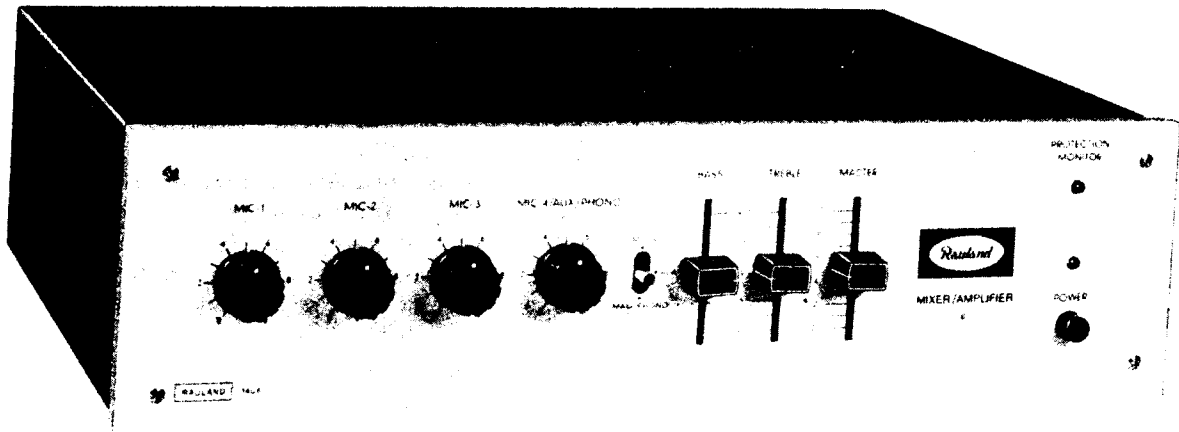




KI-1441

1406 AND 1410 MIXER-AMPLIFIERS

RAULAND-BORG CORPORATION • 3535 West Addison Street, Chicago, Illinois 60618 (312) 267-1300



GENERAL DESCRIPTION

The Rauland 1400 Series mixer-amplifiers are designed for years of trouble-free service in a variety of commercial and industrial sound systems. The units lend themselves to both temporary and permanent applications, offering the choice of desk-top or rack mounting.

There are four microphone inputs. The fourth one shares a channel with magnetic phono and auxiliary inputs, selectable by a front-panel switch. The "LINE OUT," "PREOUT," and "POWER IN" jacks can accommodate an equalizer, tape recording and monitoring functions, master-slave amplifier applications, and other interconnections. The transformer-isolated speaker outputs include 4-, 8-, and 16-ohm connections as well as constant-voltage 70.7- and 25-volt connections with a center tap.

The **BASS** and **TREBLE** controls can boost or cut the low and high frequencies, respectively. The amplifiers can operate from a 24-volt DC power source.

UNPACKING

The amplifier was thoroughly checked at the factory. Inspect the amplifier, the enclosed parts, and the shipping container for signs of improper handling during shipment. In case of damage, immediately place a claim: with the dealer or distributor from whom you purchased the unit or—if the unit was shipped to you—with the carrier.

The following parts are included with the mixer-amplifier:

Qty.	Description	Rauland Part No.
1	Battery Cable with mating connector.	
2	Rack-Mounting Brackets.	
4	Rack-Mounting Screws for tapped holes (10-32 × 1/2 unslotted, hex-head SEMS).	WA202
4	Rack-Mounting Screws for untapped holes (10 × 1/2 pan-head blunt-nosed thread-forming).	WA102
4	#10 Tinnerman "U" type Speed Nuts.	AB1889
1	Trim Panel for rack-mounting.	
1	Jumper Cable for making special connections among the speaker terminals.	

INSTALLATION

The mixer-amplifier should be installed where there is adequate ventilation, a moderate temperature, an AC power outlet within 4-1/2 feet, and provisions for grounding.

Desk-Top: The amplifier should be placed on a level, open surface. Make sure that nothing restricts the air flow: do not place the unit on a yielding surface or place objects on or around it.

Rack: With its rack-mounting hardware in place, the amplifier requires a rack with the standard 19-inch width, a 5-1/4-inch vertical space, and a 12-1/4-inch depth. A cooling fan is recommended when the rack is enclosed and:

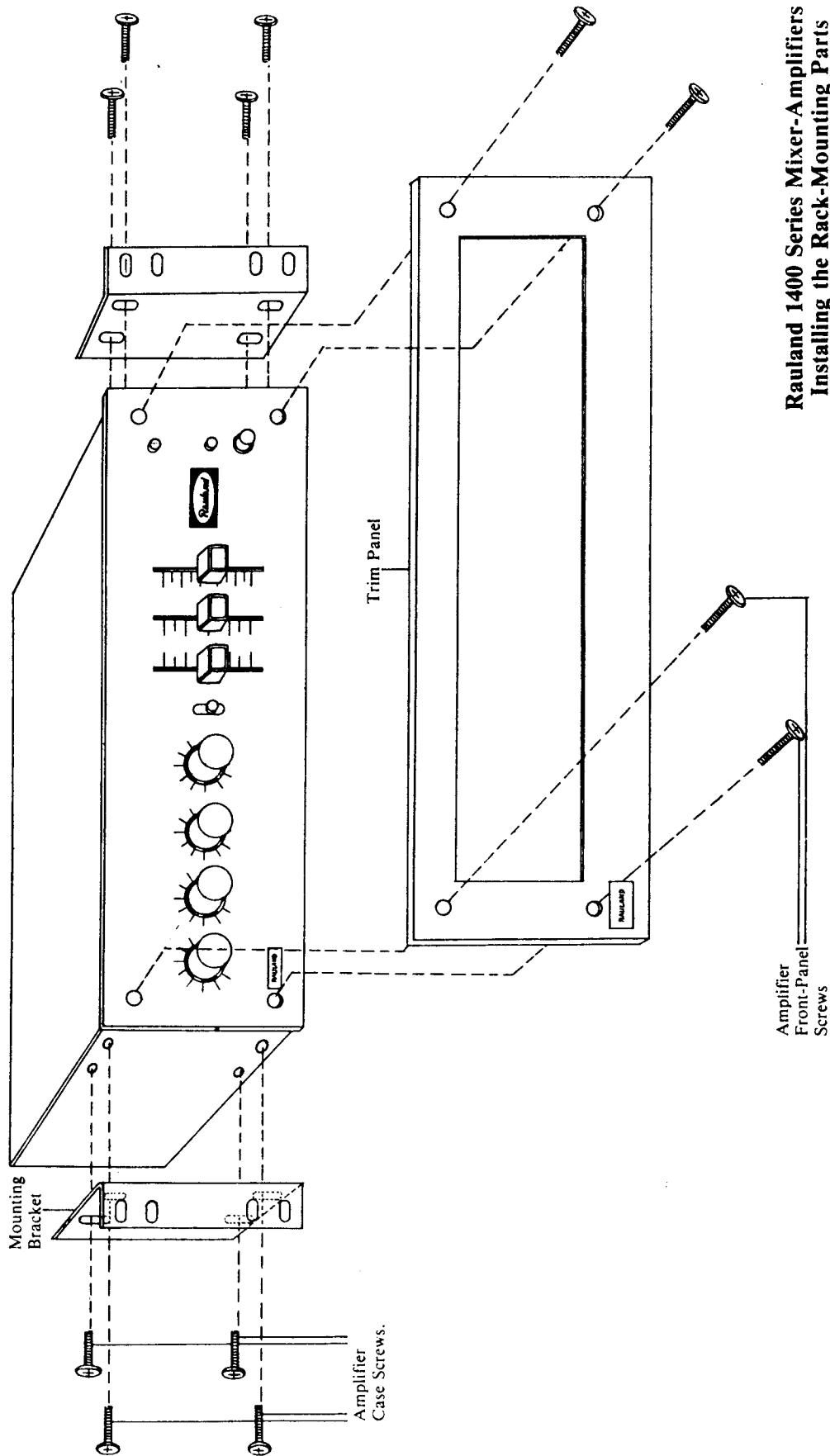
- (a) The combined rated output power of all the equipment exceeds 250 watts RMS, **OR**
- (b) The input from the AC power line exceeds 500 watts, **OR**
- (c) Restricted air flow in the rack may create extreme heat.

CAUTION:

FAILURE TO OBSERVE THE ABOVE PRECAUTIONS COULD RESULT IN OVERHEATING THAT COULD DAMAGE THE EQUIPMENT OR CREATE A FIRE HAZARD.

Rack-Mounting (refer to the rack-mounting illustration on the next page):

- (1) Remove the four front screws from each side of the amplifier's case.
- (2) Use the same screws to attach the rack-mounting brackets to the sides of the amplifier. Push up on the brackets until the screws touch the bottoms of the slotted holes, then tighten the screws.
- (3) A. **If the rack's holes are untapped**, select the #10 thread-forming screws (WA102). Push the #10 "U" nuts onto the proper holes in the rack.
B. **If the rack's holes are tapped**, select the #10 SEMS screws (WA202).
- (4) Install the amplifier in the rack, using the proper screws.
- (5) Remove the four front-panel screws and the protective covering from the amplifier's front panel. Align the trim panel over the front panel, then secure it with the four front-panel screws.



**Rauland 1400 Series Mixer-Amplifiers
Installing the Rack-Mounting Parts**

WARNING

DO NOT CONNECT AC POWER TO THE AMPLIFIER UNTIL ALL THE NECESSARY INPUT AND OUTPUT CONNECTIONS HAVE BEEN COMPLETED.

WIRING

General

Power lines, speaker wires, and microphone cables should be kept as widely separated as possible. Good practice dictates separate conduits for each type of signal cabling and isolation of the power lines. Shielded, two-conductor cable is required for the microphones.

Grounding

CAUTION

DO NOT DISCONNECT THE THIRD WIRE ON THE POWER PLUG. THIS WIRE GROUNDS THE AMPLIFIER'S CHASSIS TO PREVENT A POSSIBLE SHOCK HAZARD. IF AN ADAPTER IS USED TO CONNECT THE PLUG TO A TWO-PRONG SOCKET, MAKE SURE THAT THE AMPLIFIER'S CHASSIS IS CONNECTED TO A PROVEN EARTH GROUND.

In a desk-top or other free-standing installation, run a wire from the grounding point to the amplifier's grounding post (the knurled knob with the "ground" symbol, next to the power cord). For a rack installation, connect the rack frame to the grounding point.

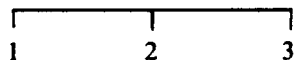
INPUT CONNECTIONS

(Note: The back-panel inputs are illustrated at the end of the manual, on the page following the specifications).

Microphones

There are four microphone inputs: "INP-1" and "INP-4" share their channels with other inputs.

Only low-Z balanced microphones with an output between 0.5 mv and 70 mv should be used. For "INP-1" microphone operation, the MIC-1/600 BAL slide switch must be in the "MIC-1" position. The connections are made to the "INP" and "MIC" terminal strips as follows:



SIGNAL GROUND SIGNAL

Route the input cables from the right side (as viewed from the back of the amplifier) to prevent any coupling from the speaker cables on the left.

Connect the cable shield to the "2" terminal. The inner conductors may be connected to the "1" and "3" terminals in either order; however, ALL MICROPHONES MUST BE CONNECTED IN THE SAME ORDER. If any microphone is connected out of phase, it may cause partial signal cancellations in multiple-microphone applications. (The "Initial Tests" section below includes a check for proper phasing.)

POWER CONNECTIONS

AC Connection

Make sure that the **POWER** switch is "OFF." Then plug the power cord into a 120-volt, 60-Hz., three-wire grounded power socket that can provide 200 watts (1406) or 300 watts (1410) of power. Check the local codes and ordinances before installing permanent AC power lines and connecting them to the equipment.

DC Connection

The amplifier can be powered by an external battery or other direct-current 24-volt source. Normally, this is used as a backup source. A cable with a polarized plug is provided with the amplifier to facilitate the connection of DC power.

Note: (1) The amplifier will not recharge the batteries. If this function is desired, obtain a UL-approved charger and follow the manufacturer's instructions.

(2) The DC source is not turned off by the amplifier's **POWER** switch. If DC power control is a requirement, an external switch or relay may be installed by a qualified service representative.

OPERATING THE CONTROLS

POWER Switch

Push in the switch to turn the amplifier "ON." Push the switch again to return it to the "out" ("OFF") position.

Level Controls (MIC-1, MIC-2, MIC-3, & MIC-4/AUX/PHONO)

These control the signal levels of their respective inputs before the signal goes on to the **MASTER** volume control. The higher the number, the greater the output volume. Normally, these should be set between the "5" and "8" positions. Once these have been set, the sound output is normally controlled with the **MASTER** volume control.

MASTER Volume Control

This controls the level of sound coming from all the inputs, after their signals have been initially adjusted by their respective level controls. To achieve the best signal-to-noise ratio, preadjust the level controls first, then use the **MASTER** volume control as the normal way of regulating the sound from the speakers.

Tone Controls

The **BASS** control will boost or cut low-frequency sounds approximately ± 10 dB at 100 Hz, and the **TREBLE** control will boost or cut high-frequency sounds approximately ± 10 dB at 10 KHz. Carefully adjusting these controls can help compensate for the sound characteristics of a room, a speaker, or the sound source.

INPUT-1 Priority

The priority mute circuit is activated by the presence of a signal at "INP-1," which automatically causes the signal coming from "MIC-4/AUX/PHONO" to be reduced to a predetermined level. In this way, the signal from "INP-1" can immediately and easily be heard. To accommodate the brief

pauses typical of paging, and to make a smooth transition back to the ongoing program after the announcement has been completed, the amplifier gradually increases the "INP-4" sound back to its normal level over a period of five to ten seconds. To adjust the muting, refer below to Step 3 of "Initial Tests."

LEDs and Circuit Breakers

When the amplifier is operating normally, the "POWER" LED glows. Should an overload or a short circuit occur in the speaker lines, the DC (8A or 10A) circuit breaker will trip. To signal this condition, the "POWER" LED will turn off and the "PROTECTION MONITOR" LED will light up. Should the AC (3A or 5A) circuit breaker trip, both LEDs will turn off.

If either of these conditions occur, ascertain what the problem is and correct it before resetting the circuit breakers. The resetting is done by pushing the stem of the appropriate circuit breaker back in. Should the circuit breaker trip repeatedly, turn the POWER switch off, unplug the power cord, and consult a qualified service representative.

INITIAL TESTS

- 1) Check for proper microphone phasing by first speaking through one microphone; then holding a second microphone next to it and speaking into both of them. If the audio level goes down when both microphones are used, they are out of phase. Reverse the "1" and "3" connections for one of the microphones and test the audio again.

Note: To avoid interaction with the automatic muting circuit, test "MIC-4" with "MIC-2" or "MIC-3."


- 2) Use a microphone on each of the four inputs (if necessary, temporarily install extra ones or move the same one from input to input). If necessary, adjust the level control for an input. If an input will not be used, return its level control to the counterclockwise position after testing it.
- 3) Play a program source through "MIC-4," then see whether speaking into a microphone or telephone connected to "INP-1" causes the program's sound level to drop, and whether stopping talking into "INP-1" causes the program to gradually resume its normal level. Test all the inputs for "MIC-4" ("MAG PHONO," "AUX," and "MIC-4") in the same manner.

The amount that the "INP-4" audio is attenuated can be adjusted by the **FADER** control in the upper right section of the rear panel. Use a flat-bladed screwdriver to adjust this recessed control. This control is preset to approximately a 15-dB attenuation; it can be adjusted between a 5-dB cut ("MIN" or counterclockwise position) and a 20-dB cut ("MAX" or clockwise position). If no muting is desired (for example, when the fourth channel is to be used primarily by a microphone rather than a program source), turn the **FADER** control counterclockwise until it clicks past the detent position (0-dB attenuation).

- 4) Test the **MASTER**, **BASS**, and **TREBLE** controls.

INITIAL TROUBLESHOOTING

Problem	Possible Causes
1) Low volume or distorted sound.	<ol style="list-style-type: none">(a) Check whether all the input and output connections are properly made and securely fastened.(b) If the problem occurs with every input channel, check the impedance between the amplifier and the speakers.(c) If the sound is distorted, check whether the speakers are being overdriven (e.g., does the distortion go away when the MASTER volume or individual channel controls are turned down?).



2) The amplifier does not operate and the "Power" LED does not light up.

(d) If the problem occurs only with one input channel, try switching the input device to determine whether it is the device or the input channel that is at fault.

(a) Make sure that the power cord is plugged in, that there is power in the outlet, and that the **POWER** switch is pushed in.

(b) Examine the input and output lines for obvious shorts (among themselves and between them and the chassis or surrounding equipment) and broken connections.

If everything appears in order, try pushing in the stem of the AC circuit breaker. If the amplifier's output and "POWER" LED lights still fail to respond, turn off the **POWER** switch, unplug the power cord, and contact your local RAULAND distributor.

LIMITED WARRANTY AND SERVICE POLICY

RAULAND-BORG CORPORATION • 3535 West Addison Street, Chicago, Illinois 60618 (312) 267-1300

LIMITED WARRANTY

This warranty supersedes any warranty or guarantee which may appear on any printed material packed with any product or any warranty or guarantee previously issued by Rauland-Borg Corporation.

Rauland-Borg Corporation warrants equipment manufactured by it to be free from defects in material and workmanship arising from normal usage for a period of one year from date of shipment by Rauland-Borg.

Our obligation under this warranty is limited to repairing any such defect and/or replacing any such defective part, provided the unit and/or the defective part is returned to us, transportation prepaid, within one year after date of original shipment by Rauland-Borg and found by our inspection to be defective in materials and workmanship. The obligation of Rauland-Borg Corporation is limited to the above and does not include either the cost or the furnishing of any labor in connection with the repair of any such defect and/or replacement of any such defective part unless accomplished at Rauland-Borg, nor does it include responsibility for any transportation expense.

This warranty is extended only to the original pur-

chaser from Rauland-Borg and is not transferable, and covers only equipment either installed by or under the direct supervision of a factory-trained and authorized Rauland distributor. This warranty does not extend to any product which has been subject to misuse, neglect, accident, improper repair, or alteration. Accessories not of our manufacture used with this equipment are not covered by this warranty.

All implied warranties, including but not limited to implied warranties of fitness and merchantability, are limited in duration to a period ending one year from the date of shipment by Rauland-Borg.

All material returned to Rauland-Borg Corporation under this warranty must be accompanied with information concerning the nature of the defect, the original date of shipment, original invoice number, and if a defective component, the model number of the unit from which it was removed.

This warranty is in lieu of all other agreements and warranties, general or special, expressed or implied, and no representative or person is authorized to assume for us any other liability in connection with the sale or use of our products.

SERVICE POLICY

The entire Rauland-Borg organization is interested in the proper maintenance of your equipment for as long as you own it. Our national network of Rauland-Borg distributors is at the service of all purchasers of our products.

Should you have a problem with your equipment, or require any advice or assistance, contact your local Rauland-Borg distributor. If you are not able to locate a local Rauland-Borg distributor, the information or action that you want can be obtained by writing to our Sales Engineering Department, at the address shown above.

No end-user replaceable components are contained within this equipment. Refer servicing to your local Rauland-Borg distributor.

WARNING

Any attempt at self-service of this equipment may result in exposure to electrical shock, or in extensive damage to the equipment and possible voiding of the equipment warranty.

SERVICE INFORMATION

THE INFORMATION THAT FOLLOWS IS INTENDED FOR QUALIFIED SERVICE TECHNICIANS

Gaining Access to the Components

If the unit is rack-mounted, first remove it from the rack (see the "Rack Mounting" instructions above). To remove the cover, unscrew the 12 side screws and lift it off. This will provide access to all the internal components.

Testing Voltages

To pinpoint a defective component, refer to the nominal voltages for the amplifier that are marked on the schematic diagram.

Removing and Replacing Transistors

Transistors are inherently long-lived devices that normally should not need replacement. If, however, systematic troubleshooting indicates a problem, observe these precautions when removing and replacing transistors:

- (1) Transistors can be damaged by excessive heat, so use a small soldering iron when removing or replacing a transistor with solder connections.
- (2) Transistors come with a wide variety of cases and leads. To avoid a costly mistake, make a careful sketch of the lead connections before removing a transistor from a printed circuit board or tie points.
- (3) Before installing a power transistor, obtain an appropriate mica insulator, coat both sides of it with silicone grease (Dow-Corning DC4 or an equivalent), and fit the insulator between the transistor and the heat sink. An alternate insulator is a Silpad[®], which does not require silicone grease.

Testing Transistors

The best way to test a transistor is to use a transistor tester. However, if one is not available, use an ohmmeter. Most failures result in a collector-to-emitter short or open circuit.

Connect the ohmmeter's leads to the collector and the emitter, then use the low ohm range to read the resistance. If the reading in this range remains the same when the leads are reversed, the transistor is shorted. If the readings are "infinite" for both connections, the transistor is open.

SPECIFICATIONS

Output Power: **Model 1406:** 60 watts RMS.
Model 1410: 100 watts RMS.

Output Regulation: Less than 2 dB change from no load to full load.

Outputs Available: Voltage-Impedance Equivalents:

1406:

Ohms:	4*	8	10.4	16	83
Volts:	15.5	22	25	31	70.7

1410:

Ohms:	4	6.3	8	16	50
Volts:	20	25	28	40	70.7

* The **boldface** indicates the numbers marked on the amplifiers' speaker terminals.

Line Output: 600 ohms, 1 volt.
 Pre-Amp Output: 600 ohms, 250 millivolts.

Frequency Response: ± 2 dB 60 Hz-13 KHz.
 (tone controls at "0")

Harmonic Distortion: Less than 1% at rated power output, 60 Hz to 13 KHz.

Inputs: 4 microphones: low-impedance balanced. "MIC-1" switchable to 600 ohm balanced. Alternate switchable inputs on "INP-4":
 Auxiliary: 200K ohms unbalanced.
 Magnetic Phono: 47K ohms unbalanced.
 Power Amp In: 10K ohms unbalanced.

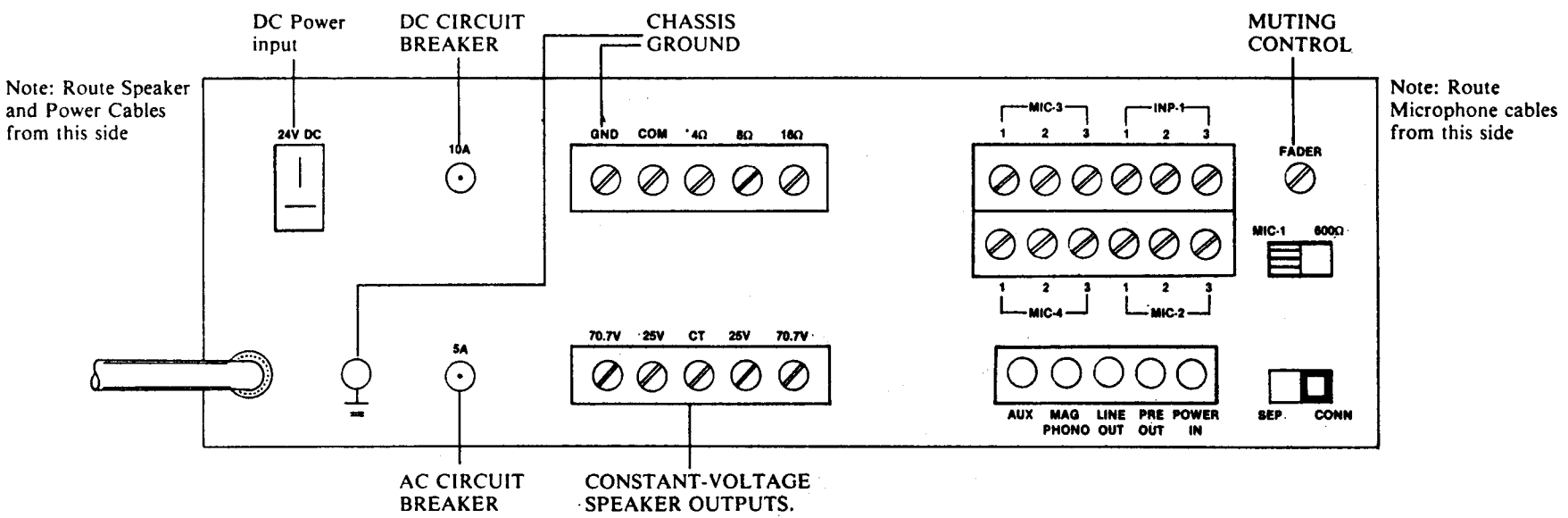
Input Sensitivity for Rated Power Output: Microphone: 0.5 mV.
 600 Ohm (switchable on "INP-1"): 90 mV.
 Alternate switchable inputs on "INP-4":
 Auxiliary: 150 mV.
 Magnetic Phono: 2.5 mV.
 Power Amp In: 0.7 V.

Input Overload: Microphones: 70 mV.
 Auxiliary: greater than 3 V.
 Mag Phono: 60 mV.

Voice-Operated Muting: Adjustable from -5dB to -20dB; can be turned off.
 (on "INP-1")

Noise Levels: Microphones: -60 dB.
 (Control of tested input fully clockwise, all other input controls fully counterclockwise, **MASTER** volume control at maximum, tone controls at "0")
 Auxiliary: -60 dB.
 Mag Phono: -60 dB.

Noise Level: **MASTER** Volume at Min.: -85 dB.
 (All input controls fully counterclockwise, tone controls at "0")
MASTER Volume at Max.: -70 dB.



**Rauland 1400 Series Mixer-Amplifiers
Back Panel (1410 shown)**

Signal-to-Noise Ratio:	Better than 60 dB.
Tone Controls:	BASS: ±10 dB at 100 Hz. TREBLE: ±10 dB at 10 KHz.
Other Controls:	MASTER Volume. Levels (MIC-1, MIC-2, MIC-3, MIC-4/AUX/PHONO). Selector Switch (MIC-4, AUX, MAG PHONO). Mute FADER Switch/Control. POWER on-off.
Power Requirements:	AC: 120 V, 60 Hz. DC: 24 V.
AC Power Consumption:	1406: 200 watts. 1410: 300 watts.
DC Current Consumption:	1406: 1410: Idle: 150 mA. 150 mA. At RPO: 7 A. 9 A.
Protection:	AC and DC Circuit Breakers. LED Indicators.
Size: (including knobs and sockets)	16-1/4" (41.24 cm) wide. 12-1/2" (31.7 cm) deep. 4-7/8" (12.4 cm) high.
Rack-Mounting Dimensions:	19" (48.2 cm) wide. 12-1/4" (31.1 cm) deep. 5-1/4" (13.3 cm) high.
Unit Weight: (without rack-mounting parts)	1406: 23.3 lb. (10.6 kg.) 1410: 28.9 lb. (13.1 kg.)