audio systems

Operation and Maintenance

WARRANTY

All ROH Corporation products are guaranteed against defects in material and workmanship. This warranty applies for one year from the date of delivery to the original purchaser. We will repair or replace, at out option, products which prove to be defective during the warranty period provided they are returned to the factory. Products returned for warranty repair will be serviced and shipped within 2 working days. Customers may repair and calibrate equipment without voiding the guarantee, provided the service is performed in a workmanlike manner. ROH Corporation will supply parts free of charge to those customers who elect to repair equipment that is under warranty. This warranty is in lieu of all other warranties, expressed or implied, and constitutes fulfillment of all our liabilities to the purchaser. We assume no liability in any event, for consequential or incidental damages incurred by the purchaser in connection with products covered under this warranty.

ROH CORPORATION 107 TECHNOLOGY PARK NORCROSS, GA 30092 (404)449-0873

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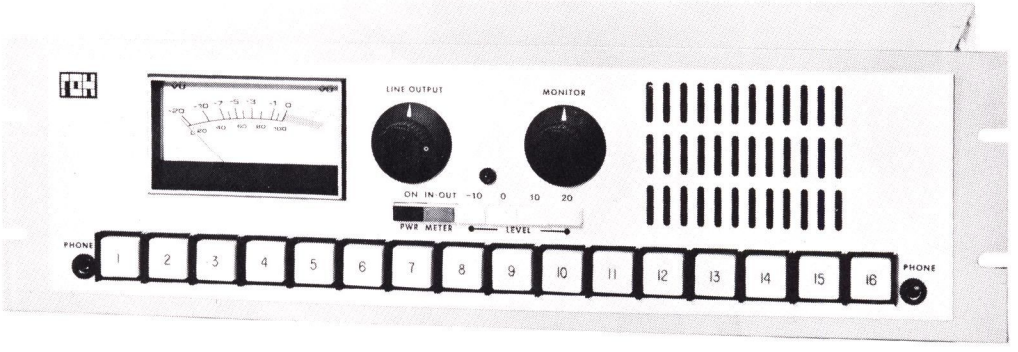
LIST OF ILLUSTRATIONS

Bridging Switcher/Line Monitor

Model 190



The Model 190 is designed to fulfill the functions of both an audio bridging switcher and a multiple input line monitor. The unit may be used to expand the number of inputs for existing equipment and/or determine the signal level and quality of critical audio circuits. The several versions of the Model 190 provide single, dual channel, or stereo operation. The single channel units incorporate a monitor speaker and VU meter. The dual channel and stereo units have a VU meter for each channel and an amplifier output for driving external monitor speakers. The input channel selection is obtained with momentary or alternate action illuminated pushbutton switches. A choice of eight or sixteen imputs are provided on the standard models and may be remote controlled using an external DC control signal. The number of inputs may be increased in increments of 16 to meet larger system requirements. Electrical specifications meet or exceed commercial broadcast requirements. Each unit is completely self-contained and operates from 115/230 Vac, 50 or 60 Hz line power.

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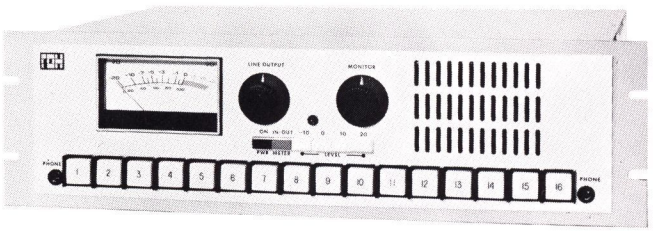
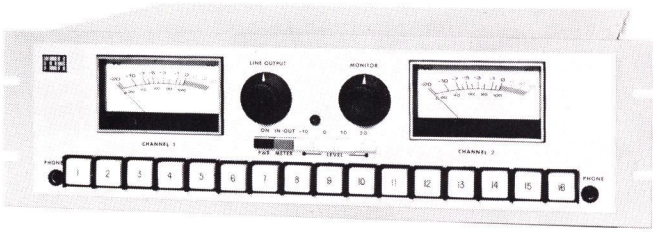
Technical Description



Model 191



Model 192, 193

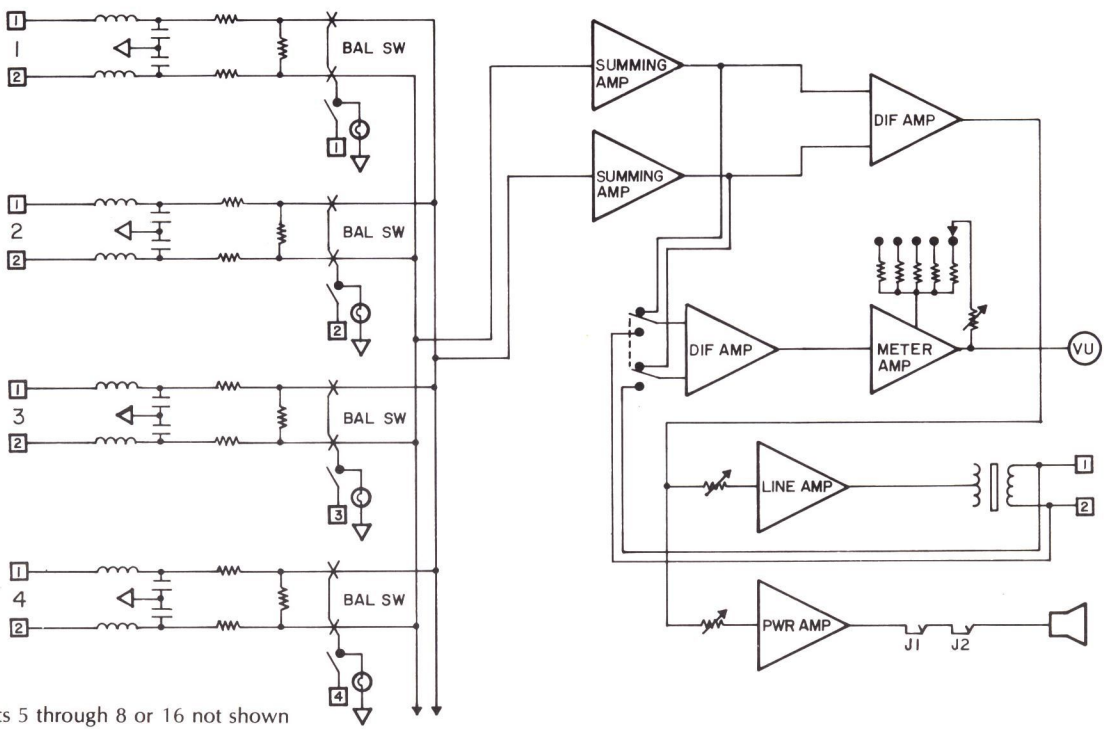
The Model 190 can select from any number of inputs and offers both monitor functions and a balanced line output. Input selection is achieved with illuminated pushbutton switches, which provide a DC control voltage to actuate solid state crosspoint switches. Each balanced bridging input is isolated and actively mixed to prevent crosstalk or signal loss as additional inputs are selected.

The switch bus mixing amplifiers drive the line and monitor amplifiers through separate level controls. The line amplifier provides 30 dB of gain and a balanced transformer output. The monitor amplifier provides 40 dB of gain and the output is connected through jacks which interrupt the speaker operation when phones are used. Both the line and speaker amplifier outputs and an auxiliary input are available on the rear panel.

Metering of either the input or output line level is selected with a front panel switch. The meter circuitry incorporates an amplifier to offer adjustable sensitivity and response ballistics. The input sensitivity is selected in 10 dB steps by interlocked front panel switches. The calibration is adjustable over a 10 dB range to indicate 0 VU for 0, +4, or +8 dBm line levels. The meter response can be switched to provide standard VU ballistics or a fast, accurate peak responding indication.

Alternate action pushbutton switches are standard. Momentary action, electrically interlocked switching, is available with the optional tally circuitry. The tally is compatible with the input expander accessory or the remote DC control option. The remote control of switching and tally circuitry is TTL logic compatable. Pushbutton switch legend is engraved and supplied to the customer's specifications.

All circuitry is powered with a multiple output regulated power supply which will operate from 115 or 230 Vac ±10%, 50 or 60 Hz. The power supply is fully protected from an output short circuit or overload condition.



Inputs 5 through 8 or 16 not shown

Specifications

Gain:	30 dB line amplifier 40 dB monitor amplifier
Input Impedance:	10k ohms balanced bridging 40 dB CMR at 60 Hz +20 dBm maximum common mode input
Switch Attenuation & Crosstalk:	≥70 dB at 10 kHz
Line Output:	600 ohms balanced
Line Output Level:	+30 dBm, 50 Hz to 20 kHz +24 dBm, 30 Hz to 20 kHz
Speaker/Headset Output:	4-600 ohms unbalanced
Power Output:	10 watts into 4 ohms, 20 Hz to 20 kHz
Frequency Response:	±.5 dB maximum deviation from specified bandwidth at rated output
Distortion, THD or IM:	−50 dB, ⅓% maximum at rated output
Noise:	85 dB S/N ratio, −65 dBm residual at 20 dB gain
Meter Range:	−20 to +20 dB in 10 dB steps
Meter Calibration:	0, +4 or +8 dBm for 0 VU indication
Meter Accuracy:	±3% of reading and ±2% of range
Meter Response:	20 Hz to 20 kHz ±.5 dB
Meter Balistics:	Standard VU or Peak Responding
Ambient Temperature:	0° to +50° C operating range
Power Requirement:	115/230 Vac, ±10%, 50 to 60 Hz, 50 watts
Size:	5.25'' H × 19'' W × 15'' D
Weight:	15 lbs.

Model Number and Name

Model 191-08	8 Input Audio Switcher, mono
Model 191-16	16 Input Audio Switcher, mono
Model 192-08	8 Input Audio Switcher, stereo
Model 192-16	16 Input Audio Switcher, stereo
Model 193-08	8 Input Audio Switcher, dual channel mono

Options

01	Remote Control of Input Switching
02	Tally Interlocked Switching for 8 Input Models
03	Tally Interlocked Switching for 16 Input Models
04	16 Switch Input Expander, mono
05	16 Switch Input Expander, stereo

SECTION II

INSTALLATION

2.1 INSPECTION

This instrument was carefully inspected both mechanically and electrically before shipment. It should be physically free of mars or scratches and in perfect electrical order upon receipt. To confirm this, the instrument should be inspected for physical damage in transit, and checked to verify electrical operation. Al material in the container should be checked against the enclosed packing list. The manufacturer will not be responsible for shortages against the packing sheet unless notified immediately. If the instrument fails to operate properly, or is damaged in any way, a claim should be filed with the carrier. A full report of the damage should be filed by the claim agent, and this report should be forwarded to ROH Corporation. Upon receipt of this report, you will be advised of the disposition of the equipment for repair or replacement. Include the model number, type number, and serial number when referring to this instrument for any reason.

2.2 POWER REQUIREMENTS

The Model 190 can be operated from an AC source of 115 or 230 volts (±10%), 50 Hz or 60 Hz. Before the instrument is connected to a power source, be sure that the slide switch (located on the rear panel) matches the voltage being used. The power requirement does not exceed 50 watts.

2.3 GROUNDING REQUIREMENTS

To protect operating personnel, the National Electrical Manufacturers' Association (NEMA) recommends that the instrument panel and cabinet be grounded. This instrument is equipped with a three-conductor power cable which, when plugged into an appropriate receptacle, grounds the instrument. The offset pin on the power cable three-prong connector is the ground wire.

2.4 INSTALLATION

The unit is designed to mount in an EIA standard 19 inch width rack. Mounting screws with nylon washers have been provided to protect the front panel finish. When mounted in a rack, additional support at the rear of the instrument should be provided if vibration on similar stress is likely to be encountered. The chassis and power supply common are grounded at the line cord receptacle which is suitable to remove an electrical shock hazard; however, when an additional system ground is employed, chassis ground terminals should be used. The Model 190 has low power consumption, and no special cooling is required. However, the unit should not be operated where the ambient temperature exceeds 50°C (122°F).

SECTION III

OPERATING INSTRUCTIONS

3.1 GENERAL OPERATING INFORMATION

The 190 series instruments are intended for use as audio QC monitors or signal routing switchers. Available options for the unit will further increase the instruments' application. Figure 3.1.1 illustrates the front and rear panel controls, connectors, and indicators and the keyed items are identified and described in the accompanying list.

The remote control of an input circuit requires that the appropriate control line be connected to ground. If the unit also incorporates the optional tally circuit, a momentary contact closure or negative transition pulse can provide the control function. The input control line is normally at a 5 Vdc level and has a 1 mA current sink requirement when connected to a ground return. The lamp output for each input switch circuit is also available at the connector and located immediately below the corresponding input terminal. The output voltage swing is between -15 and 0 to +10 Vdc depending on the lamp load. Remote switch lamps should be type 387 and the common lamp terminals should be connected to the 15 Vdc binding post. Figure 3.1.2 identifies the input connector contact positions used for the remote control option.

The optional expander accessory may be used to increase the number of inputs in increments of 16 to meet larger system requirements. Figure 3.1.3 shows how the interconnect wiring between the expander and the main unit is accomplished. The expander contains additional crosspoint switch modules and an optional tally module. Operating power and audio amplification are provided by the main unit. Operation and electrical specifications are otherwise unchanged from the Model 190.

The peak level the input switches can block is +30 dBm, therefore the maximum operating input level should be limited to approximately +20 dBm. The output should be given the same consideration, since the line amplifier will clip beyond a +30 dBm output level.

1. Meter: Indicates the level of an input or output signal.

2. Meter: Indicates the level of an input or output signal. This meter is provided on the Model 192 stereo unit and the Model 193 dual channel unit. The Model 191 mono unit provides an internal speaker in this location.

3. Zero Adjust: Mechanical zero adjustment for the meter.

4. Channel Select Switches: Input channel selection provided by illuminated pushbutton switches.

5. Line Level: The output level adjustment for the line amplifier.

6. Monitor Level: The output level adjustment for the monitor amplifier.

7. Input/Output: Selects either the line input or output for display on meter(s).

8. RMS/Peak: Selects either the VU or peak response for the meter.

9. Range: Selects operating range for the meter from -20 dB to +20 dB in 10 dB increments.

10. Phone: Jack permits signal monitoring using headphones. Speaker operation is interrupted when phones are in use.

11. Phone: Jack permits signal monitoring using headphones, of channel 2 for the Model 193 dual channel unit.

12. AC Breaker: Circuit breaker provides overload protection for the unit.

13. Voltage Switch: Slide switch selects 115 V or 230 V AC power.

14. Red Binding Post: Provides +15 Vdc power for the expander unit.

15. Black Binding Post: Provides -15 Vdc power for the expander unit.

16. Green Binding Post: Provides a power supply ground for the expander unit.

17. AC Receptacle: Accepts grounded AC power input to the unit.

18. EXP: Allows an additional input line or the addition of an input expander unit.

19. TY: Extends the tally clear bus to an expander unit.

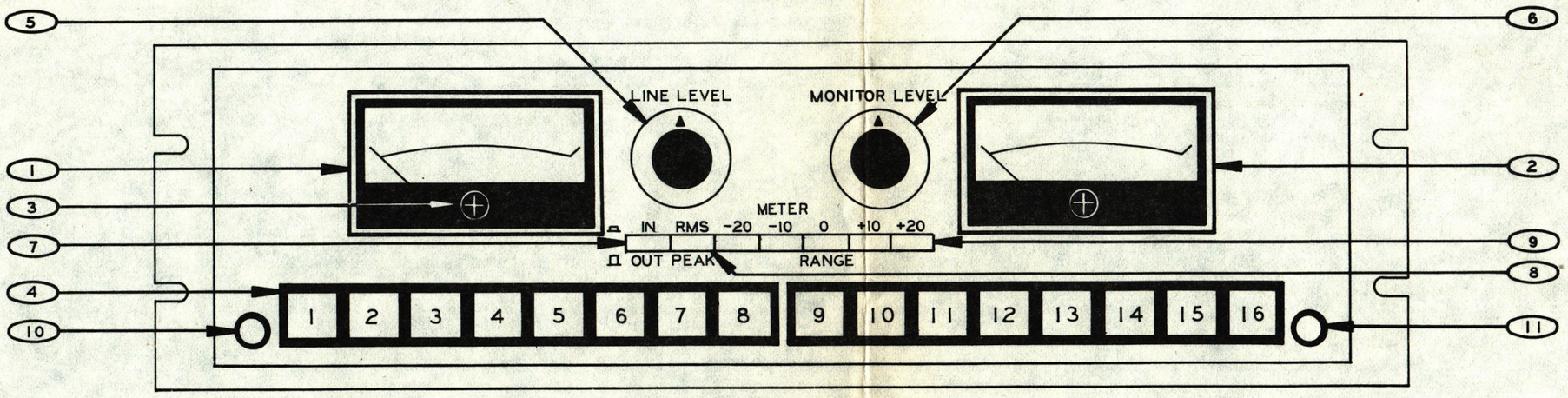
20. MON: Monitor amplifier output for use with external speakers,Note: The jumper from amplifier output terminal (H) to internal speaker terminal (S) can be opened to mute the internal speaker.

21. LINE: Output connection to the line amplifier.

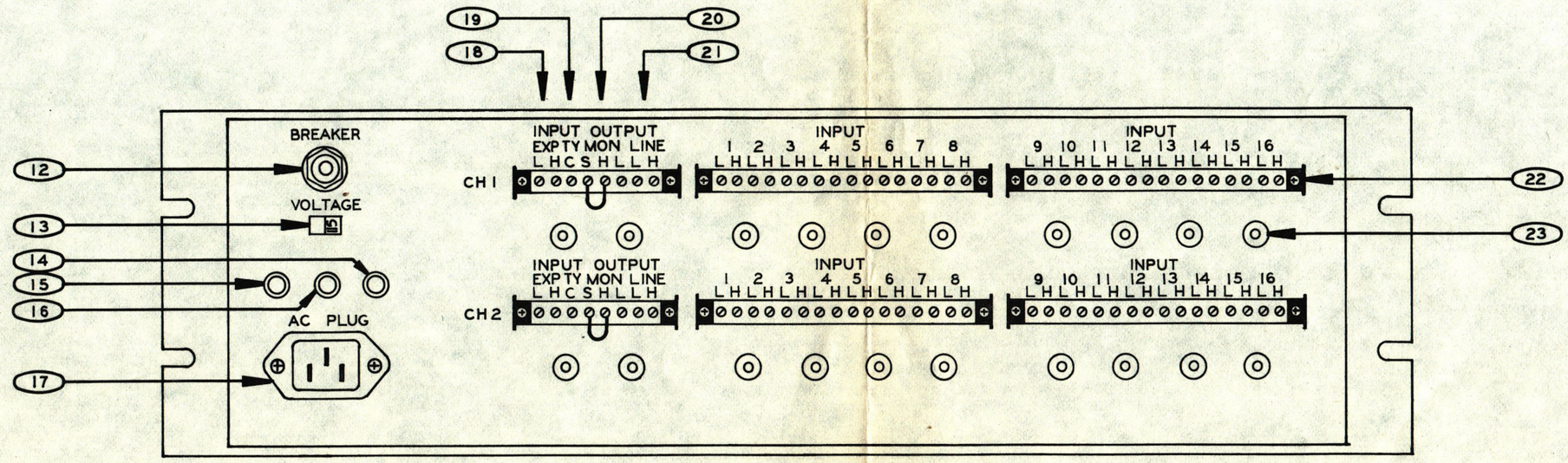
22. INPUT: Input connections for the signal inputs to the instrument.

23. Ground Terminals: Chassis ground for input and output cable shields.

FRONT AND REAR PANEL CONTROLS AND CONNECTORS



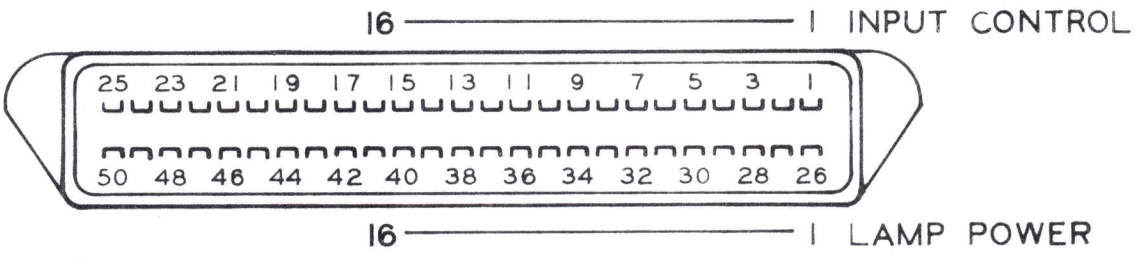
FRONT VIEW



REAR VIEW

FIGURE 3.1.1

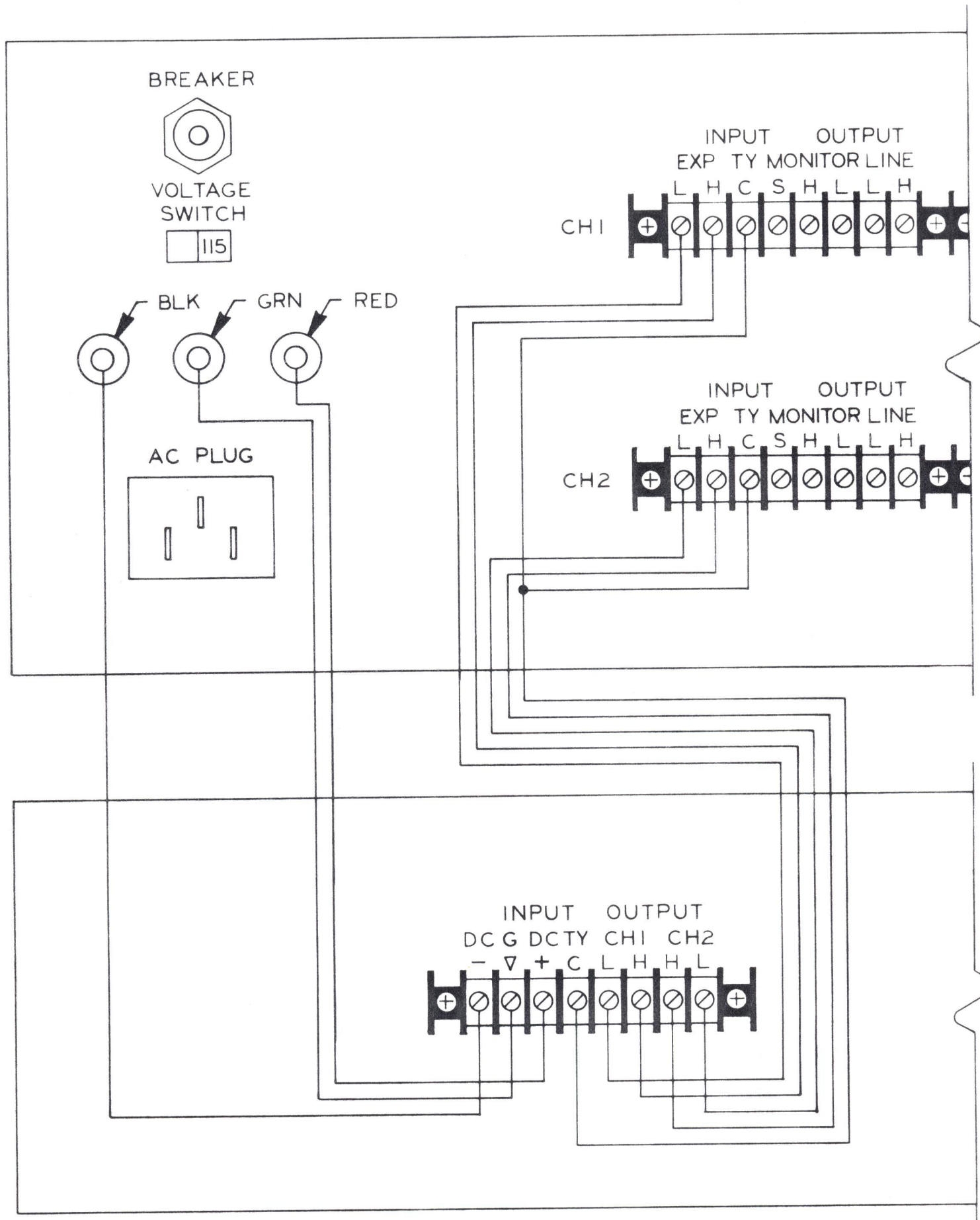
REMOTE CONTROL CONNECTOR



NOTE: CONNECTOR TERMINAL NUMBERS CORRESPOND RESPECTIVELY WITH THE INPUT SWITCH NUMBER.

FIGURE 3.1.2

MODEL 190 INPUT EXPANDER WIRING DIAGRAM



MODEL 190 8 OR 16 INPUT EXPANDER

FIGURE 3.1.3

SECTION IV

TECHNICAL DESCRIPTION

4.1 BLOCK DIAGRAM DESCRIPTION

Input channel selection is achieved with alternate action illuminated pushbutton switches located on the front panel, which provide a DC control voltage to the crosspoint switch module or tally module. DC control of input switching can also be provided from an additional location using the optional remote control input. Use of the optional tally module provides a logic interface between the input switches or remote inputs and the crosspoint switch module and provides momentary action, electrically interlocked switching. At the crosspoint switch module the DC control voltage actuages a solid state crosspoint switch which selects the appropriate audio input line. In addition, a DC voltage is generated on the crosspoint switch module in response to the DC control voltage and illuminates the corresponding input channel selector button on the front panel. From the crosspoint switch module the selected input is connected to a pair of unity gain summing amplifiers located on the audio driver/receiver module. The output of the summing amplifiers feed a unity gain differential amplifier. The differential amplifier provides a high common mode rejection capability for each of the input circuits. The output of the differential amplifier drives the line and monitor amplifiers through separate level controls located on the front panel. The line amplifier provides 0 to 30 dB of gain and a balanced transformer output to a connector located on the rear panel. The monitor amplifier provides 0 to 40 dB of gain to an external speaker connection located on a rear panel connector. On the Model 191 this output connection is normally used to drive the internal speaker located at the front panel. In addition a phone jack is located on the front panel which interrupts speaker operation when headphones are used. An auxiliary input to the summing amplifiers is located on a rear panel connector. The front panel meter can be switched to monitor either the input or output signal with a front panel pushbutton switch. The selected signal is monitored by the front panel meter with sensitivity ranges selected using a five button interlocked gang switch. The meter switching also allows selection of either peak or VU readings. A potentiometer located on the meter board offers meter calibration over a 0 to +10 dBm range. Detailed schematics and specific explanations of the individual circuits are contained in section V.

MODEL 190 BLOCK DIAGRAM

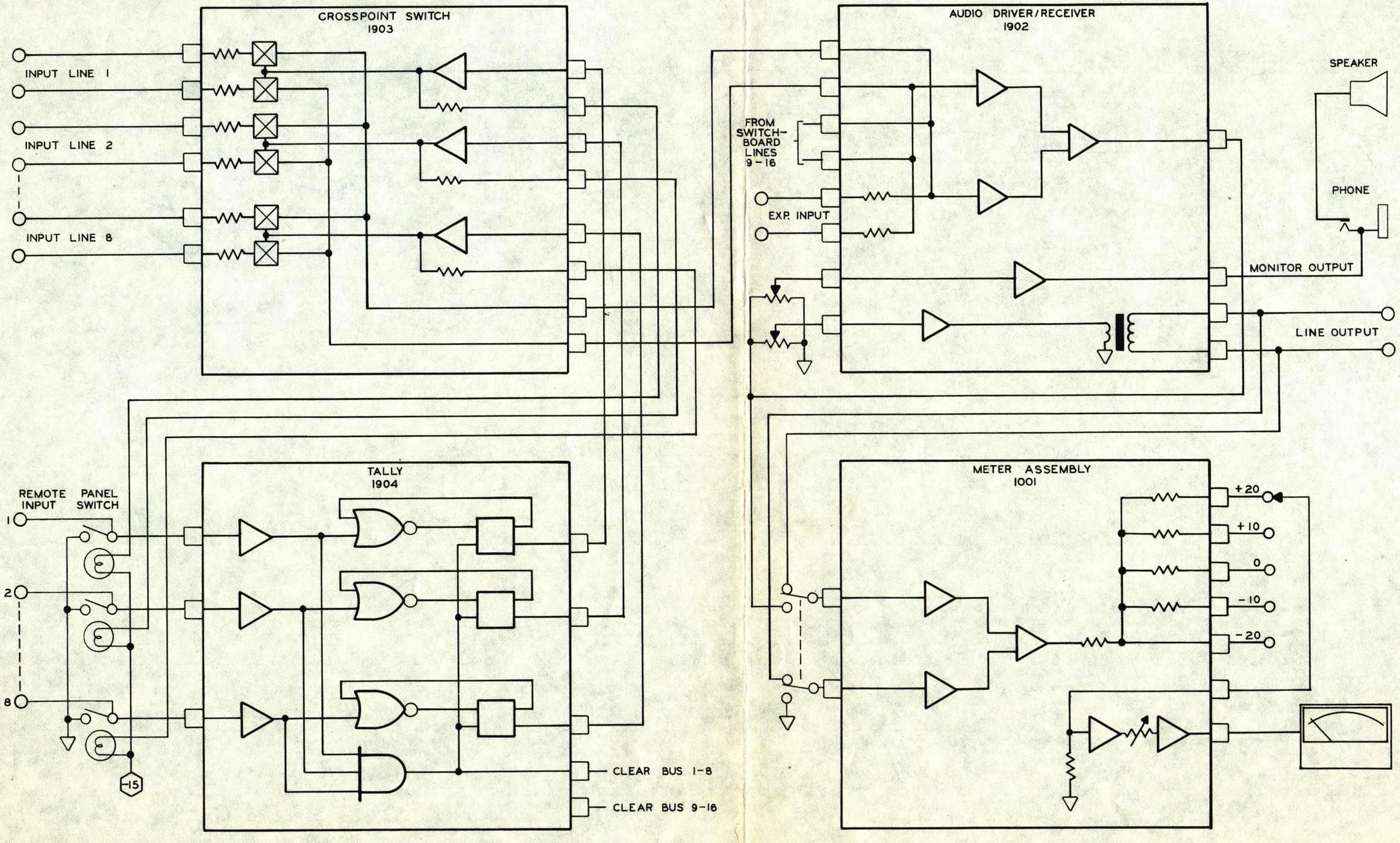


FIGURE 4.1.1

SECTION V

MAINTENANCE

5.1 METER ASSEMBLY

1001 METER ASSEMBLY

TECHNICAL DESCRIPTION

The meter assembly includes the amplifier circuitry, the meter movement, the meter lamps and the ganged pushbutton panel switch. The amplifier provides up to four balanced bridging inputs which are isolated and produce nominal line loading. The number of inputs used depends on the requirements of the instrument with which the meter is associated. The inputs are isolated by the summing amplifiers U1A,B which combine each side of the input line. The differential amplifier U1D converts the balanced inputs to an unbalanced output to drive the range switch and remaining circuitry. Resistors R16-20 in conjunction with the pushbutton range switch form a step attenuator prior to the circuit voltage amplifier section comprised of U1C and U2A. The overall voltage gain is adjusted by the calibration potentiometer R23 which provides a 10 dB variation in circuit sensitivity. IC amplifiers U2D,C drive separate full wave rectifier circuits for the RMS and peak response functions. The meter movement is switched between the two circuits depending on the desired response. An additional amplifier U2B is employed to accelerate the meter pointer travel in the peak response mode. Capacitor C6 and resistor R38 and the meter coil are enclosed in the feedback loop of U2B which helps overcome the response delay caused by the mechanical inertia of the meter movement.

PARTS LIST

Item	Description	Part Number or Type	Manufacturer
C1,2	0.1 uF 16 V cera	HY-450	Sprague
C3	0.001 uF 250 V cera	2SS-D10	Sprague
C4	1.5 uF 50 V	7CZ5U155D8	Sprague
C5	33 uF 16 V tant	T392D336K016AS	Kemet
C6	330 uF 6.3 V	T392F337K006AS	Kemet
D1-4	100 mA 50 V Ge	1N270	ITT
I1,2	55 V 0.05 A	1835	Chicago Miniature
M	Meter	13-1001	ROH
R1-8,17	30.1 k ohms 1/4 W 1%	RN55D	Allen Bradley
R9-14	10 k ohms 1/4 W 1%	RN55D	Allen Bradley
R15	100 ohms 1/4 W 5%	RCR07	Allen Bradley
R16	100 k ohms 1/4 W 1%	RN55D	Allen Bradley
R18	9090 ohms 1/4 W 1%	RN55D	Allen Bradley
R19	2150 ohms 1/4 W 1%	RN55D	Allen Bradley
R20,21,26	1000 ohms 1/4 W 1%	RN55D	Allen Bradley
R22,27	11 k ohms 1/4 W 1%	RN55D	Allen Bradley
R23,32	10 k ohms 1/2 W 10%	3389-103	Bourns
R24	2.4 k ohms 1/4 W 5%	RCR07	Allen Bradley
R25	51 k ohms 1/4 W 5%	RCR07	Allen Bradley
R28	5.1 k ohms 1/4 W 5%	RCR07	Allen Bradley
R29,30	24 k ohms 1/4 W 5%	RCR07	Allen Bradley
R31,33	7.5 k ohms 1/4 W 5%	RCR07	Allen Bradley
R34,35	10 k ohms 1/4 W 5%	RCR07	Allen Bradley
R36	1 k ohms 1/4 W 5%	RCR07	Allen Bradley
R37	1 k ohms 1/2 W 10%	3389-102	Bourns
R38	200 ohms 1/4 W 1%	RN55D	Allen Bradley
S1	4PDT 7 position switch	PB15	CRL
U1,2	Integrated Circuit	TL075CN or RC4136N	Texas Instrument

METER ASSEMBLY

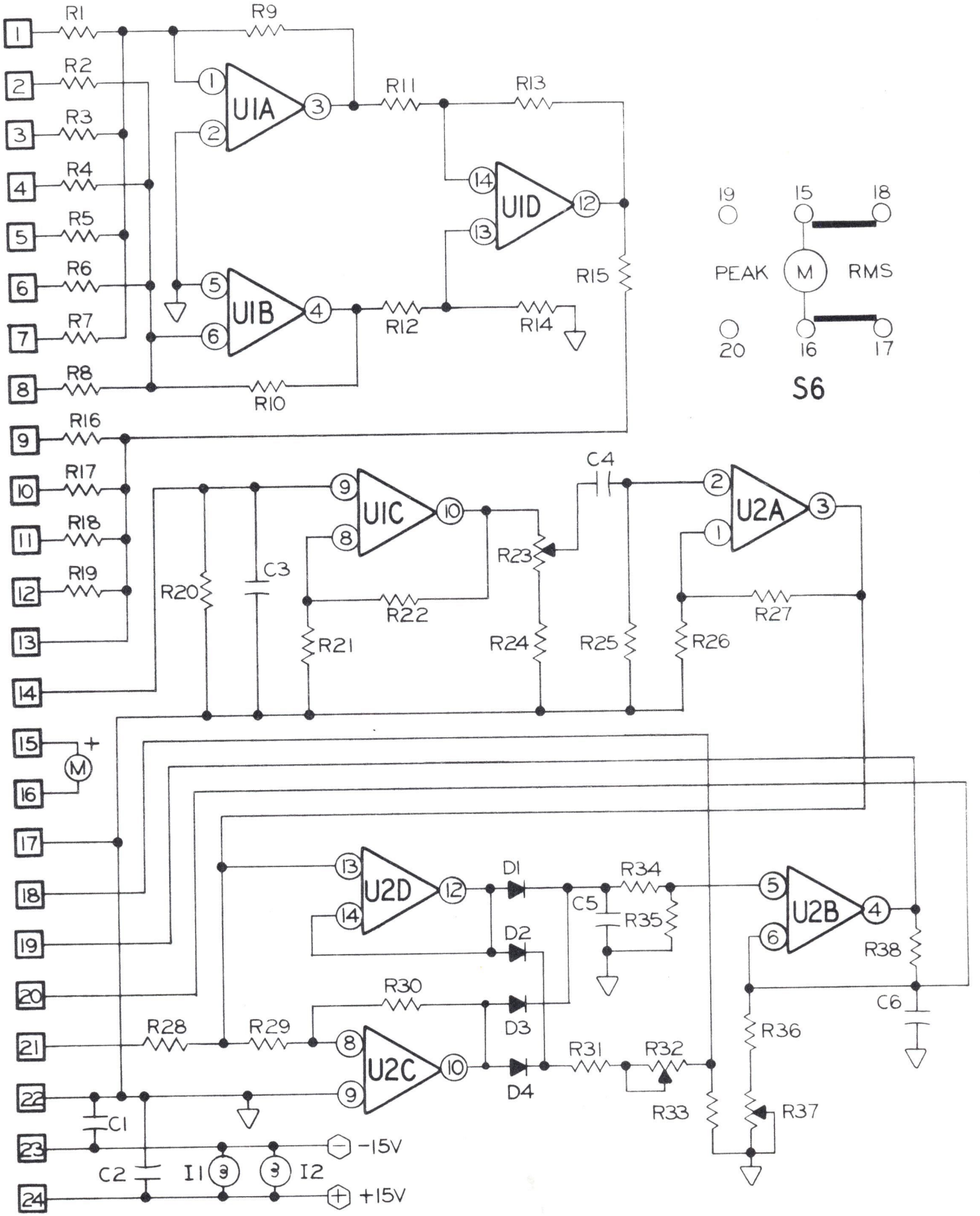


FIGURE 5.1.1

1001 METER ASSEMBLY

CALIBRATION PROCEDURE

Meter Zero Adjustment: For maximum accuracy, the meter mechanical zero should be checked periodically. The meter is properly zero-set when the pointer rests over the zero calibration mark and the unit is in its normal operating environment and is turned off. If it is necessary to reset the zero, proceed as follows: Turn the ac power off and wait one minute for all capacitors to discharge. Rotate the zero adjustment screw clockwise so that the pointer is left of zero and moving upscale. Continue to rotate screw clockwise until the pointer is exactly at zero.

Calibration Adjustment: Potentiometer R23 located at the top edge of the meter amplifier board is used to calibrate the meter assembly. The range of adjustment will accommodate 0, +4, and +8 dBm input for a 0 dB scale indication. A 1 kHz test frequency of certified amplitude should be used for the calibration adjustment.

Peak Response Adjustment: Potentiometer R37 located immediately below the calibration potentiometer adjusts damping of the meter movement. The meter response switch button should be in the released position. Apply a 1 kHz test frequency to the instrument input and observe the pointer deflection. The meter pointer will advance rapidly to the 0 dB scale mark with a minimum of overshoot. The damping should be adjusted at the 0 dB mark with approximately 10% initial overshoot. The return to 0 is slow and requires several seconds.

RMS(VU) Tracking Adjustment: The remaining potentiometer R32 on the circuit board adjusts the RMS calibration to indicate the same as the peak when the response button is depressed. With a continuous input signal the meter indication should not change when the response button is depressed or released. After the above performance is obtained the calibration potentiometer will simultaneously provide the overall calibration adjustment for both response functions.

5.2 POWER SUPPLY MODULE

1901 POWER SUPPLY MODULE

TECHNICAL DESCRIPTION

The Model 190 power supply provides regulated DC power for all circuitry within the instrument. The output of the power supply module is ±15 Vdc with up to 1.5 A load current capability. The module is completely self-contained with the exception of the externally mounted power transformer. A 115/230 switch located on the rear panel selects the line operating voltage for the power transformer. The power supply consists of a capacitor input fullwave rectifier circuit consisting of diodes D1-4 and capacitors C1-4. The output of the capacitor input filter is regulated and further filtered by integrated circuit regulators U1-4. The positive voltage regulators U1-2 and the negative regulators U3-4 have each been connected in parallel using summing resistor R7-10 to achieve the required output current capability. The output of the positive supply is dependent on the operation of the negative supply. Should the negative supply fail to reach 2/3 of its rated output voltage potential, transistor Q1 senses the condition and limits the output of the positive supply to 2 volts or less. This operating characteristic of the power supply is designed to complement the requirements of the operational amplifiers and associated circuitry within the Model 190. Capacitors C6 to C9 further reduce the output impedance of the power supply and filter high frequency noise. Diodes D6 and D7 prevent the outputs of the power supplies from becoming reversed biased. The power supply incorporates comprehensive protection for short circuit and overload conditions.

PARTS LIST

Item	Description	Part Number or Type	Manufacturer
C1,2	1800 uF 30 V elec	TCG182U030L2C3P	Mallory
C3,4	3.3 uF 35 V tant	T392C335K035AS	Kemet
C5,8,9	10 uF 25 V tant	T392C106K025AS	Kemet
C6,7	1400 uF 15 V elec	TCG142U015G1L3P	Mallory
D1-4	3 A 100 PRV	MR501	Motorola
D5	100 mA 50 V Si	1N4150	ITT
D6,7	1 A 50 PRV Si	1N4002	Motorola
Q1	NPN Transistor	MPS A20	Motorola
E1	36 k ohms 1/4 W 5%	RCR07	Allen Bradley
R2	10 k ohms 1/4 W 1%	RN55D	Allen Bradley
R3	909 ohms 1/4 W 1%	RN55D	Allen Bradley
R4,5	10 ohms 1/4 W 5%	RN55D	Allen Bradley
R6,7,9,10	0.5 ohms 2 W 10%	CW-C2	Dale
R8	10 k ohms 1/4 W 5%	RCR07	Allen Bradley
R11,12	1.6 k ohms 1/4 W 5%	RCR07	Allen Bradley
U1,2	Integrated Circuit	LM317	National
U3,4	Integrated Circuit	LM320T-15	National

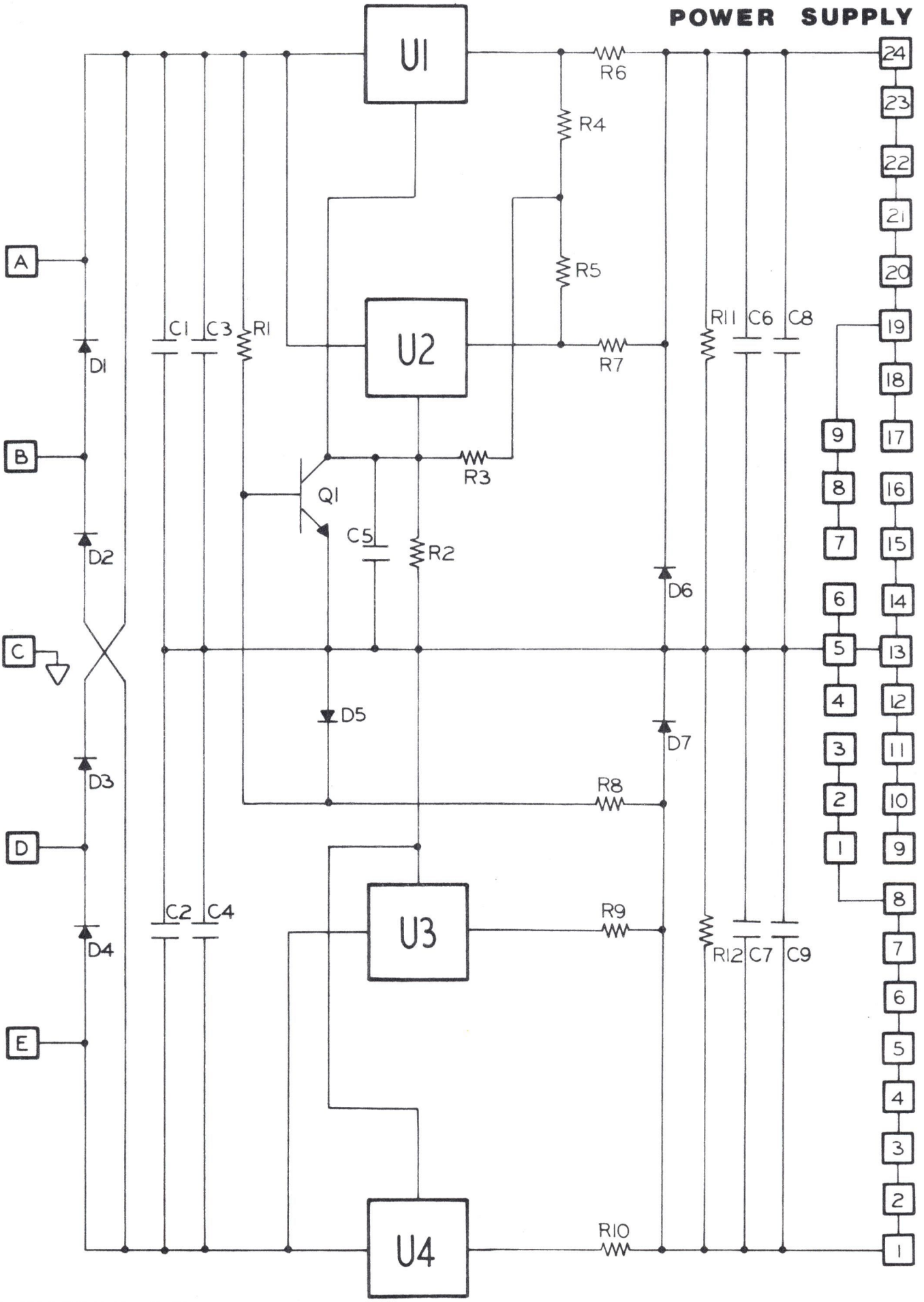


FIGURE 5.2.1

5.3 AUDIO DRIVER/RECEIVER MODULE

1902 AUDIO DRIVER/RECEIVER MODULE

TECHNICAL DESCRIPTION

The Model 190 audio module provides three separate audio amplifier functions which are a differential summing amplifier, a line amplifier and a monitor amplifier. The audio output from the input switch modules and expander accessory input is mixed at the inverting input of IC amplifiers U1A,B. The input amplifiers provide a low impedance summing point so that inputs may be mixed without loss yet will remain isolated. IC amplifier U1C converts the differential input circuitry to an unbalanced circuit for simplified use with the line and monitor amplifiers. The function of U1C is to provide the high common mode noise rejection required for the input circuitry. This is achieved using a symmetrical input termination and incorporating potentiometer R20 to maximize the null capability. The gain of the first three amplifier stages is unity and the CMR is in excess of 60 dB. The output of the differential amplifiers is used to drive individual level controls prior to the line and monitor amplifiers. The output of IC amplifiers U2A,B are buffered by complementary transistors Q1,2 and Q3,6 so they can drive the transformer and speaker loads. Each IC amplifier provides the voltage gain required for the associated output circuit. The line amplifier is transformer coupled to provide higher output levels and a balanced floating output. The monitor amplifier output is fused to protect the speaker in the event of extreme operating conditions or an amplifier component failure, however, a sustained output short will cause fuse F1 to open.

PARTS LIST

Item	Description	Part Number or Type	Manufacturer
C1,2,5,6	0.001 uF 1 kV cera	2SS-D10	Sprague
C3,4,7,9	33 uF 16 Vdc tant	T392C336K016AS	Kemet
C8,10	470 uF 15 Vdc elec	TCG471U015E1G3P	Mallory
C11,12	10 uF 25 Vdc tant	T392C106K025AS	Kemet
C13	0.3 uF 16 V cera	UK16-304	Centralab
D1,7	1 A 50 PRV Si	1N4001	ITT
D2,3,5,6	100 mA 50 PRV Si	1N4150	ITT
D4	2 V 1/4 W Zener	MZ2362	Motorola
F1	3/4 A 250 V	MDL 3/4	Bussman
Q1	NPN Transistor	MPS-U45	Motorola
Q2	PNP Transistor	MPS-U95	Motorola
Q3,5	NPN Transistor	MPS-A14	Motorola
Q4	NPN Transistor	RCA 120	RCA
Q6	PNP Transistor	RCA 125	RCA
R1-4	4990 ohms 1/4 W 1%	RN55D	Allen Bradley
R5-7	20 k ohms 1/4 W 1%	RN55D	Allen Bradley
R8	20.5 k ohms 1/4 W 1%	RN55D	Allen Bradley
R9	1 k ohms 1/2 W 10%	3389P-102	Bourns
R10,15	240 ohms 1/4 W 5%	RCR07	Allen Bradley
R11,13,17,18	10 k ohms 1/4 W 5%	RCR07	Allen Bradley
R12	75 k ohms 1/4 W 5%	RCR07	Allen Bradley
R14,16	5.1 ohms 1/4 W 5%	RCR07	Allen Bradley
R19	360 k ohms 1/4 W 5%	RCR07	Allen Bradley
R20,21,25,26	1.6 k ohms 1/4 W 5%	RCR07	Allen Bradley
R22,24	1 ohm 3 W 5%	242E	Sprague
R23	510 ohms 1/4 W 5%	RCR07	Allen Bradley
R27	5 ohms 3 W 5%	242E	Sprague
T1	Transformer	793W15	ROH
U1	Integrated Circuit	TL075CN	Fairchild TI
U2	Integrated Circuit	TL072CP	Motorola TI

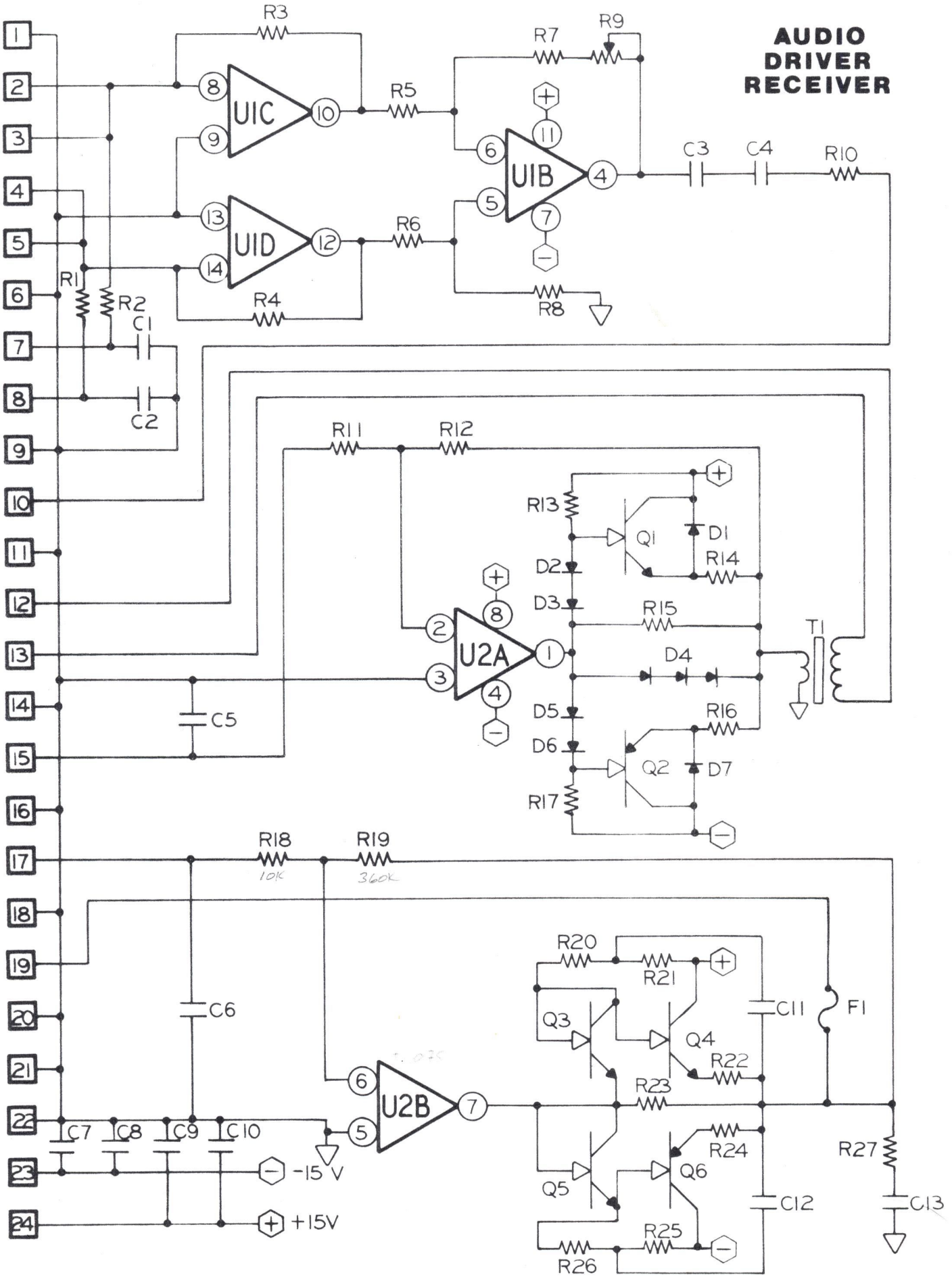


FIGURE 5.3.1

5.4 CROSSPOINT SWITCH MODULE

1903 CROSSPOINT SWITCH MODULE

TECHNICAL DESCRIPTION

The Model 190 Switch Module consists of eight identical input circuits which are switched onto one common output bus. The input lines feed the switch through an LC low pass filter L1,2 and C6,7 to reduce RFI. The balanced solid state switches U9-12AB, CD connect the input lines to the output bus through input summing resistors R62-77. Resistor R54 attenuates the input signal to improve the level which the switch can block and extends the maximum input level to ±30 dBm. Drive for each of the input audio switches and lighted push-buttons is provided by U1-8 input logic comparators. The comparators are comprised of power amplifiers which convert the 0 or 5 Vdc input level to the ±15 Vdc output level required to drive the input audio switches and the switch lamps. The amplifiers are connected to provide an inverted output logic and the switching is referenced to a 2 Vdc transition point to be compatible with 5 volt TTL or CMOS logic. The amplifier's inverting inputs are connected to a local 5 Vdc supply through resistors R1-8 which causes the output to swing to the limit of the negative power supply. When the input voltage is decreased to less than 2 Vdc, typically 0 Vdc, the output abruptly changes to the limit of the positive supply. The output transition takes place at the 2 Vdc reference to which the non-inverting input is connected. Providing a ground to a control input line will require 1 mA to switch the audio channel and illuminate the panel switch lamp. The switch lamps are supplied power through current limiting resistors R12-19 connected in series with each lamp. The lamps are operated at approximately 2/3 of rated voltage for extended life and, also, the amplifier output is protected from an extended short condition. A voltage divider reduces the ±15 Vdc comparator output swing to be within the ±7.5 Vdc supply limits of the input switches. The 5 and ±7.5 Vdc supplies required by the module are derived from on board regulators.

PARTS LIST

Item	Description	Part Number or Type	Manufacturer
C1-5	10 uF 25 V tant	T392C106K025AS	Kemet
C6-21	0.001 uF 250 V cera	2SS-D10	Sprague
D1	5.1 V Zener Diode 5%	1N5231B	Motorola
D2,3	7.5 V Zener Diode 5%	1N5236 B	Motorola
L1-16	1000 uh 50 mA	RFC-S-1000	Nytronics
R1-8,10,52,53			
54-61	5.1 k ohms 1/4 W 5%	RCR07	Allen Bradley
R9	3.6 k ohms 1/4 W 5%	RCR07	Allen Bradley
R11	2.4 k ohms 1/4 W 5%	RCR07	Allen Bradley
R12-19	250 ohms 3 W 5%	CW2	Dale
R20-27	510 k ohms 1/4 W 5%	RCR07	Allen Bradley
R28-35	10 k ohms 1/4 W 5%	RCR07	Allen Bradley
R36-43	160 k ohms 1/4 W 5%	RCR07	Allen Bradley
R44-51	100 k ohms 1/4 W 5%	RCR07	Allen Bradley
R62-77	4.99 k ohms 1/4 W .25%	RCR07	Allen Bradley
U1-8	Integrated Circuit	CA3094	RCA
U9-12	Integrated Circuit	CD4066	RCA

CROSSPOINT SWITCH

FIGURE 5.4.1

5.5 TALLY MODULE

1904 TALLY MODULE

TECHNICAL DESCRIPTION

The tally module includes sixteen identical stages of electronic interlocked latches. The module is designed to provide both alternate action latching or interlocked input switching. The module interfaces directly with pushbutton input switches or a remote input which provides a TTL compatible logic level. The output of the tally module drives the switch module control input and by use of a single wire clear bus may be connected to increase the number of interlocked stages. Each input to the module uses a single control line which is filtered or debounced by input ICs U1-3. This circuit consists of a clocked shift register which delays the output transition until the input is determined to be of a consistent logic level. The output from the input debouncer stage drives the "D" type flip flops U10-13 through the NOR gates U6-9 and is alternately steered "on" by the NOR gating. A "low" logic level at the input of U1-3 produces a "low" state alternately at the module output. The use of the NOR gate allows the "D" input of the flip flop to toggle the output every other time the input is switched "low". The AND gate circuits U4-5, Q1-2 comprise the clear circuitry required for the interlock function. All memory registers U10-13 are cleared before any stage is toggled "on" thereby cancelling the preceding stage as a subsequent one is selected. Transistors Q1-2 invert and buffer the output of U4-5 respectively. The connection of the collector outputs at terminals 17 and 18 offer the option of two independent eight stage tally circuits or a single interlocked sixteen stage circuit. The entire module operates from 5 Vdc provided by a local on board supply.

Note: This module functions with inverted logic, thus the "on" state of a tally stage is indicated by a "low" typically 0 Vdc level of that stage output and the "off" state "high" will be typically 5 Vdc.

PARTS LIST

Item	Description	Part Number or Type	Manufacturer
C1-10	0.01 uF 100 V cera	TG-S10	Sprague
C11,12	10 uF 35 Vdc tant	T392C106K025AS	Kemet
D1	5.1 V Zener Diode 5%	1N5231B	Motorola
Q1,2	PNP Transistor	MPS A70	Motorola
R1-4	10 k ohms 1/4 W 5%	RCR07	Allen Bradley
R5,6	2.4 k ohms 1/4 W 5%	RCR07	Allen Bradley
R7	510 ohms 1/4 W 5%	RCR07	Allen Bradley
U1,5	Integrated Circuit	CD4082	RCA
U2-4	Integrated Circuit	MC14490	Motorola
U6-9	Integrated Circuit	CD4001	RCA
U10-13	Integrated Circuit	MC14175	Motorola

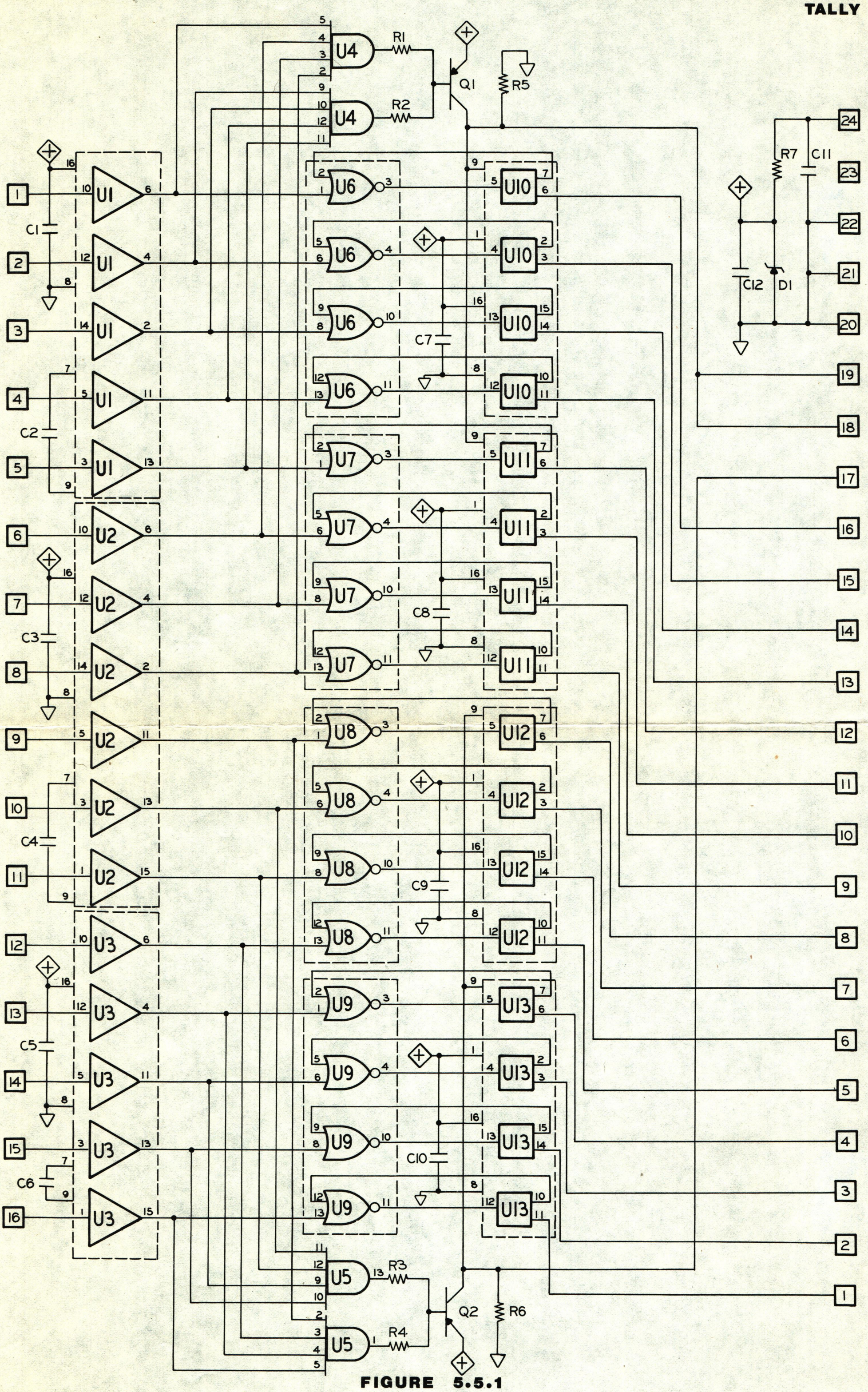


FIGURE 5.5.1

5.6 CHASSIS

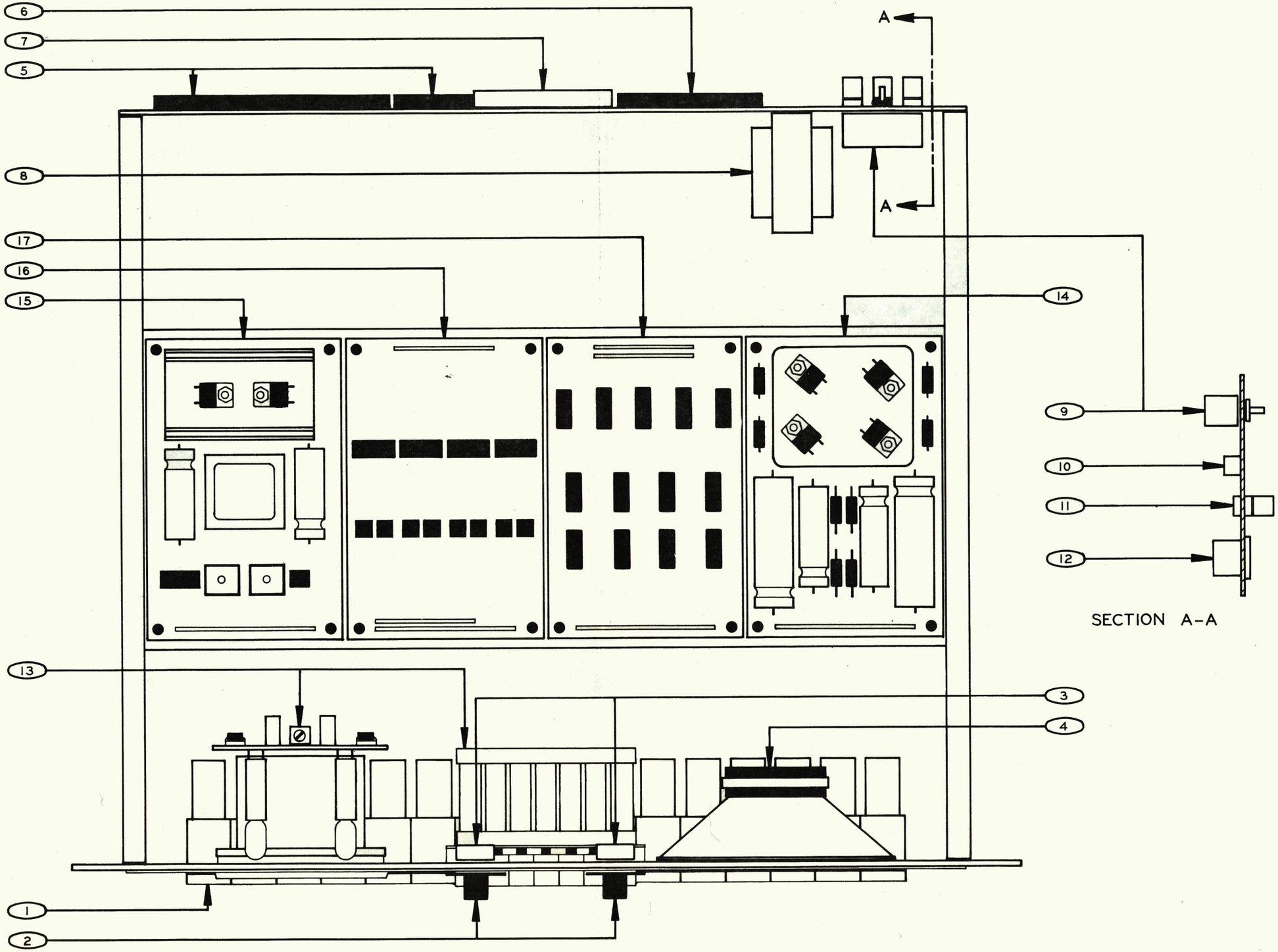
MODEL 190 CHASSIS

PARTS LIST

Item	Description	Part Number or Type	Manufacturer
1	Switch	S190-2C	Clare Pendor
2	Knob	90-3-2G	Raytheon
3	10 k ohms Potentiometer	CM 40333	Clarostat
4	Speaker	35A2Z8	Quam
5	Connector	SEPCX 16	Curtis
6	Connector	SEPCX 8	Curtis
7	Connector	57-30500	Amphenol
8	Transformer	F-354X	Triad
9	1.5 A Circuit Breaker	815175	Littelfuse
10	Voltage Switch	46256LFR	Switchcraft
11	Binding Post	1517 (specify color)	H. H. Smith
12	AC Line Cord Receptacle	EAC-203	Switchcraft
13	Meter Assembly	1001	ROH
14	Power Supply Module	1901	ROH
15	Audio Driver/Receiver Module	1902	ROH
16	Crosspoint Switch Module	1903	ROH
17	Tally Module	1904	ROH

Note: On Model 190 16 channel units with the tally option an additional cross-point switch module is located in the space occupied by the tally module in the drawing. The tally module is located under the power supply module and the bottom cover must be removed to provide access to the tally module.

TOP VIEW OF CHASSIS



SECTION A-A

FIGURE 5.6.1

5.7.1 INTERCONNECT WIRING DIAGRAM

MODEL 190 INTERCONNECT WIRING DIAGRAM

1001 METER

1	S 17 PIN 4
2	S 17 PIN 3
3	NC
4	NC
5	NC
6	NC
7	NC
8	NC
9	S 23 PIN 6
10	S 22 PIN 6
11	S 21 PIN 6
12	S 20 PIN 6
13	S 19 PIN 6
14	S 23 PIN 4
15	S 18 PIN 4
16	S 18 PIN 3
17	S 18 PIN 5
18	S 18 PIN 6
19	S 18 PIN 1
20	S 18 PIN 2
21	NC
22	GND
23	-15 V
KEY	
24	+15 V

1902 AUDIO

1	GND
2	1903 PIN 19 — NOTE 2
3	1903 PIN 19 — NOTE 2
4	1903 PIN 20 — NOTE 2
5	1903 PIN 20 — NOTE 2
6	GND
7	TB1 EXP H
8	TB1 EXP L
9	
10	S 17 PIN 5, R 1 PIN 3, R 2 PIN 3
11	S 17 PIN 6
12	S 17 PIN 2
13	S 17 PIN 1
14	
15	R 1 PIN 2
16	R 1 PIN 1
17	R 2 PIN 2
18	R 2 PIN 1
19	J 1 PIN 4
20	GND
21	GND
22	GND
23	-15 V
KEY	
24	+15 V

1903 SWITCH

1	1904 PIN 1 — NOTE 3
2	1904 PIN 2 — NOTE 3
3	1904 PIN 3 — NOTE 3
4	1904 PIN 4 — NOTE 3
5	1904 PIN 5 — NOTE 3
6	1904 PIN 6 — NOTE 3
7	1904 PIN 7 — NOTE 3
8	1904 PIN 8 — NOTE 3
9	S 1 PIN A
10	S 2 PIN A
11	S 3 PIN A
12	S 4 PIN A
13	S 5 PIN A
14	S 6 PIN A
15	S 7 PIN A
16	S 8 PIN A
17	GND
18	GND
19	1902 PIN 2 — NOTE 2
20	1902 PIN 4 — NOTE 2
21	GND
22	GND
23	-15 V
KEY	
24	+15 V

1	TB2 PIN 8L
2	TB2 PIN 8H
3	TB2 PIN 7L
4	TB2 PIN 7H
5	TB2 PIN 6L
6	TB2 PIN 6H
7	TB2 PIN 5L
8	TB2 PIN 5H
9	TB2 PIN 4L
10	TB2 PIN 4H
11	TB2 PIN 3L
12	TB2 PIN 3H
13	TB2 PIN 2L
14	TB2 PIN 2H
15	TB2 PIN 1L
KEY	
16	TB2 PIN 1H

1904 TALLY

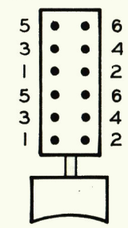
1	1903 PIN 1 — NOTE 2
2	1903 PIN 2 — NOTE 2
3	1903 PIN 3 — NOTE 2
4	1903 PIN 4 — NOTE 2
5	1903 PIN 5 — NOTE 2
6	1903 PIN 6 — NOTE 2
7	1903 PIN 7 — NOTE 2
8	1903 PIN 8 — NOTE 2
9	1903 PIN 1
10	1903 PIN 2
11	1903 PIN 3
12	1903 PIN 4
13	1903 PIN 5
14	1903 PIN 6
15	1903 PIN 7
16	1903 PIN 8
17	TB1 TY C
18	TB1 TY C
19	TB1 TY C
20	GND
21	GND
22	GND
23	-15 V
KEY	
24	+15 V

1	S 16 PIN 2
2	S 15 PIN 2
3	S 14 PIN 2
4	S 13 PIN 2
5	S 12 PIN 2
6	S 11 PIN 2
7	S 10 PIN 2
8	S 9 PIN 2
9	S 8 PIN 2 — NOTE 3
10	S 7 PIN 2 — NOTE 3
11	S 6 PIN 2 — NOTE 3
12	S 5 PIN 2 — NOTE 3
13	S 4 PIN 2 — NOTE 3
14	S 3 PIN 2 — NOTE 3
15	S 2 PIN 2 — NOTE 3
KEY	
16	S 1 PIN 2 — NOTE 3

NOTES

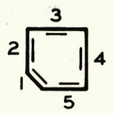
1. S1-16 : CHANNEL SELECT SWITCHES 1-16.
   S17 : INPUT / OUTPUT SWITCH.
   S18 : RMS / PEAK SWITCH.
   S19 : -20 dB METER RANGE SWITCH.
   S20 : -10 dB METER RANGE SWITCH.
   S21 : 0 dB METER RANGE SWITCH.
   S22 : +10 dB METER RANGE SWITCH.
   S23 : +20 dB METER RANGE SWITCH.
   R1 : LINE LEVEL POTENTIOMETER.
   R2 : MONITOR LEVEL POTENTIOMETER.
   J1 : PHONE JACK.
   TB1 : REAR PANEL 8 PIN TERMINAL BLOCK.
   TB2 : REAR PANEL 16 PIN TERMINAL BLOCK.
2. CERTAIN 190 MODELS CONTAIN TWO 1903 CROSSPOINT SWITCH MODULES TO ALLOW FOR ADDITIONAL INPUTS.
3. IF THE TALLY OPTION IS NOT SELECTED PINS 1-8 ON 1903 (24 PIN CONN.) ARE WIRED ACCORDING TO PINS 16-9 ON 1904 (16 PIN CONN.).
4. S17-23 ARE 2PDT SWITCHES. IF TWO METER ASSEMBLIES ARE USED THE SECOND IS WIRED IDENTICAL TO THE FIRST ON THE REAR HALF OF THE SWITCH.

TOP VIEW



5. THE PINOUT FOR R1 AND R2 IS SHOWN BELOW.

6. THE PINOUT FOR J1 IS SHOWN BELOW.



7. TB1 MONITOR H — J1 PIN 5
   TB1 MONITOR L — J1 PIN 1 — SPEAKER - (GND)
   TB1 MONITOR S — SPEAKER +
   S1-16 PIN 3 — GND
   S1-16 PIN B — -15 V
   S19-23 PINS 3 AND 4 ARE BUSSED TOGETHER.

FIGURE 5.7.1

MODEL 190 POWER SUPPLY WIRING DIAGRAM

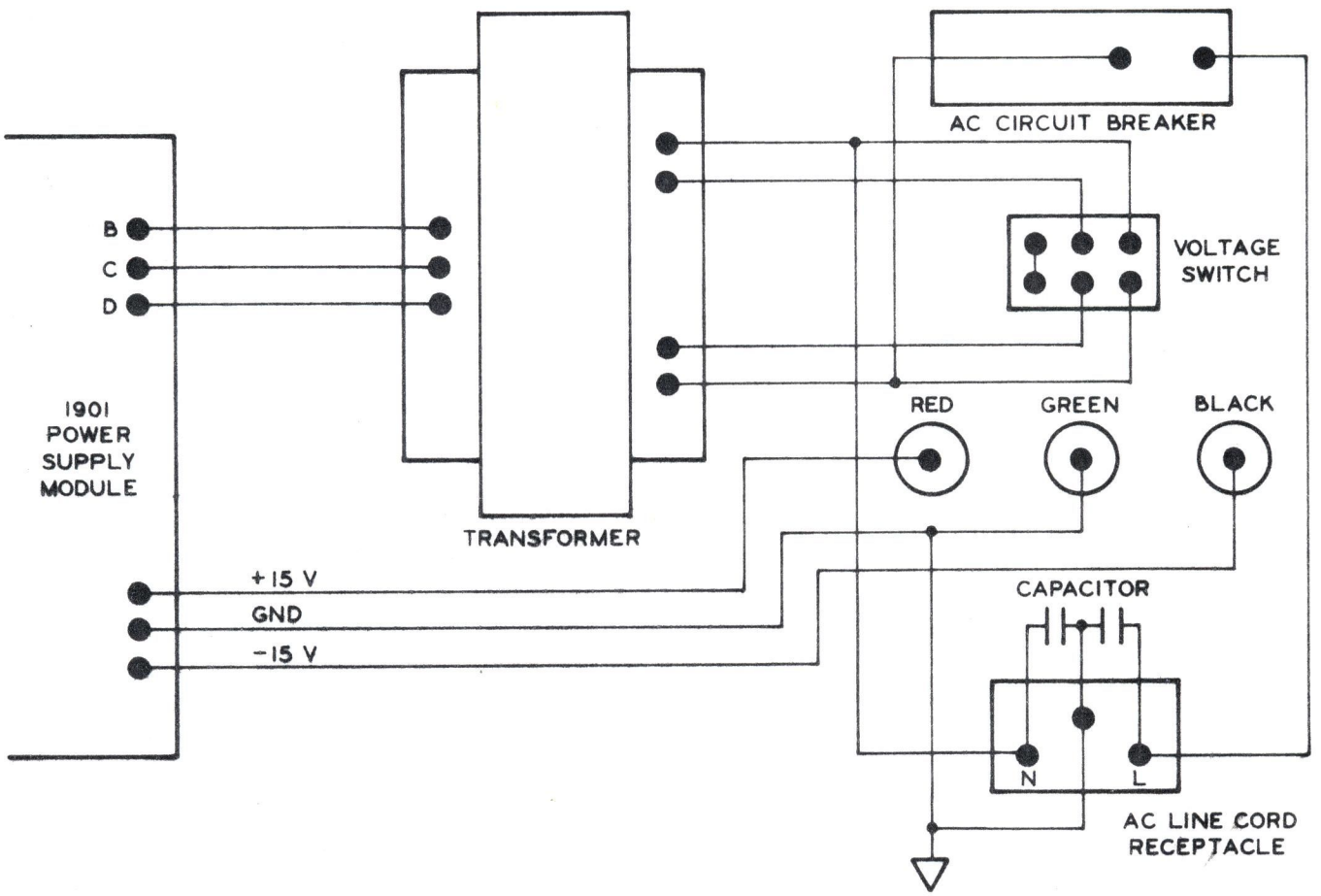


FIGURE 5.7.2