7
(SHT4) 8.192MHZB
(SHT4) 32KHZ
ANLG_IN (SHT5)
SCKD (SHT 4)
SCK (SHT 5)
L/R (SHT 5)
L/RD (SHT 4)
orban
MODEL 9200
APPROVALS DATE
DWN FC 7/96
CKD CB 8/96
APPD PC 8/96
TITLE SCHEMATIC ANALOG INPUT
SIZE D
DWG NO 60685
VER 000
REV 02
SHEET 2 of 7

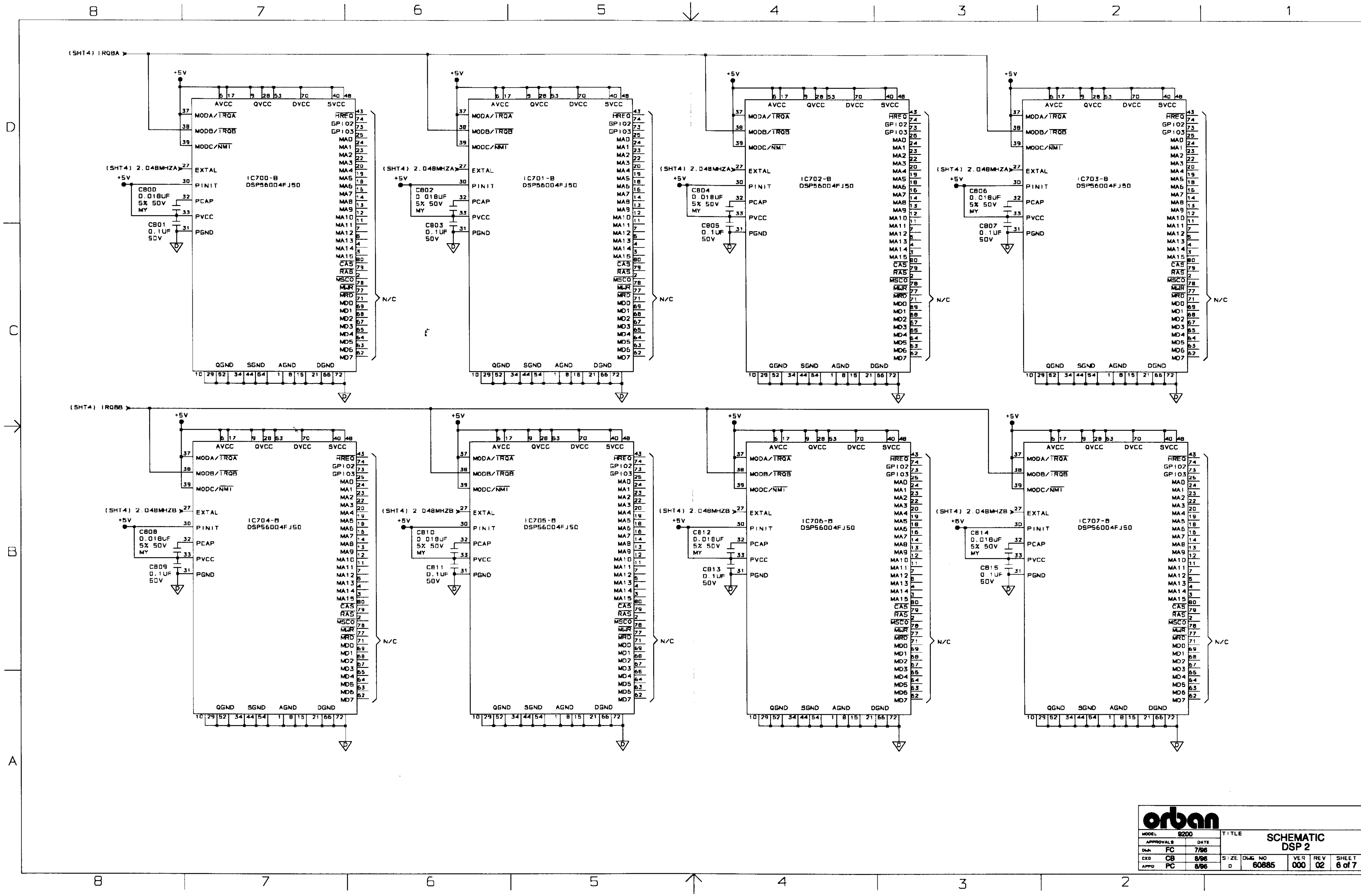

+5V
+5VA
C400 1.0UF 10% 35V
C401 0.1UF 50V
C402 0.1UF 50V
C403 1.0UF 10% 35V
C413 0.1UF 50V
-5VA
(SHT4) 32KHZA
(SHT4) 2.048MHZD
(SHT5) ANLG_OUT
(SHT4) 8.192MHZD
IC400 CS4328
LRCK
BICK
SDATAI
AOUTL
AOUTR
CMPO
CMPI
XTO
XTI
ACKO
ACKI
DIFO
DIF1
CKS
RST
CALO
CALI
VA-
VREF-
(SHT2) DARESET
(SHT1) RESET
IC201-A 74HC08
R401 0Ω
R402 51.1Ω 1%
R403 51.1Ω 1%
C407 0.010UF 5% 50V MY
C408 0.010UF 5% 50V MY
C414 1.0UF 10% 35V
C404 0.1UF 50V
C405 0.1UF 50V
C406 10UF 10% 20V
TP400
TP401
OUT 1
OUT 2
VR500 1K
R400 22.1Ω 1%
VR501 1K
R423 22.1Ω 1%
R407 845.0Ω 1%
R408 20.0K 1%
R424 324.0K 1%
C415 33PF 5% 100V CER
IC403-A NE5532
TP402
R425 20.0K 1%
R416 10.0K 1%
R415 10.0K 1%
C422 33PF 5% 100V CER
R434 4.99K 1%
IC403-B NE5532
C423 0.1UF 5% 50V MY
R430 1.00M 1%
R435 1.00M 1%
IC402-A LF412
R409 100Ω 1%
L400 1.2MH
C411 1000PF 5% 100V CER
R410 475Ω 1%
C412 0.0015UF 10%
R411 100Ω 1%
L408 1000PF
L402 1000PF
ANALOG OUTPUT 1
J400 MALE
SHELL
L409 1000PF
L403 1000PF
R414 100Ω 1%
L401 1.2MH
C421 1000PF 5% 100V CER
R413 475Ω 1%
C420 0.0015UF 10%
R412 100Ω 1%
R417 845.0Ω 1%
R418 20.0K 1%
R431 324.0K 1%
C424 33PF 5% 100V CER
IC406-A NE5532
TP403
R432 20.0K 1%
R429 10.0K 1%
R428 10.0K 1%
C425 33PF 5% 100V CER
R436 4.99K 1%
IC406-B NE5532
C426 0.1UF 5% 50V MY
R433 1.00M 1%
R437 1.00M 1%
IC402-B LF412
R419 100Ω 1%
L404 1.2MH
C416 1000PF 5% 100V CER
R420 475Ω 1%
C417 0.0015UF 10%
R421 100Ω 1%
L410 1000PF
L406 1000PF
ANALOG OUTPUT 2
J401 MALE
L411 1000PF
L407 1000PF
R427 100Ω 1%
L405 1.2MH
C419 1000PF 5% 100V CER
R426 475Ω 1%
C418 0.0015UF 10%
R422 100Ω 1%
NOTE: * FOOTPRINT ONLY
orban
MODEL 9200
DWN FC 7/96
CKD CB 8/96
APPD PC 8/96
TITLE SCHEMATIC ANALOG OUTPUT
SIZE D
DWG NO 60685
VER 000
REV 02
SHEET 3 of 7


SPARES
IC604-A
74HC74
IC605-E
74HC14A
DIGITAL I/O
OPTION
BOARD
DIOINIT (SHT 1)
INSTATUS (SHT 1)
OUTSTATUS (SHT 1)
WR (SHT 1)
RESET (SHT 1)
DIG_IN (SHT 5)
SCKD (SHT 2)
L/RD (SHT 2)
DIG_OUT (SHT 5)
2.048MHZC
32KHZB
16.384MHZ
6.144MHZ
8.192MHZ
IC201-B
74HC08
IC618
PALC16V8-15
18.432MHZ (SHT1)
IC619
74HC4046
R611
10.0Ω
1%
C606
0.1UF
50V
C607
100UF
25V
R614
75.0K
1%
R607
3.16K
1%
R608
2.15K
1%
C605
1.0UF
5% 50V
MY
TV31
TP410
C604
150PF 5%
100V CER
R605
13.3K
1%
R606
3.01K
1%
IC611
74HC374
D0-D7
WATCHDOG (SHT1)
EEPROM (SHT1)
R600
3.01K 1%
R601
10.0K 1%
R602
15.0K 1%
R603
432Ω
1%
CONTRAST (SHT1)
DIS_ON
CLKGEN (SHT1)
IC612-A
74HC74
IC612-B
74HC74
IC614-B
74HC08
IC614-C
74HC08
IRQ8A (SHT6)
IRQ8B (SHT6)
32KHZ
IC606-C
74HC08
IC604-B
74HC74
IC605-A
74HC14A
IC605-B
74HC14A
8.192MHZA (SHT5)
8.192MHZB (SHT2,3)
IC606-D
74HC08
Y602
16.384MHZ
IC613
PALC16V8-25
2.048MHZ
128KHZ (SHT 5)
64KHZ
32KHZ (SHT 2)
IC614-D
74HC08
IC614-A
74HC08
IC606-B
74HC08
IC605-C
74HC14A
2.048MHZA (SHT6)
2.048MHZB (SHT6)
2.048MHZD (SHT3,5)
IC606-A
74HC08
IC607-C
74HC08
32KHZB
(SHT3,5) 32KHZA
IC607-B
74HC08
IC607-A
74HC08
IC607-D
74HC08
64KHZ
128KHZ
C201
0.1UF
5% 50V
MY
R216
2.00K
1%
LEDPULSE (SHT 7)
orban
MODEL 9200
DWN FC 7/96
CKD CB 8/96
APPD PC 8/96
TITLE
SCHEMATIC
CLOCK CIRCUITS
SIZE D
DWG NO 60685
VER 000
REV 02
SHEET 4 of 7



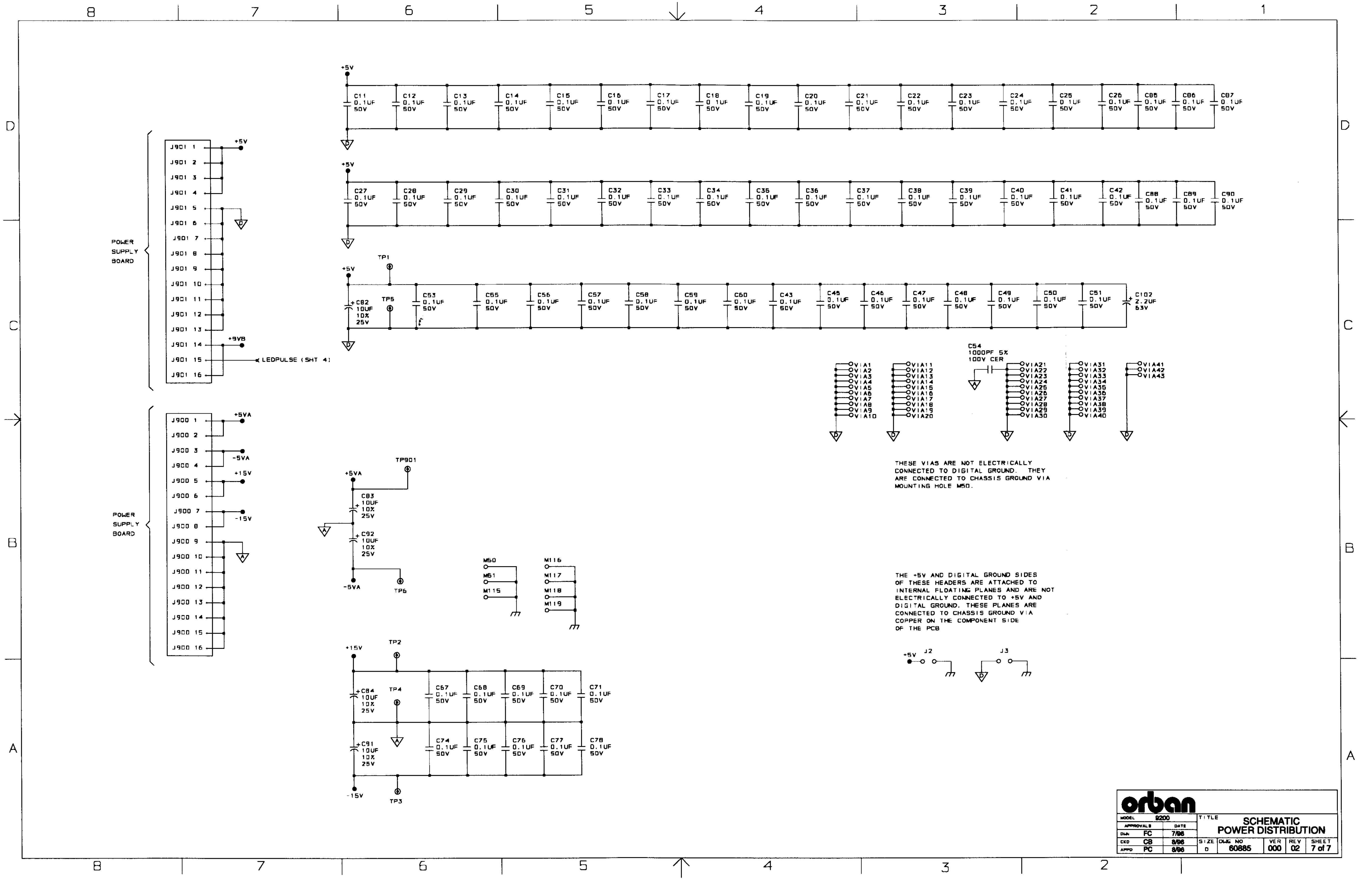
orban

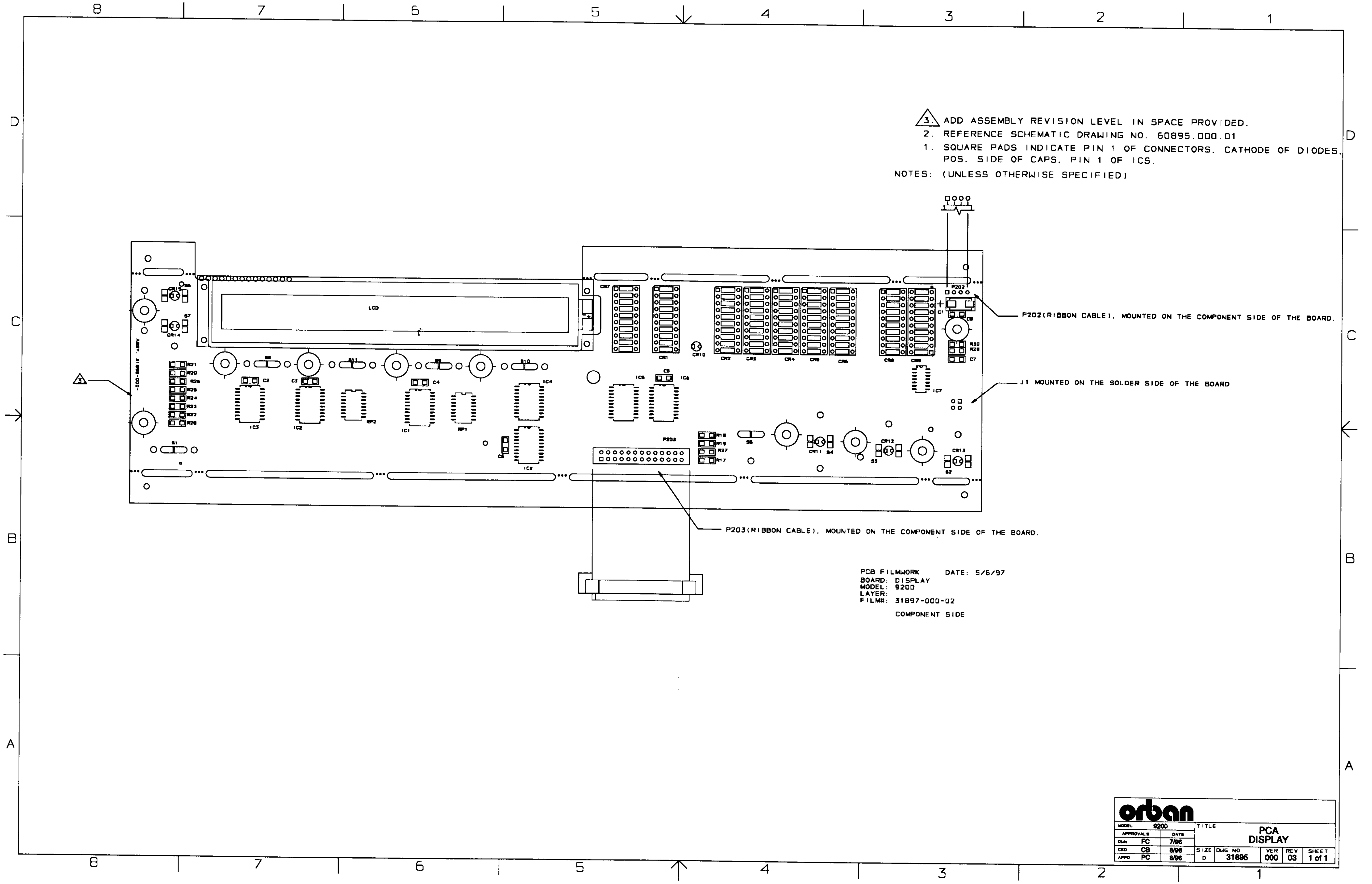
MODEL	9200	TITLE	SCHEMATIC DSP1
APPROVALS	DATE		
DRN FC	7/96		
CKD CB	8/96	SIZE D	DWG NO 60885
APPD PC	8/96	VER 000 REV 02	SHEET 5 of 7

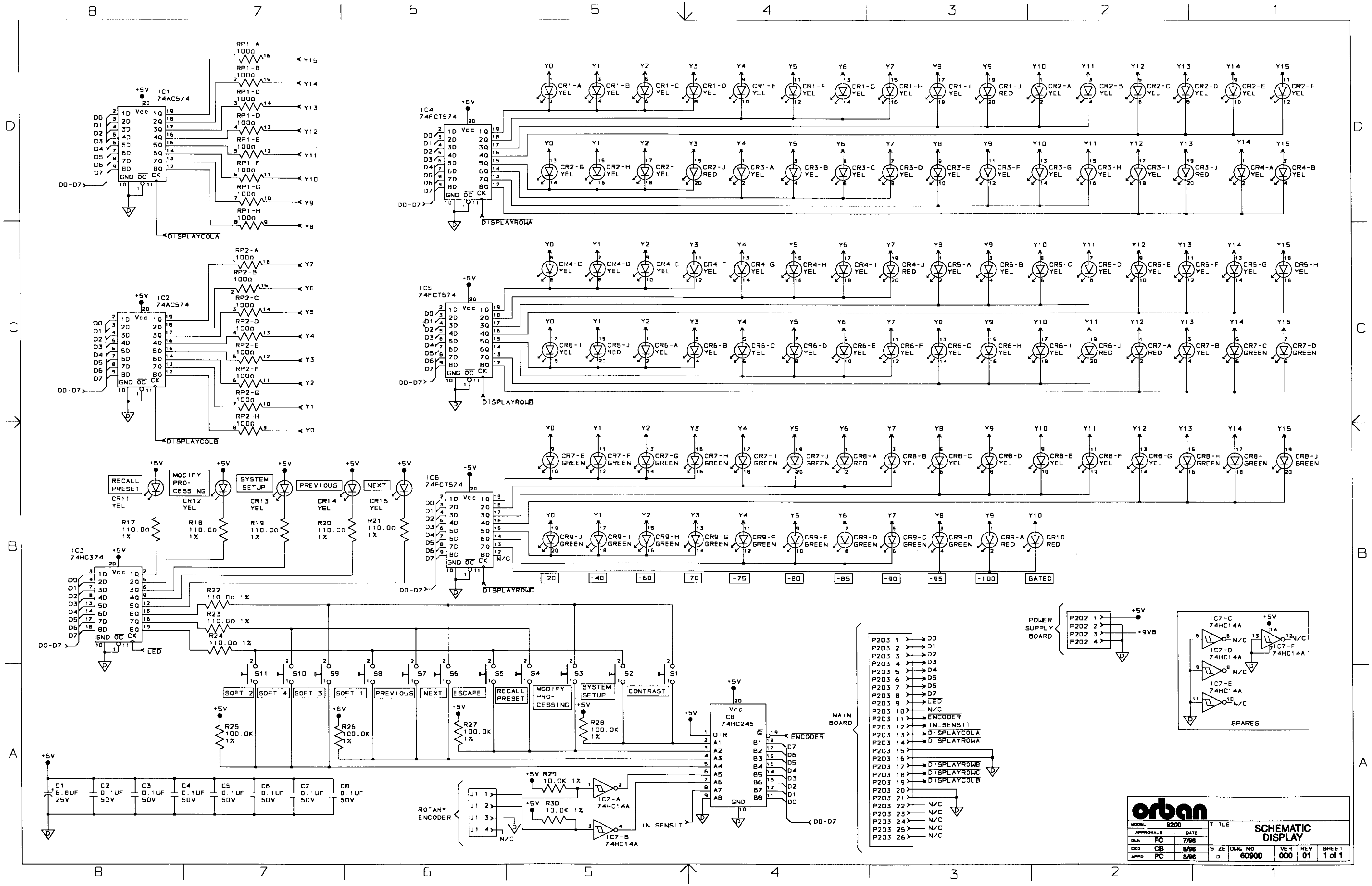


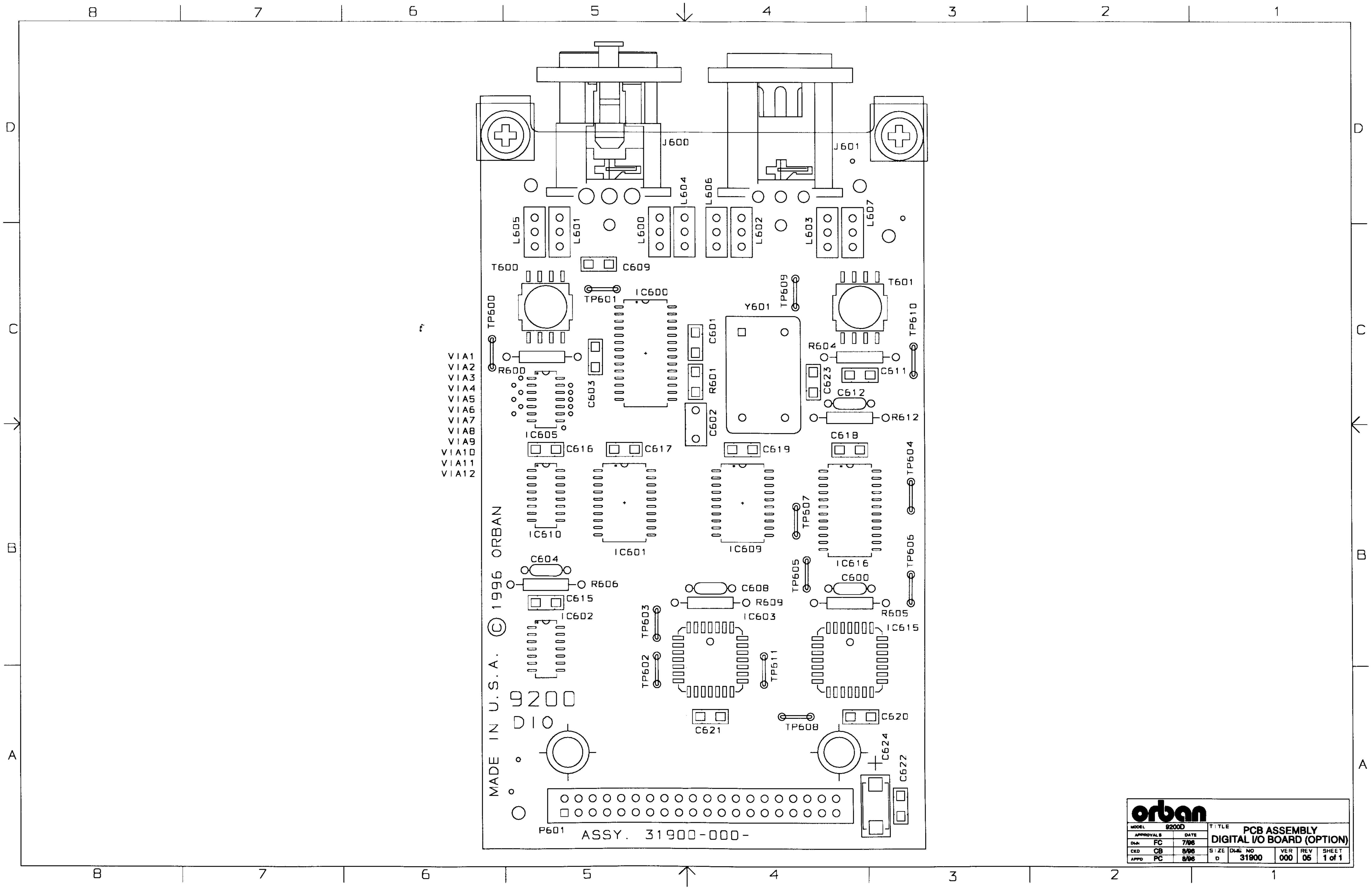
orban

MODEL	9200	TITLE	SCHEMATIC DSP 2
APPROVALS	DATE		
DWN FC	7/96		
CKD CB	8/96	SIZE D	DWG NO 60885
APPD PC	8/96	VER 000	REV 02 SHEET 6 of 7

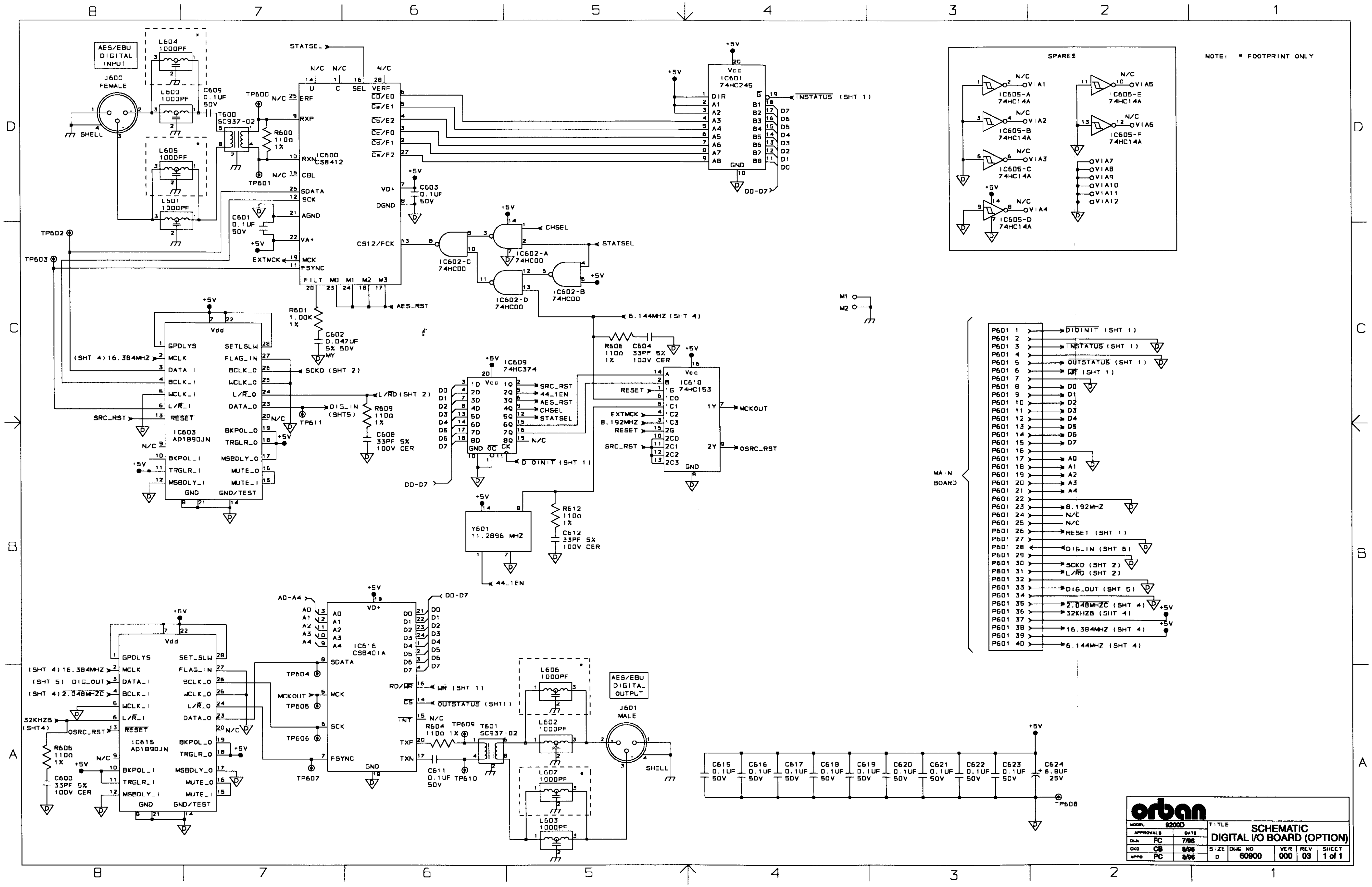

POWER SUPPLY BOARD
POWER SUPPLY BOARD
LEDPULSE (SHT 4)
THESE VIAS ARE NOT ELECTRICALLY CONNECTED TO DIGITAL GROUND. THEY ARE CONNECTED TO CHASSIS GROUND VIA MOUNTING HOLE M50.
THE +5V AND DIGITAL GROUND SIDES OF THESE HEADERS ARE ATTACHED TO INTERNAL FLOATING PLANES AND ARE NOT ELECTRICALLY CONNECTED TO +5V AND DIGITAL GROUND. THESE PLANES ARE CONNECTED TO CHASSIS GROUND VIA COPPER ON THE COMPONENT SIDE OF THE PCB
orban
MODEL 8200
TITLE SCHEMATIC POWER DISTRIBUTION
DWN FC 7/96
CKD CB 8/96
APPD PC 8/96
SIZE D
DWG NO 60885
VER 000
REV 02
SHEET 7 of 7

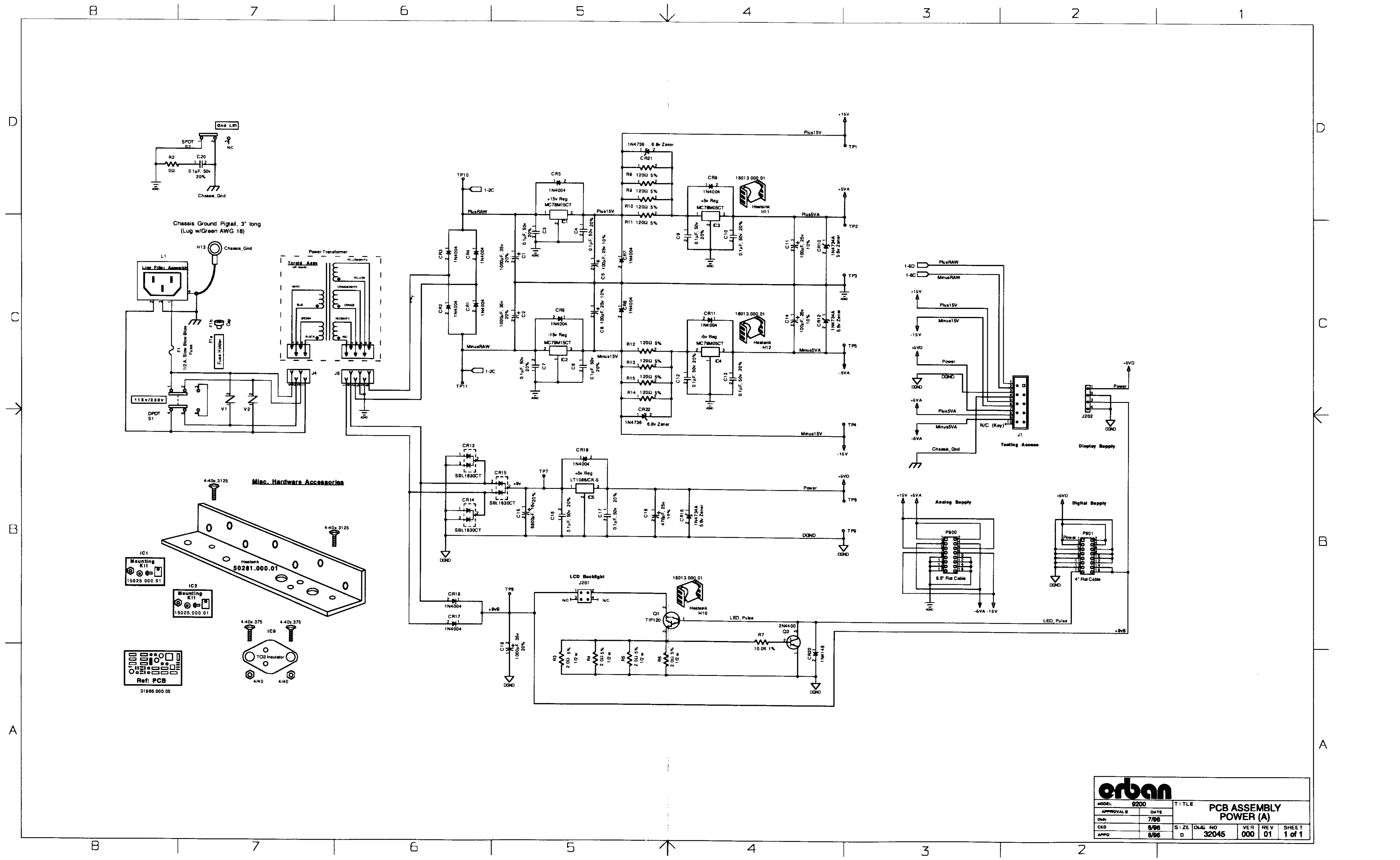

3. ADD ASSEMBLY REVISION LEVEL IN SPACE PROVIDED.
2. REFERENCE SCHEMATIC DRAWING NO. 60895.000.01
1. SQUARE PADS INDICATE PIN 1 OF CONNECTORS, CATHODE OF DIODES, POS. SIDE OF CAPS, PIN 1 OF ICS.
NOTES: (UNLESS OTHERWISE SPECIFIED)
P202(RIBBON CABLE), MOUNTED ON THE COMPONENT SIDE OF THE BOARD.
J1 MOUNTED ON THE SOLDER SIDE OF THE BOARD
P203(RIBBON CABLE), MOUNTED ON THE COMPONENT SIDE OF THE BOARD.
LCD
PCB FILMWORK DATE: 5/6/97
BOARD: DISPLAY
MODEL: 9200
LAYER:
FILM#: 31897-000-02
COMPONENT SIDE
orban
MODEL 9200
TITLE PCA DISPLAY
DWN FC 7/96
CKD CB 8/96
APPD PC 8/96
SIZE D
DWG NO 31895
VER 000
REV 03
SHEET 1 of 1

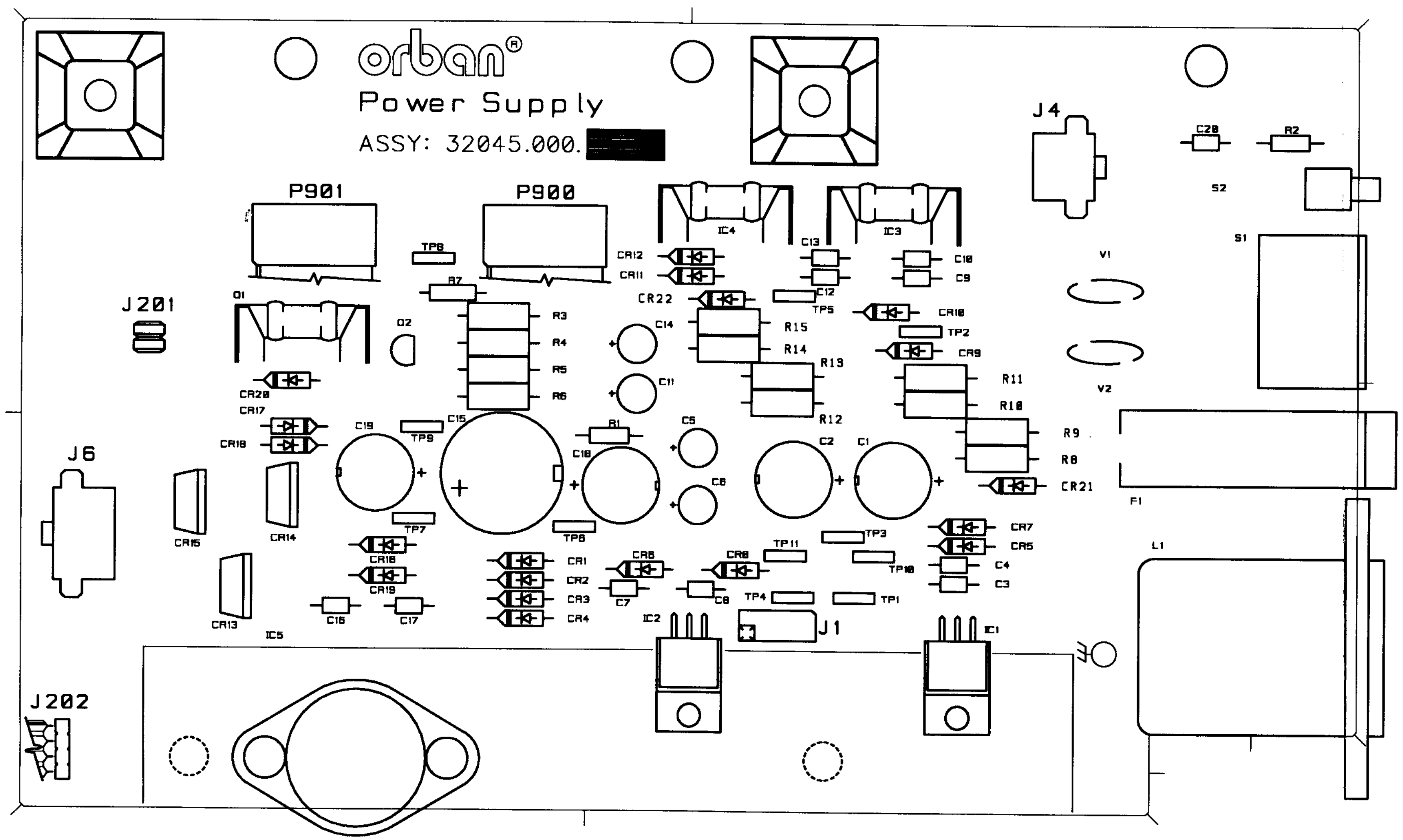

SCHEMATIC
DISPLAY
MODEL 8200
DWG NO 60900
VER 000
REV 01
SHEET 1 of 1
POWER SUPPLY BOARD
MAIN BOARD
ROTARY ENCODER
SPARES



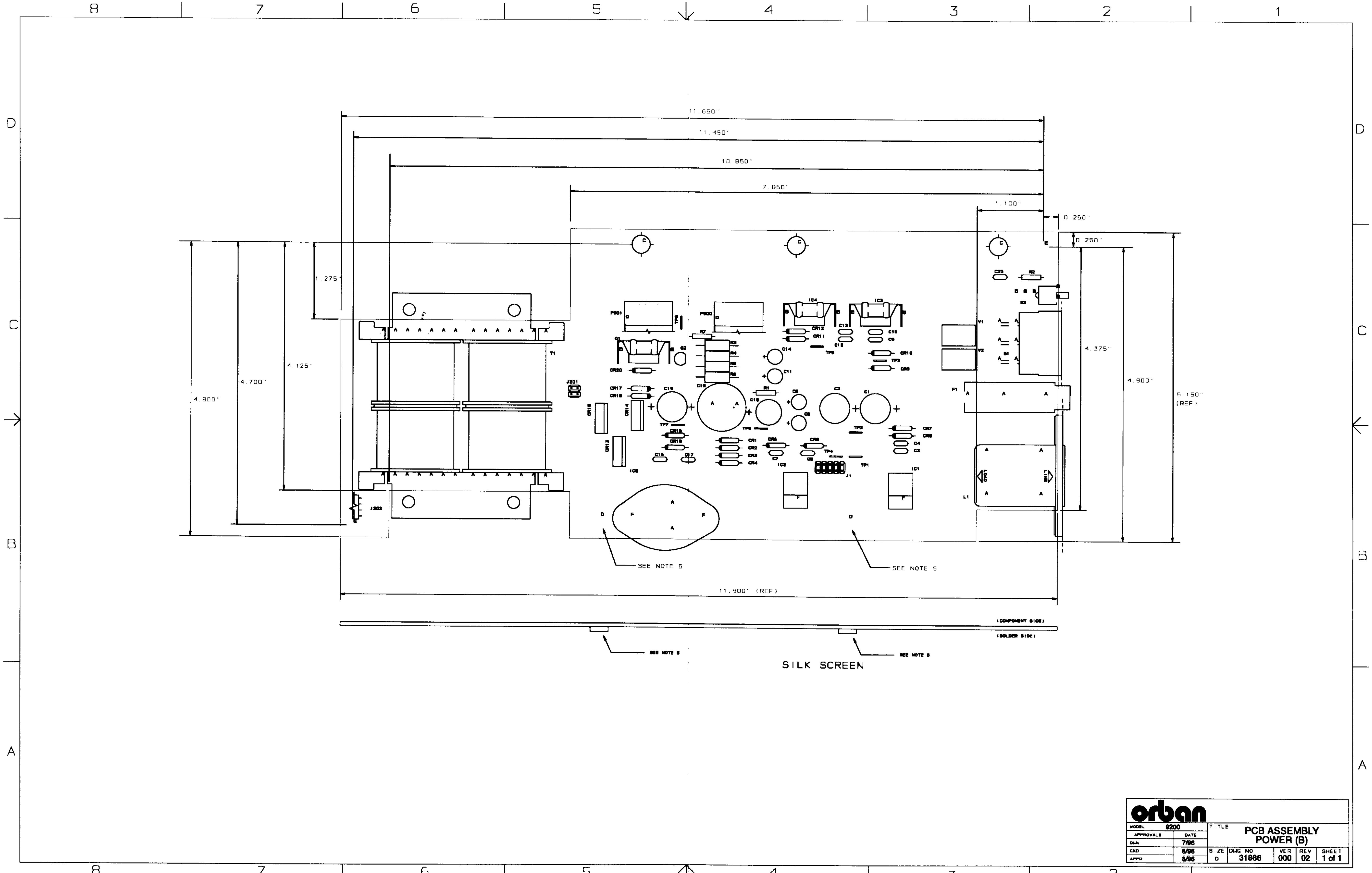
orban		TITLE	PCB ASSEMBLY DIGITAL I/O BOARD (OPTION)		
MODEL	9200D				
APPROVALS	DATE				
DWN FC	7/96				
CKD CB	8/96	SIZE D	DWG NO 31900	VER 000	REV 05
APPD PC	8/96			SHEET 1 of 1	

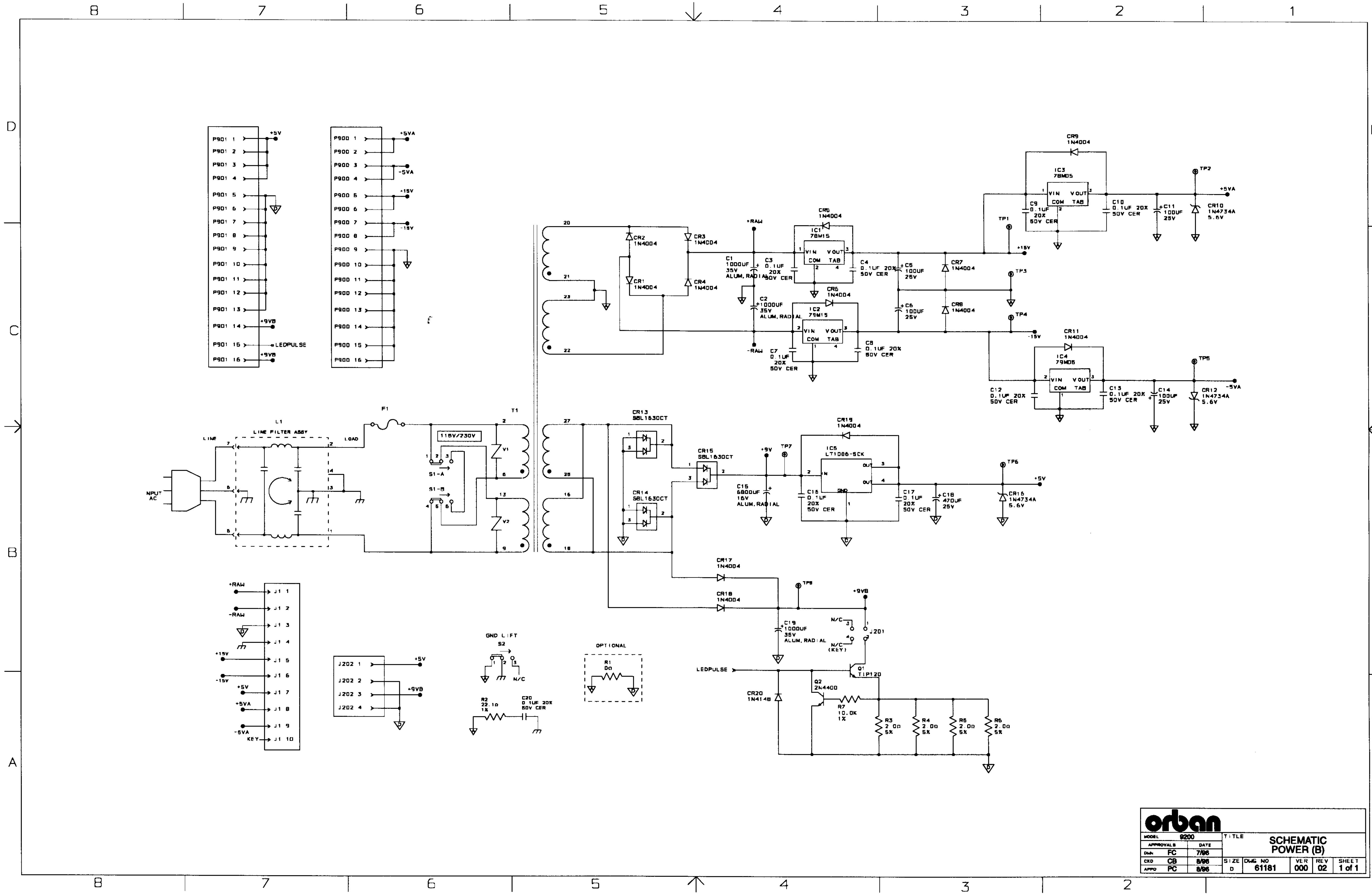

SCHEMATIC
DIGITAL I/O BOARD (OPTION)
orban
MODEL 9200D
DWG NO 60900
VER 000 REV 03 SHEET 1 of 1
NOTE: * FOOTPRINT ONLY
SPARES
AES/EBU DIGITAL INPUT
AES/EBU DIGITAL OUTPUT
MAIN BOARD


orban
MODEL 9200
TITLE
PCB ASSEMBLY
POWER (A)
SIZE D
DWG NO 32045
VER 000
REV 01
SHEET 1 of 1
Misc. Hardware Accessories
Testing Access
Display Supply
Analog Supply
Digital Supply
LCD Backlight
Power Transformer
Line Filter Assembly
Chassis Ground Pigtail, 3" long
(Lug w/Green AWG 18)



orban		TITLE	SCHEMATIC POWER (A)			
MODEL	9200					
APPROVALS	DATE					
DWN	7/96	SIZE	DWG NO	VER	REV	SHEET
CKD	8/96	D	62045	000	01	1 of 1
APPD	8/96					


11.650"
11.450"
10.850"
7.850"
1.100"
0.250"
0.250"
1.275"
4.125"
4.700"
4.900"
4.375"
4.900"
5.150" (REF)
11.900" (REF)
SEE NOTE 5
SEE NOTE 5
(COMPONENT SIDE)
(SOLDER SIDE)
SILK SCREEN
orban
MODEL 9200
TITLE PCB ASSEMBLY POWER (B)
APPROVALS DATE
DWN 7/96
CKD 8/96
APPD 8/96
SIZE D
DWG NO 31866
VER 000
REV 02
SHEET 1 of 1


orban
MODEL 9200
SCHEMATIC POWER (B)
DWG NO 61181
VER 000
REV 02
SHEET 1 of 1

Abbreviations

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

A/D (or A to D)	analog-to-digital converter
AES	Audio Engineering Society
AGC	automatic gain control
A-I	analog input
A-O	analog output
AT	"advanced technology" — IBM PC with 80286 or higher processor
BAL	balance
BBC	British Broadcasting Corporation
BNC	a type of RF connector
CALIB	calibrate
CIT	composite isolation transformer
CMOS	complementary metal-oxide semiconductor
COM	serial data communications port
D/A (or D to A)	digital-to-analog converter
dBm	decibel power measurement. 0dBm = 1mW applied to a specified load. In audio, the load is usually 600Ω.
dBu	decibel voltage measurement. 0dBu = 0.775V RMS. For this application, the dBm-into-600Ω scale on voltmeters can be read as if it were calibrated in dBu.
DI	digital input
DJ	disk jockey, an announcer who plays records in a club or on the air
DO	digital output
DOS	Microsoft disk operating system for IBM PC
DSP	digital signal processor
EBU	European Broadcasting Union
EBS	Emergency Broadcasting System (U.S.A.)
EMI	electromagnetic interference
ESC	escape
FCC	Federal Communications Commission (USA regulatory agency)
FDNR	frequency-dependent negative resistor — an element used in rc-active filters
FET	field effect transistor
FFT	fast Fourier transform
FIFO	first-in, first-out
G/R	gain reduction
HF	high-frequency

HP	high-pass
IC	integrated circuit
IM	intermodulation (or “intermodulation distortion”)
I/O	input/output
JFET	junction field effect transistor
LC	inductor/capacitor
LCD	liquid crystal display
LED	light-emitting diode
LF	low-frequency
LP	low-pass
LVL	level
MHF	midrange/high-frequency
MLF	midrange/low-frequency
MOD	modulation
N&D	noise and distortion
N/C	no connection
OSHOOT	overshoot
PC	IBM-compatible personal computer
PCM	pulse code modulation
PPM	peak program meter
RAM	random-access memory
RC	resistor/capacitor
REF	reference
RF	radio frequency
RFI	radio-frequency interference
RMS	root-mean-square
ROM	read-only memory
SC	subcarrier
SCA	subsidiary communications authorization — a non program-related subcarrier in the FM baseband above 23kHz (monophonic) or 57kHz (stereophonic)
S/P-DIF	Sony/Philips digital interface
TRS	tip-ring-sleeve (2-circuit phone jack)
THD	total harmonic distortion
TX	transmitter
µs	microseconds
VCA	voltage-controlled amplifier
VU	volume unit (meter)
XLR	a common style of 3-conductor audio connector
XTAL	crystal

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Serial #: ______________________

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