Section 6
Technical Data

page contents

Specifications

Performance

Frequency response: ±0.25Hz below compressor, de-esser, or gate threshold, 20–20,000Hz.

RMS noise: >85dB below output clipping level.

Installation

Audio Input – Line Level, Effects Receive Port

Impedance: >10kΩ load impedance, electronically balanced. Balanced source ≤600Ω recommended (not required).

Sensitivity: Can be used with nominal levels from −10dBu to +8dBu.

EMI suppressed: Yes.

Connector: XLR and Barrier strip (Barrier strip only for Effects Return) (#5 screws).

Audio Input – Mic Level (with optional mic preamp)

Impedance: 1500Ω load impedance, transformer balanced. Selectable −20dB pad.

Sensitivity: Can be used with nominal levels from −65dBu to −10dBu (with pad).

EMI suppressed: Yes.

Connector: XLR.

Audio Output — Line Level

Impedance: 30Ω source impedance, electronically balanced and floating to simulate transformer output. Output can be unbalanced by grounding one output terminal.

Output level: Adjustable for use with −10dBm to +8dBm (into 600Ω) systems. Output clipping level: >+20dBm into 600Ω.

EMI suppressed: Yes.

Connector: XLR and Barrier strip (#5 screws).

Audio Output — Mic Level

Impedance: 200Ω, balanced.

Level: −55dBm into 600Ω.

Audio Output — Effects Send Port

Impedance: 47Ω, single-ended.

Level: +4dBm into 600Ω.

Power

Power requirement: 115/230V AC (±10%), 50–60Hz, 16VA.

Connector: IEC mains connector with 3-wire "U-ground" or CEE7/7 power cord and plug.

EMI suppressed: Yes.

Fuse: 1/2-amp 3AG 250V Slow-Blo fuse for 115-volt operation; .250-amp "T" type 250V fuse for 230-volt operation.

Physical

Dimensions: 19 inches (48.3 cm) wide, 11 1/4 inches (28.5 cm) deep, 3 1/2 inches high. 787SL is 1 3/4 inches (4.5 cm) high.

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

Humidity: 0–95% relative humidity, non-condensing.

Options

MIDI interface: For sending data and commands between units — see page 3-14. Order RET045.

RS-232 interface: For sending data and commands between units — see page 3-17. Order RET050.

Mic preamp: Raises mic-level inputs to line level. Order RET046.

Basic remote control accessory: For remote control of UP, DOWN, RECALL, and SELECT CHANNEL. Displays preset number. Order ACC024.

Security cover (acrylic): To prevent unauthorized adjustment of controls — see page 3-12.

Circuitry

Compressor

Attack time: approximately 5 ms; program dependent.

Release time: adjustable between approximately 1dB/sec to 50dB/sec; linear release rate.

Compressor ratio: ∞ to 1

Range of gain reduction: 25dB.

Interchannel tracking with 787ASL: ±0.5dB, STEREO COUPLED.

Total harmonic distortion: <0.1% at 1kHz (release time = 2.5dB/sec, 15dB gain reduction). Typically <0.1% at 20Hz, <0.05% from 100–20,000Hz.

SMPTE intermodulation distortion: <0.05% (60/7,000Hz 4:1; 15dB gain reduction; release time = 2dB/sec).

Gain reduction element: Class-A proprietary VCA.

Equalizer

Type: 3-band parametric.

Equalization range: +16, −40dB.

Tuning range: 30–632Hz, 210–7,650Hz, 420–15,300Hz.

Bandwidth range: (at 8dB boost) 0.1–5 octaves (Q = 0.3–12.5).

Overload indicator: Lights for 200ms if the instantaneous peak output of any amplifier rises to within 1dB of its clipping point.

De-Esser

Attack time: Approximately 200ms.

Release time: Approximately 200ms.

Available attenuation: 25dB.

Noise Gate

Hold time: Approximately 250ms.

Attack time: Approximately 200ms.

Release time: <0.1ms.

Available attenuation: 25dB.

Memory

Capacity: 99 user-programmable registers for host unit; 99 user-programmable registers for slave unit.

Back-up: 5 year lithium battery.

Warranty

One year, parts and labor: Subject to limitations set forth in our Standard Warranty.

All 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.

This section begins with an overview of the 787A circuitry, and then provides a description of the digital and analog control circuitry.

Digital control circuitry is described in 9 major blocks: clock circuitry, power monitoring circuitry, basic microcomputing circuitry, display driver circuitry, switch decoding circuitry, digitally-controlled analog processing circuitry, MIDI option, RS-232 option, and remote control option.

Analog audio circuitry is described in 13 major blocks: input buffer, input attenuator, VCA (voltage-controlled amplifier), equalizer, compressor control, noise gate control, de-esser control, PEAK OUTPUT LEVEL metering, effects send and receive, overload indicator, power supply, and optional microphone pre-amp.

Overview

The Programmable Mic Processor is an analog signal processing device controlled by a microprocessor. The microprocessor and associated digital circuitry allow instant and repeatable modification of the analog signal processing. 99 user-definable processing settings are stored in battery backed-up RAM. These are called PRESETs and can be recalled at any time via front panel switches, rear panel contact closures, serial communications link (MIDI or RS-232), or with the REMOTE CONTROL unit. The presets are created using simple front panel keys and the LED displays. The microprocessor interprets and controls the activity of these input devices.

The parameters of the analog processing circuitry are set with Digital to Analog Converter (DAC) ICs. The DACs are controlled by the Z-80 microprocessor. The DACs are written to an 8-bit word and then clocked to latch the word in its internal register. This word adjusts the DACs internal resistor ladder network which is part of the analog circuit, thus altering a parameter of the analog circuit.

To set the operating parameter for a DAC, the Z-80 writes the data and address for the DAC to a pair of latches on the DIGITAL PCB. This isolates the analog cicuitry from the digital circuitry and the noise it generates.

The latches buffer the data and address lines and drive the ribbon cable connecting the two boards. The data line on the **analog board** directly connects to the DACs. Address decoders receive the address from the **digital board** and select the DAC to read the data. The DAC latches the data when clocked by the address decoder so the Z-80 can load the next DAC with data.

1. Digital Circuit Description

1. Overview

A Z-80 microprocessor is the central controller of the 787A. The basic functions of the Z-80 and its supporting digital circuitry decode the switches, drive the displays, set the analog processing circuitry, and store and retrieve the operating parameters and presets in memory.

2. Clock Circuitry

The clock circuit provides a 4MHz signal to the clock input of the Z-80 microprocessor and any serial board connected to the system. This provides the timing and synchronization necessary to make the digital circuitry work correctly.

Component-level description:

An 8MHz crystal Y1 is the feedback element in an inverter oscillator circuit consisting of inverter IC2a and loading and phase-shift compensation components R1, R2, C1, and C2. The 8MHz output at IC2b pin 4 is then buffered by IC2c, then divided by 2 with flip-flop IC3a. This 4MHz signal appears at the output of IC3a pin 5 and is then buffered by IC2d to provide the clock signal required by the Z-80 microprocessor. IC13b divides the buffered 8MHz clock signal at pin 6 IC2c to 4MHz and provides the inverted phase to drive the serial board.

3. Power Monitoring Circuitry

A voltage level sensing circuit monitors the regulated +5 volts. This circuit shuts down the Z-80 and protects the contents of the RAM when the voltage falls below 4.5 volts.

Component-level description:

The +5 volt supply is scaled with voltage divider R9 and R10 to 1.34 volts. This voltage is compared to a 1.2 volt precision reference diode CR1 with biasing resistor R12. When the +5 volt supply drops below 4.5 volts the output of IC13b pin 1 goes low and quickly discharges C3. Hysteresis is provided by R11 with CR2 to prevent current from flowing back to the input of IC13b. IC8a and IC8b double buffered this signal to obtain the correct polarity to enable the $\overline{\text{RESET}}$ pin 26 of the Z-80 microprocessor. The Z-80 will halt when the $\overline{\text{RESET}}$ pin of the Z-80 is set low. When +5 volts recovers to above 4.5 volts, IC13b pin 1 will go open collector allowing R13 to charge

C3. This triggers IC8a and IC8b to disable the $\overline{\text{RESET}}$ pin. The Z-80 will then re-initialize itself.

The $\overline{\text{RESET}}$ signal at IC8 pin 6 also disables the RAM chip IC7 at CE2 pin 26. CE2 low prevents any data from being written to the RAM. This prevents any data from becoming corrupt when +5 volts falls below the operating voltage of the circuit. The $\overline{\text{RESET}}$ signal also goes to J5 to reset appropriate ICs on any serial boards that are connected.

To prevent erratic display messages, the output of IC8a provides the DISPLAY BLANK signal to blank all of the front panel LEDS and displays except for the overload LEDS when the +5 volt supply is not in its correct operating range. Q3 is used as a low leakage diode to isolate IC8 from circuits on the display board which are not powered by the battery. R36 is a pull-up resistor.

The front panel RESET switch also activates the RESET condition described above. When the switch is pressed, C4 discharges through R15 which sets pin 2 of NAND gate IC8b low. This causes its output to go low, enabling the $\overline{\text{RESET}}$ signal.

4. Microcomputing Circuitry

The microcomputing circuitry consists of the Z-80 microprocessor, a random access memory (RAM) IC, a read only memory (ROM) IC, latched buffers, and other logic devices.

The Z-80 is the central computing device and controls the states of the other components. The software program in the ROM determines what operations the Z-80 will execute.

The digital board features two sections; **memory** and **input/output**. The memory section allows the Z-80 to access ROM and RAM. The input/output section allows access to the devices off the digital board: digital-controlled analog components, switches, displays, MIDI and RS-232.

Component-level description:

The $\overline{\text{MREQ}}$ (pin 19) of IC4 goes low when a **memory** function is executed. This signal enables the memory address decoder IC5 which selects the proper memory device to be accessed by the Z-80. If the address is in the range of 0000H to 4000H, pin 15 or pin 14 of IC5 will clock low. These outputs are ANDed together by AND gate IC9b and pin 6 will go low if either of its inputs are low. This will select ROM IC10. If the address is in the range of 4001H to 6000H IC5 pin 13 will clock low selecting RAM IC7. The $\overline{\text{WR}}$ (pin 22) of IC4 determines if the RAM is to be read from (high) or written to (low).

The $\overline{\text{I/O REQ}}$ (pin 20) IC4 goes low to access the **input/output** devices. This line allows IC6 to decode the address of the device being accessed. The address range of the input/output devices are from 0 to 100H. Address locations 0 to 1FH select the DAC buffered latches IC12 and IC14. 20H selects $\overline{\text{DACSELA}}$. 21H selects $\overline{\text{DACSELB}}$. 60H selects the serial port enable line $\overline{\text{MIDI}}$. 80H with $\overline{\text{WR}}$ selects $\overline{\text{SWWR}}$ to write to the **switch matrix**. 80H with $\overline{\text{RD}}$ selects $\overline{\text{SWRD}}$ to read the **switch matrix**. C0H selects the DISPLAY CHARACTER control line. E0H selects the DISPLAY SEGMENT control line.

5. Display Circuit

A constant current driver circuit multiplexed by the microprocessor drives the 4 numeric displays and most of the discrete LEDS on the front panel. There are 8 discrete constant current sources to drive up to 8 led segments or individual LEDs at each multiplexed time slot. There are eight sets of 8 segments or individual LEDs being multiplexed. Each of these sets is called a character.

Component-level description:

The constant current source consists of Q1–Q11, CR1–CR10, R1–R29, and C14. R1, CR1, and R2 set a constant current through Q1. The voltage at the emitter of Q1 and R4 determine this current. This current causes a voltage drop across R3 which is referenced to +8 volts (TP2). This voltage appears at TP1 buffered by Q2 and Q3 and filtered by C14. R5 biases Q2 and Q3 and CR2 prevents reverse biasing of the transistors.

There are eight constant current elements with outputs labeled A-H. These outputs are connected directly to the segments of the numeric displays and to the LEDs.

The voltage at the emitter of each segment driver transistor (Q4–Q11) determines the magnitude of the drive current. This voltage equals the voltage at TP1.

Each output transistor is turned on by drawing a base current through its corresponding 3.3kΩ base resistor. This current is sinked by transistor array IC4. The transistors in IC4 are driven by latch IC3. A high bit at the output of IC3 selects the character by turning on the corresponding transistor in IC4.

IC5 and IC6 select the character to be driven in a given time slot. The 787 multiplex rate is approximately 14.5 msec, or 1.8 msec per character. The data is set at input ports 1D to 8D of IC5. Pin 11 is then clocked to load the latch. IC5's latched outputs drive IC6 which is a package of 8 open collector NPN transistors. These transistors each drive a character consisting of up to 8 segments or discrete LEDs. A high bit at the output of IC5 selects the character by turning on the specific transistor in IC6. The outputs of IC6 go low to sink current through the desired segment from the 8 constant current sources.

6. Switch Decoding

The microprocessor decodes the front panel switches and the internal LOCKOUT RESET switch. The switches are arranged in a matrix so that a software algorithm can determine which if any of the switches are closed. The matrix is organized into 7 rows and 3 columns.

Component-level description:

The first step to decode the switches is to set all of the row drivers low with 8-bit latch IC16, and then to read the columns with buffer IC15. A closed switch causes the column the switch is connected to go low. If no switches in that column are closed, pull-up resistors R21a-R21g pull the column inputs

high. If the microprocessor finds that there are switches closed, it sets one row low at a time and reads the column inputs. By knowing which row and column is low the microprocessor can determine which switch is closed

IC15 and IC16 are also used to determine if any options are installed at the serial port J5, if the 787ASL slave chassis is connected, and if the slave is in the STEREO COUPLE position.

Options are detected much in the same way as the switch decoding scheme described above. Columns 1–3 are shared with the front panel switch circuitry, so the status of the options are only checked when none of the switches are closed. OPTION DETECT pin 12 of IC16 is a row driver. However, instead of switches being connected, diodes are installed on the option boards so that when the $\overline{\text{OPTION DETECT}}$ line goes low, the corresponding diode will pull its column low. Column 1 is used to detect the MIDI or RS-232 option. Column 2 detects the 787ASL. Column 3 checks if the slave is in the **STEREO COUPLE** mode.

The rear panel remote closure contacts are also read through IC15. These switches are not in a matrix. Each of the four switches has its own input port with IC15. Each connection to the terminal block has the same RF protection as the audio inputs, a .001uF capacitor chassis bypass and two ferrite beads. R17–R20 are in series with the inputs to current limit. To prevent excessive voltages from damaging internal circuitry CR5–10, CR15, CR16 clamp input voltages from exceeding +5.6 volts or −.6 volts.

The 3 volt RAM back-up battery is also monitored. IC13b compares the voltage of the battery to the voltage produced by divider R22 and R23. When the voltage of the battery falls below +2.5 volts, pin 14 of IC13 goes low. This output is read by the microprocessor at pin 8 of IC15. The decimal point of display 4 will blink when this condition is detected to warn the user that the battery needs to be replaced.

7. Digital-controlled Analog Processing Circuitry

These parameters of the analog processing circuitry are set with Digital to Analog Converters (DAC) ICs: INPUT GAIN, compressor RELEASE TIME, GATE THRESHOLD, NOISE GATE DEPTH, equalizer BOOST/CUT, CENTER FREQUENCY, and BANDWIDTH, DE-ESSER THRESHOLD, and EFFECTS RETURN LEVEL. The DACs are controlled by the Z-80 microprocessor. The DACs are written to an 8-bit word and then clocked to latch the word in its internal register. This word adjusts the DACs internal resistor ladder network which is part of the analog circuit, thus altering a parameter of the analog circuit.

Component-level description:

The Z-80 sends the address of the DAC to be accessed and the data to be written to it with latches IC12 and IC14. IC12 and IC14 are 8-bit latches that buffer the data and address busses from the digital board to the analog board. This prevent the high frequency noise present on the digital board busses from entering into the audio path on the analog board since the outputs of IC12 and IC14 only change state when new data is written to a DAC.

Pin 11 of IC12 and IC14 are clocked high simultaneously to set the address and data at the inputs of the IC's to their internal registers. The word stored

in the register of the latch is seen at its output because the OUTPUT ENABLE pin 1 is held low for both IC12 and IC14.

Control lines $\overline{\text{DACSELA}}$ and $\overline{\text{DACSELB}}$ are decoded with IC1 and connect directly to the analog board. $\overline{\text{DACSELA}}$ is used to enable the 787A DAC decoding circuitry on the analog board. $\overline{\text{DACSELB}}$ sets the 787ASL DAC decoding circuits. These control lines clock low after IC12 and IC14 have been loaded with the data and address.

This completes the discussion of the digital control lines from the **digital board**. The following discussion describes the **Digital Control Logic** on the **analog board**.

The data from IC12 is directly connected to all of the DACs and the address data from IC14 is sent to address decoders IC22, IC23, IC24, and IC25. The address data, plus the state of either DACSELA or DACSELB, enables the decoders to determine which DAC is selected to receive new data. One of the output pins of IC22, IC23, or IC24 clocks high to set the latch of the desired DAC. The DAC immediately changes the settings of its resistor ladder network to that directed by the new data.

8. MIDI Option:

The MIDI option is based on a serial **input/output** (SIO) IC and a counter timer chip (CTC) IC. The SIO IC provides serial to parallel and parallel to serial conversion. The CTC IC provides the transmit/receive clock for the SIO.

Component-level description:

The RESET signal from the DG board resets IC1 (pin 21) and IC6 (pin 17) whenever the Z-80 is reset.

CR2 is part of the **Option Detect** circuit described in the **Switch Decoding** section. CR2 allows the Z-80 to determine if the MIDI board is present.

The 4 megahertz clock from the DG board is buffered by IC2a and IC2d to drive IC1 pin 20 and IC6 pin 15. This clock allows synchronized communication between the Z-80 and the SIO and CTC IC's. IC2b, IC2c, and IC3f provide address decoding so the Z-80 can select either the CTC (IC6 pin 10 and 16) or the SIO (IC 1 pin 35 and 36).

IC7a divides the 4 megahertz clock to 2 megahertz, which appears at pin 5. The CTC generates the 31.5kHz transmit/receive clock for the SIO from the 2 megahertz signal. The 31.5kHz signal is seen at IC6 pin 7. This output drives IC1 pin 13 and 14.

The SIO receives data to be transmitted from the Z-80 on the 8-bit data bus labeled DB0–DB7. When the $\overline{\text{CE}}$ and $\overline{\text{IORQ}}$ (pins 35 and 36) are low in conjunction with $\overline{\text{RD}}$ the data is written to the SIO. This data is transmitted out serially at TxDa (pin 15). This output is buffered by IC3b which drives IC4b. IC4b is an open collector inverting buffer which provides the current driver for the MIDI current loop.

The MIDI current loop presents the diode of an opto-isolator between pins 4 and 5 of J3 with the anode connected to pin 4. Thus the transmitted signal

will not be seen at the MIDI OUT connector (J3) unless a MIDI device is connected to J3.

Serial data is received from the MIDI IN port (J1). R7 and IC5 are elements of a current loop. IC5 is a high gain opto-isolator with gain set by R12. Pin 6 of IC5 goes low when current passes through pins 2 and 3. R1 pulls pin 6 to +5 volts when there is no current in the loop. The signal at IC5 pin 6 is buffered by IC3d and IC3e. IC3e drives the receive data (RxDa pin 12) of IC1.

IC3e also drives the MIDI THRU port (J2). The MIDI THRU port operates the same as the MIDI OUT port described above.

9. RS-232 Option

The RS-232 option is based on a serial input/output (SIO) IC and a counter timer chip (CTC) IC. The SIO IC provides serial to parallel and parallel to serial conversion. The CTC IC provides the transmit/receive clock for the SIO.

Component-level description:

The RESET signal from the DG board resets IC7 (pin 21) and IC6 (pin 17) whenever the Z-80 is reset.

CR1 is part of the **Option Detect** circuit described in the **Switch Decoding** section. CR1 allows the Z-80 to determine if the RS-232 board is present.

The 4 megahertz clock from the DG board is buffered by IC1b and IC1c to drive IC7 pin 20 and IC6 pin 15. This clock allows synchronized communication between the Z-80 and the SIO and CTC IC's. IC5a, IC5d, and IC1e provide address decoding so the Z-80 can select either the CTC (IC6 pin 10 and 16) or the SIO (IC7 pin 35 and 36).

IC1a, Y1, C9, C10, R4, and R5 define a 6.144MHz oscillator circuit. The 6.144MHz clock signal appears at pin 2 IC1a. This signal is buffered by IC1f and then divided to 1.5285MHz by IC2a and IC2b. This signal drives pin 23 of IC6. The CTC generates the transmit/receive clock at the selected baud rate for the SIO from the 1.5285MHz signal. The clock signal at the selected baud rate is seen at IC6 pin 7. This output drives IC7 pin 13 and 14.

The SIO receives data to be transmitted from the Z-80 on the 8-bit data bus labeled DB0–DB7. When the $\overline{CE}$ and $\overline{IORQ}$ (pins 35 and 36) are low in conjunction with $\overline{RD}$ the data is written to the SIO. This data is transmitted out serially at TxDa (pin 15). This output drives the line interface IC IC4b. $\overline{RTS}$ (pin 17) and DTR (pin 16) are control lines which control the RS-232 communication protocols.

Serial data is received from the RS-232 connector (J1) at pin 2. IC3a is the receive buffer which drives the SIO RxDa input (pin 12). The serial data is converted to an 8-bit word and sent to the Z-80 on the data bus labeled DB0–DB7.

C1 and C4 are high frequency bypass capacitors to prevent oscillation on the ±22 volt supply. C2 and C9 are filter capacitors. C3 and C6 are output bypass capacitors. IC9 and IC8 are ±12 volt regulators which supply the

source voltages to drive the RS-232 outputs (J1 pins 3, 5, and 6) at the correct voltage levels.

10. Remote Control Option

The remote control circuitry allows for data from the Digital Board to be sent and received serially from the internal remote PCB to the external remote unit. This data will be interpreted at the remote external PCB to control the displays and LEDs and allow for the **digital board** to determine what keys have been pressed on the remote unit.

Component-level description:

Internal Remote Circuit

Data bit D0 is buffered by IC1d and present at the D inputs of flip-flops IC3a and IC3b. The data will appear inverted at the $\overline{Q}$ outputs of one of the flip-flops when IC1a and IC1b decode $\overline{MIDI}$ and A0 and clocks the flip-flop. This signal will then be level shifted by open collector inverters IC5a or IC5b. Pull-up resistors on the external remote PCB will allow the outputs of these inverters swing between 0 and +15 volts. R2 and R6 are for current limiting and work with C11 and C16 for signal shaping.

The signal at RD0 is level shifted by R7 and R8 and will appear at pin 9 of IC4b. CR2 assures that this signal will not exceed +5.6 volts. IC2b and IC2c buffer this signal. Data is read from pin 8 IC2c when IC1c decodes $\overline{MIDI}$ and $\overline{RD}$ to enable buffer IC4b.

Regulator IC6 provides the +15 volts for the external remote circuitry. C4, C5, and C6 provide frequency compensation for IC6. R3 provides a discharge path for C5 when the external unit is not connected. CR1 prevents IC6 from becoming reversed biased.

Capacitors C6–C16 with ferrite beads FB1–FB4 prevent high frequency noise from being radiated from the unit.

External Remote Circuit

C1, C2, C8, and C9 with FB1–FB4 provide RF filtering for the four wire connection to the Internal Remote PCB. R3 and R4 are pull-up resistors and R1 and R2 provide current limiting. CR1–CR4 prevent the voltage on RD0 and RD1 from going above +15 volts or below 0 volts.

Data received on RD0 and RD1 is buffered by IC6b, IC6c, IC7d and IC7d. Binary counter IC1 counts the pulses received on RD0 when RD1 is high. RD1 goes low to clock flip-flops IC3a, IC3b, and IC2b to latch the current count of IC1 at the flip-flops. RD1 low will also clear the current count of IC1. The outputs of the flip-flops are used to address either one of the switches, SW1–SW4; one of the displays, D1–D2; or the LEDs.

IC8 decodes the address from the flip-flops and selects binary counter IC5 to enable counting by IC6a. This count will be decoded by BCD to 7 segment drivers IC10 or IC4 and displayed on D1 or D2 when pin 5 is clocked setting the drivers latch. R21–R34 are current limiting resistors to set the displays segment current. BCD to 7 segment driver IC11 is selected by

IC8 to drive the discrete LEDs. Flip-flop IC2a pin 1 is set to +5 volts when the IC1 counts to 9 and triggers IC6d low. This signal is inverted by IC7b which sets flip-flop IC2a. Pin 1 of IC2a will drive R13 to turn on transistor Q1 to enable the LEDs contained in SW1–SW3.

2. Analog Circuit Description

1. Overview

The **block diagram** on 6-41 illustrates the following overview of 787A circuitry.

The line level input signal enters the 787A in balanced form receiving moderate **RFI suppression**. It is then applied to a very low-noise opamp configured as an "**active transformer**."

The microphone pre-amp input signal is applied to an input transformer. This signal is then fed to an opamp circuit with gain and summed with the line level input

The three bands of equalization are created by a state variable topology. This provides very stable operating characteristics. Constant "Q" is maintained when boost/cut, center frequency, or bandwidth is adjusted. Notching capabilities are provided.

The current-controlled gain block used in the 787A is a proprietary class-A **voltage-controlled amplifier** (VCA). It operates as a two-quadrant analog divider with gain *inversely* proportional to a current injected into a first gain-control port, and is cascaded with a two-quadrant analog multiplier with gain *directly* proportional to a current injected into a second gain-control port. Any "**thumps**" due to control current feedthrough are eliminated by applying DC to offset to the VCA's input.

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

The proprietary compressor **timing module** generates a control signal that enables the 787A to achieve natural-sounding control and very low modulation distortion. The RELEASE TIME control allows a 50:1 variation in the basic release dynamics. The release dynamics are determined by the **timing module** on the basis of the past history of the input.

Release time circuitry allows the recovery to proceed at a constant rate (in dB/second) regardless of the absolute gain reduction.

A **gating detector** monitors the level of the 787A's input signal, and activates the compressor gate or compressor and noise gate if this level drops below a threshold set with the GATE THRESHold control.

When the NOISE GATE is enabled the output of the 787A will be attenuated by the amount selected with the DEPTH control.

The DE-ESSER detects sibilance in the region of 6kHz and above and reduces the gain of the VCA until the average level of the sibilance is reduced below the threshold determined by the DE-ESSER THRESHOLD control.

EFFECTS SEND and RECEIVE ports allow the signal prior to the output attenuator to be sent to another processing device. The processed signal is then summed back in with the main signal at the desired level using the EFFECTS RETURN control.

The GAIN REDUCTION meter consists of ten comparators arranged to produce a meter with a 0–25dB linear scale.

The PEAK OUTPUT LEVEL meter is an LED bargraph that monitors the output level of the 787A just prior to the balanced output stage. 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).

Unregulated voltage is supplied by three pairs of **full wave diode rectifiers.** ±15v and +5v regulated voltages are supplied by a pair of overrated 500mA "three-terminal" IC regulators. A discrete circuit supplies the regulated +48 volts.

2. Input Buffer

The signal enters the 787A in balanced form receiving modest **RF suppression.** It 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 which is small with respect to 40k (600Ω or less), 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.**"

Since the INPUT ATTEN control is located after the opamp, the opamp will overload if its differential input exceeds approximately +26dBu (0dBu = 0.775V RMS; the dBm @ 600Ω scale on voltmeters can be read as if were calibrated in dBu).

Component-level description:

C1 and C2 shunt RF from the input leads to the chassis. Since these capacitors are not effective at VHF and higher frequencies, ferrite beads have been placed around the input and output leads to suppress such high-frequency RF. Although this **RF suppression** is modest, it should be adequate for the vast majority of installations.

The filtered signal is applied to opamp IC2a.

3. Input Attenuator

A Multiplying Digital to Analog Converter (MDAC) controls the input gain digitally. The transconductance of the MDAC and the resistors connected to the inverting terminal of the opamp determines the voltage gain of this stage. No gain is available with jumper A in the +4dB position. Approximately 14dB is available in the −10dB setting.

Component-level description:

The IC1's internal resistor ladder is set by the 8-bit word written to its internal data latch. The word present on the data bus labelled DB0–DB7 is loaded into the MDAC when pins 12 and 13 of IC1 are clocked low. The resistor ladder of IC1 is in the feedback path of inverting amplifier IC5b, controlling gain. R3 and R4 are summing resistors, in series when jumper A is in the +4dBu position. R4 is shorted in the −10dBu position. The gain can be adjusted from 0dB to −30dB in the +4dBu position and from +14dB to −16dB in the −10dBu position.

When jumper B is in the MIC OPTION position, the MIC PRE-AMP signal is summed into IC5b through the internal resistor between pin 16 and pin 1 of IC1. The gain applied to the mic signal can be adjusted from +30dB to 0dB.

The range of INPUT ATTEN**uation** is displayed on the front panel display as "+5dB" to "−25dB" for all jumper settings and input sources.

4. Voltage-controlled Amplifiers

The current-controlled gain block used in the 787A is a proprietary class-A **voltage-controlled amplifier** (VCA). It operates as a two-quadrant analog divider with gain *inversely* proportional to a current injected into a first gain-control port, and is cascaded with a two-quadrant analog multiplier with gain *directly* proportional to a current injected into a second gain-control port. For most gains, levels, and frequencies, total harmonic distortion (THD) is well under 0.1

A specially-graded Orban IC contains two matched, non-linear gain-control blocks with differential inputs and current outputs. Used alone, one such gain-control block would introduce considerable distortion. Therefore, the first of the two matched blocks is used as the feedback element for a separate opamp, and the second is driven by the pre-distorted output of that opamp. The gain of the VCA is therefore *inversely* proportional to the gain of the non-linear gain-control blocks. This enables the VCA to function as a two-quadrant analog divider.

If the VCA is not perfectly balanced, "**thumps**," due to control current feedthrough can appear at the output. These are eliminated by applying DC offset to the VCA's input.

The basic current-controlled gain in the compressor is *inversely* proportional to the control current generated by the compressor control circuitry. The gain is made proportional to a control voltage in dB by an exponential current converter.

Component-level description:

The first gain-control port is pin 6 of IC8; the second gain-control port is pin 3 of IC8. IC8 is the specially-graded Orban IC containing two matched non-linear gain-control blocks with differential inputs and current outputs. The separate opamp in the feedback loop is IC7.

The output of IC8 is first attenuated by R36, R35, C12, and then applied to the input of the feedback element IC8b at pin 9. The output of IC8 is pre-distorted as necessary to force the current output of IC8b to precisely and linearly cancel the audio input into the "virtual ground" summing junction of IC7. This same pre-distorted voltage is also connected to the input of IC8a at pin 16. Thus the output of IC8a at pin 13 is an undistorted current. This current is converted to a voltage in current-to-voltage converter IC6, R42, and C15. The output of IC6 at pin 1 is the output of the VCA.

The VCA behaves like a two-quadrant analog divider when the control current from Q2 is applied to the control port (pin 6) of IC8b. The gain-control current injected into this control port is developed by the compressor control circuitry.

The gain of IC8a is fixed by the current source which is set by R72 and IC18b. This current source is also the control current used by the DE-ESSER.

Second-harmonic distortion is introduced by differential offsets in either section of IC8. This distortion is canceled by applying a nulling voltage directly to the input of IC8a by means of resistor network R38, R39, and DIST NULL trimmer R37.

The "**thumps**" which can occur if the VCA is not perfectly balanced, are equivalent to multiplying the control current by DC. An adjustable DC offset is applied to the VCA input provided by R31 and THUMP NULL trimmer R30 for nulling this equivalent DC multiplication to zero.

C10, C11, R27, R28 provide frequency-compensation to prevent the VCA from oscillating supersonically.

The compressor control current is dB-linear. This voltage is transformed into a current *inversely* proportional to the desired compressor gain by exponential current converter IC20 and associated components.

IC19 and associated components form a log/antilog multiplier which multiplies the current flowing in R21 by the exponential of the voltage on the base of IC20 (pin 5). The current gain of the multiplier (and thus the output current of the exponential converter) increases as the voltage on the base of IC5 (pin 5) becomes more negative.

The current output of the log/antilog multiplier appears on the collector of IC20 (pin 3). Since it is the wrong polarity and level to correctly drive the control-current port of IC8b, it is applied to current inverter IC19b, Q2, R32, R33, C9. This circuit has a gain of 6.66x, and operates as follows:

A voltage proportional to the current output of IC20 (pin 3) is developed across R32 because of the feedback action of IC19b. C9 stabilizes IC19b against oscillations. Feedback forces IC19's (–) and (+) inputs to be at the same voltage. Thus, the same voltage that appears across R32 also appears across R33, and current flows in R33 in proportion to the ratio between the values of R32 and R33.

This current flows out of the (+) input line of IC19b into the emitter of Q2. Because Q2's base current is small compared to its emitter current, essentially the same current flows out of Q2's collector into the gain-control port of IC8b.

Since the base of Q2 is grounded, its emitter therefore sits at +0.6V. This forces both (+) and (−) inputs of IC19 to also sit at +0.6V, and ensures correct bias voltage for IC20's collector (pin 3).

CR2 protects Q2 from reverse base-emitter voltage which otherwise could cause junction breakdown and latch-up of the entire current-inverter circuit.

5. Equalizer

The three band equalizer consists of three stages of a state-variable topology. The switched resistor elements of multiplying Digital to Analog Converters (MDACs) allow microprocessor control of boost-cut, center frequency, and "Q" or bandwidth. The high and mid bands differ from the low band in that compensation capacitors C7 and C12 are used to correct phase characteristics to achieve maximum notching depth.

Component-level description:

The following component level description of the low band circuit can be readily extended to the other bands by analogy.

The LOW band consists of ICs 13–15 and ICs 1–4 with associated components. The state variable topology used provides a low-pass, high-pass, and band-pass output.

Pin 7, IC15 is the low-pass output. IC15b with MDAC IC3, C4, C25, and C26 is an integrator with gain adjustable with MDAC IC3.

The low-pass output is summed at IC13b by R3 with the input of the state variable to obtain the high-pass signal at pin 7 IC13b. The gain of the input signal set with MDAC IC1 determines the "Q", or bandwidth. MDAC IC4 with C2, C3, and C5 integrates the high-pass output to provide the band-pass output at pin 1 of IC 15.

The band-pass signal is summed at pin 6 IC14 with the input of the state variable and with an inversion of it's bandpass output. The gain of the inverted bandpass output is set with MDAC IC2 and IC13a determines the boost-cut characteristics at the output of the filter at Pin 7 IC14.

6. Compressor Control

The compressor is a feedback circuit: the gain-controlled output of the compressor is used to develop a gain-control signal that is applied to the compressor 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 of the opamp in the VCA is applied to a rectifier with threshold.

The rectifier feeds the compressor **timing module**, which contains proprietary circuitry that outputs 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 of an arbitrary number of channels.

The RELEASE TIME control allows a 50:1 variation in the basic release dynamics, which are determined by the **timing module** on the basis of the past history of the input. The release recovery proceeds at a constant rate (in dB/second) regardless of the absolute gain reduction.

A **gating detector** monitors the level of the 787A's input signal, and activates the gate if this level drops below a threshold set with the GATE THRESHold 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 IC7 in the VCA is applied to a rectifier with threshold in IC21b, a conventional **full-wave rectifier. Attack times** are determined by R67, R65. Any DC offsets at IC7's output are blocked by C13.

IC15b is a comparator that prevents the release module from being overdriven by the input signal. When the gain control voltage at TP3 reaches 11.8v, pin 2 of IC15b will go to -15 volts and pinch off FET Q3. This will prevent any further gain reduction from taking place until the gain reduction control voltage drops below 11.8 volts.

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

The gain reduction voltage, which is dB-linear, is attenuated and inverted by IC32a, R135, and R136 such that +3V = 25dB gain reduction. The attenuated voltage is mixed with a 50 or 60Hz "dither" signal through CR29, R30, and C23 (connected to the power transformer secondary), and then applied to the input of LM3914 bargraph driver IC2.

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.

Q13 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. R31 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 IC29a.

C1 bypasses the LM3914 power supply to prevent the LM3914 from oscillating.

The compressor release time is set by the DC voltage produced by IC27 and IC28b. IC27 scales the +15 volt reference voltage at pin 15 and is buffered by IC28b. This voltage is fed into the compressor module A1 at pin 8.

Under gated conditions (when the gating FET Q1 is turned off by pulling its gate towards +15 volts), the gain control voltage is forced to move slowly towards the voltage produced by divider R19 and R18. This voltage is then routed to the **timing module** through R20.

The *gate is activated* when the output of IC38a at pin 1 is pulled HIGH by R16, and is *defeated* when it is negative.

The gating circuit determines the threshold and response time of the compressor gate and noise gate.

IC33A and IC33B full wave rectify the signal from the input attenuator. The charge time constant at hold capacitor C34 is set by R108, and the discharge time is set by R107. C33 provides a low frequency roll-off. R107 sets a gain of 20dB.

IC35 and IC36A form a digitally-controlled reference voltage. The output of IC36A is a fraction of the +15 volt reference at pin 15, inverted. The magnitude of this reference voltage will depend on the control word written to MDAC IC35.

The reference voltage is scaled by R109 and R110 and compared to the rectified input signal at IC36B. The output of IC36B will go low to −15V when the rectified signal is greater than the reference at pin 5 of IC36B and is high (+15) otherwise. R111 and R112 provide hysteresis to prevent noise from re-triggering this comparator circuit.

The **gate threshold** circuit is common to the noise and compressor gate, although each gate has its own timing circuity.

The compressor gate time constants are set by R93, R99, and C31. When the signal at pin 10 of comparator IC38 reaches the 7.5 volts set by divider R98 and R96, pin 13 of IC38 goes low. This forces comparator IC38 pin 1 low which turns off FET Q1. Q1 off causes the control voltage at TP4 to advance towards −4 volts, set by divider R18 and R19. R97 provides hysteresis.

When the signal at pin 10 IC38d goes above 7.5 volts, pin 13 IC38d is pulled to 2 volts by R100 and R101. This forces IC38a pin 1 high turning Q1 on. Normal release will then occur.

The gate LED on the front panel is driven by IC37a which is triggered by the compressor **gate detector** IC38d.

The control current input of the second stage of the VCA is also used for the DE-ESSER and the NOISE GATE.

The de-esser control current flows from the collector of IC17a. A current identical to the de-esser control current flows from the collector of IC17b, since IC17a and IC17b are matched transistors. The current output of IC17b is inverted in current mirror IC17c-e, and injected into the junction of R40 and R41, where it develops a voltage. The voltage is amplified in both inverting and non-inverting modes by IC6a. When the wiper of R41 is at 50% rotation, then IC6a's inverting and non-inverting gains are equal, and no effect is produced at IC6as' output due to cancellation. Moving the wiper of R41 to either side of the null point permits introduction of sufficient control voltage into IC6a's output to cancel any feedthrough in IC8A, regardless of the feedthrough's polarity.

7. Noise Gate:

The time constants for the noise gate is set by R113, R114, and C32. When the signal at pin 8 of comparator IC38c reaches the 7.5 volts set by divider R115 and R116 at pin 9 the output of the comparator goes low. This forces the output of IC15c (pin 13) low which swamps the voltage from IC13a applied through R81. CR11 prevents the depth control voltage at pin 5 IC16b from going below −.7 volts.

IC12, 13a, and 16b with associated components determine the noise gate depth, **attack time** and **release time**. IC12 scales the reference voltage set by CR22 R151a and R151b to determine the noise gate depth. R81 and R82 with C19 will determine the rate at which the gate will attenuate the audio signal.

8. DE-ESSER

The DE-ESSER circuit detects sibilance in the region of 6kHz and above and will attenuate the output of the VCA until the sibilance is below the amount selected by the DE-ESSER THRESHOLD control.

Component-level description:

The VCA output (which includes the effect of IC6B, the de-esser gain control element) is applied to the de-esser control module, A2. This contains circuitry which detects the presence of sibilance and which outputs a current when sibilance levels exceed a level set by IC14, IC13b, R79, and R80, the de-esser THRESHOLD control circuit.

The output current of the de-esser control module is applied to CR7 and CR9, which charge C17 and C18 to approximately equal positive voltages. The release time of the circuit is determined by R75 which discharges C18. When C18 has been discharged sufficiently to overcome the turn-on voltage of CR8, C17 will also discharge. Since the voltage on C17 determines the amount of de-esser gain reduction, this recovery delay function provided by CR8 substantially aids in smoothing the de-esser control voltage and reduces dynamic distortion.

IC18b is a non-inverting voltage-to-current converter. When the de-esser control voltage (buffered by IC16a) is at ground, 9.1 volts set by CR22 appears across R72 because feedback holds IC18b's (+) and (−) inputs at the same voltage. This causes current to flow in R72, which flows in the emitter IC17a. Essentially the same amount of current flows out of IC17a collector to the control-current port of IC8a, thus determining the quiescent gain of IC8a.

When the de-esser gain control voltage becomes more positive, The voltage across R72 is decreased, thus reducing the control current into IC8a and reducing the gain of the VCA.

The DE-ESSER control voltage is OR'ed with the NOISE GATE control voltage at IC18b. Therefore, both circuits can operate at the same time, with the voltage of greater magnitude determining the amount of attenuation.

9. Effects Send and Receive:

EFFECTS SEND and RECEIVE ports allow the signal prior to the output attenuator to be sent to another processing device. The processed signal is summed back in with the main signal at the desired level.

Component-level description:

Pin 16 of connector P3 is the output of the compressor and equalizer stages. This signal is buffered by IC11a and isolated with R10 before being sent to the EFFECTS SEND output of TB1.

The EFFECTS RECEIVE input stage consists of a balanced opamp circuit IC11b and R12–13. DC blocking capacitors C6 and C7 feed the EFFECTS RECEIVE gain stage IC4, IC5a, R143, and R144. R143 and R144 allow this stage to have up to 14dB of gain depending on the control word written to IC4. The output of the EFFECTS RECEIVE is at pin 1 IC5.

10. PEAK OUTPUT LEVEL Metering

The peak-detecting PEAK OUTPUT LEVEL meter is an LED bargraph that monitors the output level of the 787A just prior to the balanced output stage. 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:

The output of IC9 (pin 6) is applied to amplifier IC32b. The output of IC32b is rectified by an inverting **half-wave precision rectifier** IC30a and associated components. The output of the rectifier is summed (through R127) with its input to create a full-wave rectified signal at the (+) input of IC30b (pin 5).

IC30b operates as a dual-time constant **peak detector.** A DC voltage equal to the peak value of the rectified signal at pin 5 of IC30b is developed at the top of C35, which is charged by IC30b pin 7 through diode-connected transistor Q5. IC29b buffers this voltage and provides feedback to IC30b's pin 6, "telling" IC30b how to charge C35, C36 so that the peak value of the waveform on IC30b's pin 5 is accurately followed.

To achieve the very fast response desired, the peak-holding capacitors C35 and C36 are relatively small. To achieve a sufficiently slow recovery time with a practical value resistor (R131 = 22meg), R131 is bootstrapped to the output of IC29b through R132. R133 introduces enough DC offset to produce approximately 0.5V across R130 and R131 at all times. This multiplies the effective value of R130 and R131 by about 30, and slows down the recovery time as desired.

The output of **peak detector** IC30a (pin 1) is applied to LM3916 bargraph driver IC1 (DP board). Other than the fact that this IC provides a VU (rather than a linear) scale, its operation is identical to the operation of the LM3914 used in the IC2 (DP board) socket (see above).

11. Overload Indicator

The output of each main-signal-path amplifier in the 787A is connected to an overload bus. This overload bus will light the front panel OVERLOAD LED when the signal at any point in the 787A is within 1dB of clipping.

Component-level description:

The output of each main-signal-path amplifier in the 787A is connected to a pair of diodes. One diode is connected to a +10 volt bus (created by R87, R88); and the other diode is connected to a −10 volt bus (created by R83, R84). If the instantaneous output of any amplifier exceeds ±10 volts, then the appropriate diode will conduct and couple a pulse onto one of the busses, which are of relatively high impedance. Positive-going overload pulses are fed into transistor inverter Q6 and appear at Q6's collector amplified and inverted so that they are negative going. Thus any overload appears at Q6's collector as a negative-going pulse. This pulse is coupled through C29 to IC34 and associated circuitry, connected as a one-shot multivibrator.

Ordinarily, IC34 is held off (pin 6 low) because R89 holds IC34's inverting input at a higher voltage than voltage divider R90, R92 holds its non-inverting input. A negative-going pulse transmitted through C29 pulls IC32's inverting input down, thus briefly switching IC32's output high. This in turn pulls IC32's non-inverting input high through R91, C30, and latches IC32's output high until C30 can discharge through R91, R90, R92, which normally takes 200 milliseconds. While IC34's output is high, the OVERLOAD lamp is illuminated through R102 and Q7, connected as a zener diode. Thus very fast overloads are "timestretched" and can be easily seen.

Under continuous overload conditions, it is normal for the overload LED to flash on and off.

12. Power Supply

Unregulated voltage for the analog circuitry is supplied by two pairs of **full-wave diode rectifiers**. 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.

Unregulated voltage for the digital circuitry is supplied by two pairs of **full-wave diode rectifiers**. The nominal unregulated voltage is ±10 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 ±7 volts.

This unregulated voltage is also used to power the front panel LEDs and displays.

Unregulated voltage for the phantom power is supplied by a **full-wave diode rectifier**. The nominal unregulated voltage is +70 volts DC at rated line voltage. This will vary widely with line voltage variations and load to the +48 volt source

Regulator dropout will occur if the unregulated voltage falls below about +55 volts.

Regulated voltages for the +15 volts and +5 volts are supplied by a pair of 500mA "three-terminal" IC regulators.

The +48 volt phantom power is supplied by a discreet voltage regulator.

Component-level description:

The two pairs of **full-wave diode rectifiers** that supply unregulated voltage are located in package BR1, BR2, and BR3. The rectifier pairs drive energy storage capacitors C9 C6, C7, and C8. The power transformer T1 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).

Four of the ICs which supply regulated voltages are "three-terminal" IC regulators IC1, IC2, IC3, IC17. These regulators are frequency-compensated by C12, C14, C15, C18 at their outputs to prevent high-frequency oscillations. Small 0.1mF/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.

(If replaced, C12, C14, C18, and C15 *must* be replaced by low-inductance aluminum electrolytic capacitors *only* — see "Power supply problems" on 5-3.)

The +48 volt phantom power is regulated by Darlington pass transistor Q1. The base of Q1 is referenced by a 51 volt zener diode CR13 which is biased by R32. The emitter of Q1 has a 1.2 volt forward drop across it when a load is applied. Current limiting protection is provided by Q2 and R33. When the output current sourced by Q1 causes a .6 volt drop across R33, Q2 will turn on and shut Q1 off by shunting its base to emitter voltage.

13. Microphone Pre-amp

The microphone pre-amp is a transformer/IC opamp hybrid. The transformer provides 20dB of gain and the opamp provides 16dB. A jumper selectable pad is provided to attenuate the input signal 20dB. +48 volt phantom power is also jumper selectable.

Component-level description:

The microphone pre-amp input signal is applied to input transformer T1.

T1's secondary winding is loaded by R6. R7 raises the DC impedance IC1 sees at its input to an appropriate level to avoid excessive open loop gain.

C2 and C3 provide RFI suppression. C14 compensates IC1's open loop gain for stability. R9, R10, and C4 set the gain and frequency response of IC1. R8 decouples IC1's output (pin 6) and C9, C10, and C11 are DC blocking capacitors. C11 bypasses C9, C10 to ensure highest audio quality.

The +48 volt phantom power is filtered by R1, C1, and C12. R2a and R2b are matched to increase the common mode rejection.

Parts List

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

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

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

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

RESISTORS should only be replaced with the same style and with the *exact* value marked on the resistor body. If the value marking is not legible, consult the schematic or the factory. Performance and stability will be compromised if you do not use exact replacements. Unless listed by reference designator in the following parts list, resistors are:

Metal film resistors which have conformally-coated bodies, and are identified by five color bands or a printed value. They are rated at 1/8 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 which have conformally-coated bodies, and are identified by four color bands. They are rated at 1/4 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 which have molded phenolic bodies, and are identified by four color bands. The 0.090 × 0.250 inch (2.3 × 6.4 mm) size is rated at 1/4 watt, and the 0.140 × 0.375 inch (3.6 × 9.5 mm) size is rated at 1/2 watt, both ±5% @ 70° C. Orban part numbers 2001x-xxx, USA Military Specification MIL-R-11 Style RC-07 (1/4 watt) or RC-20 (1/2 watt). Manufactured by Allen-Bradley, TRW/IRC, and Matsushita.

Cermet trimmer resistors which have 3/8-inch (9 mm) square bodies, and are identified by printing on their sides. They are rated at 1/2 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. Their USA headquarters addresses are given on page 6-39.

REF DES	DESCRIPTION	ORBAN P/N	VEN (1)	VENDOR P/N	ALTERNATE VENDORS (1)	NOTES
MAIN UNIT FINAL ASSEMBLY						
Miscellaneous						
B1	Coin Cell, Lithium; 3V	28041-000	DUR	DL2032	GE	
F1	Fuse, 3AG, Slo-Blo, 1/2A	28004-150	LFE	313.500	BUS	
NONE	Transformer, Power; 39VCT, 10VCT, 23VA	55012-000	ORB			
NONE	Filter, Line, 3 Amp	28015-000	COR	3EF1	MANY	
NONE	Line Cord, CEE	28102-002	BEL	17500	MANY	
NONE	Sub Assy, 10 Position Barrier Strip	40064-000	ORB			
NONE	Sub Assy, 10 Position Barrier Strip	40067-000	ORB			
NONE	Sub Assy, Heatsink Regulator	40068-001	ORB			
NONE	Sub Assy, XLR Connector, Input	40065-000	ORB			
NONE	Sub Assy, XLR Connector, Output	40066-000	ORB			
Switches						
NONE	Switch, Slide, Mains voltage selector	26140-000	SW	EPSI-SLI		
PCB ANALOG ASSEMBLY [AG]						
Capacitors						
C1,2	Mica, 500V, +1/2pF -1/2pF; 22pF	21017-022	CD	CD15-CD220D03	SAN	
C3	Met. Polyester, 100V, 10%; 1.0uF	21441-510	WIM	MKS-4100V5.1.0	WES,SIE	
C4-7	Alum., Radial, 50V, -20% +100%; 47uF	21208-647	SPR	502D 476G050CD1C	PAN	
C8	Mica, 500V, 5%; 100pF	21020-110	CD	CD15-FD101J03	SAN	
C9	Mica, 500V, +1/2pF -1/2pF; 10pF	21017-010	CD	CD15-CD100D03	SAN	
C10,11	Mica, 500V, 5%; 150pF	21020-115	CD	CD15-FD151J03	SAN	
C12	Mica, 500V, +1/2pF -1/2pF; 5pF	21017-005	CD	CD15-CD050D03	SAN	
C13	Alum., Radial, 63V, -20% +100%; 4.7uF	21209-547	SPR	502D 475G063BB1C	PAN	
C14	Tantalum, 35V, 10%; 0.22uF	21307-422	SPR	196D 224X9035HA1	MANY	
C15	Mica, 500V, +1/2pF -1/2pF; 47pF	21017-047	CD	CD15-CD470D03	SAN	
C16	Not used	---				
C17,18	Met. Polyester, 100V, 10%; 0.1uF	21441-410	WIM	MKS-4100V5.0.1	WES,SIE	
C19	Met. Polyester, 100V, 10%; 0.047uF	21441-347	WES	160C 473K250	SIE	
C20,21	Alum., Radial, 25V, -20% +100%; 100uF	21206-710	PAN	ECE-A1EV101S		
C22,23	Monolythic Ceramic, 50V, 20%; 0.1uF	21123-410	SPR	1C25 Z5U104M050B	KEM	
C24,25	Alum., Radial, 25V, -20% +100%; 100uF	21206-710	PAN	ECE-A1EV101S		
C26,27	Monolythic Ceramic, 50V, 20%; 0.1uF	21123-410	SPR	1C25 Z5U104M050B	KEM	
C28,29	Ceramic Disc, 50V, +80% -20%; 0.005uF	21108-250	CRL	CK-502		
C30	Ceramic Disc, 25V, 20%; 0.15uF	21106-415	CRL	UK25-154	MUR	
C31,32	Met. Polyester, 100V, 10%; 0.047uF	21441-347	WES	160C 473K250	SIE	
C33	Met. Polyester, 100V, 10%; 0.01uF	21441-310	WES	160C 103K630	SIE,WIM	

FOOTNOTES:
(1) See last page for 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

787A MIC PROCESSOR
Main Unit Final Assy, PCB Analog Assy: Capacitors

REF DES	DESCRIPTION	ORBAN P/N	VEN (1)	VENDOR P/N	ALTERNATE VENDORS(1)	NOTES
C34	Met. Polyester, 100V, 10%; 0.047uF	21441-347	WES	160C 473K250	SIE	
C35,36	Met. Polyester, 100V, 10%; 0.01uF	21441-310	WES	160C 103K630	SIE,WIM	
C37	Mica, 500V, 5%; 1000pF	21024-210	CD	CD19-FD102J03	SAN	
C38	Met. Polyester, 100V, 10%; 0.047uF	21441-347	WES	160C 473K250	SIE	
C39-64	Monolythic Ceramic, 50V, 20%; 0.1uF	21123-410	SPR	1C25 Z5U104M050B	KEM	
C65	Met. Polyester, 100V, 10%; 1.0uF	21441-510	WIM	MKS-4100V5,1.0	WES,SIE	
C66,67	Alum., Radial, 25V, -20% +100%; 100uF	21206-710	PAN	ECE-A1EV101S		
	Diodes					
CR5	Not used	---				
CR15	Not used	---				
CR22	Diode, Zener, 1W; 9.1V	22003-091	MOT	1N4739	MANY	
	Integrated Circuits					
IC1	Digital, Multiplying DAC	24714-302	AD	AD7524JN		
IC2	Linear, Dual Opamp	24207-202	SIG	NE5532N	TI,EXR	
IC3	Not used	---				
IC4	Digital, Multiplying DAC	24714-302	AD	AD7524JN		
IC5	Linear, Dual Opamp	24209-202	NAT	LF412CN		
IC6	Linear, Dual Opamp	24206-202	TI	TL072CP	MOT	
IC7	Linear, Single Opamp	24014-202	SIG	NE5534N	TI	
IC8	Linear, Dual Opamp	24208-302	RCA	CA3280A		
IC9	Linear, Single Opamp	24017-202	NAT	LF411CN		
IC10	Not used	---				
IC11	Linear, Dual Opamp	24207-202	SIG	NE5532N	TI,EXR	
IC12	Digital, Multiplying DAC	24714-302	AD	AD7524JN		
IC13	Linear, Dual Opamp	24209-202	NAT	LF412CN		
IC14	Digital, Multiplying DAC	24714-302	AD	AD7524JN		
IC15	Quad Comparator	24710-302	NAT	LM339		
IC16	Linear, Dual Opamp	24209-202	NAT	LF412CN		
IC17	Multiple Discrete, TR. Array	24406-302	RCA	CA3096AE		
IC18	Linear, Dual Opamp	24206-202	TI	TL072CP	MOT	
IC19	Linear, Dual Opamp	24209-202	NAT	LF412CN		
IC20	Multiple Discrete, TR. Array	24406-302	RCA	CA3096AE		
IC21	Linear, Dual Opamp	24209-202	NAT	LF412CN		
IC22-25	Digital, 3 To 8 Line Decoder	24556-302	NAT	MM74HCT138N	TI	
IC26	Digital, Flip-Flop	24561-302	NAT	MM74HCT374N		
IC27	Digital, Multiplying DAC	24714-302	AD	AD7524JN		
IC28-30	Linear, Dual Opamp	24209-202	NAT	LF412CN		
IC31	Quad Comparator	24710-302	NAT	LM339		
IC32,33	Linear, Dual Opamp	24209-202	NAT	LF412CN		
IC34	Linear, Single Opamp	24002-202	TI	UA741CN	RAY	
IC35	Digital, Multiplying DAC	24714-302	AD	AD7524JN		
IC36	Linear, Dual Opamp	24209-202	NAT	LF412CN		
IC37	Linear, Dual Opamp	24203-202	MOT	MC1458CP1	TI,RCA	
IC38	Quad Comparator	24710-302	NAT	LM339		

FOOTNOTES:
(1) See last page for 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

787A MIC PROCESSOR

PCB Analog Assy: Capacitors, Diodes, ICs

REF DES	DESCRIPTION	ORBAN P/N	VEN (1)	VENDOR P/N	ALTERNATE VENDORS (1)	NOTES
Modules						
A1	Module Assy, Compressor	31125-000-xx*	ORB			*Add suffix printed on part
A2	Module Assy, De-esser	31130-000-xx*	ORB			*Add suffix printed on part
A3	Module Assy, Output	31160-001-xx*	ORB			*Add suffix printed on part
Resistors						
R153a,b	Resistor Set, MF; 20.5K	28521-008	ORB			3
R45	Pot, Single, 10%; 50K (5020)	20721-000	ORB			20% CW Log
Transistors						
Q1	Transistor, JFET/P	23407-101	NAT	J174	SIL	
Q2	Transistor, Signal, PNP	23001-101	MOT	2N4125	FSC	
Q3,4	Transistor, JFET/N	23406-101	NAT	J113	SIL	
Q5-8	Transistor, Signal, NPN	23202-101	MOT	2N4400	FSC	
PCB DIGITAL & PWR SUPPLY ASSY [DG]						
Capacitors						
C1	Mica, 500V, +1/2pF -1/2pF; 30pF	21017-030	CD	CD15-CD300D03	SAN	
C2	Mica, 500V, 5%; 100pF	21020-110	CD	CD15-FD101J03	SAN	
C3-5	Alum., Radial, 63V, -20% +100%; 1uF	21209-510	SPR	502D 105G063BBIC	PAN	
C6-8	Alum., Axial, 40V, -10% +100%; 1000uF	21224-810	SIE	B41010-1000-40	PAN	
C9	Alum., Axial, 100V, -20% +20%; 100uF	21226-710	ME	3074HH101T100JPB	PAN	
C10	Not used	---				
C11	Monolythic Ceramic, 50V, 20%; 0.1uF	21123-410	SPR	1C25 Z5U104M050B	KEM	
C12	Alum., Radial, 25V, -20% +100%; 100uF	21206-710	PAN	ECE-A1EV101S		
C13	Monolythic Ceramic, 50V, 20%; 0.1uF	21123-410	SPR	1C25 Z5U104M050B	KEM	
C14,15	Alum., Radial, 25V, -20% +100%; 100uF	21206-710	PAN	ECE-A1EV101S		
C16,17	Monolythic Ceramic, 50V, 20%; 0.1uF	21123-410	SPR	1C25 Z5U104M050B	KEM	
C18	Alum., Radial, 25V, -20% +100%; 100uF	21206-710	PAN	ECE-A1EV101S		
C19	Monolythic Ceramic, 50V, 20%; 0.1uF	21123-410	SPR	1C25 Z5U104M050B	KEM	
C20	Alum., Radial, 63V, -20% +100%; 33uF	21209-633	SPR	502D 336G063CC1C	PAN	
C21	Met. Polyester, 100V, 10%; 0.01uF	21441-310	WES	160C 103K630	SIE,WIM	
C22	Met. Polyester, 100V, 10%; 0.1uF	21441-410	WIM	MKS-4100V5,0.1	WES,SIE	
C23	Met. Polyester, 100V, 10%; 0.01uF	21441-310	WES	160C 103K630	SIE,WIM	
C24-33	Monolythic Ceramic, 50V, 20%; 0.1uF	21123-410	SPR	1C25 Z5U104M050B	KEM	
Diodes						
BR1-3	Diode, Bridge, 200V, 1A	22301-000	VARO	VE-27	GI	
CR1	Diode, Voltage Reference	22081-112	NAT	LM385	MOT	
CR11,12	Diode, Signal, Hot Carrier	22102-001	HP	HP5082-2800	MANY	
CR13	Diode, Zener, 1W; 51V	22004-510	MOT	1N4757A	MANY	
CR14	Diode, Rectifier, 400V, 1A	22201-400	MOT	1N4004	MANY	

FOOTNOTES:
(1) See last page for 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

787A MIC PROCESSOR
PCB Analog Assy: Modules, Resistors, Transistors; PCB Digital & Pwr Supply Assy: Capacitors, Diodes

REF DES	DESCRIPTION	ORBAN P/N	VEN (1)	VENDOR P/N	ALTERNATE VENDORS (1)	NOTES
Integrated Circuits						
IC1	Digital, NAND Gate	24557-302	RCA	CD54/74HCT32		
IC2	Digital, Hex Inverter	24551-302	NAT	74HCT04N	TI	
IC3	Digital, Dual Flip-Flop	24552-302	NAT	MM74HCT74N	TI	
IC4	Digital, CPU, Z80	24804-302	TOS	TMPZ84C00AP		
IC5,6	Digital, 3 To 8 Line Decoder	24556-302	NAT	MM74HCT138N	TI	
IC7	Digital, RAM	24806-302	TOS	TC5564PL-20		
IC8	Digital, Quad 2-Input NAND	24559-302	RCA	74HCT132E	TI	
IC9	Digital, AND Gate	24560-302	NAT	74HCT08		
IC10	Digital,PROM	44002-000	ORB			
IC11	Digital, Transceiver	24558-302	NAT	MM74HCT245N	RCA	
IC12	Digital, Flip-Flop	24561-302	NAT	MM74HCT374N		
IC13	Quad Comparator	24710-302	NAT	LM339		
IC14	Digital, Flip-Flop	24561-302	NAT	MM74HCT374N		
IC15	Digital, Buffer	24554-302	NAT	MM74HCT244N	TI	
IC16	Digital, Flip-Flop	24561-302	NAT	MM74HCT374N		
IC17	D.C. Regulator, 5V Positive	24307-901	NAT	LM78M05C	TI,MOT	
Miscellaneous						
NONE	Battery Holder, Coin Cell	28031-000	KEY	106		
P2	Cable Assy, Flat, 40 Pin, 5 inches	42008-050	ORB			
Y1	Crystal; 8 MHz	28051-001	MID	C2150		
Resistors						
R4-7	Resistor Network, SIP; 100K	20221-101	BEK	L10-1C104		
R21	Resistor Network, SIP; 100K	20221-101	BEK	L10-1C104		
R34	Resistor Network, SIP; 100K	20221-101	BEK	L10-1C104		
Switches						
S1	Switch, MOM., Gray; SPST	26301-005	SCH	D6-02-05		
Transistors						
Q1	Transistor, Power, NPN; TO-220	23604-201	TI	TIP122	RCA	
Q2,3	Transistor, Signal, NPN	23202-101	MOT	2N4400	FSC	

FOOTNOTES:
(1) See last page for 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

787A MIC PROCESSOR

PCB Digital & Pwr Supply Assy: ICs, Misc., Resistors, Switches, Transistors

REF DES	DESCRIPTION	ORBAN P/N	VEN (1)	VENDOR P/N	ALTERNATE VENDORS(1)	NOTES
PCB DISPLAY ASSEMBLY [DP]						
Capacitors						
C1	Alum., Radial, 63V, -20% +100%; 2.2uF	21209-522	SPR	502D 225G063BB1C	PAN	
C2-6	Alum., Radial, 25V, -20% +100%; 100uF	21206-710	PAN	ECE-A1EV101S		
C7-12	Monolythic Ceramic, 50V, 20%; 0.1uF	21123-410	SPR	1C25 Z5U104M050B	KEM	
C13	Alum., Radial, 63V, -20% +100%; 2.2uF	21209-522	SPR	502D 225G063BB1C	PAN	
C14	Alum., Radial, 63V, -20% +100%; 1uF	21209-510	SPR	502D 105G063BB1C	PAN	
C15	Monolythic Ceramic, 50V, 20%; 0.1uF	21123-410	SPR	1C25 Z5U104M050B	KEM	
Integrated Circuits						
IC1	Digital, Display Driver	24713-302	NAT	LM3916		
IC2	Digital, Display Driver	24712-302	NAT	LM3914		
IC3	Digital, Flip-Flop	24561-302	NAT	MM74HCT374N		
IC4	Digital, LED Driver	24410-302	MOT	ULN2803		
IC5	Digital, Flip-Flop	24561-302	NAT	MM74HCT374N		
IC6	Digital, LED Driver	24410-302	MOT	ULN2803		
LEDs						
D1-3	LED Display, 0-9, Red	25402-000	HP	5082-7613	GI	
D4	LED Display, +/- 1	25401-000	HP	5082-7616		
DS1	LED, Red	25106-003	HP	HLMP-1300	GI	
DS2	LED, Green	25106-002	HP	HLMP-1503	GI	
DS3-8	LED, Red	25106-003	HP	HLMP-1300	GI	
DS9	LED Array, 6-Green, 3-Yellow, 1-Red	25151-000	ORB			
DS10	Not used	---				
DS11,12	LED, Red	25106-003	HP	HLMP-1300	GI	
DS13	LED, Green	25106-002	HP	HLMP-1503	GI	
DS14-19	LED, Red	25106-003	HP	HLMP-1300	GI	
DS20	LED Array, 9-Yellow, 1-Red	25152-000	ORB			
Miscellaneous						
P1	Cable Assy, Flat, 40 Pin, 6 inches	42008-060	ORB			
Switches						
S1	Switch, MOM.; SPST	26302-001	SCH	D6-01-01		
S2-5	Switch, MOM., With Red LED; SPDT	26323-011	SCH	SEAUo.A.0102R		
S6	Switch, MOM.; SPDT	26322-010	SCH	SEAUo.A.0101		
S7-17	Switch, MOM., With Red LED; SPDT	26323-011	SCH	SEAUo.A.0102R		
S18	Switch, MOM.; SPDT	26322-010	SCH	SEAUo.A.0101		

FOOTNOTES:
(1) See last page for 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

787A MIC PROCESSOR
PCB Display Assy: Capacitors, ICs
LEDs Misc., Switches

REF DES	DESCRIPTION	ORBAN P/N	VEN (1)	VENDOR P/N	ALTERNATE VENDORS (1)	NOTES
Transistors						
Q1	Transistor, Signal, NPN	23202-101	MOT	2N4400	FSC	
Q2	Transistor, Signal, PNP	23002-101	MOT	2N4402	FSC	
Q3	Transistor, Signal, NPN	23202-101	MOT	2N4400	FSC	
Q4-11	Transistor, Signal, PNP	23002-101	MOT	2N4402	FSC	
Q12,13	Transistor, Signal, NPN	23202-101	MOT	2N4400	FSC	
PCB EQUALIZER ASSEMBLY [EQ]						
Capacitors						
C1	Met. Polyester, 100V, 10%; 1.0uF	21441-510	WIM	MKS-4100V5,1.0	WES,SIE	
C2	Polypropylene, 50V, 1%; 0.01uF	21701-310	NOB	CQ15P1H103FPP	WES	
C3	Mica, 500V, 1%; 1000pF	21022-210	CD	CD19-FD102F03	SAN	
C4	Polypropylene, 50V, 1%; 0.01uF	21701-310	NOB	CQ15P1H103FPP	WES	
C5	Mica, 500V, 1%; 1000pF	21022-210	CD	CD19-FD102F03	SAN	
C6	Alum., Radial, 50V, -20% +100%; 47uF	21208-647	SPR	502D 476G050CD1C	PAN	
C7	Polypropylene, Trimmer; 2-10pF	21802-000	ME	2807C00210MJ02F		
C8	Alum., Radial, 50V, -20% +100%; 47uF	21208-647	SPR	502D 476G050CD1C	PAN	
C9,10	Mica, 500V, 1%; 1000pF	21022-210	CD	CD19-FD102F03	SAN	
C11	Mica, 500V, +1/2pF -1/2pF; 22pF	21017-022	CD	CD15-CD220D03	SAN	
C12	Polypropylene, Trimmer; 2-10pF	21802-000	ME	2807C00210MJ02F		
C13	Mica, 500V, +1/2pF -1/2pF; 22pF	21017-022	CD	CD15-CD220D03	SAN	
C14-17	Mica, 500V, 1%; 1000pF	21022-210	CD	CD19-FD102F03	SAN	
C18	Mica, 500V, +1/2pF -1/2pF; 22pF	21017-022	CD	CD15-CD220D03	SAN	
C19-21	Alum., Radial, 25V, -20% +100%; 100uF	21206-710	PAN	ECE-A1EV101S		
C22-24	Monolythic Ceramic, 50V, 20%; 0.1uF	21123-410	SPR	1C25 Z5U104M050B	KEM	
C25,26	Mica, 500V, 1%; 1000pF	21022-210	CD	CD19-FD102F03	SAN	
C27-38	Monolythic Ceramic, 50V, 20%; 0.1uF	21123-410	SPR	1C25 Z5U104M050B	KEM	
Integrated Circuits						
IC1	See selected components	---				
IC2	Digital, Multiplying DAC	24714-302	AD	AD7524JN		
IC3-5	See selected components	---				
IC6	Digital, Multiplying DAC	24714-302	AD	AD7524JN		
IC7-9	See selected components	---				
IC10	Digital, Multiplying DAC	24714-302	AD	AD7524JN		
IC11,12	See selected components	---				
IC13,14	Linear, Dual Opamp	24207-202	SIG	NE5532N	TI,EXR	
IC15	Linear, Dual Opamp	24209-202	NAT	LF412CN		
IC16,17	Linear, Dual Opamp	24207-202	SIG	NE5532N	TI,EXR	
IC18,19	Linear, Dual Opamp	24211-202	MOT	MC34082P		
IC20	Linear, Dual Opamp	24209-202	NAT	LF412CN		
IC21	Linear, Dual Opamp	24211-202	MOT	MC34082P		

FOOTNOTES:
(1) See last page for 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

787A MIC PROCESSOR
PCB Display Assy: Transistors; PCB Equalizer Assy: Capacitors, ICs

REF DES	DESCRIPTION	ORBAN P/N	VEN (1)	VENDOR P/N	ALTERNATE VENDORS (1)	NOTES
PCB REMOTE INTERFACE ASSEMBLY [RI]						
Capacitors						
C1,2	Monolythic Ceramic, 50V, 20%; 0.1uF	21123-410	SPR	1C25 Z5U104M050B	KEM	
C3	Alum., Radial, 25V, -20% +100%; 100uF	21206-710	PAN	ECE-A1EV101S		
C4	Monolythic Ceramic, 50V, 20%; 0.1uF	21123-410	SPR	1C25 Z5U104M050B	KEM	
C5	Alum., Radial, 25V, -20% +100%; 100uF	21206-710	PAN	ECE-A1EV101S		
C6	Monolythic Ceramic, 50V, 20%; 0.1uF	21123-410	SPR	1C25 Z5U104M050B	KEM	
C7,8	Ceramic Disc, 25V, 20%; 0.01uF	21106-310	CRL	UK25-103	MUR, SPR	
C9,10	Ceramic Disc, 1KV, 10%; 0.001uF	21112-210	CRL	DD-102	MUR	
C11-13	Ceramic Disc, 25V, 20%; 0.01uF	21106-310	CRL	UK25-103	MUR, SPR	
C14,15	Ceramic Disc, 1KV, 10%; 0.001uF	21112-210	CRL	DD-102	MUR	
C16	Ceramic Disc, 25V, 20%; 0.01uF	21106-310	CRL	UK25-103	MUR, SPR	
Diodes						
CR1	Diode, Rectifier, 400V, 1A	22201-400	MOT	1N4004	MANY	
Integrated Circuits						
IC1	Digital, NAND Gate	24557-302	RCA	CD54/74HCT32		
IC2	Digital, Quad 2-Input NAND	24559-302	RCA	74HCT132E	TI	
IC3	Digital, Dual Flip-Flop	24552-302	NAT	MM74HCT74N	TI	
IC4	Digital, Buffer	24554-302	NAT	MM74HCT244N	TI	
IC5	Digital, Hex Inverter	24601-302	TI	SN7406		
IC6	D.C. Regulator, 15V Positive	24304-901	NAT	LM78M15UC	TI,MOT	
Miscellaneous						
NONE	Cable Assy, Flat, 26 Pin, 8 inches	42007-080	ORB			
PCB RS-232 ASSEMBLY [RS]						
Capacitors						
C1	Monolythic Ceramic, 50V, 20%; 0.1uF	21123-410	SPR	1C25 Z5U104M050B	KEM	
C2	Alum., Radial, 25V, -20% +100%; 100uF	21206-710	PAN	ECE-A1EV101S		
C3,4	Monolythic Ceramic, 50V, 20%; 0.1uF	21123-410	SPR	1C25 Z5U104M050B	KEM	
C5	Alum., Radial, 25V, -20% +100%; 100uF	21206-710	PAN	ECE-A1EV101S		
C6	Monolythic Ceramic, 50V, 20%; 0.1uF	21123-410	SPR	1C25 Z5U104M050B	KEM	
C7	Alum., Radial, 25V, -20% +100%; 100uF	21206-710	PAN	ECE-A1EV101S		
C8	Monolythic Ceramic, 50V, 20%; 0.1uF	21123-410	SPR	1C25 Z5U104M050B	KEM	
C9	Mica, 500V, 5%; 100pF	21020-110	CD	CD15-FD101J03	SAN	
C10	Mica, 500V, +1/2pF -1/2pF; 33pF	21017-033	CD	CD15-CD330D03	SAN	
C11-14	Monolythic Ceramic, 50V, 20%; 0.1uF	21123-410	SPR	1C25 Z5U104M050B	KEM	

FOOTNOTES:
(1) See last page for 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

787A MIC PROCESSOR
PCB Remote Interface Assy; PCB RS-232 Assy: Capacitors

REF DES	DESCRIPTION	ORBAN P/N	VEN (1)	VENDOR P/N	ALTERNATE VENDORS (1)	NOTES
Miscellaneous						
P2	Cable Assy, Flat, 26 Pin, 6 inches	42007-060	ORB			Main unit only
P2	Cable Assy, Flat, 26 Pin, 3 inches	42007-030	ORB			Slave unit only
Resistors						
R1	Resistor Network, 8 POS.; 20K	20201-501	BEK	698-3-R20KD		
R2	See selected components	---				
R5,6	See selected components	---				
R8	Resistor Network, 8 POS.; 20K	20201-501	BEK	698-3-R20KD		
R9	See selected components	---				
R12,13	See selected components	---				
R15	Resistor Network, 8 POS.; 20K	20201-501	BEK	698-3-R20KD		
R16	See selected components	---				
R19,20	See selected components	---				
Selected Components						
IC1/R2	Matched Set, IC/Resistor	40075-000	ORB			3
IC3/R6	Matched Set, IC/Resistor	40075-000	ORB			3
IC4/R5	Matched Set, IC/Resistor	40075-000	ORB			3
IC5/R9	Matched Set, IC/Resistor	40075-000	ORB			3
IC7/R13	Matched Set, IC/Resistor	40075-000	ORB			3
IC8/R12	Matched Set, IC/Resistor	40075-000	ORB			3
IC9/R16	Matched Set, IC/Resistor	40075-000	ORB			3
IC11/R20	Matched Set, IC/Resistor	40075-000	ORB			3
IC12/R19	Matched Set, IC/Resistor	40075-000	ORB			3
PCB MIC OPTION ASSEMBLY [MC]						
Capacitors						
C1	Met. Polyester, 100V, 10%; 0.1uF	21441-410	WIM	MKS-4100V5.0.1	WES,SIE	
C2,3	Mica, 500V, +1/2pF -1/2pF; 33pF	21017-033	CD	CD15-CD330D03	SAN	
C4	Mica, 500V, 1%; 160pF	21018-116	CD	CD15-FD161F03	SAN	
C5	Alum., Radial, 25V, -20% +100%; 100uF	21206-710	PAN	ECE-A1EV101S		
C6	Monolythic Ceramic, 50V, 20%; 0.1uF	21123-410	SPR	1C25 Z5U104M050B	KEM	
C7	Alum., Radial, 25V, -20% +100%; 100uF	21206-710	PAN	ECE-A1EV101S		
C8	Monolythic Ceramic, 50V, 20%; 0.1uF	21123-410	SPR	1C25 Z5U104M050B	KEM	
C9,10	Alum., Radial, 50V, -20% +100%; 47uF	21208-647	SPR	502D 476G050CD1C	PAN	
C11	Met. Polyester, 100V, 10%; 1.0uF	21441-510	WIM	MKS-4100V5.1.0	WES,SIE	
C12	Alum., Radial, 63V, -20% +100%; 22uF	21209-622	SPR	502D 226G063CC1C	PAN	
C13	Not used	---				
C14	Mica, 500V, +1/2pF -1/2pF; 22pF	21017-022	CD	CD15-CD220D03	SAN	

FOOTNOTES:
(1) See last page for abbreviations
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(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

787A MIC PROCESSOR

PCB RS-232 Assy: Misc., Resistors, Selected Components; PCB Mic Option Assy: Capacitors

REF DES	DESCRIPTION	ORBAN P/N	VEN (1)	VENDOR P/N	ALTERNATE VENDORS (1)	NOTES
	Integrated Circuits					
IC1	Linear, Single Opamp	24014-202	SIG	NE5534N	TI	
	Miscellaneous					
T1	Transformer	29108-000	JEN	JE-115K-E		
	Resistors					
R2a,b	Resistor Set, MF; 6.81K	28521-023	ORB			3
PCB MIDI OPTION ASSEMBLY [MD]						
	Capacitors					
C1	Alum., Radial, 25V, -20% +100%; 100uF	21206-710	PAN	ECE-A1EV101S		
C2,3	Monolythic Ceramic, 50V, 20%; 0.1uF	21123-410	SPR	1C25 Z5U104M050B	KEM	
	Diodes					
CR1	Diode, Rectifier, 400V, 1A	22201-400	MOT	1N4004	MANY	
	Integrated Circuits					
IC1	Digital, Microprocessor, Z80, SIO/0	24803-302	TOS	TMPZ84C40P		
IC2	Digital, NAND Gate	24557-302	RCA	CD54/74HCT32		
IC3	Digital, Hex Inverter	24551-302	NAT	74HCT04N	TI	
IC4	Digital, Hex Inverter	24601-302	TI	SN7406		
IC5	Optocoupler	25005-302	HP	6N138	GI	
IC6	Digital, Microprocessor, Z80	24807-302	TOS	TMPZ84C30P		
IC7	Digital, Dual Flip-Flop	24552-302	NAT	MM74HCT74N	TI	
	Miscellaneous					
P1	Cable Assy, Flat, 26 Pin, 8 inches	42007-080	ORB			
PCB R/C DISPLAY ASSEMBLY [DB]						
	LEDs					
D1,2	LED Display, 0-9, Red	25402-000	HP	5082-7613	GI	

FOOTNOTES:
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SPECIFICATIONS AND SOURCES FOR REPLACEMENT PARTS

787A MIC PROCESSOR
PCB Mic Option Assy: ICs, Misc., Resistors; PCB MIDI Option Assy; PCB R/C Display Assy

REF DES	DESCRIPTION	ORBAN P/N	VEN (1)	VENDOR P/N	ALTERNATE VENDORS (1)	NOTES
PCB R/C MAIN ASSEMBLY [MB]						
Capacitors						
C1,2	Ceramic Disc, 1KV, 10%; 0.001uF	21112-210	CRL	DD-102	MUR	
C3-7	Monolythic Ceramic, 50V, 20%; 0.1uF	21123-410	SPR	1C25 Z5U104M050B	KEM	
C8,9	Ceramic Disc, 1KV, 10%; 0.001uF	21112-210	CRL	DD-102	MUR	
C10	Alum., Radial, 25V, -20% +100%; 100uF	21206-710	PAN	ECE-A1EV101S		
C11	Monolythic Ceramic, 50V, 20%; 0.1uF	21123-410	SPR	1C25 Z5U104M050B	KEM	
Diodes						
CR1-6	Diode, Rectifier, 400V, 1A	22201-400	MOT	1N4004	MANY	
Integrated Circuits						
IC1	Digital, Up-Counter	24508-302	RCA	CD4520BE		
IC2,3	Digital, Dual Flip-Flop	24502-302	RCA	CD4013BE		
IC4	Digital, Driver	24563-302	NAT	CD4511BC	RCA	
IC5	Digital, Up-Counter	24508-302	RCA	CD4520BE		
IC6	Digital, Quad 2-Input NAND	24509-302	RCA	CD4093BE		
IC7	Digital, Hex Inverter	24505-302	RCA	CD4069UBE	SIG	
IC8	Digital, 1-in-4 Decoder	24506-302	RCA	CD4555BE	SIG	
IC9	Digital, 8 Channel Analog Multiplexer	24530-302	NAT	CD4051BC	RCA	
IC10,11	Digital, Driver	24563-302	NAT	CD4511BC	RCA	
IC12	Digital, Dual Flip-Flop	24502-302	RCA	CD4013BE		
IC13	Digital, Encoder	24529-302	NAT	CD4532BCN	RCA	
IC14	Digital, Quad 2-Input NAND	24509-302	RCA	CD4093BE		
IC15	Digital, Dual Flip-Flop	24502-302	RCA	CD4013BE		
Transistors						
Q1	Transistor, Signal, NPN	23202-101	MOT	2N4400	FSC	
PCB R/C SWITCH ASSEMBLY [SB]						
Capacitors						
C1-4	Ceramic Disc, 1KV, 10%; 0.001uF	21112-210	CRL	DD-102	MUR	
Switches						
S1-3	Switch, MOM., With Red LED; SPDT	26323-011	SCH	SEAUo.A.0102R		
S4	Switch, MOM.; SPDT	26322-010	SCH	SEAUo.A.0101		

FOOTNOTES:
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SPECIFICATIONS AND SOURCES FOR REPLACEMENT PARTS

787A MIC PROCESSOR
PCB R/C Main Assy; PCB R/C Switch Assy

REF DES	DESCRIPTION	ORBAN P/N	VEN (1)	VENDOR P/N	ALTERNATE VENDORS (1)	NOTES
PCB REMOTE INTERFACE ASSEMBLY [R1]						
Capacitors						
C1,2	Monolythic Ceramic, 50V, 20%; 0.1uF	21123-410	SPR	1C25 Z5U104M050B	KEM	
C3	Alum., Radial, 25V, -20% +100%; 100uF	21206-710	PAN	ECE-A1EV101S		
C4	Monolythic Ceramic, 50V, 20%; 0.1uF	21123-410	SPR	1C25 Z5U104M050B	KEM	
C5	Alum., Radial, 25V, -20% +100%; 100uF	21206-710	PAN	ECE-A1EV101S		
C6	Monolythic Ceramic, 50V, 20%; 0.1uF	21123-410	SPR	1C25 Z5U104M050B	KEM	
C7,8	Ceramic Disc, 25V, 20%; 0.01uF	21106-310	CRL	UK25-103	MUR, SPR	
C9,10	Ceramic Disc, 1KV, 10%; 0.001uF	21112-210	CRL	DD-102	MUR	
C11-13	Ceramic Disc, 25V, 20%; 0.01uF	21106-310	CRL	UK25-103	MUR, SPR	
C14,15	Ceramic Disc, 1KV, 10%; 0.001uF	21112-210	CRL	DD-102	MUR	
C16	Ceramic Disc, 25V, 20%; 0.01uF	21106-310	CRL	UK25-103	MUR, SPR	
Diodes						
CR1	Diode, Rectifier, 400V, 1A	22201-400	MOT	1N4004	MANY	
Integrated Circuits						
IC1	Digital, NAND Gate	24557-302	RCA	CD54/74HCT32		
IC2	Digital, Quad 2-Input NAND	24559-302	RCA	74HCT132E	TI	
IC3	Digital, Dual Flip-Flop	24552-302	NAT	MM74HCT74N	TI	
IC4	Digital, Buffer	24554-302	NAT	MM74HCT244N	TI	
IC5	Digital, Hex Inverter	24601-302	TI	SN7406		
IC6	D.C. Regulator, 15V Positive	24304-901	NAT	LM78M15UC	TI,MOT	
Miscellaneous						
NONE	Cable Assy, Flat, 26 Pin, 8 inches	42007-080	ORB			
PCB RS-232 ASSEMBLY [R5]						
Capacitors						
C1	Monolythic Ceramic, 50V, 20%; 0.1uF	21123-410	SPR	1C25 Z5U104M050B	KEM	
C2	Alum., Radial, 25V, -20% +100%; 100uF	21206-710	PAN	ECE-A1EV101S		
C3,4	Monolythic Ceramic, 50V, 20%; 0.1uF	21123-410	SPR	1C25 Z5U104M050B	KEM	
C5	Alum., Radial, 25V, -20% +100%; 100uF	21206-710	PAN	ECE-A1EV101S		
C6	Monolythic Ceramic, 50V, 20%; 0.1uF	21123-410	SPR	1C25 Z5U104M050B	KEM	
C7	Alum., Radial, 25V, -20% +100%; 100uF	21206-710	PAN	ECE-A1EV101S		
C8	Monolythic Ceramic, 50V, 20%; 0.1uF	21123-410	SPR	1C25 Z5U104M050B	KEM	
C9	Mica, 500V, 5%; 100pF	21020-110	CD	CD15-FD101J03	SAN	
C10	Mica, 500V, +1/2pF -1/2pF; 33pF	21017-033	CD	CD15-CD330D03	SAN	
C11-14	Monolythic Ceramic, 50V, 20%; 0.1uF	21123-410	SPR	1C25 Z5U104M050B	KEM	

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

SPECIFICATIONS AND SOURCES FOR REPLACEMENT PARTS

787A MIC PROCESSOR
PCB Remote Interface Assy;
PCB RS-232 Assy: Capacitors

REF DES	DESCRIPTION	ORBAN P/N	VEN (1)	VENDOR P/N	ALTERNATE VENDORS (1)	NOTES
	Integrated Circuits					
IC1	Digital, Hex Inverter	24551-302	NAT	74HCT04N	TI	
IC2	Digital, Dual Flip-Flop	24552-302	NAT	MM74HCT74N	TI	
IC3	Digital, Quad Line Receiver	24662-302	NAT	DS14C89A		
IC4	Digital, Quad Line Driver	24661-302	NAT	DS14C88N		
IC5	Digital, NAND Gate	24557-302	RCA	CD54/74HCT32		
IC6	Digital, Microprocessor, Z80	24807-302	TOS	TMPZ84C30P		
IC7	Digital, Microprocessor, Z80, SIO/0	24803-302	TOS	TMPZ84C40P		
IC8	D.C. Regulator, 12V Negative	24310-901	NAT	LM79M12C	TI,MOT	
IC9	D.C. Regulator, 12V Positive	24309-901	NAT	LM78M12C	TI,MOT	
	Miscellaneous					
NONE	Cable Assy, Flat, 26 Pin, 8 inches	42007-080	ORB			
Y1	Crystal; 6.144MHz	28051-002	MID	C1950		
	PCB SLAVE DISPLAY ASSEMBLY [SD]					
	Capacitors					
C1,2	Alum., Radial, 63V, -20% +100%; 2.2uF	21209-522	SPR	502D 225G063BB1C	PAN	
	Integrated Circuits					
IC1	Digital, Display Driver	24713-302	NAT	LM3916		
IC2	Digital, Display Driver	24712-302	NAT	LM3914		
	LEDs					
DS1	LED, Red	25106-003	HP	HLMP-1300	GI	
DS2,3	LED, Green	25106-002	HP	HLMP-1503	GI	
DS4	LED Array, 9-Yellow, 1-Red	25152-000	ORB			
DS5	LED Array, 6-Green, 3-Yellow, 1-Red	25151-000	ORB			
	Transistors					
Q1,2	Transistor, Signal, NPN	23202-101	MOT	2N4400	FSC	

FOOTNOTES:
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SPECIFICATIONS AND SOURCES FOR REPLACEMENT PARTS

787A MIC PROCESSOR
PCB RS-232 Assy: ICs, Misc.; PCB Slave Display Assy

REF DES	DESCRIPTION	ORBAN P/N	VEN (1)	VENDOR P/N	ALTERNATE VENDORS (1)	NOTES
PCB SLAVE INTERCONNECT ASSY [SI]						
Capacitors						
C1	Monolythic Ceramic, 50V, 20%; 0.1uF	21123-410	SPR	1C25 Z5U104M050B	KEM	
C2	Alum., Axial, 40V, -10% +100%; 1000uF	21224-810	SIE	B41010-1000-40	PAN	
C3	Monolythic Ceramic, 50V, 20%; 0.1uF	21123-410	SPR	1C25 Z5U104M050B	KEM	
C4	Alum., Radial, 25V, -20% +100%; 100uF	21206-710	PAN	ECE-A1EV101S		
C5	Monolythic Ceramic, 50V, 20%; 0.1uF	21123-410	SPR	1C25 Z5U104M050B	KEM	
C6	Alum., Axial, 40V, -10% +100%; 1000uF	21224-810	SIE	B41010-1000-40	PAN	
C7	Monolythic Ceramic, 50V, 20%; 0.1uF	21123-410	SPR	1C25 Z5U104M050B	KEM	
C8	Alum., Radial, 25V, -20% +100%; 100uF	21206-710	PAN	ECE-A1EV101S		
C9	Monolythic Ceramic, 50V, 20%; 0.1uF	21123-410	SPR	1C25 Z5U104M050B	KEM	
C10	Alum., Axial, 40V, -10% +100%; 1000uF	21224-810	SIE	B41010-1000-40	PAN	
C11	Monolythic Ceramic, 50V, 20%; 0.1uF	21123-410	SPR	1C25 Z5U104M050B	KEM	
C12	Alum., Radial, 25V, -20% +100%; 100uF	21206-710	PAN	ECE-A1EV101S		
C13	Met. Polyester, 100V, 10%; 0.1uF	21441-410	WIM	MKS-4100V5.0.1	WES,SIE	
C14	Alum., Axial, 100V, -20% +20%; 100uF	21226-710	ME	3074HH101T100JPB	PAN	
C15	Met. Polyester, 100V, 10%; 0.1uF	21441-410	WIM	MKS-4100V5.0.1	WES,SIE	
C16	Alum., Radial, 63V, -20% +100%; 33uF	21209-633	SPR	502D 336G063CC1C	PAN	
C17,18	Met. Polyester, 100V, 10%; 0.01uF	21441-310	WES	160C 103K630	SIE,WIM	
Diodes						
CR1	Diode, Rectifier, 400V, 1A	22201-400	MOT	1N4004	MANY	
CR2	Diode, Zener, 1W; 51V	22004-510	MOT	1N4757A	MANY	
Integrated Circuits						
IC3	D.C. Regulator, 5V Positive	24307-901	NAT	LM78M05C	TI,MOT	
Miscellaneous						
P2	Cable Assy, Flat, 40 Pin, 2 inches	42008-020	ORB			
P4	Cable Assy, Flat, 16 Pin, 6.5 inches	40056-065	ORB			
Switches						
SW1	Switch, Single, Push-Push; 4PDT	26116-000	SCH	F014UEEB01BAG		
Transistors						
Q1	Transistor, Power, NPN; TO-220	23604-201	TI	TIP122	RCA	
Q2	Transistor, Signal, NPN	23202-101	MOT	2N4400	FSC	

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SPECIFICATIONS AND SOURCES FOR REPLACEMENT PARTS

787A MIC PROCESSOR
PCB Slave Interconnect Assy

REF DES	DESCRIPTION	ORBAN P/N	VEN (1)	VENDOR P/N	ALTERNATE VENDORS (1)	NOTES
REMOTE CONTROL FINAL ASSEMBLY						
LEDs						
DS1,2	LED, Red	25103-000	GI	MV-5053		
Miscellaneous						
NONE	Cable Assy, Flat, 14 Pin, 2.5 inches	42006-025	ORB			
NONE	Cable Assy, Flat, 16 Pin, 2.5 inches	42009-025	ORB			
SLAVE UNIT FINAL ASSEMBLY						
Miscellaneous						
NONE	Cable Assy, Flat, 37 Pin, "D" Conn.	42011-000	ORB			Main unit to slave unit
NONE	Cable Assy, Flat, 37 Pin, 8 inches	42010-080	ORB			Internal main unit
NONE	Cable Assy, Flat, 37 Pin, 3.5 inches	42010-035	ORB			
NONE	Sub Assy, 10 Position Barrier Strip	40064-000	ORB			
NONE	Sub Assy, XLR Connector, Output	40066-000	ORB			
NONE	Sub Assy, Heatsink Regulator	40068-002	ORB			
NONE	Sub Assy, XLR Connector, Input	40065-000	ORB			
SUB ASSY, 10 POSITION BARRIER STRIP						
Capacitors						
C1-7	Ceramic Disc, 1KV, 10%; 0.001uF	21112-210	CRL	DD-102	MUR	TB1
NONE	Ceramic Disc, 1KV, 10%; 0.001uF	21112-210	CRL	DD-102	MUR	TB2
SUB ASSY, HEATSINK REGULATOR						
Integrated Circuits						
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	D.C. Regulator, 5V Positive	24307-901	NAT	LM78M05C	TI,MOT	Main unit only

FOOTNOTES:
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SPECIFICATIONS AND SOURCES FOR REPLACEMENT PARTS

787A MIC PROCESSOR
Remote Ctrl Final Assy; Slave Final Assy; Sub Assy, 10 Position Barrier Strip; Sub Assy, Heatsink Regulator

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

CLIF Cliff Electronics Company, Inc.
4876 East Second Street
Benicia, CA 94510

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

KB Kingbright USA Corporation
225 Brea Canyon Road
City of Industry, CA 91789

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

NEC NEC Technologies
159 Swanson
Bax Braugh, MA 01719

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

Vendor Codes

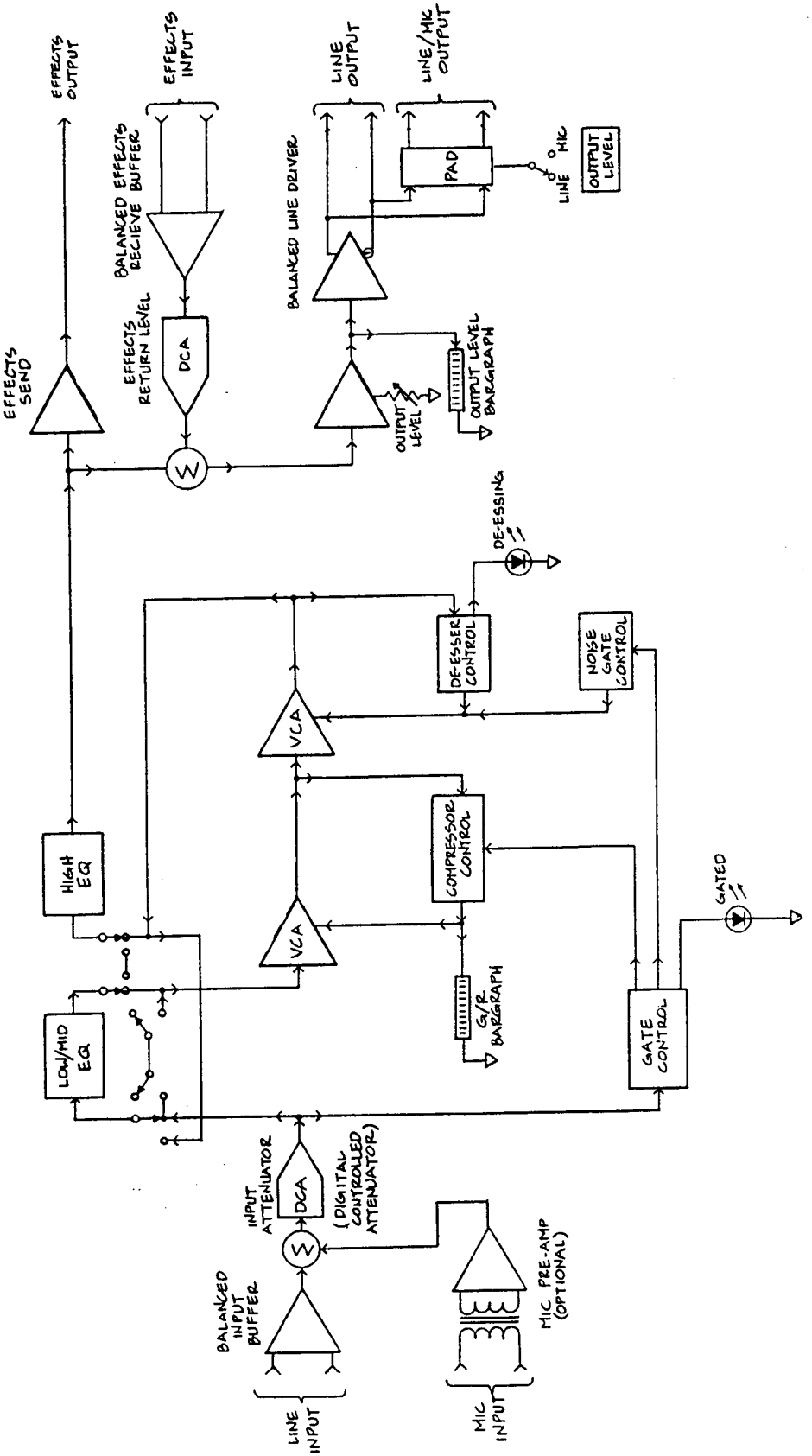
Schematics, Assembly Drawings

The following drawings are included in this manual:

Page	Board ID	Function	Drawing
6-41		Block Diagram	
6-42	AG	Analog	PC Assembly
6-43	AG	Analog	Schematic
6-44			Schematic
6-46	EQ	Equalizer	PC Assembly
6-47	EQ	Equalizer	Schematic
6-48	DG	Digital & Power Supply	PC Assembly
6-49	DG	Digital & Power Supply	Schematic
6-50			Schematic
6-52	DP	Display	PC Assembly
6-53	DP	Display	Schematic
6-54	SI	Slave Interconnect	PC Assembly
6-55	SI	Slave Interconnect	Schematic
6-56	SD	Slave Display	PC Assembly
6-57	SD	Slave Display	Schematic
6-58	MC	Mic Option	PC Assembly
6-59	MC	Mic Option	Schematic
6-60	DB	Remote Control Display	PC Assembly
6-61	MB	Remote Control	PC Assembly
6-62	MB	Remote Control	Schematic
6-63	SB	Remote Control Switch	PC Assembly
6-64	RI	Remote Interface	PC Assembly
6-65	RI	Remote Interface	Schematic
6-66	MD	Midi Option	PC Assembly
6-67	MD	Midi Option	Schematic
6-68	RS	RS-232	PC Assembly
6-69	RS	RS-232	Schematic

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. Major changes are described in addenda to this manual.

If you intend to replace parts, please read page 6-23.



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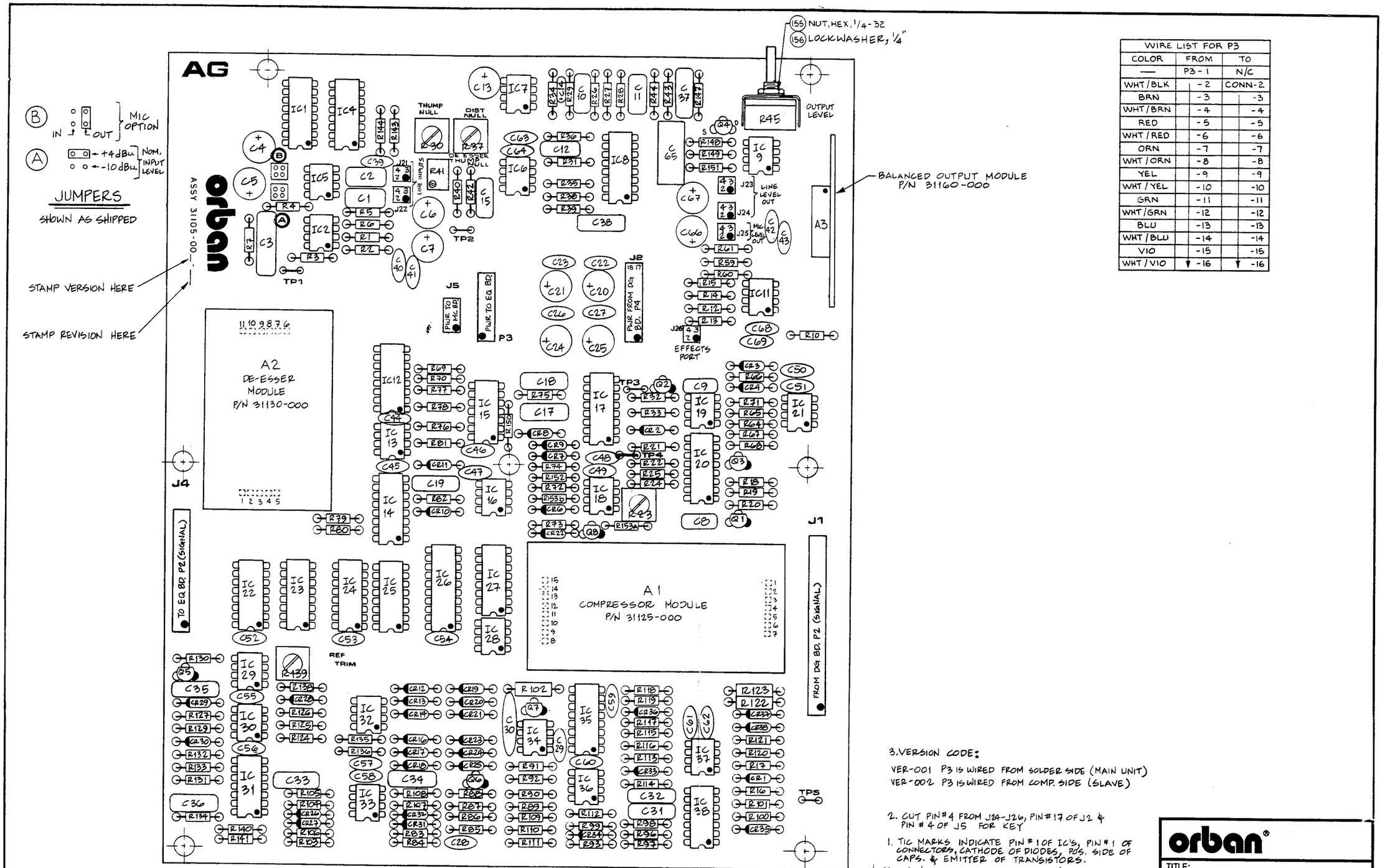
TITLE: BLOCK DIAGRAM
787A & 787ASL
60181-000-01



COMPONENT SIDE

WIRE LIST FOR P3		
COLOR	FROM	TO
—	P3-1	N/C
WHT/BLK	-2	CONN-2
BRN	-3	-3
WHT/BRN	-4	-4
RED	-5	-5
WHT/RED	-6	-6
ORN	-7	-7
WHT/ORN	-8	-8
YEL	-9	-9
WHT/YEL	-10	-10
GRN	-11	-11
WHT/GRN	-12	-12
BLU	-13	-13
WHT/BLU	-14	-14
VIO	-15	-15
WHT/VIO	-16	-16

3. VERSION CODE:
VER-001 P3 IS WIRED FROM SOLDER SIDE (MAIN UNIT)
VER-002 P3 IS WIRED FROM COMP. SIDE (SLAVE)

2. CUT PIN #4 FROM J24-J26, PIN #17 OF J2 & PIN #4 OF J5 FOR KEY

1. TIC MARKS INDICATE PIN #1 OF IC'S, PIN #1 OF CONNECTORS, CATHODE OF DIODES, POS. SIDE OF CAPS. & EMITTER OF TRANSISTORS.

NOTES: (UNLESS OTHERWISE SPECIFIED)

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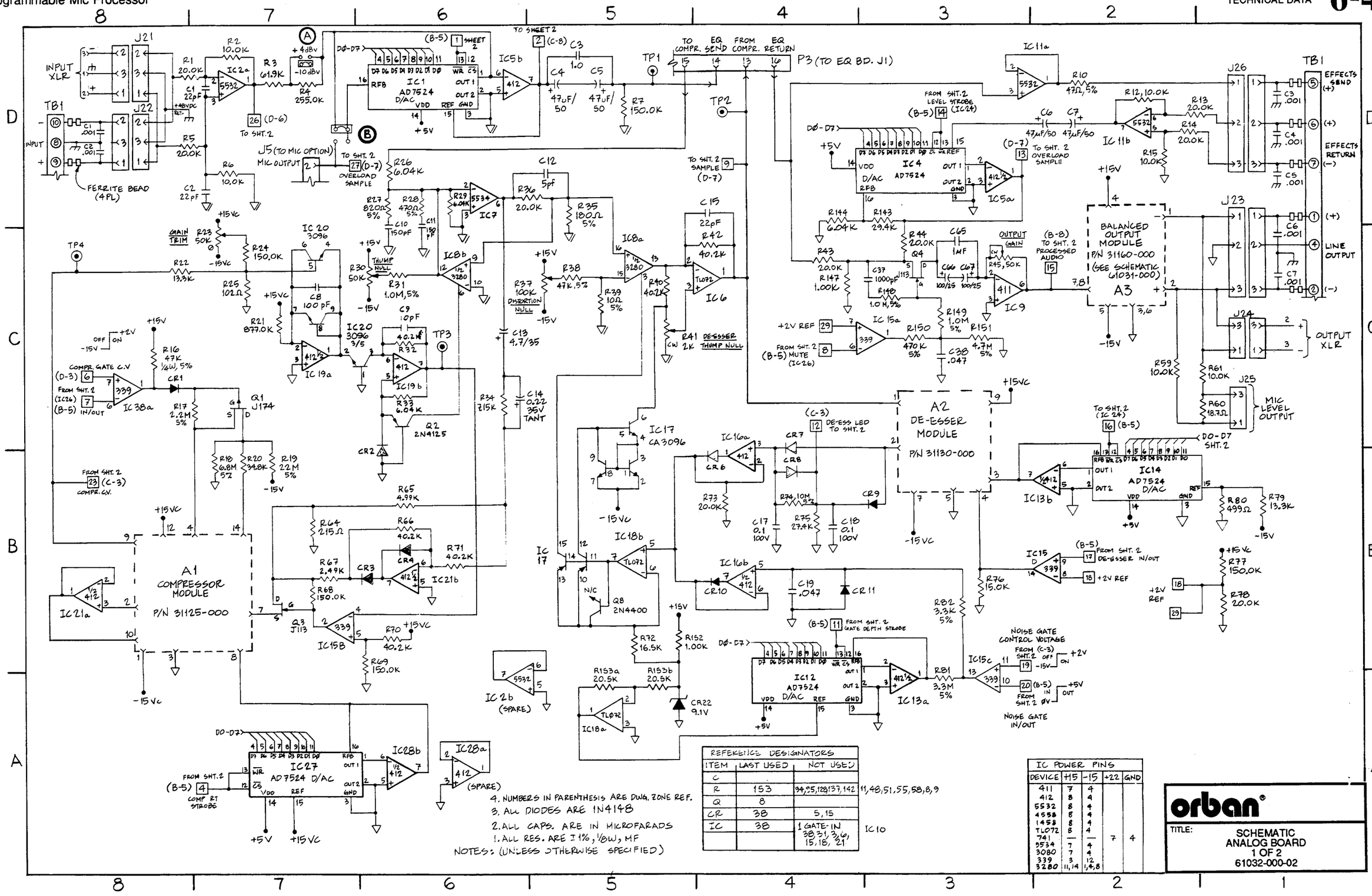
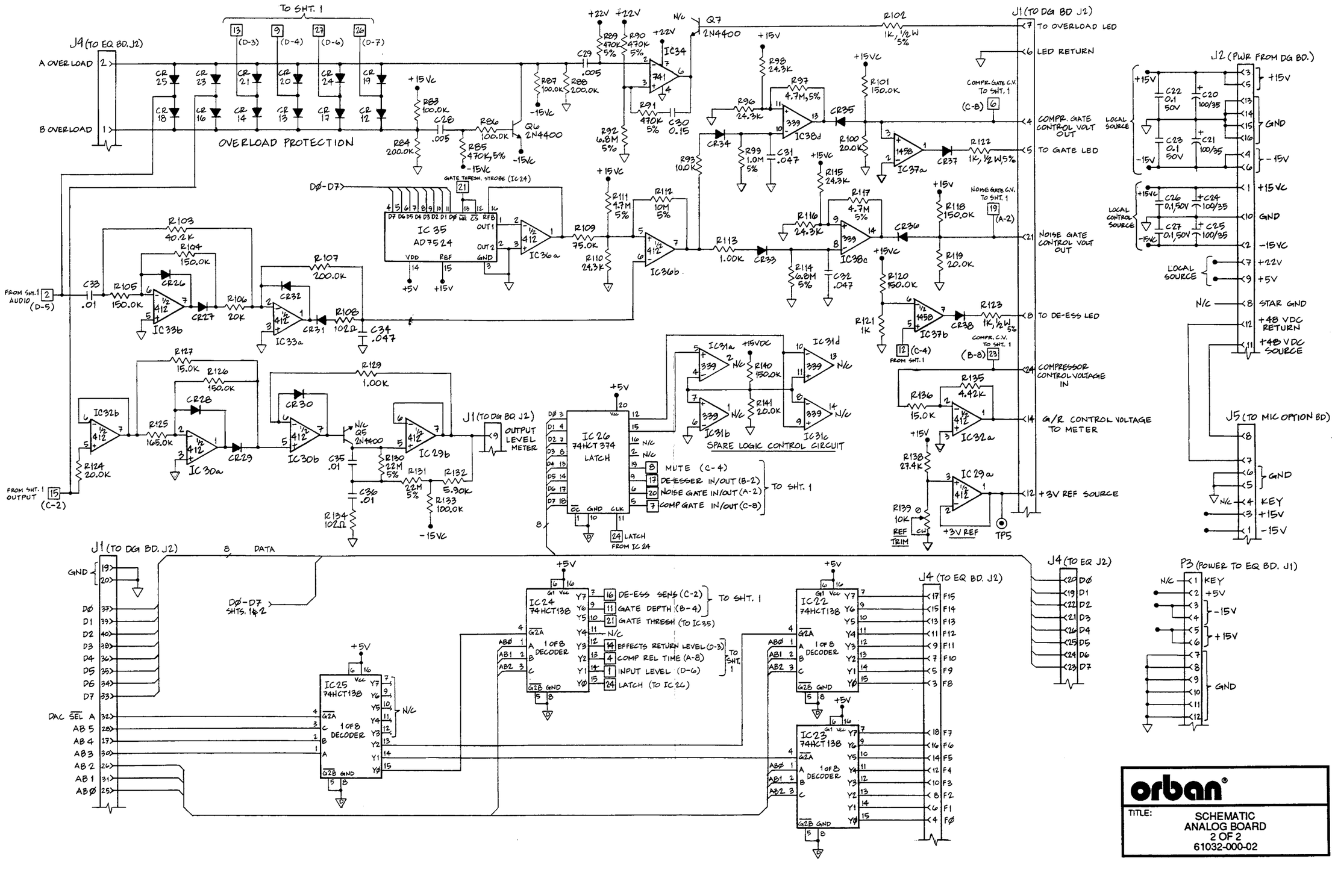
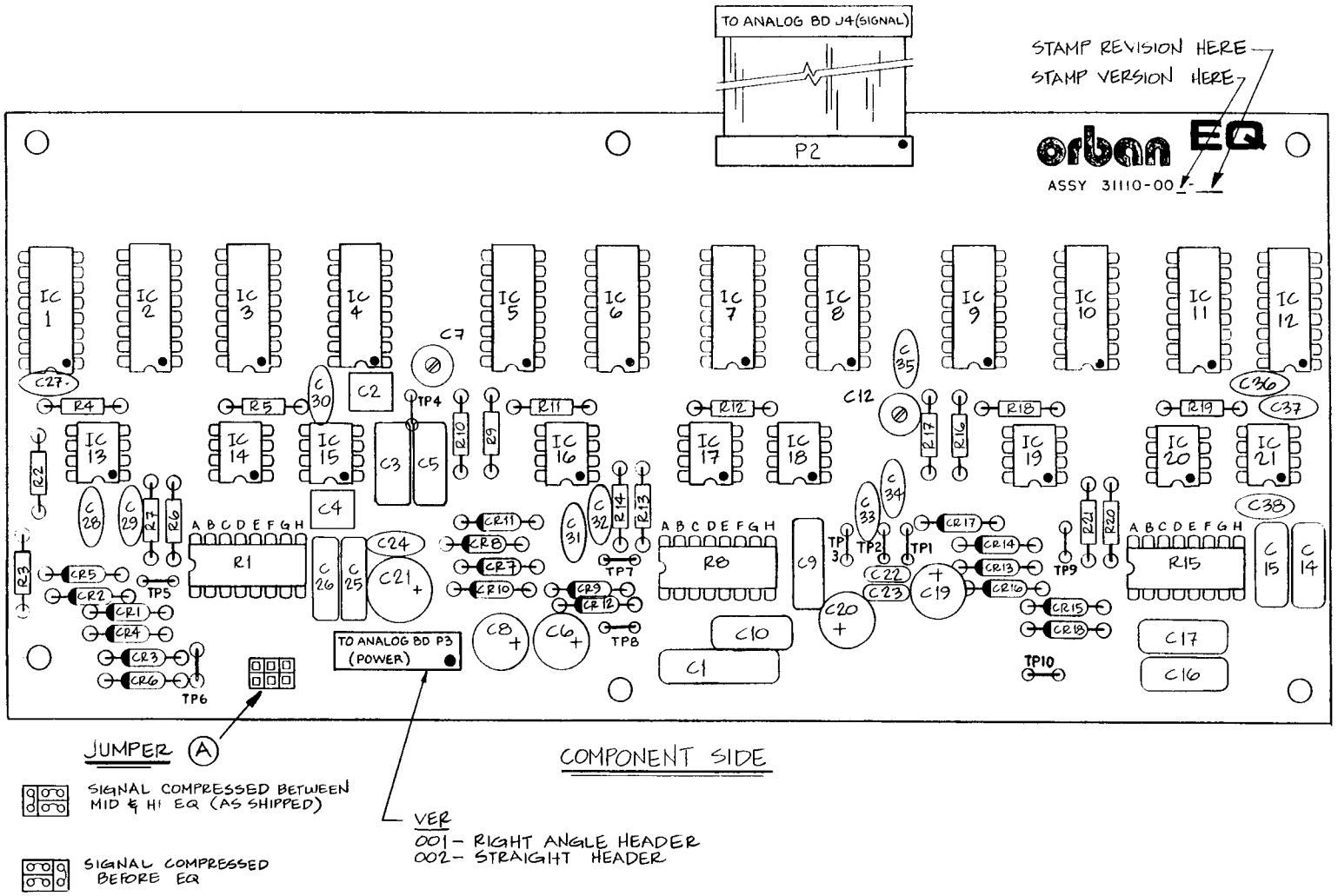
TITLE:
ASSEMBLY DRAWING
ANALOG BOARD
31105-000-02


J21
INPUT XLR
J22
TB1
INPUT
FERRITE BEAD (4PL)
C1 .001
C2 .001
R1 20.0K
R2 10.0K
C1 22pF
IC2a 5532
R3 61.9K
R4 255.0K
+4dBv
-10dBv
+48VDC EXT.
R5 20.0K
R6 10.0K
C2 22pF
26 (D-6) TO SHT.2
+15VC
GAIN TRIM R23 50K
R24 150.0K
R22 13.3K
R25 102Ω
TP4
IC 20 3096
C8 100 pF
R21 877.0K
-15VC
OFF ON +2V -15V
R16 47K 1/4W, 5%
COMPR. GATE C.V (D-3)
FROM SHT. 2 (IC26) (B-5) IN/OUT
IC 38a 339
CR1
R17 2.2M 5%
Q1 J174
R18 6.8M 5%
R20 34.8K
R19 22M 5%
FROM SHT. 2 23 (C-3) COMPR. C.V.
A1 COMPRESSOR MODULE P/N 31125-000
IC21a 1/2 412
IC 21b
R64 215Ω
R65 4.99K
R66 40.2K
R67 2.49K
CR3
CR4
R68 150.0K
R71 40.2K
Q3 J113
IC15B 339
R70 40.2K
R69 150.0K
IC 20 3096 3/5
IC 19a
C9 10pF
R32 40.2K
IC19 b
R33 6.04K
Q2 2N4125
CR2
TP3
R34 715R
C14 0.22 35V TANT
C13 4.7/35
R30 50K THUMP NULL
R31 1.0M,5%
IC8b 1/2 3280
R37 100K DISTORTION NULL
R38 47K,5%
R39 10Ω 5%
IC8a 1/2 3280
R40 40.2K
R41 DE-ESSER THUMP NULL 2K
IC 2b (SPARE)
IC 28a 412 (SPARE)
IC27 AD7524 D/AC
FROM SHT.2 (B-5) 4 COMP RT STROBE
DO-D7
+5V
+15VC
J5 (TO MIC OPTION) MIC OUTPUT
TO SHT. 2 27 (D-7) OVERLOAD SAMPLE
R26 6.04K
R27 820Ω 5%
R28 470Ω 5%
C10 150pF
C11 150 pF
R29 6.04K
IC7 5534
C12 5pF
R36 20.0K
R35 180Ω 5%
TO SHT. 2 SAMPLE (D-7) 9
C15 22pF
R42 40.2K
IC6 TL072
R41 DE-ESSER THUMP NULL 2K
IC 17 CA3096
IC18b TL072
Q8 2N4400
N/C
-15VC
R72 16.5K
R152 1.00K
R153a 20.5K
R153b 20.5K
IC18a TL072
CR22 9.1V
IC 17
IC 16a
CR6
CR7
CR8
CR9
R73 20.0K
R74 10M 5%
R75 27.4K
C17 0.1 100V
C18 0.1 100V
IC 16b
CR10
CR11
C19 .047
(C-3) 12 DE-ESS LED TO SHT. 2
A2 DE-ESSER MODULE P/N 31130-000
IC12 AD7524 D/AC
IC 13a 412
R81 3.3M 5%
IC15c 339
NOISE GATE CONTROL VOLTAGE FROM (C-3) SHT.2 OFF -15V +2V ON
(B-5) 20 FROM SHT. 2 +5V OUT
NOISE GATE IN/OUT
(B-5) 11 FROM SHT. 2 GATE DEPTH STROBE
TO COMPR. EQ SEND FROM EQ COMPR. RETURN
P3 (TO EQ BD. J1)
TP1
TP2
R7 150.0K
IC11a 5532
R10 47Ω, 5%
FROM SHT.2 LEVEL STROBE (B-5) 14 (IC24)
IC4 AD7524 D/AC
IC5a 412
C6 47µF/50
C7 47µF/50
(D-7) 13 TO SHT. 2 OVERLOAD SAMPLE
R144 6.04K
R143 29.4K
R44 20.0K
Q4
C65 1MF
C66 100/25
C67 100/25
OUTPUT GAIN
R45, 50K
IC9 411
(B-8) TO SHT. 2 PROCESSED AUDIO 15
R43 20.0K
R147 1.00K
C37 1000pF
R148 1.0 M,5%
R149 1.0M 5%
R150 470K 5%
R151 4.7M 5%
C38 .047
+2V REF 29
FROM SHT. 2 (B-5) MUTE (IC26) 8
IC 15a 339
IC11b 5532
R12, 10.0K
R13 20.0K
R14 20.0K
R15 10.0K
C3 .001
C4 .001
C5 .001
C6 .001
C7 .001
TB1
EFFECTS SEND (+) 5
(+) 6
EFFECTS RETURN (-) 7
LINE OUTPUT (+) 1
(-) 2
OUTPUT XLR
J26
J23
J24
J25
BALANCED OUTPUT MODULE P/N 31160-000 (SEE SCHEMATIC 61031-000) A3
R59 10.0K
R61 10.0K
R60 18.7Ω
MIC LEVEL OUTPUT
TO SHT.2 (IC 24) 16 (B-5)
DO-D7 SHT. 2
IC14 AD7524 D/AC
IC13b 1/2 412
R80 499Ω
R79 13.3K
R76 15.0K
R82 3.3K 5%
IC15 339
(B-5) 17 FROM SHT. 2 DE-ESSER IN/OUT
18 +2V REF
R77 150.0K
R78 20.0K
+2V REF 18 29
REFERENCE DESIGNATORS
ITEM | LAST USED | NOT USED
C | - | -
R | 153 | 94,95,128,137,142
Q | 8 | -
CR | 38 | 5, 15
IC | 38 | 1 GATE-IN 38, 31, 3, 6, 15, 18, 21
IC10 11,48,51,55,58,8,9
IC POWER PINS
DEVICE | +15 | -15 | +22 | GND
411 | 7 | 4
412 | 8 | 4
5532 | 8 | 4
4558 | 8 | 4
1458 | 8 | 4
TL072 | 8 | 4
741 | — | — | 7 | 4
5534 | 7 | 4
3080 | 7 | 4
339 | 3 | 12
3280 | 11, 14 | 1, 4, 8
4. NUMBERS IN PARENTHESIS ARE DWG. ZONE REF.
3. ALL DIODES ARE 1N4148
2. ALL CAPS. ARE IN MICROFARADS
1. ALL RES. ARE 1%, 1/8W, MF
NOTES: (UNLESS OTHERWISE SPECIFIED)
orban®
TITLE: SCHEMATIC ANALOG BOARD 1 OF 2
61032-000-02



orban®	
TITLE:	SCHEMATIC ANALOG BOARD 2 OF 2 61032-000-02



NOTES: (UNLESS OTHERWISE SPECIFIED)

1. TIC MARKS INDICATE PIN 1 OF ICs, CATHODE OF DIODES, PLUS OF CAPS & PIN 1 OF CONNECTORS.

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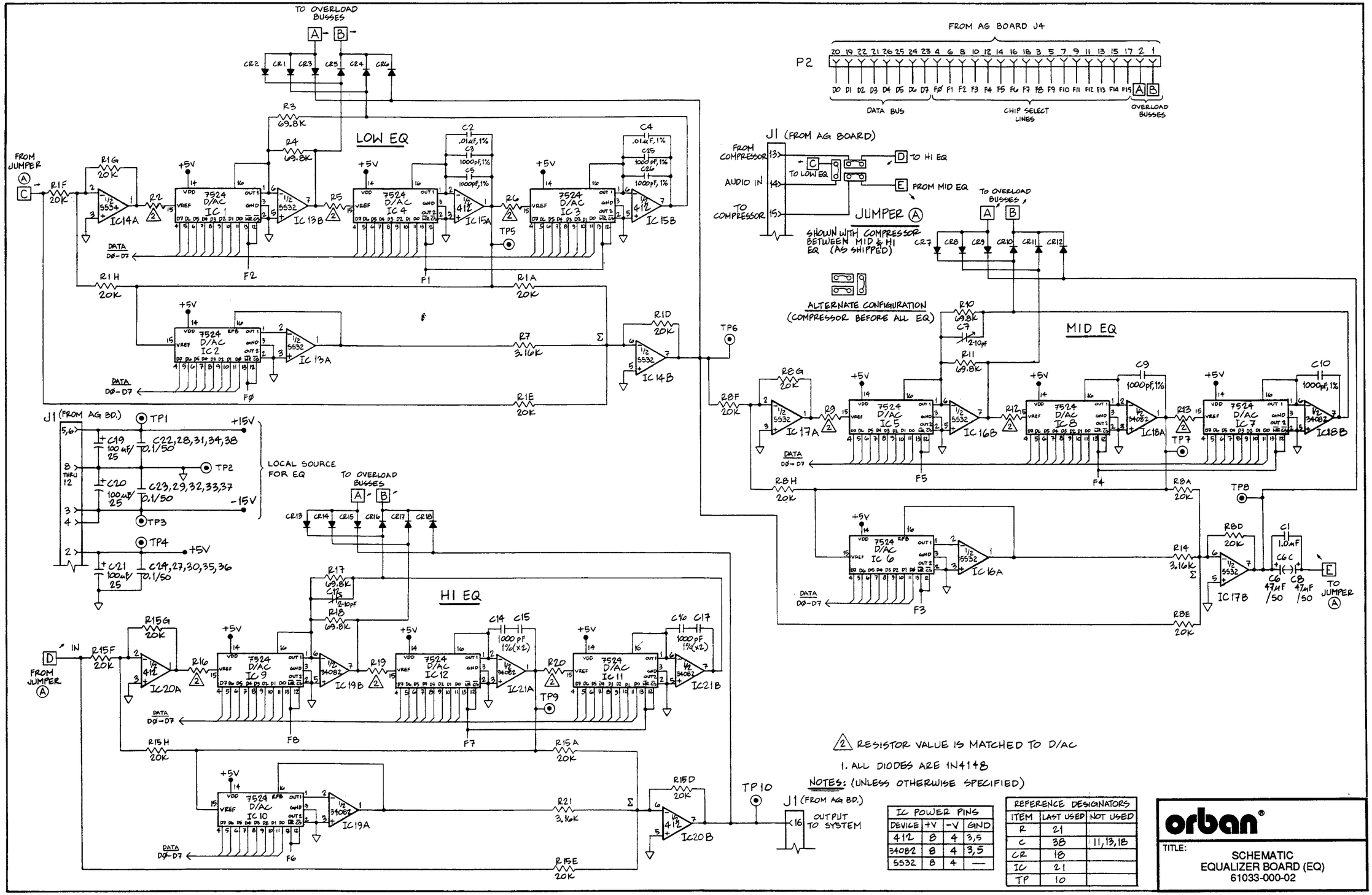
TITLE:
ASSEMBLY DRAWING
EQUALIZER BOARD
31110-000-03



2 RESISTOR VALUE IS MATCHED TO D/AC

1. ALL DIODES ARE 1N4148

NOTES: (UNLESS OTHERWISE SPECIFIED)

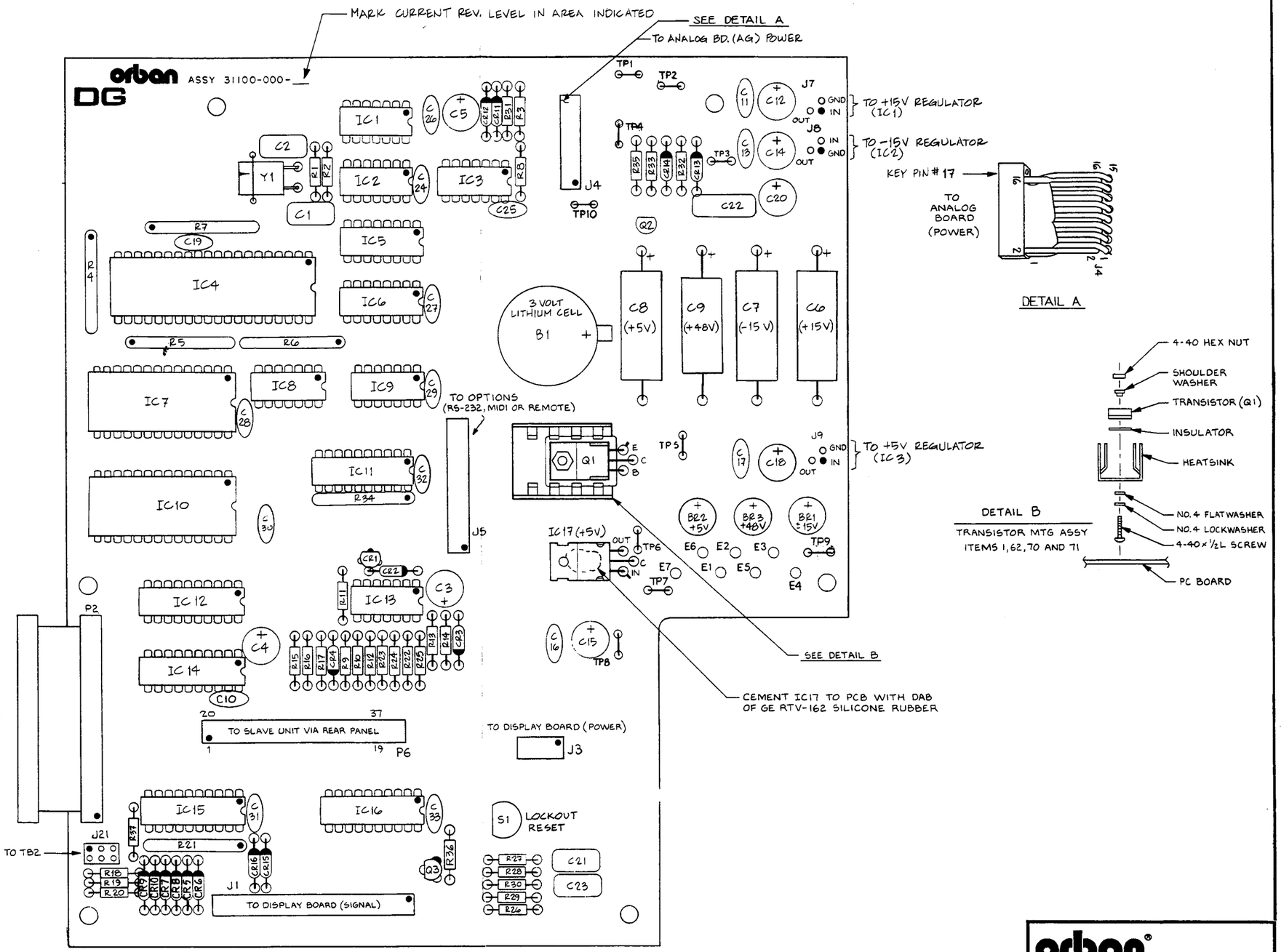
IC POWER PINS			
DEVICE	+V	-V	GND
4112	8	4	3,5
34082	8	4	3,5
5532	8	4	—

REFERENCE DESIGNATORS		
ITEM	LAST USED	NOT USED
R	21	
C	38	11,13,18
CR	18	
IC	21	
TP	10	

orban®

TITLE:
SCHEMATIC
EQUALIZER BOARD (EQ)
61033-000-02

WIRE LIST FOR P4		
COLOR	FROM	TO
BLK	P4-1	CONN-1
WHT/BLK	-2	-2
BRN	-3	-3
WHT/BRN	-4	-4
RED	-5	-5
WHT/RED	-6	-6
ORN	-7	-7
WHT/ORN	-8	-8
YEL	-9	-9
WHT/YEL	-10	-10
GRN	-11	-11
WHT/GRN	-12	-12
BLU	-13	-13
WHT/BLU	-14	-14
V10	-15	-15
WHT/V10	-16	-16
—	N/C	-17
—	N/C	-18



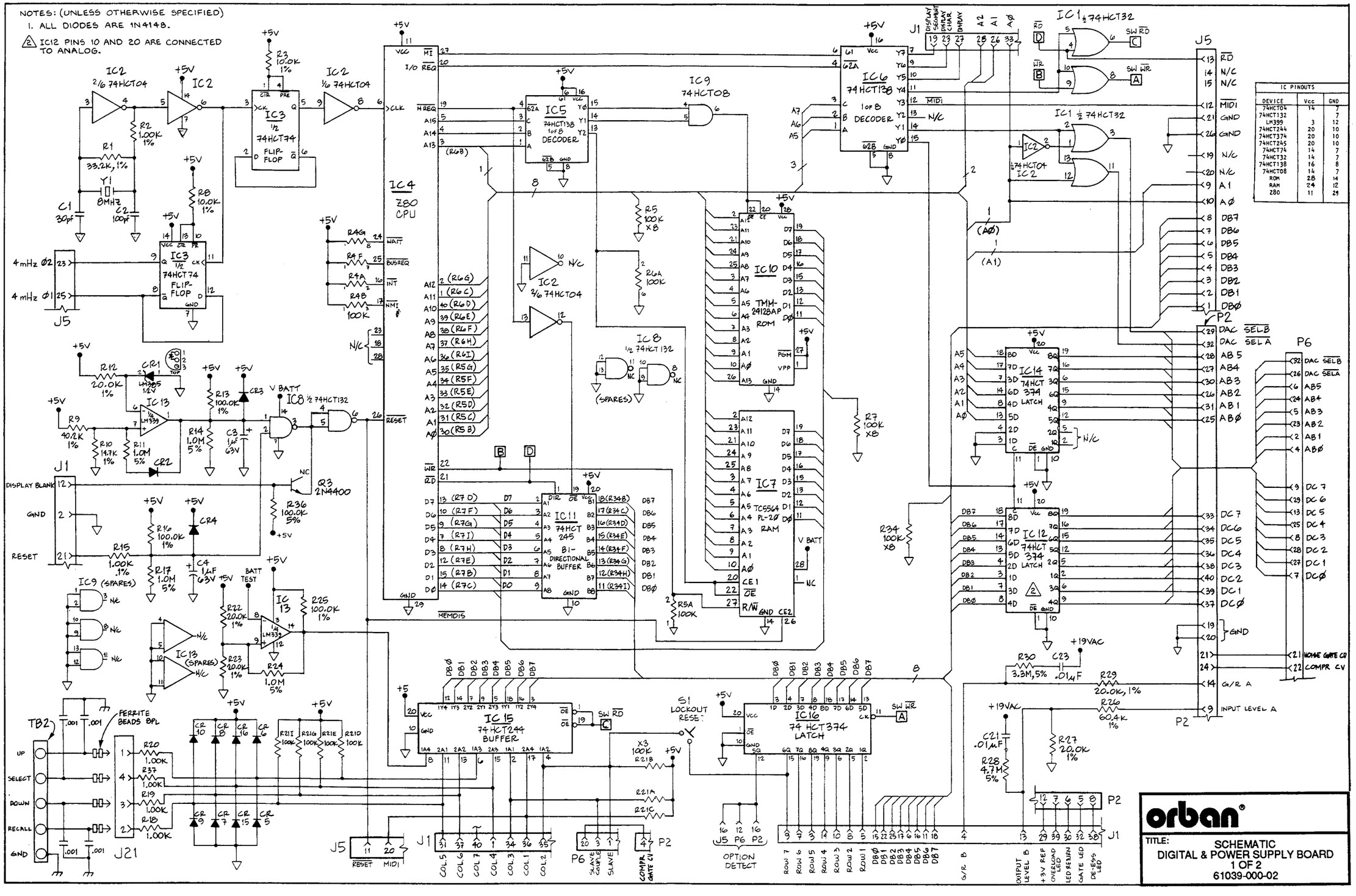
1. TIC MARKS INDICATE PIN#1 OF IC'S, PIN #1 OF CONNECTORS, CATHODE OF DIODE, POS. SIDE OF CAPS, EMITTER OF TRANSISTORS, POS. SIDE OF BATTERY, PIN#1 OF SIP'S.

NOTES: (UNLESS OTHERWISE SPECIFIED)

COMPONENT SIDE

orban®

TITLE:
ASSEMBLY DRAWING
DIGITAL & POWER SUPPLY BOARD
31100-000-03


NOTES: (UNLESS OTHERWISE SPECIFIED)
1. ALL DIODES ARE 1N4148.
2. IC12 PINS 10 AND 20 ARE CONNECTED TO ANALOG.
IC1 1/4 74HCT32
IC2 2/6 74HCT04
IC2 1/6 74HCT04
IC3 1/2 74HCT74 FLIP-FLOP
IC4 Z80 CPU
IC5 74HCT138 1 OF 8 DECODER
IC6 74HCT138 1 OF 8 DECODER
IC7 TC5564 PL-20 RAM
IC8 1/2 74HCT132
IC9 74HCT08
IC10 TMM-2912BAP ROM
IC11 74HCT 245 BI-DIRECTIONAL BUFFER
IC12 74HCT 374 LATCH
IC13 1/4 LM339
IC14 74HCT 374 LATCH
IC15 74HCT244 BUFFER
IC16 74HCT374 LATCH
IC PINOUTS
DEVICE | Vcc | GND
74HCT04 | 14 | 7
74HCT132 | 14 | 7
LM399 | 3 | 12
74HCT244 | 20 | 10
74HCT374 | 20 | 10
74HCT245 | 20 | 10
74HCT74 | 14 | 7
74HCT32 | 14 | 7
74HCT138 | 16 | 8
74HCT08 | 14 | 7
ROM | 28 | 14
RAM | 24 | 12
Z80 | 11 | 29
4 mHz Ø2
4 mHz Ø1
J5
J1
J21
TB2
P2
P6
R1 33.2K, 1%
R2 1.00K 1%
R3 10.0K 1%
R4A 100
R4B 100
R4F 100
R4G 100
R5 100K X8
R5A 100K
R6A 100K
R7 100K X8
R8 10.0K 1%
R9 40.2K 1%
R10 14.7K 1%
R11 1.0M 5%
R12 20.0K 1%
R13 100.0K 1%
R14 1.0M 5%
R15 1.00K 1%
R16 100.0K 1%
R17 1.0M 5%
R18 1.00K
R19 1.00K
R20 1.00K
R21A 100K
R21B 100K
R21C 100K
R21D 100K
R21E 100K
R21F 100K
R21G 100K
R21I 100K
R22 20.0K 1%
R23 20.0K 1%
R24 1.0M 5%
R25 100.0K 1%
R26 60.4K 1%
R27 20.0K 1%
R28 4.7M 5%
R29 20.0K, 1%
R30 3.3M, 5%
R34 100K X8
R36 100.0K 5%
R37 1.00K
C1 30pf
C2 100pf
C3 1µF 63V
C4 1µF 63V
C21 .01µF
C23 .01µF
Y1 8MHz
CR1 LM385 1.2V
CR2
CR3
CR4
Q3 2N4400
S1 LOCKOUT RESET
V BATT
+5V
+19VAC
(SPARES)
FERRITE BEADS 8PL
UP
SELECT
DOWN
RECALL
GND
RESET
MIDI
OPTION DETECT
SW RD
SW WR
DISPLAY BLANK
MEMDIS
WAIT
BUSREQ
INT
NMI
RESET
DAC SELB
DAC SELA
AB5
AB4
AB3
AB2
AB1
ABØ
DC7
DC6
DC5
DC4
DC3
DC2
DC1
DCØ
GND
NOISE GATE CV
COMPR CV
G/R A
INPUT LEVEL A
G/R B
INPUT LEVEL B
+3V REF
OVERLOAD LED
LED RETURN
GATE LED
DE-ESS LED
orban
TITLE: SCHEMATIC DIGITAL & POWER SUPPLY BOARD 1 OF 2
61039-000-02

REFERENCE DESIGNATORS		
ITEM	LAST USED	NOT USED
C	33	10
IC	17	
R	36	
CR	14	
BR	3	
TP	10	

P6 (TO SLAVE UNIT VIA 37-PIN D-CONN)

P4 (TO ANALOG BD. J2)

J5 (TO MIDI, RS-232 OR REMOTE P1)

J3 (TO DISPLAY BD. P2)

L1 LINE FILTER ASSY.

VOLTAGE SELECTOR

BACKUP POWER SUPPLY

POWER SUPPLY SECTION

SEE SHEET 1 FOR NOTES

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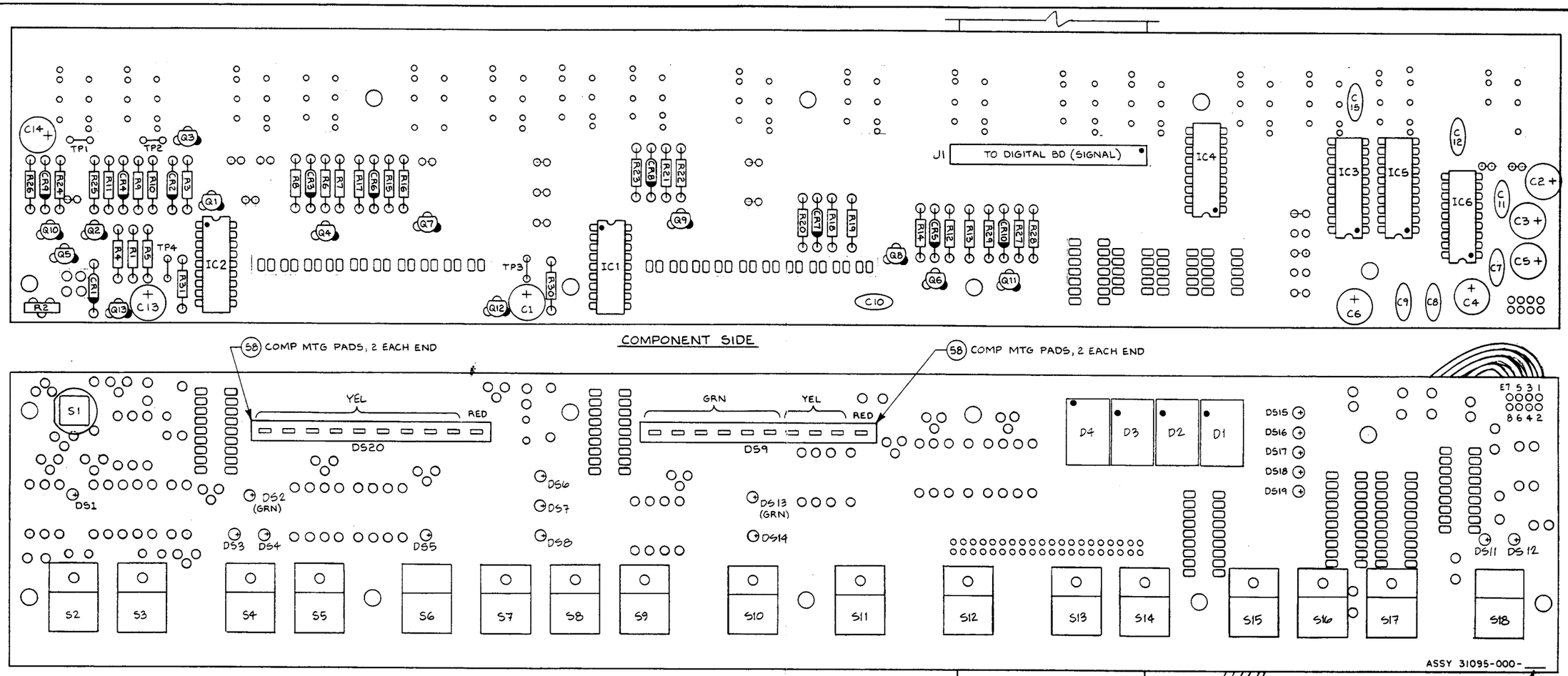
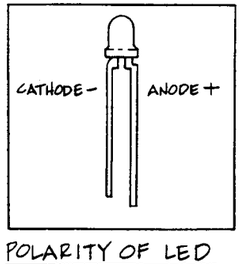
TITLE: SCHEMATIC
DIGITAL & POWER SUPPLY BOARD
2 OF 2
61039-000-02





POLARITY OF LED

5. DO NOT ALLOW SWITCH TO COME IN CONTACT WITH SOLVENTS OR FLUX.
4. COMPONENTS MOUNTED ON SOLDERSIDE MUST LIE FLUSH, FLAT & SQUARE.
3. MAX COMPONENT HEIGHT IS .450. MOUNT C1-6, 13 & 14 PARALLEL TO BOARD SHOULD THEY EXCEED .450.
2. WIRES TO E#'S CONNECTED ON FAR SIDE, PUT POLARIZING PLUG IN POSITION 1 OF CONNECTOR.

1. TIC MARKS INDICATE PIN 1 OF IC'S, CATHODE OF DIODE, PIN #1 OF DISPLAY, EMITTER OF TRANSISTOR, PLUS OF CAP, PIN#1 OF HEADER

NOTES: (UNLESS OTHERWISE SPECIFIED)

WIRE LIST FOR P2		
COLOR	FROM	TO
BLK	P2-1	CONN-1
WHT/BLK	P2-2	CONN-2
BRN	P2-3	CONN-3
WHT/BRN	P2-4	CONN-4
RED	P2-5	CONN-5
WHT/RED	P2-6	CONN-6
—	P2-7	N/C
WHT/ORN	P2-8	CONN-8

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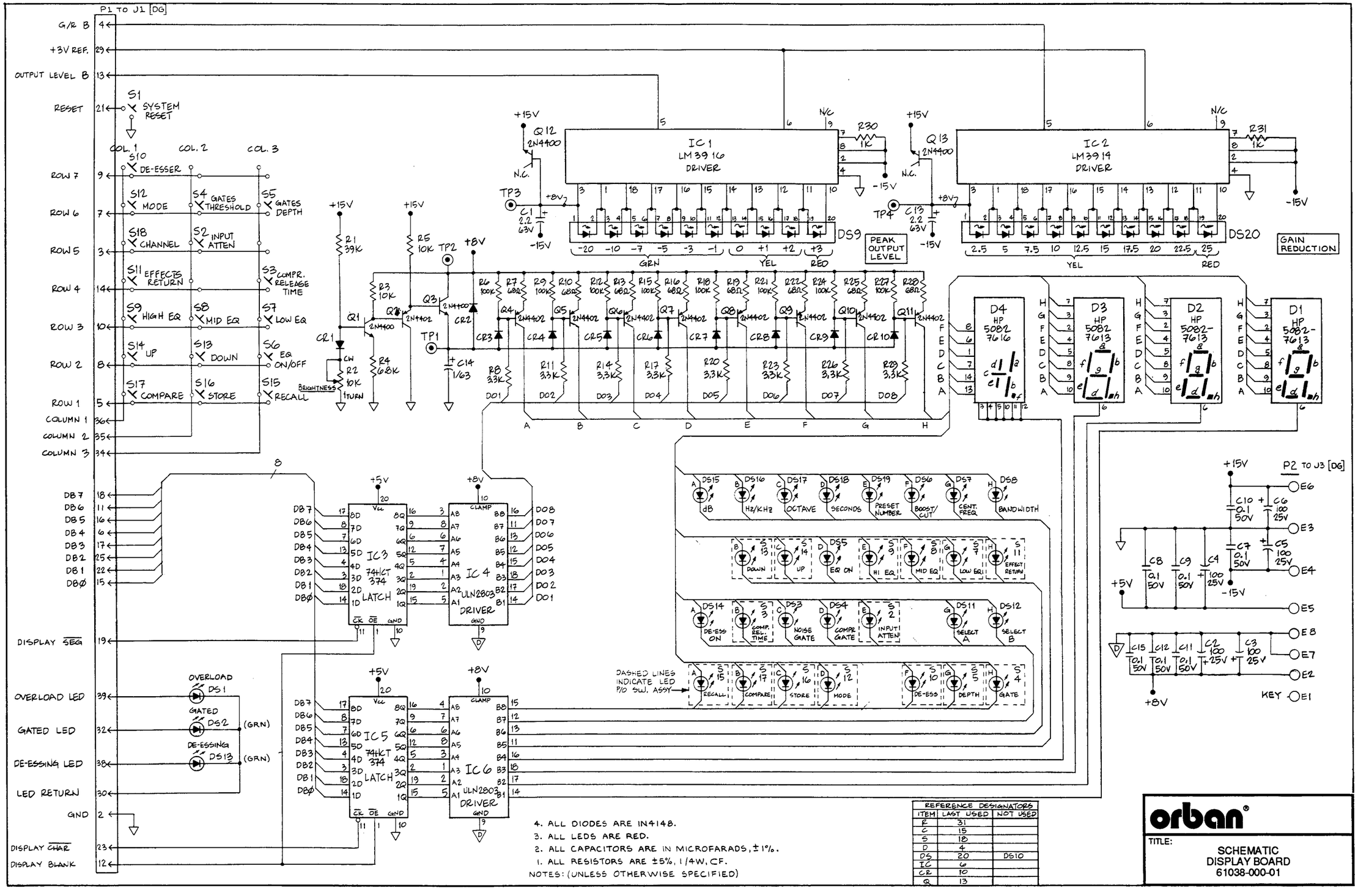
TITLE:
PCA
DISPLAY BOARD (DP)
31095-000-03



4. ALL DIODES ARE IN4148.
3. ALL LEDS ARE RED.
2. ALL CAPACITORS ARE IN MICROFARADS, ±1%.
1. ALL RESISTORS ARE ±5%, 1/4W, CF.

NOTES: (UNLESS OTHERWISE SPECIFIED)

REFERENCE DESIGNATORS		
ITEM	LAST USED	NOT USED
R	31	
C	15	
S	18	
D	4	
DS	20	DS10
IC	6	
CR	10	
Q	13	

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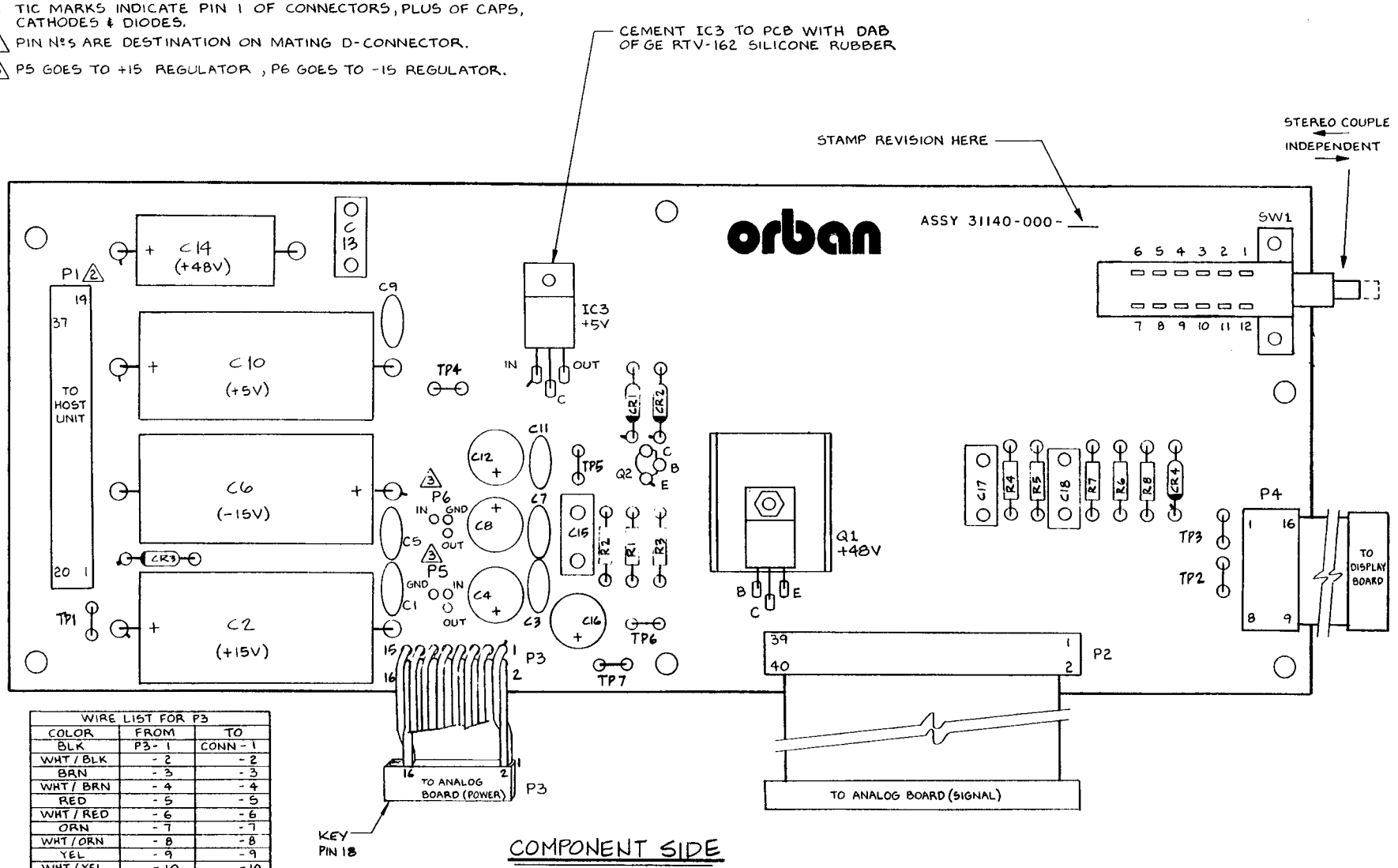
TITLE:
SCHEMATIC
DISPLAY BOARD
61038-000-01

NOTES: (UNLESS OTHERWISE SPECIFIED)

1. TIC MARKS INDICATE PIN 1 OF CONNECTORS, PLUS OF CAPS, CATHODES & DIODES.
2. PIN Nos ARE DESTINATION ON MATING D-CONNECTOR.
3. P5 GOES TO +15 REGULATOR, P6 GOES TO -15 REGULATOR.

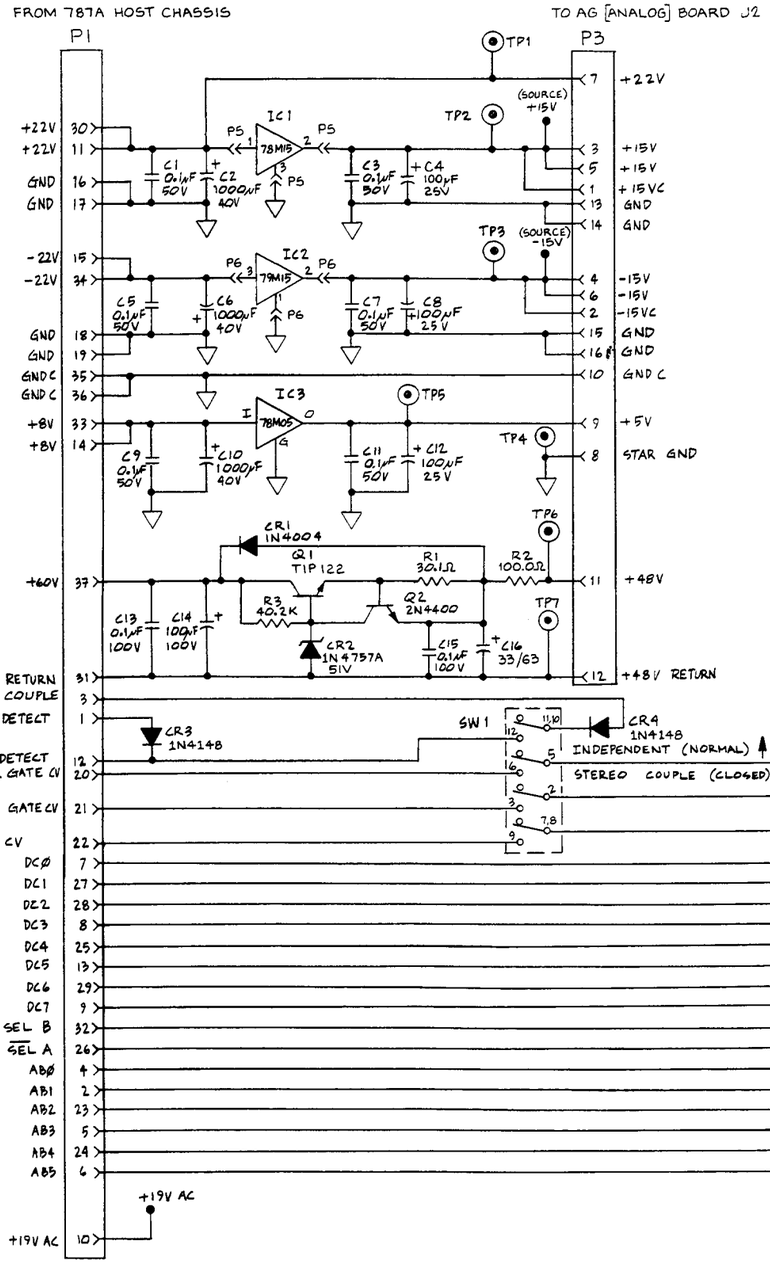


COMPONENT SIDE

WIRE LIST FOR P3		
COLOR	FROM	TO
BLK	P3- 1	CONN - 1
WHT / BLK	- 2	- 2
BRN	- 3	- 3
WHT / BRN	- 4	- 4
RED	- 5	- 5
WHT / RED	- 6	- 6
ORN	- 7	- 7
WHT / ORN	- 8	- 8
YEL	- 9	- 9
WHT / YEL	- 10	- 10
GRN	- 11	- 11
WHT / GRN	- 12	- 12
BLU	- 13	- 13
WHT / BLU	- 14	- 14
VIO	- 15	- 15
WHT / VIO	- 16	- 16
—	N/C	- 17
—	N/C	- 18

orban®

TITLE:
ASSEMBLY DRAWING
SLAVE INTERCONNECT
31140-000-02



NOTES: (UNLESS OTHERWISE SPECIFIED)

1. ALL RESISTORS ARE 1/8W, ±1% MF

REFERENCE DESIGNATORS

ITEM	LAST USED	NOT USED
C	18	
CR	4	
Q	2	
P	6	
R	8	
SW	1	
TP	6	

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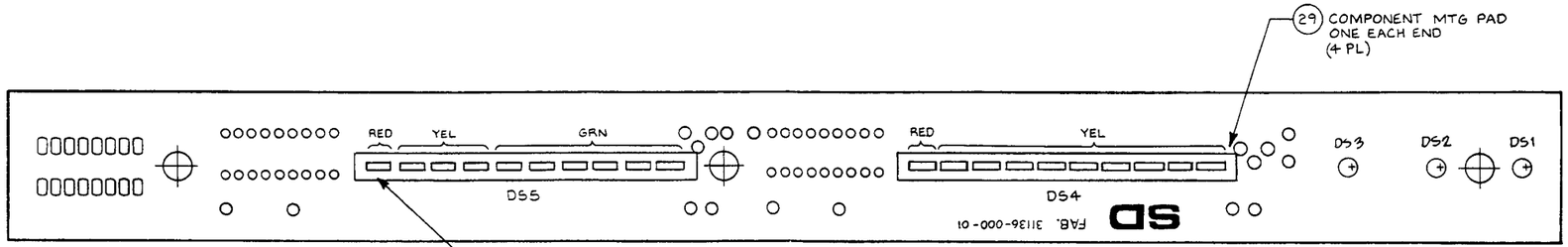
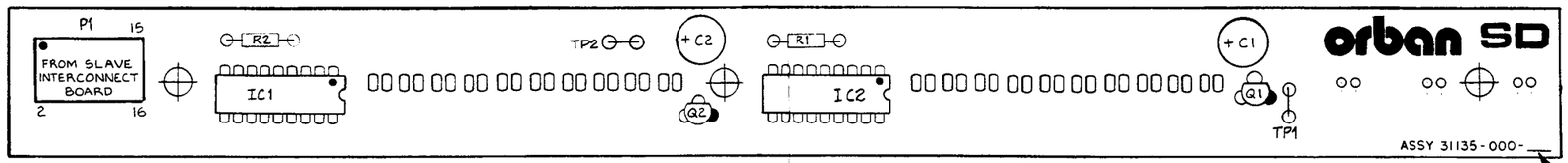
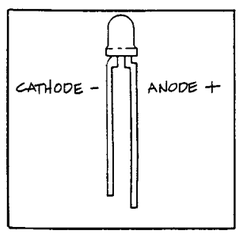
TITLE:
SCHEMATIC
SLAVE INTERCONNECT
61040-000-02



SOLDER SIDE
SHOWN UPSIDE DOWN (SECOND ASSEMBLY)



COMPONENT SIDE



POLARITY OF LED

1. TIC MARKS INDICATE PIN 1 OF IC'S, EMITTER OF TRANSISTORS POSITIVE SIDE OF CAPACITORS AND PIN 1 OF CONNECTORS.

NOTES: (UNLESS OTHERWISE SPECIFIED)

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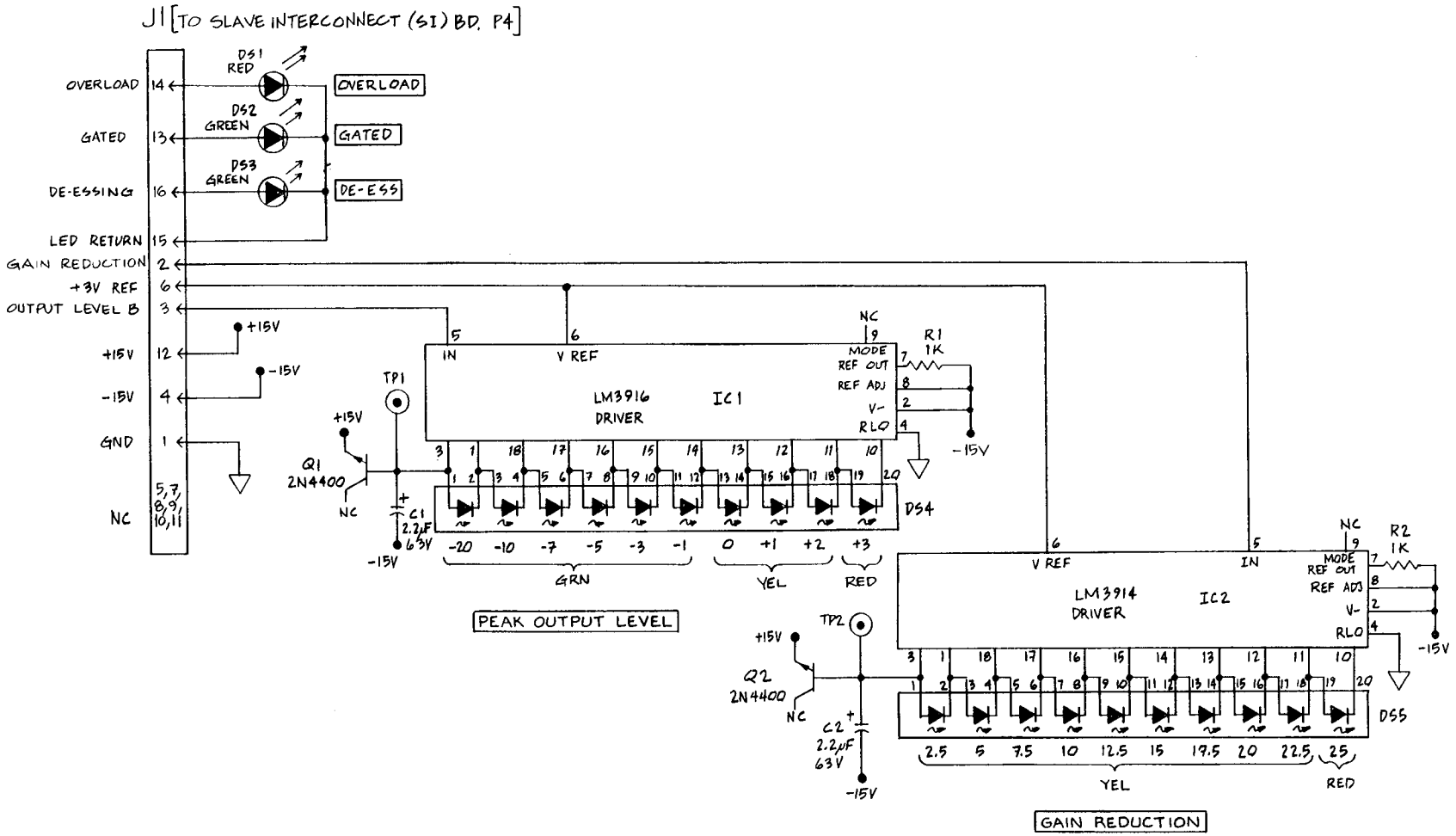
TITLE:
ASSEMBLY DRAWING
SLAVE DISPLAY
31135-000-02



1. ALL RESISTORS ARE 1/8W, ±1%, MF.

NOTES: (UNLESS OTHERWISE SPECIFIED)

REFERENCE DESIGNATORS

ITEM	LAST USED	NOT USED
C	2	
DS	5	
IC	2	
Q	2	
R	2	
TP	2	
P	1	

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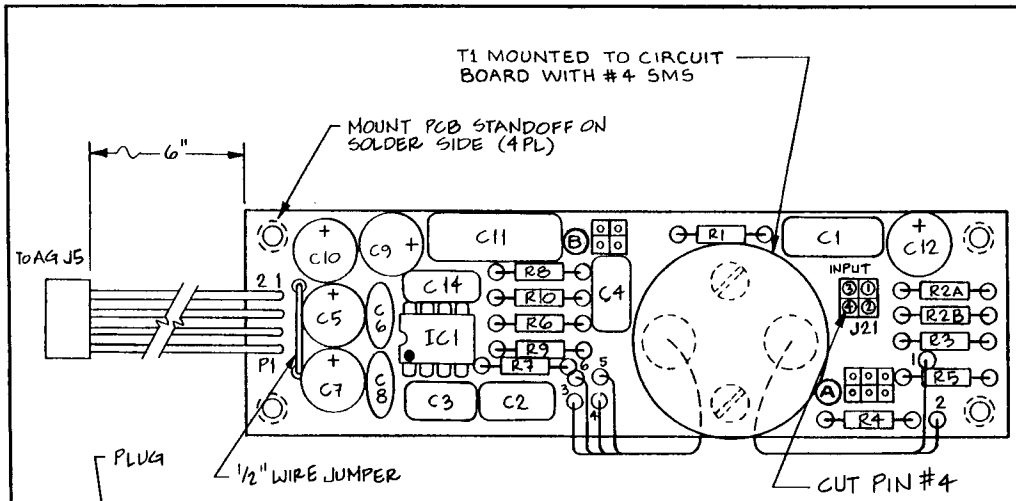
TITLE:
SCHEMATIC
SLAVE DISPLAY
61041-000-01



WIRE LIST FOR P1		
COLOR	FROM	TO
BLK	P1-1	CONN-1
WHT/BLK	-2	-2
BRN	-3	-3
——	-4	-4
RED	-5	-5
WHT/RED	-6	-6
ORN	-7	-7
WHT/ORN	-8	-8

TRANSFORMER CONN'S	
COLOR	TO
T1- RED	1
- BRN	2
- WHT	3
- BLK	4
- ORN	5
- YEL	6

COMPONENT SIDE

BERG CONN. END VIEW

+48V PHANTOM POWER { OUT, IN

JUMPER (B) (SHOWN AS SHIPPED)

OUT IN 20dB PAD

JUMPER (A) (SHOWN AS SHIPPED)

1. TIC MARKS INDICATE PIN # 1 OF IC'S, POS. SIDE OF CAPS & PIN # 1 OF CONNECTORS

NOTES: (UNLESS OTHERWISE SPECIFIED)

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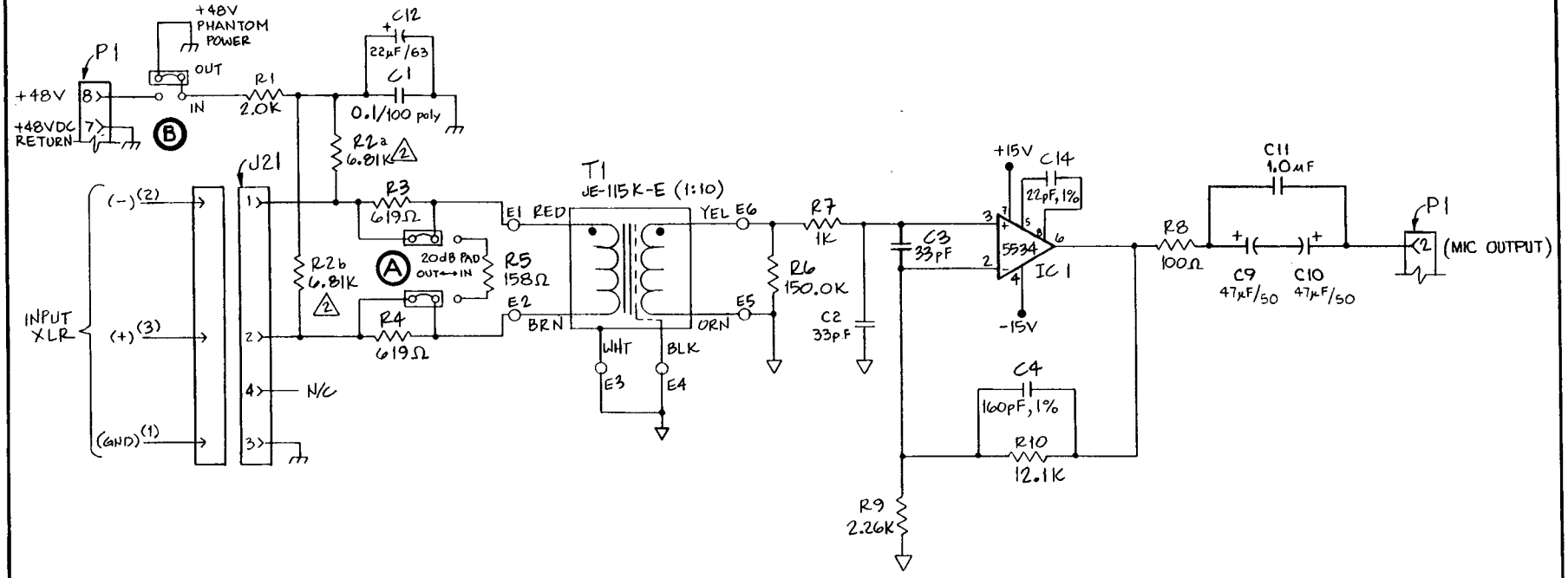
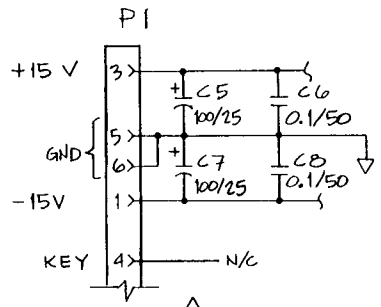
TITLE: ASSEMBLY DRAWING MIC OPTION 31115-000-02





2 SELECTED

1. JUMPERS SHOWN AS SHIPPED

NOTES: (UNLESS OTHERWISE SPECIFIED)

REFERENCE DESIGNATORS		
ITEM	LAST USED	NOT USED
R	10	
C	14	13
IC	1	
E	6	
T	1	

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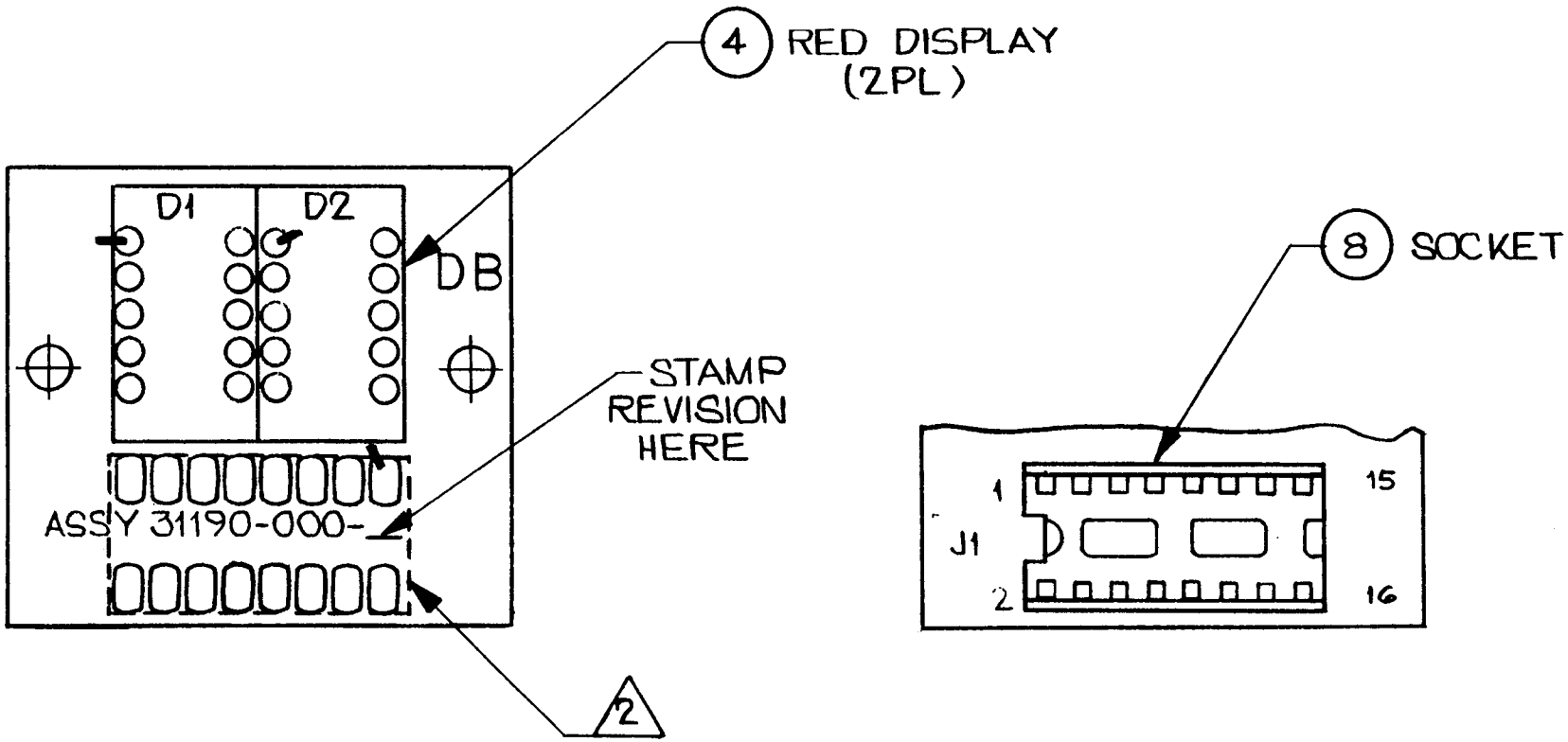
TITLE:
SCHEMATIC
MIC OPTION BOARD
61035-000-01



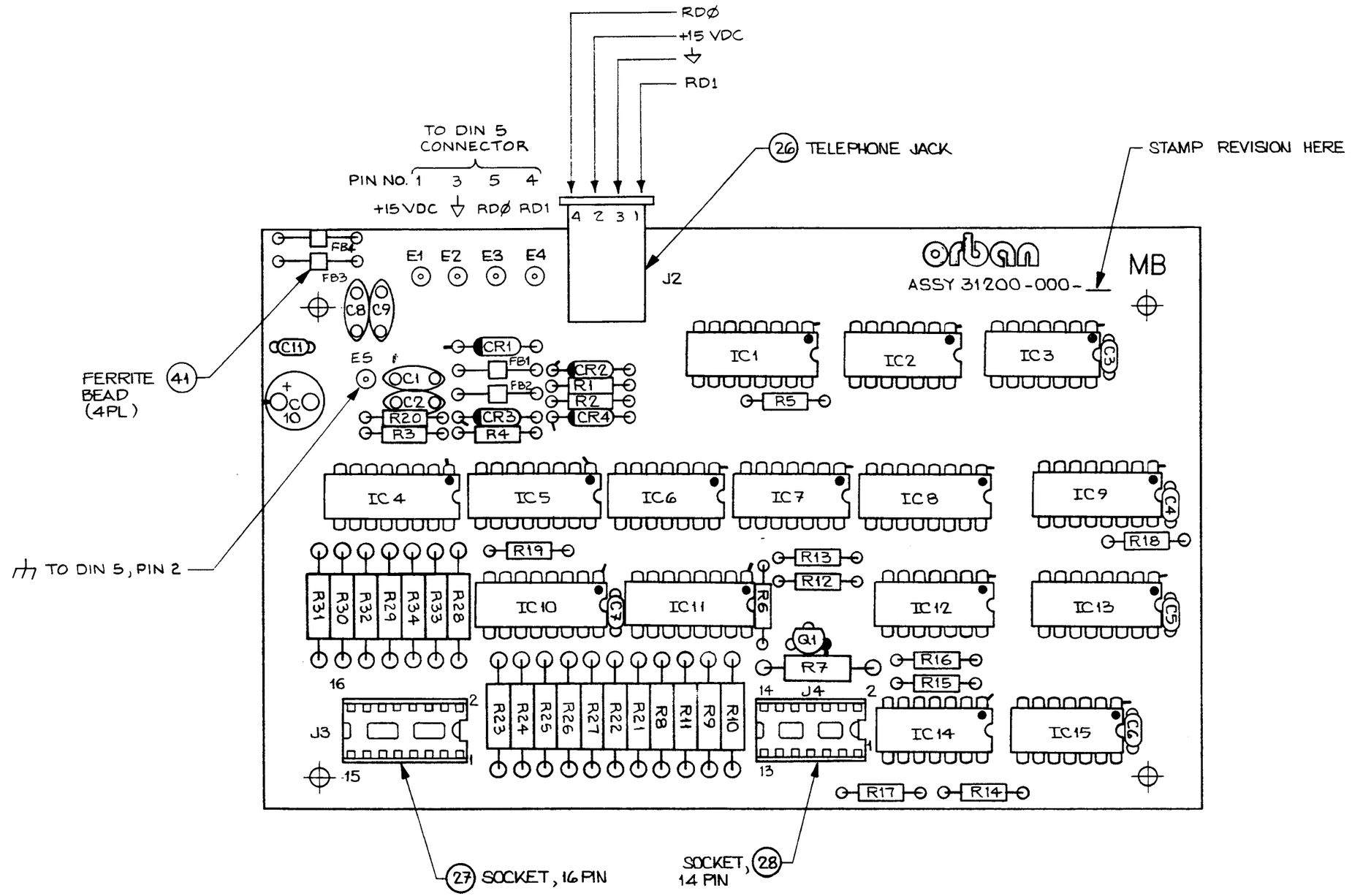
COMPONENT SIDE

SOLDER SIDE

2. DOTTED COMPONENT TO BE INSTALLED ON SOLDER SIDE AS SHOWN
1. TIC MARKS INDICATE PIN #1 OF LED'S, PIN #1 OF CONNECTOR.
NOTES: (UNLESS OTHERWISE SPECIFIED)

orban®

TITLE: PCB ASSEMBLY
REMOTE CONTROL
DISPLAY BOARD (DB)
31190-000-01



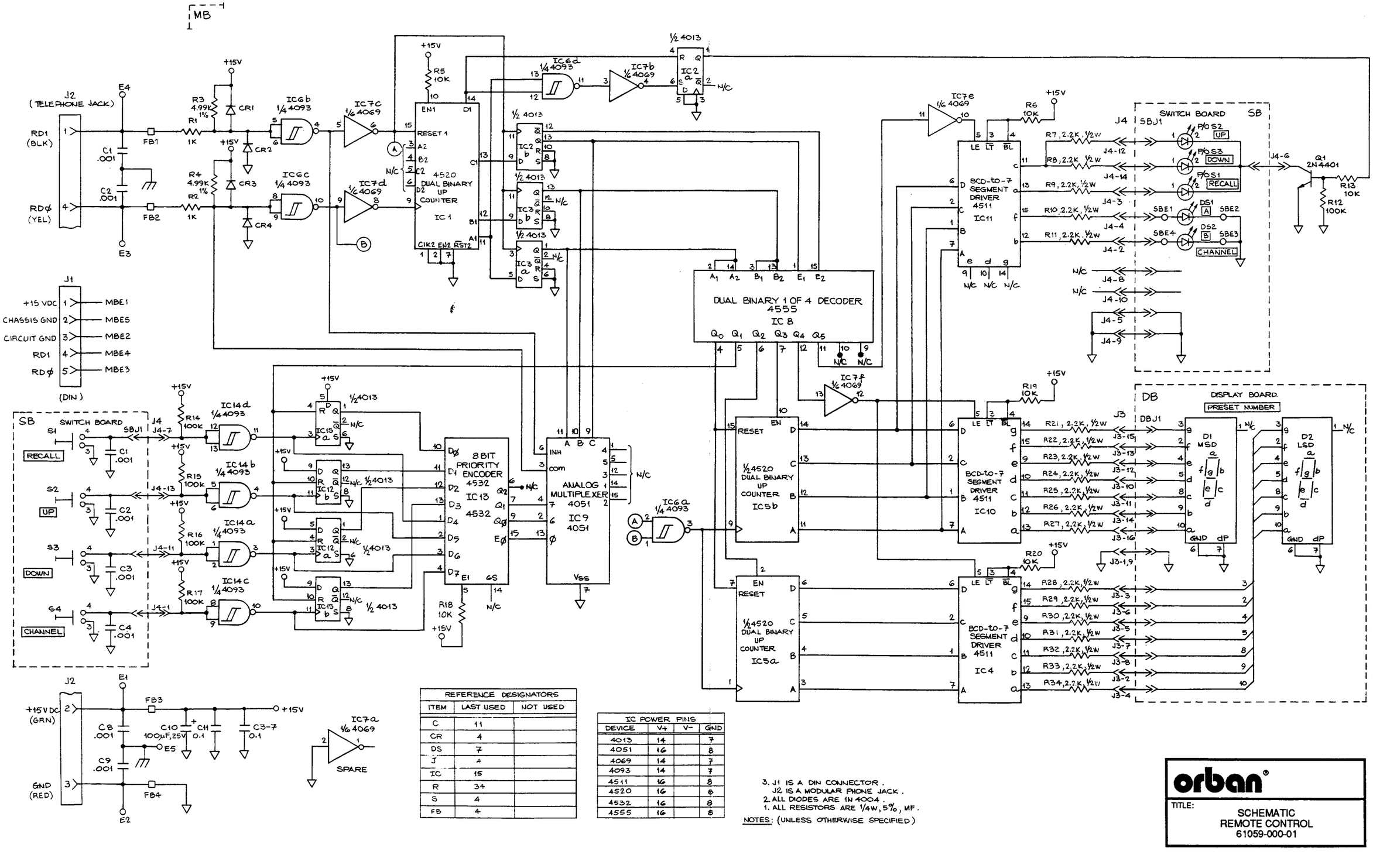
2. TIC MARKS INDICATE PIN #1 OF IC, PIN #1 OF CONNECTORS, CATHODE OF DIODES, POS. SIDE OF CAPACITORS, EMITTER OF TRANSISTOR.
1. REFERENCE SCHEMATIC DWG. NO. 61059-000

NOTES: (UNLESS OTHERWISE SPECIFIED)

COMPONENT SIDE

orban®

TITLE:
PCB ASSEMBLY
REMOTE CONTROL (MB)
31200-000-02



REFERENCE DESIGNATORS		
ITEM	LAST USED	NOT USED
C	11	
CR	4	
DS	7	
J	4	
IC	15	
R	34	
S	4	
FB	4	

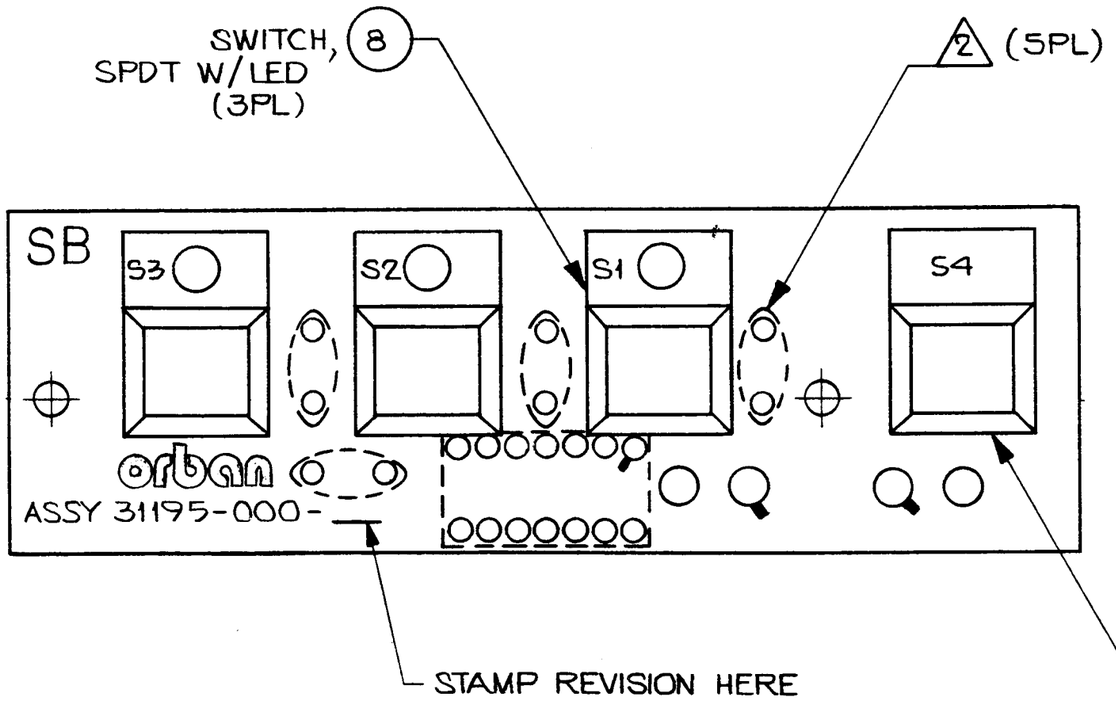
IC POWER PINS			
DEVICE	V+	V-	GND
4013	14		7
4051	16		8
4069	14		7
4093	14		7
4511	16		8
4520	16		8
4532	16		8
4555	16		8

3. J1 IS A DIN CONNECTOR. J2 IS A MODULAR PHONE JACK.
2. ALL DIODES ARE 1N4004.
1. ALL RESISTORS ARE 1/4W, 5%, MF.

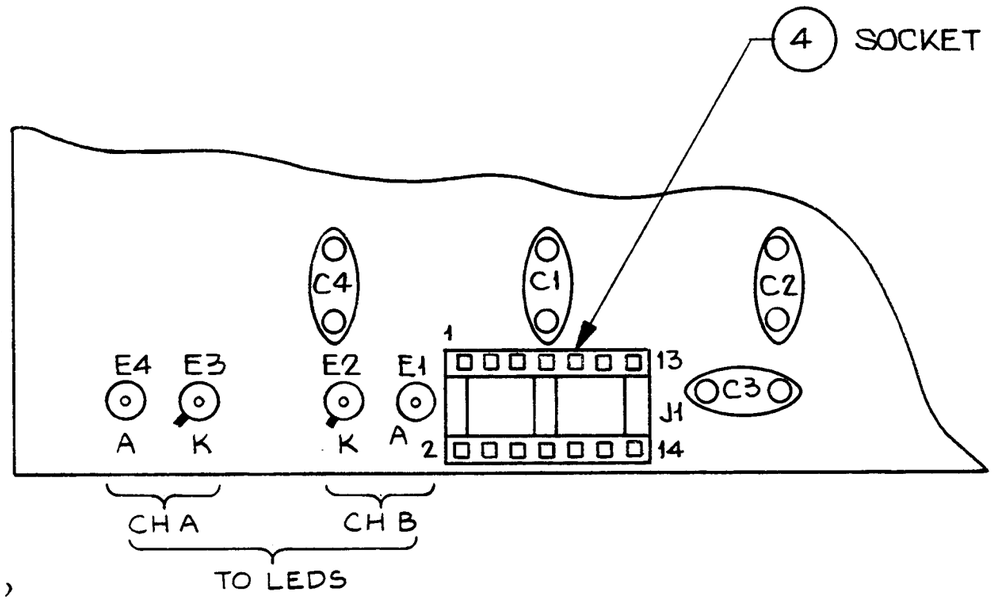
NOTES: (UNLESS OTHERWISE SPECIFIED)

orban®

TITLE: SCHEMATIC REMOTE CONTROL 61059-000-01



COMPONENT SIDE



SOLDER SIDE

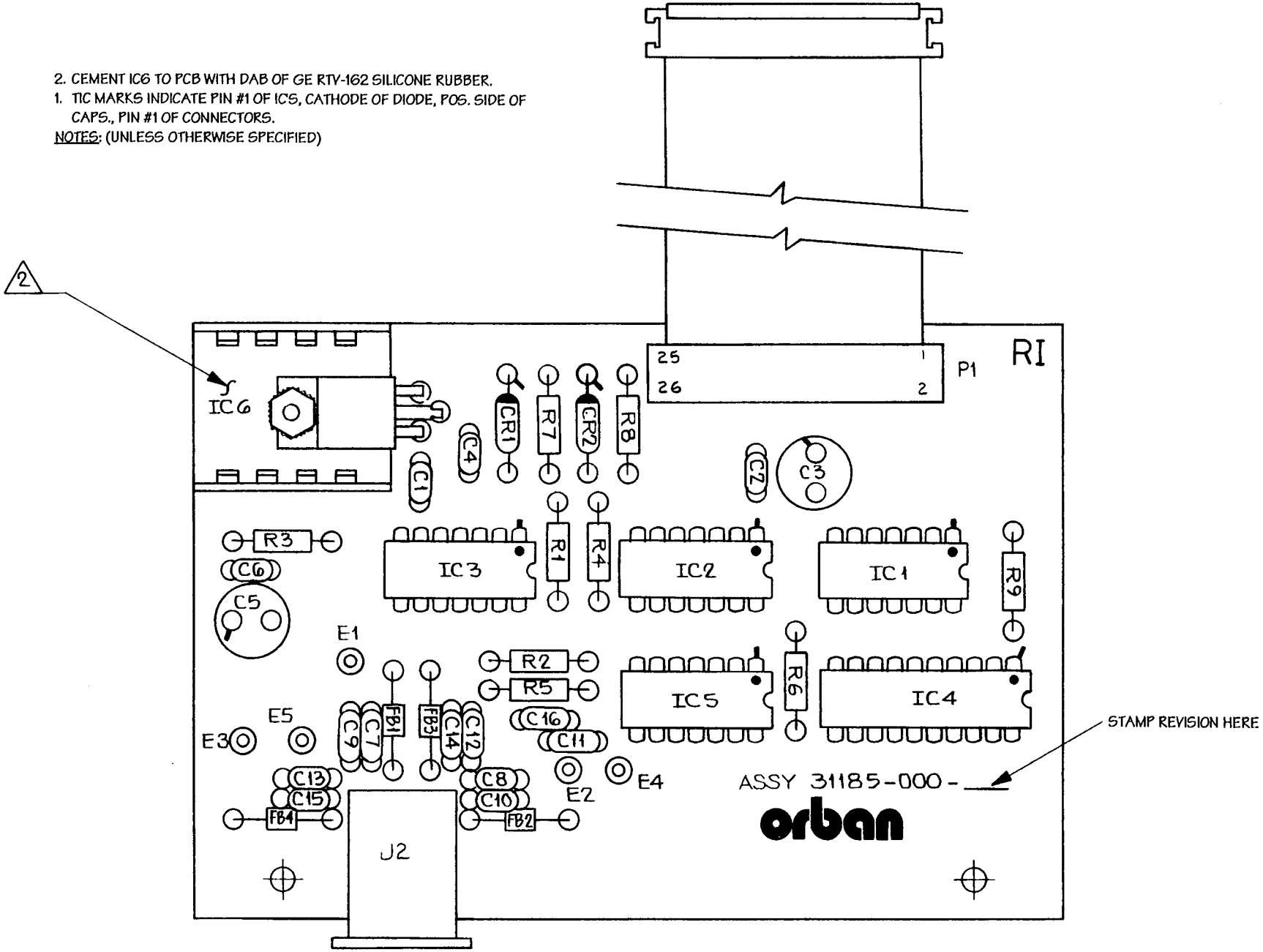
2. DOTTED COMPONENTS TO BE INSTALLED ON SOLDER SIDE AS SHOWN.
1. TIC MARKS INDICATE PIN #1 OF CONNECTOR, CATHODE OF LED'S.
NOTES: (UNLESS OTHERWISE SPECIFIED)

orban®

TITLE: PCB ASSEMBLY
REMOTE CONTROL
SWITCH BOARD (SB)
31195-000-01

2. CEMENT IC6 TO PCB WITH DAB OF GE RTV-162 SILICONE RUBBER.
1. TIC MARKS INDICATE PIN #1 OF ICS, CATHODE OF DIODE, POS. SIDE OF CAPS., PIN #1 OF CONNECTORS.

NOTES: (UNLESS OTHERWISE SPECIFIED)



COMPONENT SIDE

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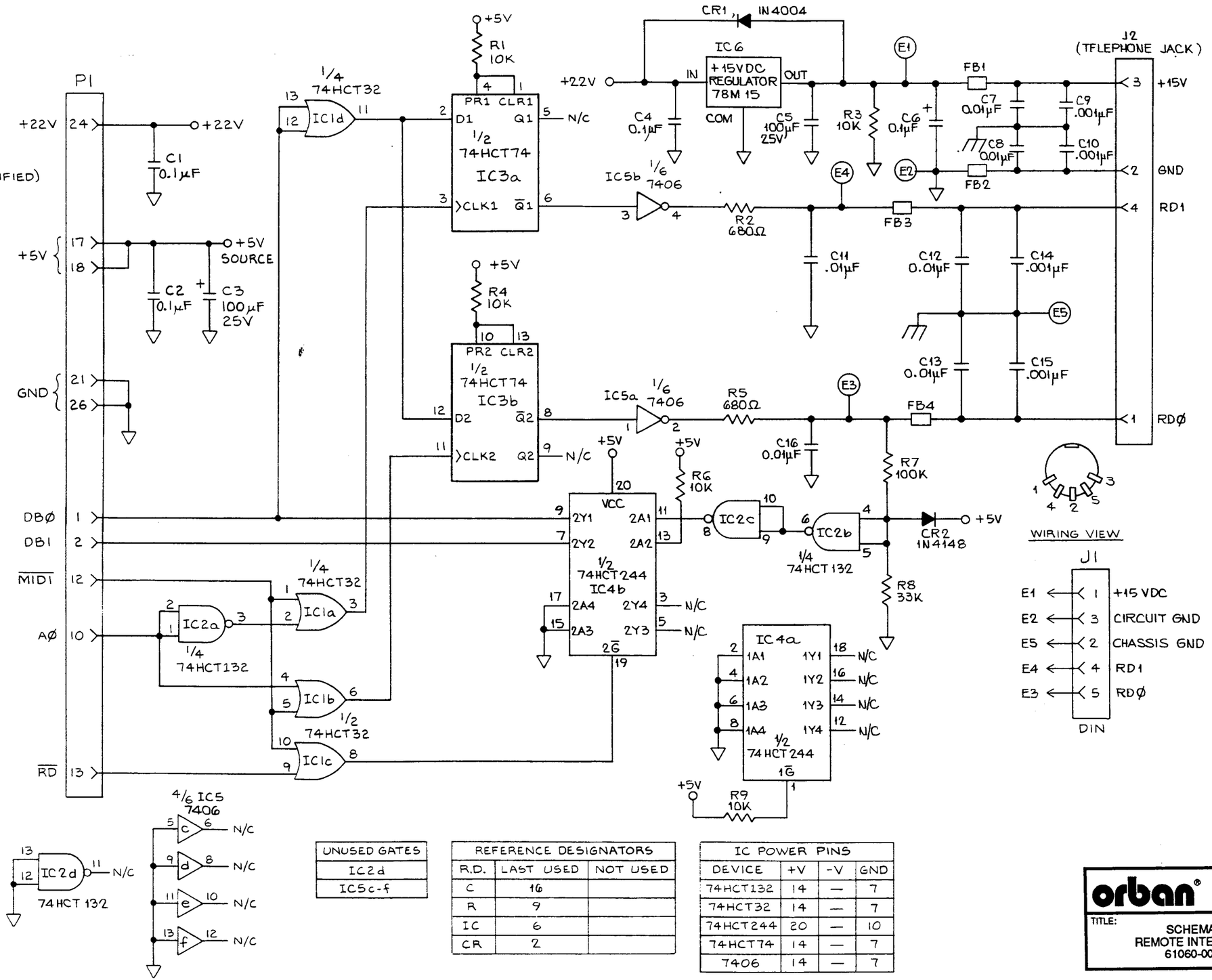
TITLE:
PCB ASSEMBLY
REMOTE INTERFACE (RI)
31185-000-02

NOTES:(UNLESS OTHERWISE SPECIFIED)
1. ALL RESISTORS ARE 1/4W, 5%



UNUSED GATES
IC2d
IC5c-f

REFERENCE DESIGNATORS		
R.D.	LAST USED	NOT USED
C	16	
R	9	
IC	6	
CR	2	

IC POWER PINS			
DEVICE	+V	-V	GND
74HCT132	14	—	7
74HCT32	14	—	7
74HCT244	20	—	10
74HCT74	14	—	7
7406	14	—	7

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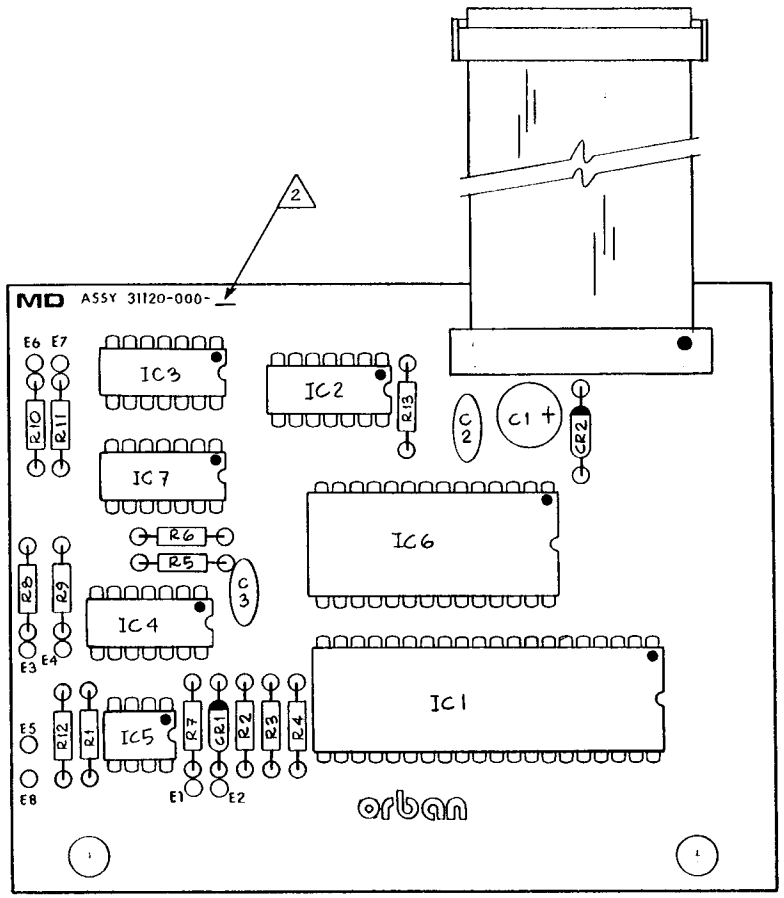
TITLE: SCHEMATIC
REMOTE INTERNAL (RI)
61060-000-01



COMPONENT SIDE

REFERENCE WIRELIST

FROM	TO	FUNCTION
E1	J1-4	IN
E2	J1-5	IN
E3	J2-4	THRU
E4	J2-5	THRU
E5	J2-2	GND
E6	J3-4	OUT
E7	J3-5	OUT
E8	J3-2	GND

2 MARK ASSEMBLY REV. LEVEL IN SPACE PROVIDED

1. TIC MARKS INDICATE PIN # 1 OF IC'S, CATHODE OF DIODE, POS. SIDE OF CAPS & PIN # 1 OF CONNECTOR

NOTES: (UNLESS OTHERWISE SPECIFIED)

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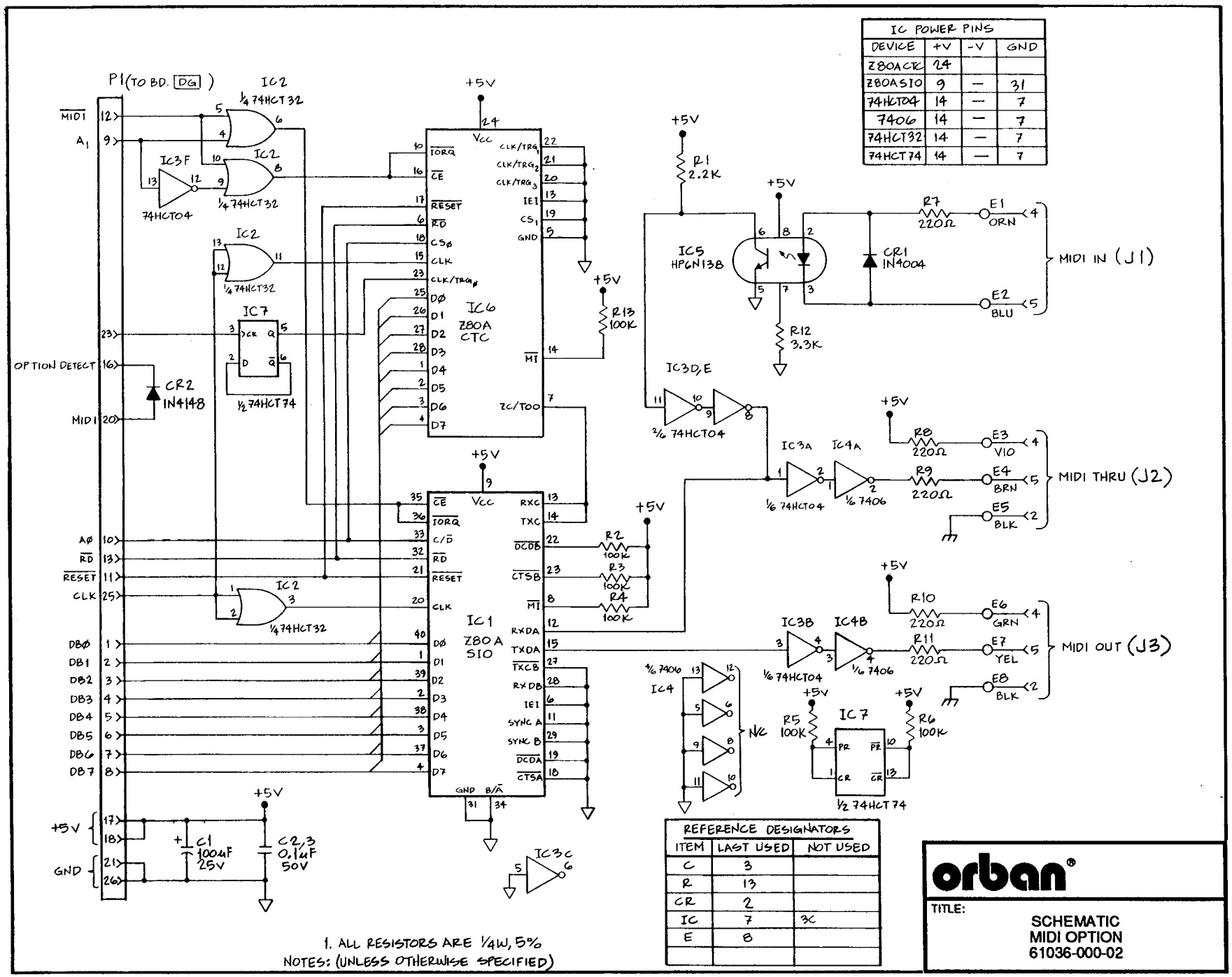
TITLE:
ASSEMBLY DRAWING
MIDI OPTION
31120-000-02



IC POWER PINS			
DEVICE	+V	-V	GND
Z80ACTC	24		
Z80ASIO	9	—	31
74HCT04	14	—	7
7406	14	—	7
74HCT32	14	—	7
74HCT74	14	—	7

REFERENCE DESIGNATORS		
ITEM	LAST USED	NOT USED
C	3	
R	13	
CR	2	
IC	7	3C
E	8	

1. ALL RESISTORS ARE 1/4W, 5%

NOTES: (UNLESS OTHERWISE SPECIFIED)

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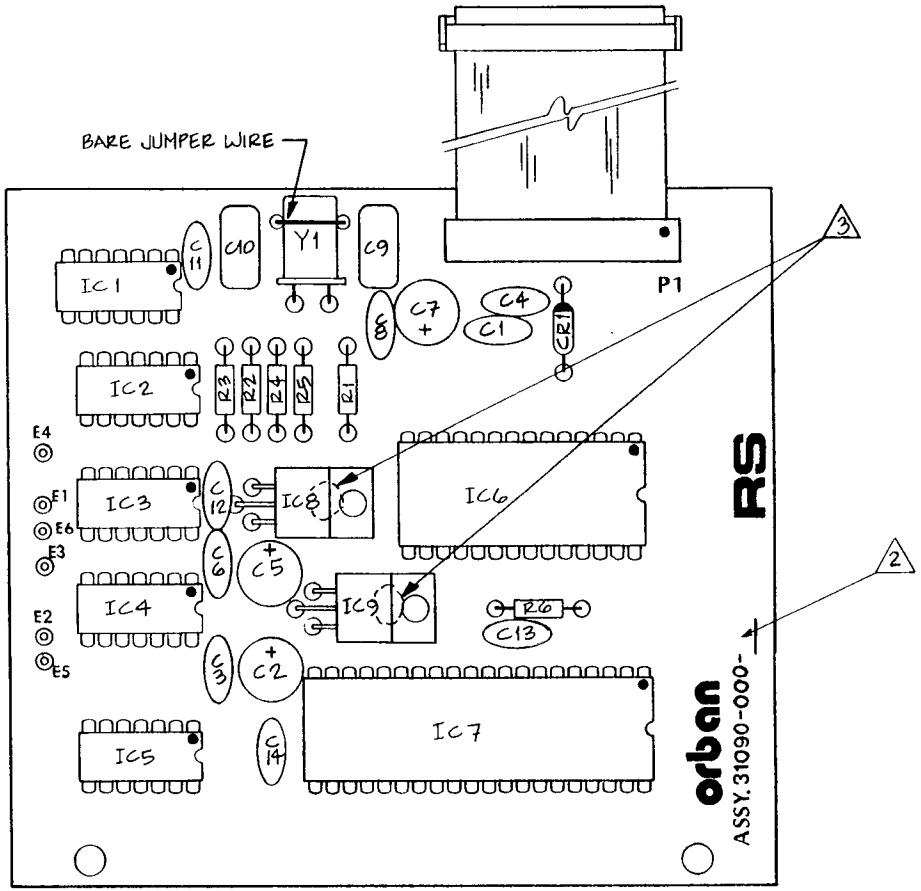
TITLE:
SCHEMATIC
MIDI OPTION
61036-000-02



REFERENCE WIRELIST

FROM	TO	FUNCTION
E1	J1-2	TxD
E2	J1-3	RxD
E3	J1-5	CTS
E4	J1-4	RTS
E5	J1-6	DSR
E6	J1-20	DTR
E7	J1-7	SIG. GND
E8	J1-1	CHAS. GND

COMPONENT SIDE

NOTES: (UNLESS OTHERWISE SPECIFIED)

1. TIC MARKS INDICATE PIN Nº 1 OF IC'S, CATHODE OF DIODE, POS. SIDE OF CAPS., PIN Nº 1 OF CONNECTOR

△2 MARK ASSEMBLY REVISION LEVEL, WITH RED MARKER IN SPACE PROVIDED.

△3 CEMENT IC8 & IC9 TO PCB WITH DAB OF GE RTV-162 SILICONE RUBBER

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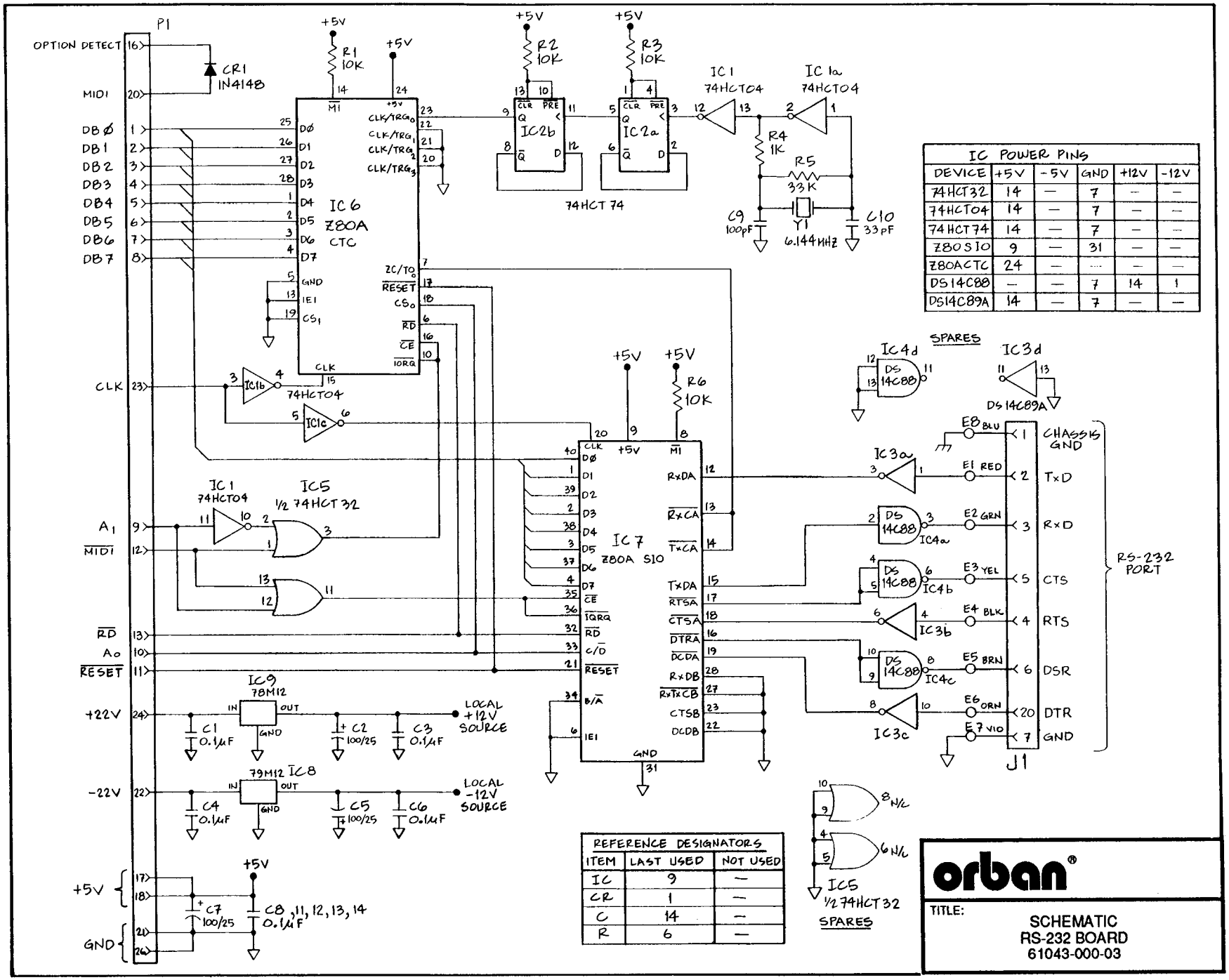
TITLE:
PC ASSEMBLY
RS-232 BOARD
31090-000-02



IC POWER PINS					
DEVICE	+5V	-5V	GND	+12V	-12V
74HCT32	14	—	7	—	—
74HCT04	14	—	7	—	—
74HCT74	14	—	7	—	—
Z80SIO	9	—	31	—	—
Z80ACTC	24	—	—	—	—
DS14C88	—	—	7	14	1
DS14C89A	14	—	7	—	—

REFERENCE DESIGNATORS		
ITEM	LAST USED	NOT USED
IC	9	—
CR	1	—
C	14	—
R	6	—

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TITLE:
SCHEMATIC
RS-232 BOARD
61043-000-03

Abbreviations

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

AGC	automatic gain control
dBu	0dBu = 0.775V RMS. For this application, the dBm-into-600Ω scale on voltmeters can be read as if it were calibrated in dBu.
DJ	disk jockey, an announcer who plays records in a club or on the air
EMI	electromagnetic interference
FCC	Federal Communications Commission (USA regulatory agency)
FET	field effect transistor
G/R	gain reduction
IC	integrated circuit
IM	intermodulation (or "intermodulation distortion")
JFET	junction field effect transistor
LED	light-emitting diode
N&D	noise and distortion
RF	radio frequency
RFI	radio-frequency interference
RMS	root-mean-square
THD	total harmonic distortion
VCA	voltage-controlled amplifier
XLR	a common style of 3-conductor audio connector