

SPECIFICATIONS

OUTPUT POWER

100 watts minimum continuous sine wave average power output per channel with all channels driving 16 ohms over a power bandwidth of 20Hz to 20kHz at a maximum total harmonic distortion of 0.1%.

150 watts minimum continuous sine wave average power output per channel with all channels driving 8 ohms over a power bandwidth of 20Hz to 20kHz at a maximum total harmonic distortion of 0.2%.

OUTPUT IMPEDANCE

Designed for load impedances of 8-16 ohms.

AC POWER REQUIREMENTS

120VAC 50 or 60Hz 1500 watts maximum.

NOISE

100dB below full output into 16 ohms 15.7kHz noise bandwidth.

SECTION IV THEORY OF OPERATION

4.1 INPUT AMPLIFIER

A low noise dual op-amp, IC1-A and IC1-B, is configured as a differential input amplifier of unity gain (max input +20dB). It thereby accepts a balanced or unbalanced input source.

An attenuator type level control located on the control board follows the input amp. The mid point of control rotation corresponds to 6 dB of attenuation.

4.2 SUMMING AMPLIFIER

The summing amplifier, IC2-B, has a gain of 10. It combines a filtered signal from the input level control with frequency compensated negative feedback from the power amplifier output. IC2-B's output drives the forward gain section of the amplifier. The nominal amount of the feedback is 1/40 (-32 dB).

4.3 VOLTAGE AMPLIFIER

The voltage amp consists of Q3 through Q7, and is driven by the summing amplifier output. The stage has a gain of 50, set by local negative feedback, keeping THD low and optimizing linearity.

Q7 is controlled by R36, a trimmer control on the circuit board, and sets the bias of the output stage for Class AB operation.

4.4 CURRENT AMPLIFIER

Comprised of Q11, Q12, and Q15 - Q18, this section has an overall voltage gain of 1. Q11 and Q12 provide the initial current gain necessary to drive the main output transistors from the voltage amplifier's output. Output transistors Q15, Q16, Q17 and Q18 then provide the high current necessary to drive rated loads.

4.5 OUTPUT PROTECTION

Transistors Q13 and Q14 sense output current in the load. Signal to the pre-drivers (Q11 and Q12) is reduced as the signal approaches the limits of the safe operating area (SOA) of the output devices.

Transistors Q27 and Q28 sense overcurrent in the voltage amplifier stage; if overload occurs they protect the voltage amplifier.

4.5 CLIP INDICATOR

Comprised of IC2-C and the CLIP indicator, this stage senses the summing amplifier output. The LED is turned on when the feedback loop goes non-linear. A pulse-stretching circuit ensures that the LED will stay on long enough to be visible even with short duration overloads.

4.7 RELAY CIRCUIT

Normally the output relay is closed and completes the signal path from the output of the power amplifier to the output binding posts. If IC2-D senses a DC voltage at the amplifier output caused by amplifier or power supply failure, or the thermistor R52 measures a temperature in excess of 90°C on the heat sink, the base drive to the relay drive transistor is turned off and the relay opens. The relay amplifier also drives transistors on the control board to supply current to the NORMAL or STANDBY LEDs as appropriate.

4.8 FAN CIRCUIT

The Model 6400 Amplifier is designed to be basically convection cooled with the large heatsinks providing adequate surface area for ambient air to flow past and dissipate any heat generated by the amplifier. An auxiliary fan circuit is incorporated in the Model 6400 to provide forced ventilation in the event that the air flow across the heat sinks is insufficient.

Each module senses the voltage at the junction of thermistor R52 and resistor R51. This voltage becomes more positive with increasing temperature. A diode couples this voltage out of the module on connector J1-6 and provides isolation between modules. The four modules connect to integrated circuit IC301 on the fan control board. This operational amplifier is configured as a Schmidt trigger with its negative input biased through resistor R304 from the collector of Q301. With the transistor not conducting the voltage at the collector is approximately +12VDC. This forces the output of the operational amplifier negative. Diode CR301 prevents Q301 from being back-biased. Resistors R303 and R304 establish positive voltage at the negative input to the operational amplifier. When one or more modules heats up the voltage on the positive input increases until, at 80°C, it exceeds the voltage at the negative input. The output of IC301 goes positive causing Q301 to conduct. The voltage at the collector of Q301 goes to zero as the relay is turned on energizing the fan. Resistors R302 and R303 establish a lower DC voltage at the negative input of IC301. As the fan cools the modules and the thermistors cool down the voltage at the positive input of IC301 will decrease until it is then lower than the voltage on the negative input. The IC trips to the opposite state and turns off the transistor and the relay. This point has been set at approximately 10-15°C lower than the fan turn-on temperature to prevent the fan from cycling on and off over a narrow temperature range.

4.9 CONTROL BOARD

The control board contains the gain controls and level and function displays and drivers for the amplifiers. Each amplifier module connects to the control board via an 8 pin connector which connects to the gain control and provides drive for the LED clip indicator and the NORMAL-STANDBY LEDs.

A fifth cable from the power supply/relay board brings post-relay output signals and power supplies for the displays. The headroom display circuit is identical for the four channels. Channel #1 will be described for illustration: Signal output from the relay board is taken through an attenuator made from resistor R211 and R103 which connect to the half-wave rectifier CR102 and storage capacitor C105. Resistor R108 provides a discharge path for C105. The voltage at CR102/C105 is +10VDC at 6dB below full output into 16 ohms. Resistors R101, R102 and transistor Q101 provide a reference voltage to the integrated circuit IC101 which is a 3dB/step LED driver. All of the LEDs are illuminated when the level into pin 5 of the IC exceeds +10VDC. As the voltage drops below this level the first LED (-6) extinguishes. LEDs are connected to every second output and therefore the next LED will extinguish at 12dB below full output, the third at 18dB and the fourth at 24dB below full output. Capacitor C105 allows the LEDs to stay on long enough to be visible.

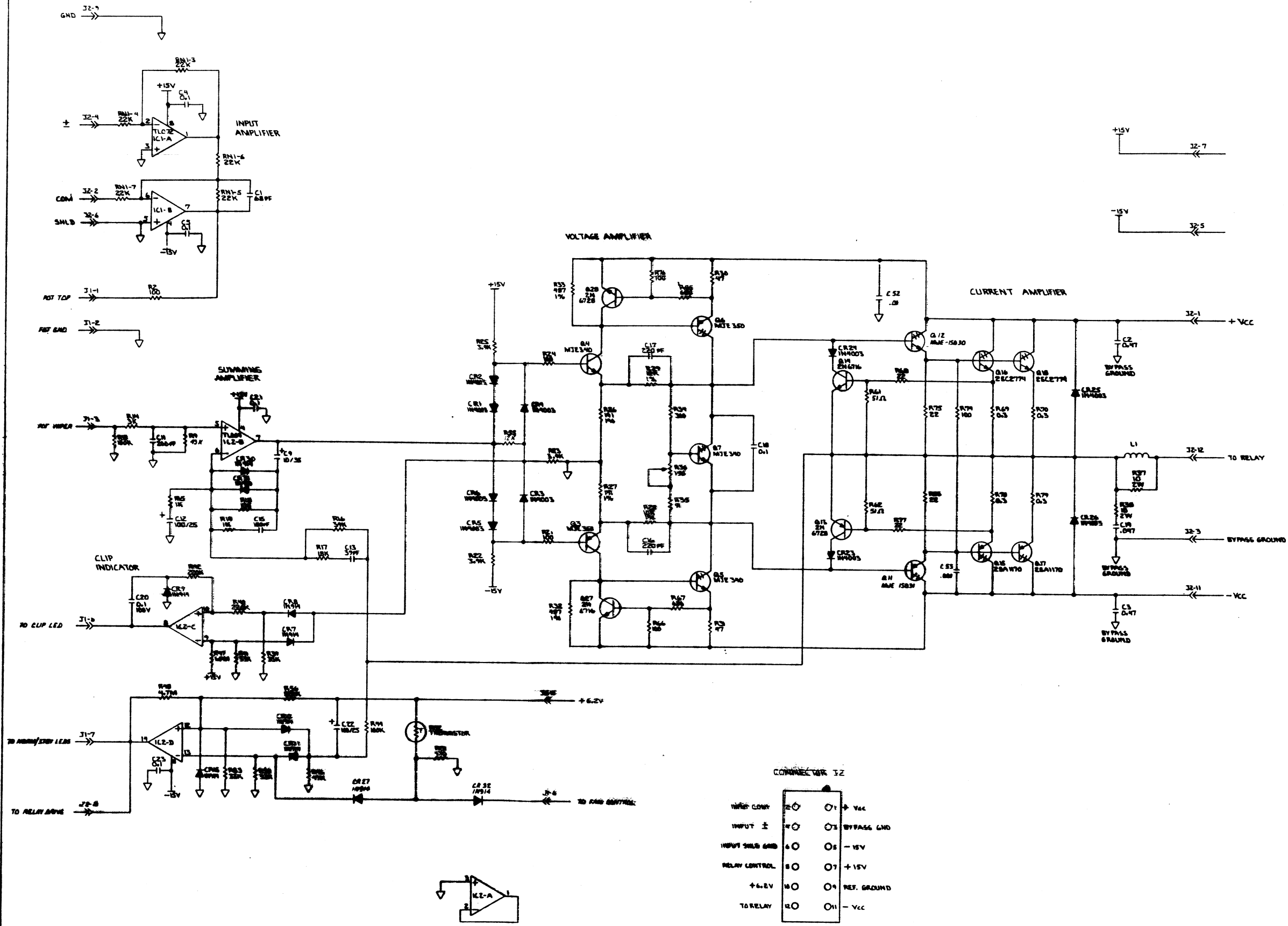
Integrated circuit VR3 is an on-board power supply regulator for the displays and the +15 volts necessary for the CLIP and NORMAL LEDs. The -15VDC for the STANDBY LEDs is taken from the voltage regulator VR2 on the power supply/relay board.

4.10 POWER SUPPLY

The power transformer, bridge rectifier BR1 and the large filter capacitors C46 and C47 supply high voltage high current DC for the output stages of the amplifiers. Idling voltage is approximately + 75VDC. The high voltage lines to each amplifier module are internally fused to prevent a major failure in one amplifier from causing all of the amplifiers to be shut down.

Low voltage +15VDC is established on the power supply/relay board and coupled to each amplifier through diodes and low value resistors which act as fuses isolating modules in case of catastrophic failure.

A separate +12VDC supply provides relay power and from this a 6.2VDC regulated voltage is derived and sent to the modules to supply voltage for the over temperature thermistor and the NORMAL-STANDBY circuit.

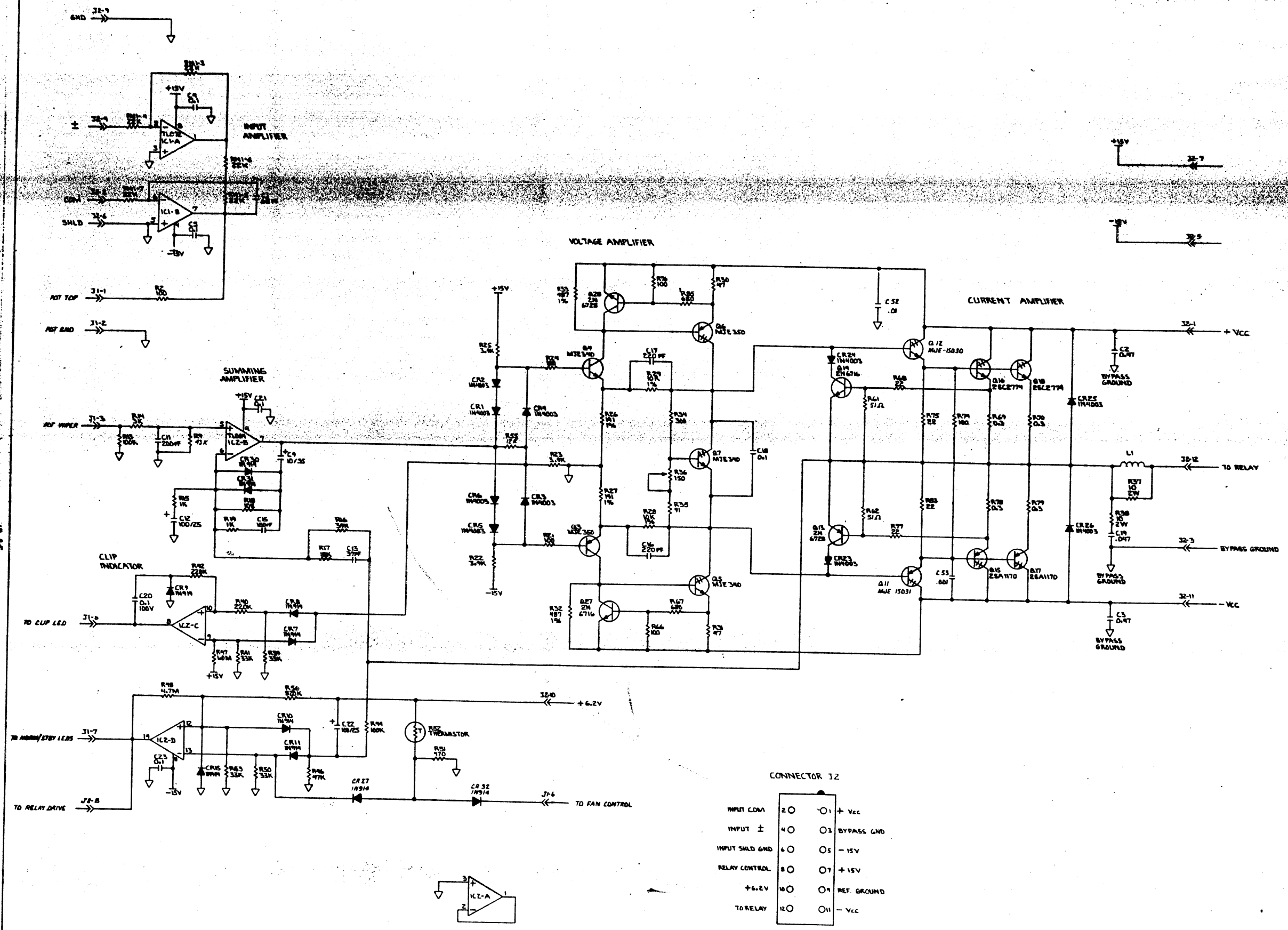


1. INDICATES P.C. BOARD CONNECTOR.
 2. CAPACITOR VALUES ARE IN MICROFARADS.
 3. RESISTOR VALUES ARE IN OHMS ± 5% 1/2W.
 NOTES: UNLESS OTHERWISE SPECIFIED.

RELAY ADDED CAR'S 0204225, 012-01-01
SCHEMATIC AMPLIFIER BOARD
 DES MODEL DRAWING NO. R 6405 14236-A
 DESIGNED BY: [Signature]

IC#2, C 3:V chip out
 IC#2, C, 8, No chip -15V
 chip #11
 Price 128
 NO 302.1 +8 MV
 WITH 302.1 +12 MV

10 25



CONNECTOR J2

INPUT COM	2 0	0 1	+ Vcc
INPUT ±	4 0	0 3	BYPASS GND
INPUT SHLD GND	6 0	0 5	- 15V
RELAY CONTROL	8 0	0 7	+ 15V
+6.2V	10 0	0 9	REF. GROUND
TO RELAY	12 0	0 11	- Vcc

1. ↓ INDICATES CIRCUIT GROUND.
 2. → INDICATES P.C. BOARD CONNECTOR.
 3. CAPACITOR VALUES ARE IN MICROFARADS.
 4. RESISTOR VALUES ARE IN OHMS ± 5% 1/2W.
 NOTES: UNLESS OTHERWISE SPECIFIED.

REV A ADDED CAPS C52, C53, 2:13-PM/MP

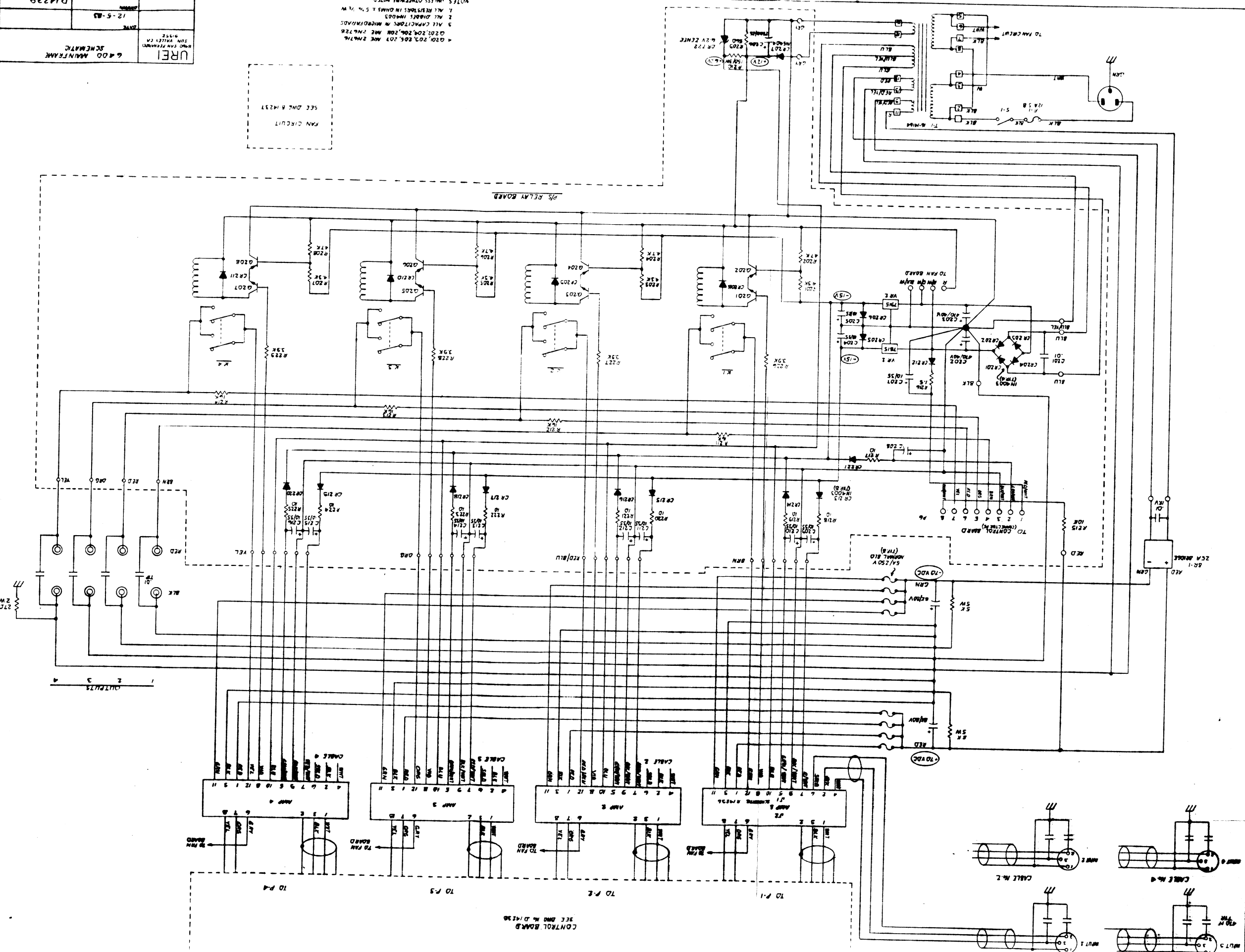
SCHEMATIC AMPLIFIER BOARD		
SIZE	MODEL	DRAWING NO.
R	6405	14236 A
DATE 4-4-65 BY: W. W. BARNETT		

NOTES UNLESS OTHERWISE NOTED:
1. ALL RESISTORS IN OHMS UNLESS OTHERWISE NOTED.
2. ALL CAPACITORS IN MICROFARADS UNLESS OTHERWISE NOTED.
3. ALL CAPACITORS IN MICROFARADS UNLESS OTHERWISE NOTED.
4. Q201, Q202, Q203, Q204, Q205, Q206, Q207, Q208, Q209, Q210, Q211, Q212, Q213, Q214, Q215, Q216, Q217, Q218, Q219, Q220, Q221, Q222, Q223, Q224, Q225, Q226, Q227, Q228, Q229, Q230, Q231, Q232, Q233, Q234, Q235, Q236, Q237, Q238, Q239, Q240, Q241, Q242, Q243, Q244, Q245, Q246, Q247, Q248, Q249, Q250, Q251, Q252, Q253, Q254, Q255, Q256, Q257, Q258, Q259, Q260, Q261, Q262, Q263, Q264, Q265, Q266, Q267, Q268, Q269, Q270, Q271, Q272, Q273, Q274, Q275, Q276, Q277, Q278, Q279, Q280, Q281, Q282, Q283, Q284, Q285, Q286, Q287, Q288, Q289, Q290, Q291, Q292, Q293, Q294, Q295, Q296, Q297, Q298, Q299, Q300, Q301, Q302, Q303, Q304, Q305, Q306, Q307, Q308, Q309, Q310, Q311, Q312, Q313, Q314, Q315, Q316, Q317, Q318, Q319, Q320, Q321, Q322, Q323, Q324, Q325, Q326, Q327, Q328, Q329, Q330, Q331, Q332, Q333, Q334, Q335, Q336, Q337, Q338, Q339, Q340, Q341, Q342, Q343, Q344, Q345, Q346, Q347, Q348, Q349, Q350, Q351, Q352, Q353, Q354, Q355, Q356, Q357, Q358, Q359, Q360, Q361, Q362, Q363, Q364, Q365, Q366, Q367, Q368, Q369, Q370, Q371, Q372, Q373, Q374, Q375, Q376, Q377, Q378, Q379, Q380, Q381, Q382, Q383, Q384, Q385, Q386, Q387, Q388, Q389, Q390, Q391, Q392, Q393, Q394, Q395, Q396, Q397, Q398, Q399, Q400, Q401, Q402, Q403, Q404, Q405, Q406, Q407, Q408, Q409, Q410, Q411, Q412, Q413, Q414, Q415, Q416, Q417, Q418, Q419, Q420, Q421, Q422, Q423, Q424, Q425, Q426, Q427, Q428, Q429, Q430, Q431, Q432, Q433, Q434, Q435, Q436, Q437, Q438, Q439, Q440, Q441, Q442, Q443, Q444, Q445, Q446, Q447, Q448, Q449, Q450, Q451, Q452, Q453, Q454, Q455, Q456, Q457, Q458, Q459, Q460, Q461, Q462, Q463, Q464, Q465, Q466, Q467, Q468, Q469, Q470, Q471, Q472, Q473, Q474, Q475, Q476, Q477, Q478, Q479, Q480, Q481, Q482, Q483, Q484, Q485, Q486, Q487, Q488, Q489, Q490, Q491, Q492, Q493, Q494, Q495, Q496, Q497, Q498, Q499, Q500, Q501, Q502, Q503, Q504, Q505, Q506, Q507, Q508, Q509, Q510, Q511, Q512, Q513, Q514, Q515, Q516, Q517, Q518, Q519, Q520, Q521, Q522, Q523, Q524, Q525, Q526, Q527, Q528, Q529, Q530, Q531, Q532, Q533, Q534, Q535, Q536, Q537, Q538, Q539, Q540, Q541, Q542, Q543, Q544, Q545, Q546, Q547, Q548, Q549, Q550, Q551, Q552, Q553, Q554, Q555, Q556, Q557, Q558, Q559, Q560, Q561, Q562, Q563, Q564, Q565, Q566, Q567, Q568, Q569, Q570, Q571, Q572, Q573, Q574, Q575, Q576, Q577, Q578, Q579, Q580, Q581, Q582, Q583, Q584, Q585, Q586, Q587, Q588, Q589, Q590, Q591, Q592, Q593, Q594, Q595, Q596, Q597, Q598, Q599, Q600, Q601, Q602, Q603, Q604, Q605, Q606, Q607, Q608, Q609, Q610, Q611, Q612, Q613, Q614, Q615, Q616, Q617, Q618, Q619, Q620, Q621, Q622, Q623, Q624, Q625, Q626, Q627, Q628, Q629, Q630, Q631, Q632, Q633, Q634, Q635, Q636, Q637, Q638, Q639, Q640, Q641, Q642, Q643, Q644, Q645, Q646, Q647, Q648, Q649, Q650, Q651, Q652, Q653, Q654, Q655, Q656, Q657, Q658, Q659, Q660, Q661, Q662, Q663, Q664, Q665, Q666, Q667, Q668, Q669, Q670, Q671, Q672, Q673, Q674, Q675, Q676, Q677, Q678, Q679, Q680, Q681, Q682, Q683, Q684, Q685, Q686, Q687, Q688, Q689, Q690, Q691, Q692, Q693, Q694, Q695, Q696, Q697, Q698, Q699, Q700, Q701, Q702, Q703, Q704, Q705, Q706, Q707, Q708, Q709, Q710, Q711, Q712, Q713, Q714, Q715, Q716, Q717, Q718, Q719, Q720, Q721, Q722, Q723, Q724, Q725, Q726, Q727, Q728, Q729, Q730, Q731, Q732, Q733, Q734, Q735, Q736, Q737, Q738, Q739, Q740, Q741, Q742, Q743, Q744, Q745, Q746, Q747, Q748, Q749, Q750, Q751, Q752, Q753, Q754, Q755, Q756, Q757, Q758, Q759, Q760, Q761, Q762, Q763, Q764, Q765, Q766, Q767, Q768, Q769, Q770, Q771, Q772, Q773, Q774, Q775, Q776, Q777, Q778, Q779, Q780, Q781, Q782, Q783, Q784, Q785, Q786, Q787, Q788, Q789, Q790, Q791, Q792, Q793, Q794, Q795, Q796, Q797, Q798, Q799, Q800, Q801, Q802, Q803, Q804, Q805, Q806, Q807, Q808, Q809, Q810, Q811, Q812, Q813, Q814, Q815, Q816, Q817, Q818, Q819, Q820, Q821, Q822, Q823, Q824, Q825, Q826, Q827, Q828, Q829, Q830, Q831, Q832, Q833, Q834, Q835, Q836, Q837, Q838, Q839, Q840, Q841, Q842, Q843, Q844, Q845, Q846, Q847, Q848, Q849, Q850, Q851, Q852, Q853, Q854, Q855, Q856, Q857, Q858, Q859, Q860, Q861, Q862, Q863, Q864, Q865, Q866, Q867, Q868, Q869, Q870, Q871, Q872, Q873, Q874, Q875, Q876, Q877, Q878, Q879, Q880, Q881, Q882, Q883, Q884, Q885, Q886, Q887, Q888, Q889, Q890, Q891, Q892, Q893, Q894, Q895, Q896, Q897, Q898, Q899, Q900, Q901, Q902, Q903, Q904, Q905, Q906, Q907, Q908, Q909, Q910, Q911, Q912, Q913, Q914, Q915, Q916, Q917, Q918, Q919, Q920, Q921, Q922, Q923, Q924, Q925, Q926, Q927, Q928, Q929, Q930, Q931, Q932, Q933, Q934, Q935, Q936, Q937, Q938, Q939, Q940, Q941, Q942, Q943, Q944, Q945, Q946, Q947, Q948, Q949, Q950, Q951, Q952, Q953, Q954, Q955, Q956, Q957, Q958, Q959, Q960, Q961, Q962, Q963, Q964, Q965, Q966, Q967, Q968, Q969, Q970, Q971, Q972, Q973, Q974, Q975, Q976, Q977, Q978, Q979, Q980, Q981, Q982, Q983, Q984, Q985, Q986, Q987, Q988, Q989, Q990, Q991, Q992, Q993, Q994, Q995, Q996, Q997, Q998, Q999, Q1000.

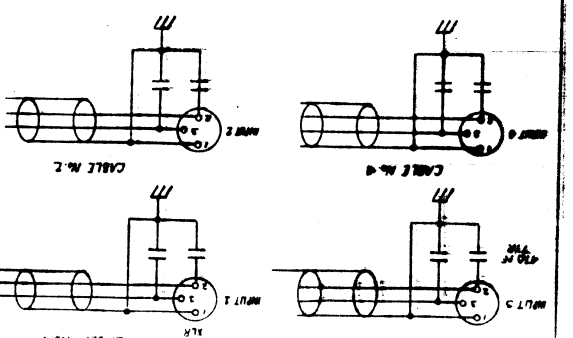
FAN CIRCUIT
SEE DWG R14237

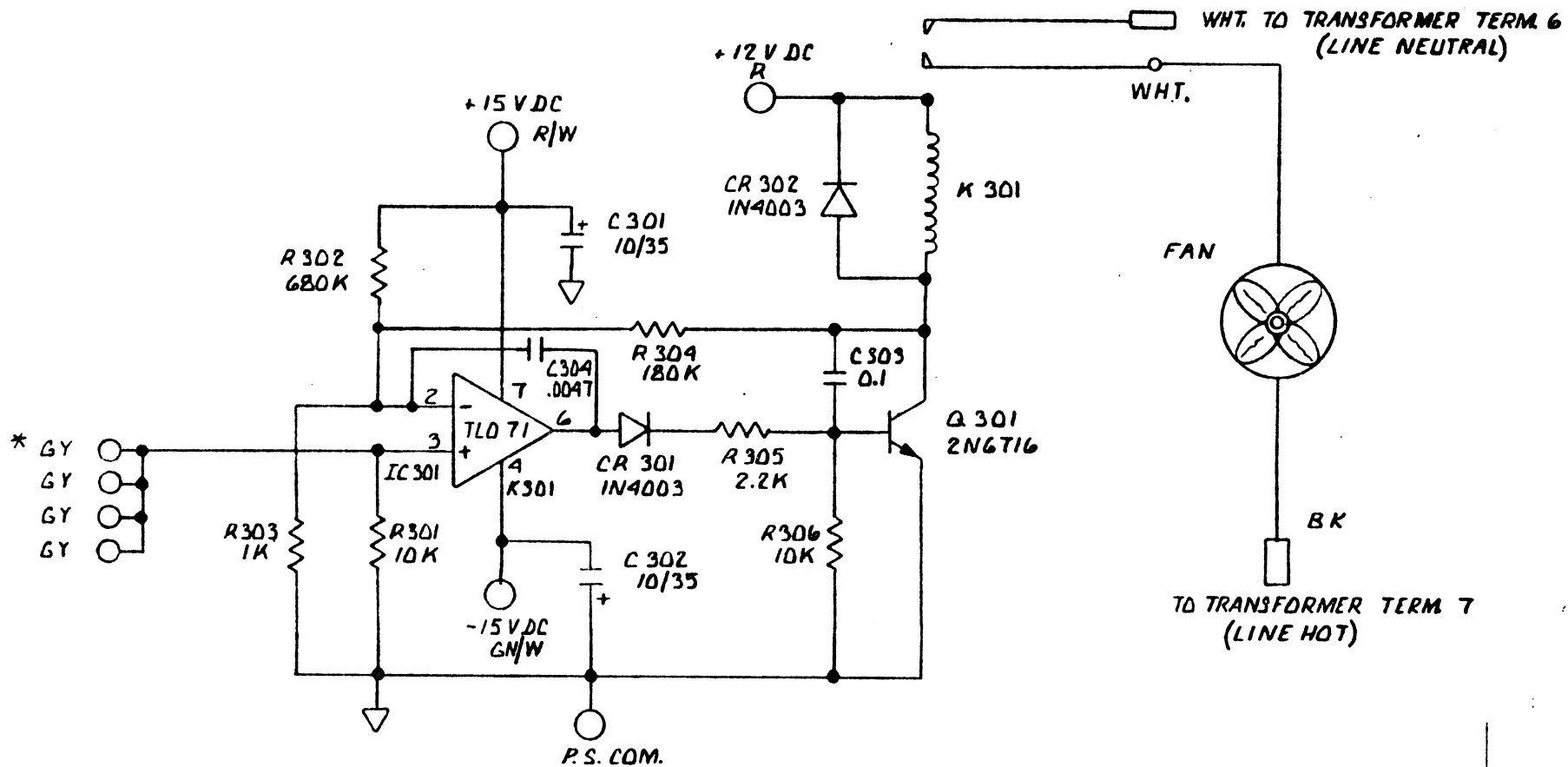
P/S RELAY BOARD

CONTROL BOARD
SEE DWG R14230



OUTPUTS
1
2
3
4





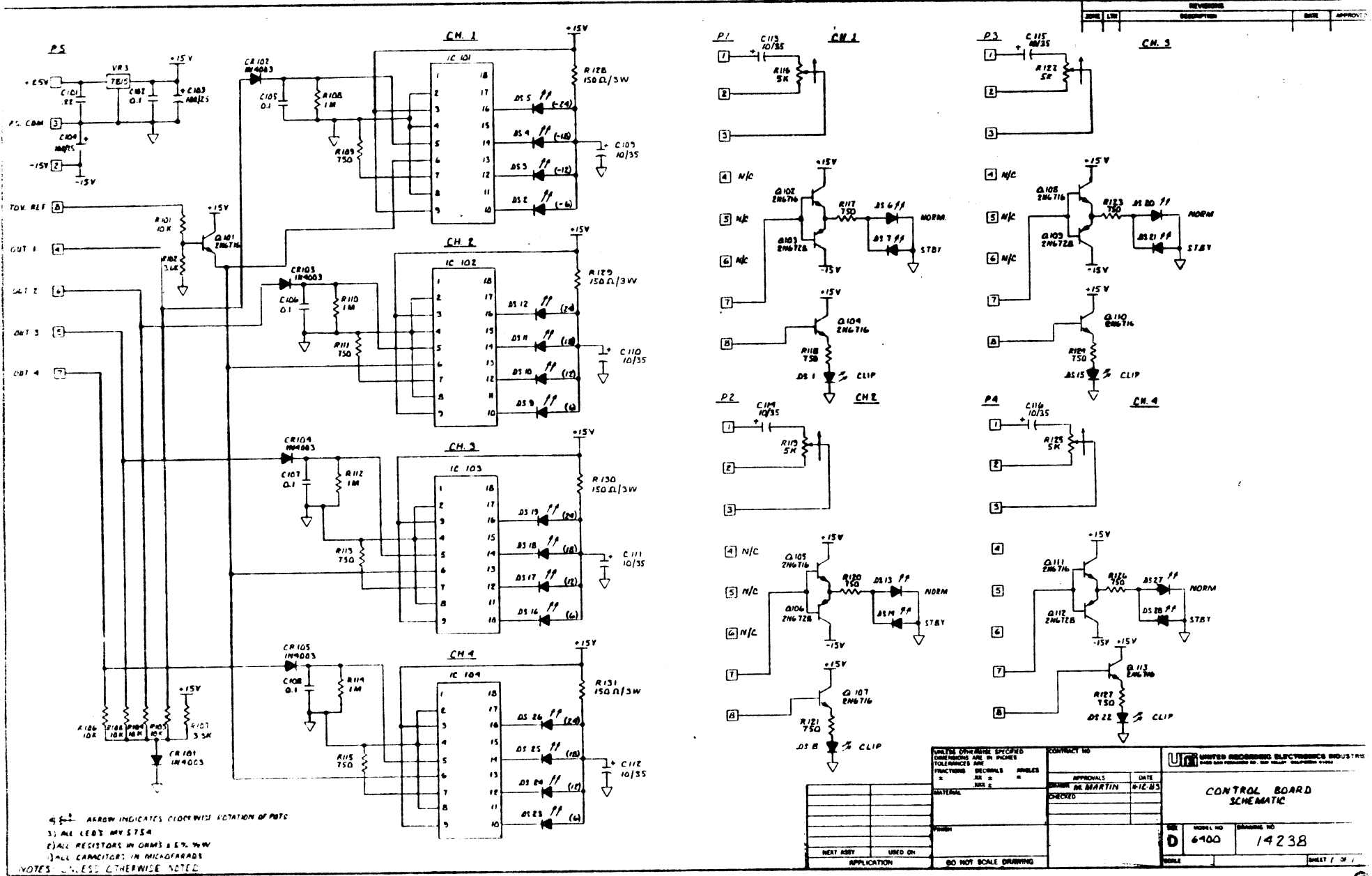
REV. A ADDED CAP
C 304 12-13-83
REVISIONS

UNITED RECORDING ELECTRONICS INDUSTRIES	FAN CIRCUIT SCHEMATIC	
	MODEL 6400	DATE 11-9-83
LOS ANGELES CALIFORNIA	CHECKED M.R. MARTIN	ISSUE APPROVED B 14237A

16.354

- * 3. GY WIRES FROM J1 PIN 6 OF EACH AMPLIFIER MODULE
- 2. ALL CAPS IN MICROFARADS
- 1. ALL RESISTORS IN OHMS \pm 5% 1/2 W

ES:



REVISIONS		DATE	APPROVAL
NO.	DESCRIPTION		

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE FRACTIONS DECIMALS ANGLES .015 .01 .05 .01		CONTRACT NO. APPROVALS DATE DRAWN BY MARTIN 4-12-55 CHECKED	UNITED RECORDING ELECTRONICS INC./STARS 14238 CONTROL BOARD SCHEMATIC
MATERIAL PARTS NEXT ASSEMBLY USED ON APPLICATION	DO NOT SCALE DRAWING	MODEL NO D 6400	DRAWING NO 14238
SHEET 1 OF 1		32 902	