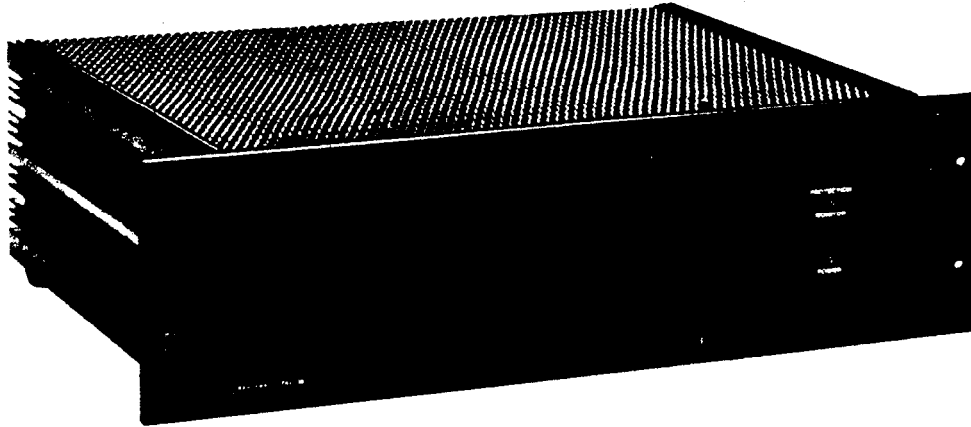



**FAX60 AND FAX120 AMPLIFIERS**


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GENERAL DESCRIPTION

The Rauland FAX Series amplifiers are designed for years of trouble-free service in a variety of commercial and industrial sound systems. They may also be installed in a UL-listed enclosure for use in fire-alarm-signaling systems.

The FAX amplifiers incorporate many useful features. The input can be set to operate in a BAL (balanced) or UNBAL (unbalanced) mode by a switch on the rear panel. In the balanced mode, it is transformer-isolated. A RESPONSE switch has a LO-CUT position that provides protection for horn-type speakers. The transformer-isolated speaker outputs include 4- and 8-ohm connections as well as constant-voltage 70.7- and 25-volt connections with a center tap. There is also an auxiliary power output for pre-amps (24VDC, 250 mA maximum).

The FAX60 and FAX120 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 directly to you--with the carrier.

The following parts are included with the mixer-amplifier:

<u>Description</u>	<u>Rauland Part No.</u>
1 Battery Cable with mating connector.	
2 Rack-Mounting Screws for tapped holes (10-32 x 5/8 black truss-head Phillips machine).	WA221
4 Rack-Mounting Screws for untapped holes (10 x 5/8 black truss-head Phillips thread-forming).	WA222
4 #10 Tinnerman "U" type Speed Nuts.	AB1889
1 Jumper Cable for making special connections among the speaker and ground terminals.	

### INSTALLATION

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

The rack should have the standard 19-inch width and a vertical space of 5-1/4 inches. Adding an inch of space behind the amplifier for connections, the rack should have a total depth of 11-1/2 inches (FAX60) or 15 inches (FAX120). 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

The front panels of the FAX60 and FAX120 amplifiers are designed to allow the amplifiers to be directly mounted into standard 19-inch racks. Two kinds of mounting screws are supplied with each amplifier:

- A. If the rack's holes are untapped, select the #10 thread-forming screws (WA222). Push the #10 "U" nuts onto the proper holes in the rack.
- B. If the rack's holes are tapped, select the #10 machine screws (WA221).

WARNING

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

Grounding

Connect the rack frame to the grounding post (the knurled knob marked "GROUND").

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.

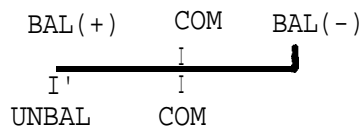
INPUT CONNECTIONS

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

The input can be switched to a balanced or unbalanced mode. Refer to the representation of the input terminals below and adopt one of the following two combinations of wiring and switch position:

Balanced input: (a) Place the switch in the BAL position and (b) connect the signal wires to the two end ("BAL") terminals and the shield to the common ("COM") terminal.

Unbalanced input: (a) Place the switch in the UNBAL position and (b) connect the signal wires to the left ("UNBAL") terminal and the center ("COM") terminal.



Note: "BAL(+)" and "UNBAL" designate the same terminal.

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.

## SPEAKER CONNECTIONS

The first two subsections apply to both amplifiers. However, their output taps differ significantly: on the FAX60, "COM" (Common) is internally connected to "CT" (Center Tap), but, on the FAX120, "COM" is connected to a "25V" terminal instead. Hence, the output connections of the two amplifiers are given in separate subsections.

Note: The back-panel outputs are illustrated after the 'Specifications.'

### Routing the Wires

Route the speaker wires from the left side (as viewed from the rear of the amplifier). This will prevent coupling with the input lines on the right.

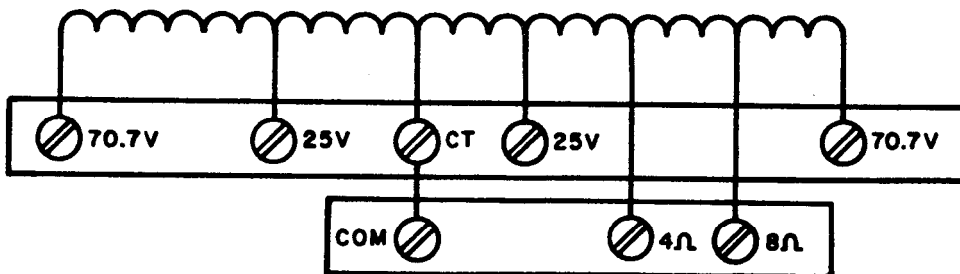
### Selecting the Proper Outputs


The 4- and 8-ohm outputs are generally used when the wires running to the speakers are relatively short and the line loss is less than 0.5dB (most audio and sound-system handbooks have tables listing the line loss for each wire size and load impedance). For best performance, make sure that the impedance of the total speaker load matches that of the tap being used. Use series or parallel speaker arrangements as needed to obtain the proper impedance-matching.

The 25- and 70.7-volt outputs are for speakers designed for constant-voltage lines. Each speaker must have a line-matching transformer, and the speakers must be connected in parallel. The impedance taps on the primaries of the line-matching transformers indicate how much power will be taken from the line. Speakers can be added as required until the total wattage absorbed by all of the transformers is equal to the rated power output of the amplifier. It is good practice to allow an amplifier a headroom of 10% to 20%. For a 120-watt amplifier, -the maximum speaker load should be approximately 100 watts.

### FAX60 Speaker Connections

The speaker taps on the output transformer of the FAX60 (internal details) are illustrated below, in KM0759. On the next page is a table detailing the connections (see also the "Outputs Available" tables in the "Specifications").



KM0759 

Note: The transformer "Center Tap" terminal and the "Common" terminal are wired together internally on the FAX60.

Use X8 spade lugs to attach the speaker wires to the amplifier's terminals. The following table summarizes the proper speaker connections to the FAX60:

OUTPUT DESIRED	AMPLIFIER CONNECTIONS
70.7v balanced	Both "70.7v" taps.*
70.7v <u>un</u> balanced	Both "70.7v" taps; jumper from left "70.7v" to "GROUND."***
25v balanced	Both "25v" taps.*
25v <u>un</u> balanced	Both "25v" taps, jumper from left "25v" to "GROUND."***
4 ohms	"4" and "COM."***
8 ohms	"8" and "COM. "***

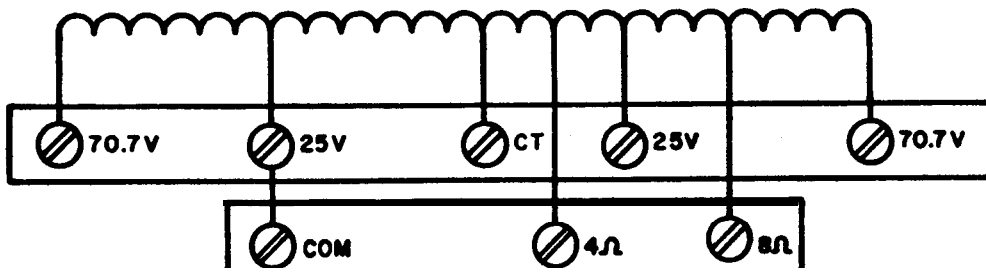
\* Install the supplied jumper between "GROUND" and "COM" with these connections only if balanced and grounded operation is desired.

\*\* DO NOT INSTALL A JUMPER BETWEEN "GROUND" AND "COM" WITH THE **UNBALANCED** 70.7-VOLT AND 25-VOLT CONNECTIONS: IT WOULD CREATE A SHORT CIRCUIT ACROSS THE OUTPUT TRANSFORMER.

\*\*\* Install the supplied jumper between "GROUND" and "COM" with these connections for unbalanced and grounded operation (the standard configuration for 4- and 8-ohm outputs).

### FAX120 Speaker Connections

The speaker taps on the output transformer of the FAX120 (internal details) are illustrated below, in KM0764. On the next page is a table detailing the connections (see also the "Outputs Available" tables in the "Specifications").



**KM0764** [0]

Note: The transformer "Center Tap" terminal and the "Common" terminal are not wired together on the FAX120.

Use #8 spade lugs to attach the speaker wires to the amplifier's terminals. The following table summarizes the proper speaker connections to the FAX120:

OUTPUT DESIRED	AMPLIFIER CONNECTIONS
70.7v balanced	Both "70.7v" taps.*
70.7v unbalanced	Both "70.7v" taps; jumper from left "70.7v" to "GROUND."**
25v balanced	Both "25v" taps.*
25v <u>un</u> balanced	Both "25v" taps, jumper from left "25v" to "GROUND."**
4 ohms	"4" and "COM."***
8 ohms	"8" and "COM"***

\* Install the supplied jumper between "GROUND" and "CT" with these connections only if balanced and grounded operation is desired.

\*\* DO NOT INSTALL A JUMPER BETWEEN "GROUND" AND "CT" WITH THE **UNBALANCED** 70.7-VOLT AND 25-VOLT CONNECTIONS: IT WOULD CREATE A SHORT CIRCUIT ACROSS THE OUTPUT TRANSFORMER.

\*\*\* Install the supplied jumper between "GROUND" and "COM" with these connections for unbalanced and grounded operation (the standard configuration for 4- and 8-ohm outputs).

### Auxiliary Power Supply

The 24-VDC power supply on the screw terminals can provide a maximum of 250 mA to preamplifiers and other auxiliary devices requiring DC power.

### POWER CONNECTIONS

#### AC Connection

Plug the power cord into a 120-V, 60-Hz., three-wire grounded outlet that can provide 220 watts (FAX60) or 320 watts (FAX120) of power. **Check' the** local regulations before installing permanent AC lines and plugging in the equipment.

#### DC Connection

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

Note: The amplifier will not recharge the batteries. For recharging, obtain an approved charger and follow the manufacturer's instructions.

## USING THE CONTROLS, SWITCHES, AND LED INDICATORS

### "INPUT LEVEL" Control

This control on the back panel is used to adjust the sound output to an appropriate level. It should be set so that the maximum possible input signal will not cause the output to clip. This control should be adjusted by the installer and then left alone.

### "RESPONSE" (Low-Frequency Roll-Off) Switch

Use the FLAT position of the "RESPONSE" switch to obtain the rated frequency response of the amplifier. To protect horn-only speaker systems, place the switch in the LO-CUT position: this will cause at least a 10-dB roll-off at 100 Hertz.

### 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 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 fuse blow, both LEDs will be off.

If either of these conditions occurs' ascertain what the problem is and correct it before resetting the circuit breaker or inserting a new fuse. The resetting is done by pushing the stem of the circuit breaker back in. Should the circuit breaker trip repeatedly, unplug the power cord and consult a qualified service representative.

## INITIAL TROUBLESHOOTING

<u>Problem</u>	<u>Possible Causes</u>
1) Low volume or distorted sound.	(a) Check whether all the input and output connections are properly made and securely fastened.  (b) If the sound is distorted, check whether the speakers are being overdriven (e.g., does the distortion go away when the level control is turned down?).
2) The amplifier does not operate and the "Power" LED does not light up.	(a) Make sure that the power cord is plugged in and that there is power in the outlet.  (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, check the fuse. If the amplifier's output and 'POWER' LED lights still fail to respond, unplug the power cord and contact your local RAULAND distributor.

## SERVICING INFORMATION

THE INFORMATION THAT FOLLOWS IS INTENDED FOR QUALIFIED SERVICE TECHNICIANS.

### Conversion to 240-VAC Operation

Step 1. Remove the two top and the two rear screws fastening the top cover to the amplifier cabinet, then take off the top cover by sliding it backwards.

Step 2. Locate the "120V/240V" switch (in the middle of the chassis) and place it in the 240V position. Then replace the top cover.

Step 3. Replace the fuse with a slow-blow fuse that is rated at 1.5 A (FAX60) or 2.5 A (FAX120).

Step 4. Replace the plug on the AC power cord with one of equivalent quality that will mate with the power outlets at the installation site.

### 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 top cover, remove the two screws on top and the two holding the cover on the back, and slide the cover off. This will provide access to all of the internal components. The bottom cover may be removed in similar fashion, if access to the bottom of the chassis is desired.

### Testing Voltages

To pinpoint a defective component, refer to the nominal voltages for the amplifier that are marked on its 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:

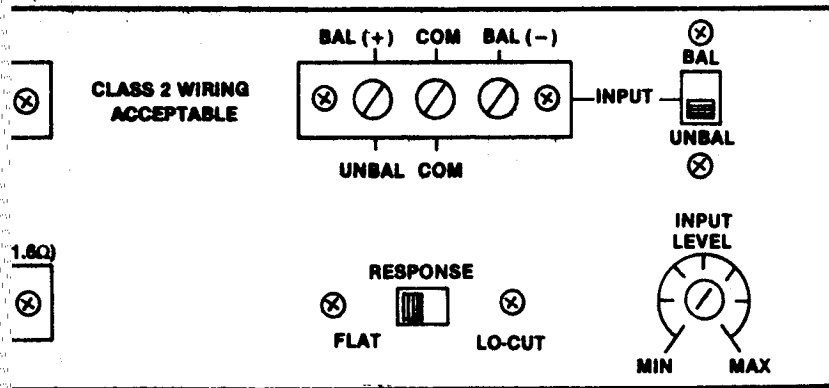
- (1) Transistors can be damaged by excessive heat, so use a small soldering iron when removing or replacing a transistor with solder connections.
- (2) Transistors come with a wide variety of cases and leads. To avoid a costly mistake, make a careful sketch of the lead connections before removing a 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 short or an open circuit between the collector and the emitter.

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.



**RAULAND FAX SERIES AMPLIFIER  
BACK PANEL  
(FAX 120 SHOWN)**