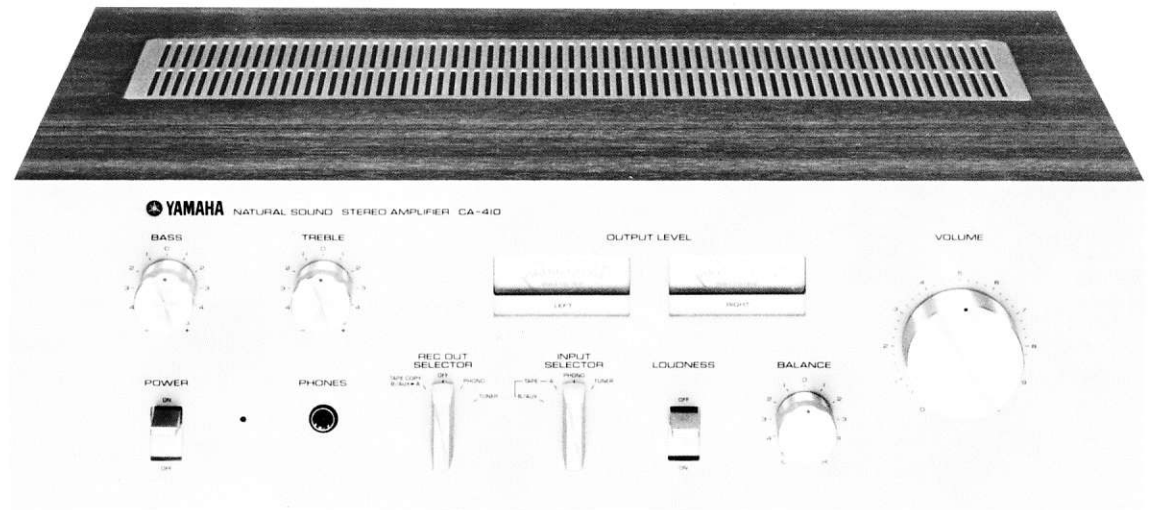


YAMAHA

CA-410

Integrated Amplifier

Owner's Manual



CA-410

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SPECIAL FEATURES

1. Ample Power and Lower Distortion

With a generous minimum rms output power of 25 Watts per channel, both channels driven, from 20 Hz to 20 kHz, into 8-ohm speakers, and no more than 0.05% distortion, CA-410 performance is exceptional. And the same low distortion is preserved right down to 250 mW, a tremendous power-distortion range.

2. Full-Range Power Output Meters

The separate meters for L and R-hand channels cover the whole range from 0.01 Watt to 50 Watts in one unswitched range, a valuable feature that lets you know how much power your speakers are handling.

3. Special Low Distortion Low Noise Tone Controls

A Yamaha 'first,' these tone controls use a combination of negative feedback (NFB) and capacitor-resistor (CR) elements, giving smooth and accurate control of tonal quality, and a flat response in the zero position, with extremely low noise level (-100 dB) and correspondingly low distortion.

4. Comprehensive Operating Controls and Functions

With the CA-410 you can listen to any one source while recording another, or while copying one tape recording onto a second deck. Also you can use the Rec Out Off position to disconnect the CA-410 from your tape recorder when not actually recording.

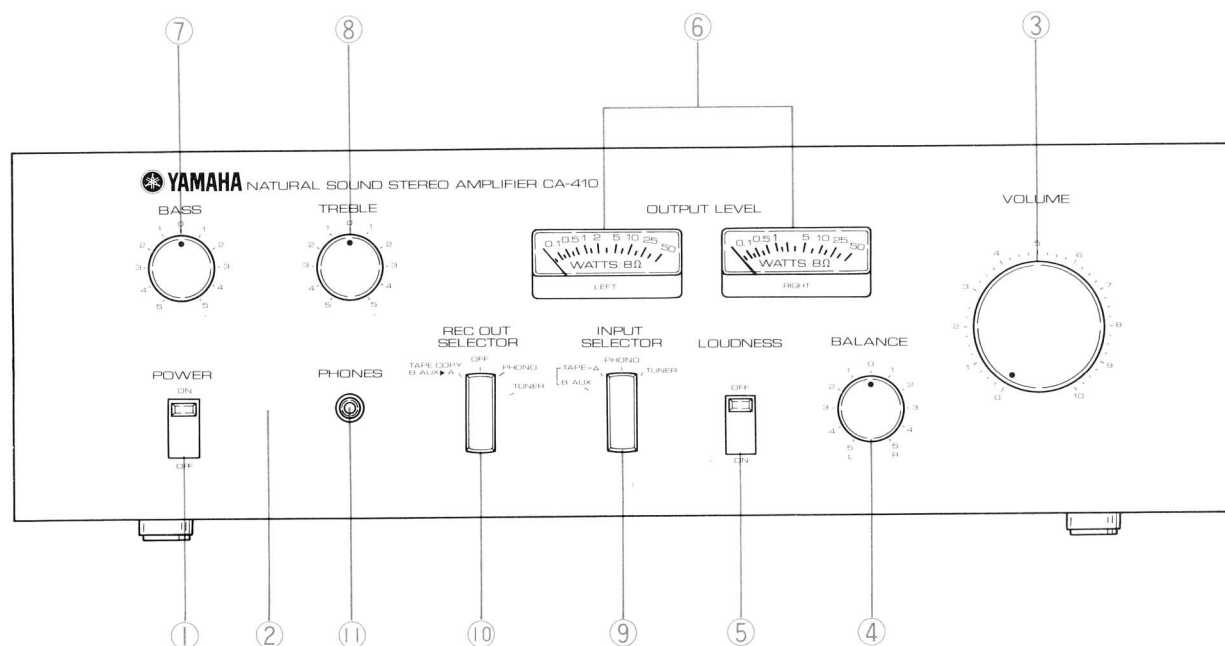
5. Precise Continuous Volume Control and Full Loudness Compensation

The volume control is an extremely precise, continuous type, accurately in balance within ± 1 dB from maximum down to -70 dB. For listening at low volumes, there is a Loudness Switch which gives greatly increased naturalness of reproduction, compensating for our ears' reduced sensitivity to high and low frequencies.

- 1 The CA-410 is a high performance integrated amplifier, combining 25 Watts per channel of output power with a full range of controls. This manual is required reading if you are to get the best from it.
- 2 Do not drop or otherwise jar the CA-410, which is a piece of precision equipment.
- 3 Do not place the CA-410 where it will be exposed to direct sunlight, excessive heat, moisture, or dust.
- 4 Do not use chemical solvents (such as benzene or alcohol) to remove traces of dirt. Wipe only with a soft, slightly damp cloth.
- 5 Do not attempt to carry out internal adjustments or repairs. Leave these to your local service representative.
- 6 Do not assume that your CA-410 is faulty before checking the 'Trouble-Shooting' list on page 13 for common operating errors.
- 7 Note that the relay protecting the speakers will keep the CA-410 silent for a few seconds after switching ON, to prevent the pops and clicks that can sometimes occur.
- 8 If your CA-410 is provided with spare AC outlets on the rear panel (models intended for Europe cannot be provided with this feature), make sure that the units you connect do not require more power than the outlets are rated to provide.
- 9 If your CA-410 has a voltage selector on the rear panel, check that it is set to your local voltage BEFORE you plug in the AC supply. If not properly set, turn the knob to the correct position. Voltage settings: 110, 120, 130, 220, 230, and 240 V. Use the next higher voltage setting if your voltage is not included (i.e. 120 if your voltage is 115 V). Models intended for N. America have no voltage selector, and are set for 117 V AC, 60 Hz.
- 10 Keep this manual in a safe place for future reference, and refer to it frequently until you are perfectly familiar with all CA-410 controls and functions.

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FRONT PANEL AND CONTROLS



① POWER ON/OFF Switch

Switch ON to connect the main electrical supply. The CA-410 will remain silent for a few seconds while the speakers are protected from the pops and clicks that can occur immediately after switching ON.

② POWER LED Indicator

With the POWER switch in the ON position, this light-emitting diode will illuminate, indicating that the main electrical supply has been connected. If it goes out, with the POWER switch still ON, this can mean that the power fuse has blown.

③ VOLUME Control

Use this control to give the volume of sound that you require. Always start with the control turned fully to the left (counter-clockwise) at the '0' position, and turn it down when lowering the phono cartridge stylus onto a record, and when switching from program source to source.

4 BALANCE Control

This controls the balance between the L and R stereo channels. It should normally be set at the central '0' position: turn it to the right (clockwise) to make the sound appear to come from the right-hand speaker, and to the left (counter-clockwise) to emphasize the sound from the left-hand speaker.

5 LOUDNESS Switch

In the ON position, this gives more natural quality of sounds at low listening volumes. It boosts the extreme low and high frequencies to compensate for our ears' reduced sensitivity to these frequencies at low volumes. It should be switched OFF when listening at high (loud) levels.

6 OUTPUT LEVEL Meters

These sensitive, wide-range meters measure the output power for each channel from 0 to 50 Watts. The minimum continuous rms output power of the CA-410 is 25 Watts per channel with both channels driven into 8 ohms, but peak power can considerably ex-

ceed this. The Watt reading is correct for 8-ohm speakers, but should be multiplied by two for 4-ohm speakers, and divided by two for 16-ohm speakers.

7 BASS Tone Control

This enables you to emphasize low frequency sounds (rhythm section, etc.) or to reduce them if your speakers sound 'boomy.' Turning to the right increases the bass response, and turning to the left reduces it.

8 TREBLE Tone Control

This works similarly for the upper (treble) frequencies. Sometimes turning slightly to the left, to reduce treble response, can cut out unwanted 'hiss' noise or record scratch, although turning too far will give an unnatural or muffled sound. Turning to the right increases high frequency response to compensate for absorption by soft furnishings, curtains, etc.

9 INPUT SELECTOR

This switch is used to select the program source of your choice, whether PHONO, TUNER, TAPE, or AUX. The AUX setting enables you to play back TV sound, a short-wave radio, or even another tape deck. Tapes played back via the AUX setting can be copied onto another tape deck.

10 REC OUT SELECTOR

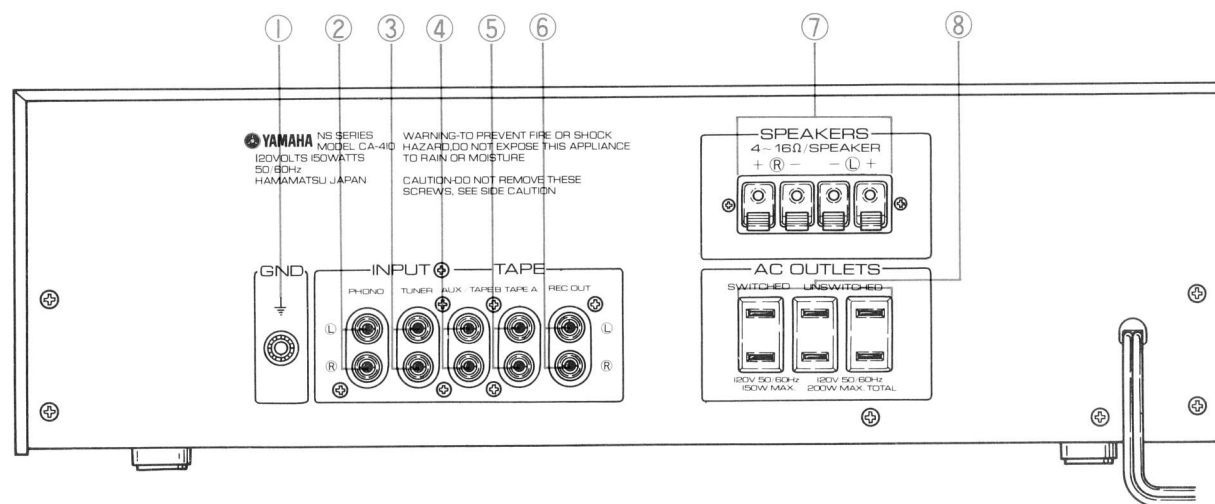
This switch selects which of the programs connected to the CA-410 will be recorded. It works independently of the INPUT SELECTOR, so that you can listen to one program while recording any other, and record directly from one tape deck to another. At the OFF position the CA-410 is completely disconnected electrically from the tape recording terminals.

11 PHONES Jack

Plugging in headphones, like the superb Yamaha HP-1, 2, or 3 units, switches off the speakers automatically, for truly personal listening.

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REAR PANEL AND CONNECTIONS



1 GND (Ground) Terminal

Ground terminals and leads from turntable units and other components used with the CA-410 should be connected to this GND terminal, particularly if there is any audible 'hum' problem. Consult your local hi-fi dealer if you require detailed advice.

2 PHONO Inputs

Connect the pin-jack cables from your turntable unit to these terminals (the left-channel sockets are upper-most for all CA-410 input terminals). All conventional moving magnet (MM), induced magnet (IM), etc., phono cartridges are suitable, although some moving coil (MC) types have output voltages too low for satisfactory results. Your hi-fi dealer can advise.

3 TUNER Input

Connect your FM or other tuner to these terminals. If it has an adjustable output level, adjust this so that the volume does not change abruptly when switching from PHONO to TUNER.

4 AUX/TAPE B Terminals

These terminals are for connecting a second tuner, or other item of audio equipment, short-wave radio, TV sound, 8-track tape cartridge player, etc. They also act as a spare pair for tape playback (not recording) from a second 'B' tape deck.

5 TAPE A Terminals*

These are for playback from your tape recorder. If you sometimes use a second tape recorder (for copying tapes, perhaps), these are the terminals to use with your main 'A' recorder.

6 REC OUT Terminals*

These terminals carry the signal selected by the REC OUT SELECTOR on the front panel. They should normally be connected to your 'A' recorder for tape recording.

When not actually recording, protect the CA-410 against any effect of unused tape deck input impedances by setting the REC OUT SELECTOR to REC OUT OFF. Recording will, of course, be impossible.

*Note that models for Europe are provided with DIN REC/PB sockets, which are convenient if you have a tape deck with similar sockets and the appropriate connecting cable. The single DIN plug replaces all four pin jack connections.

7 SPEAKER Output Terminals

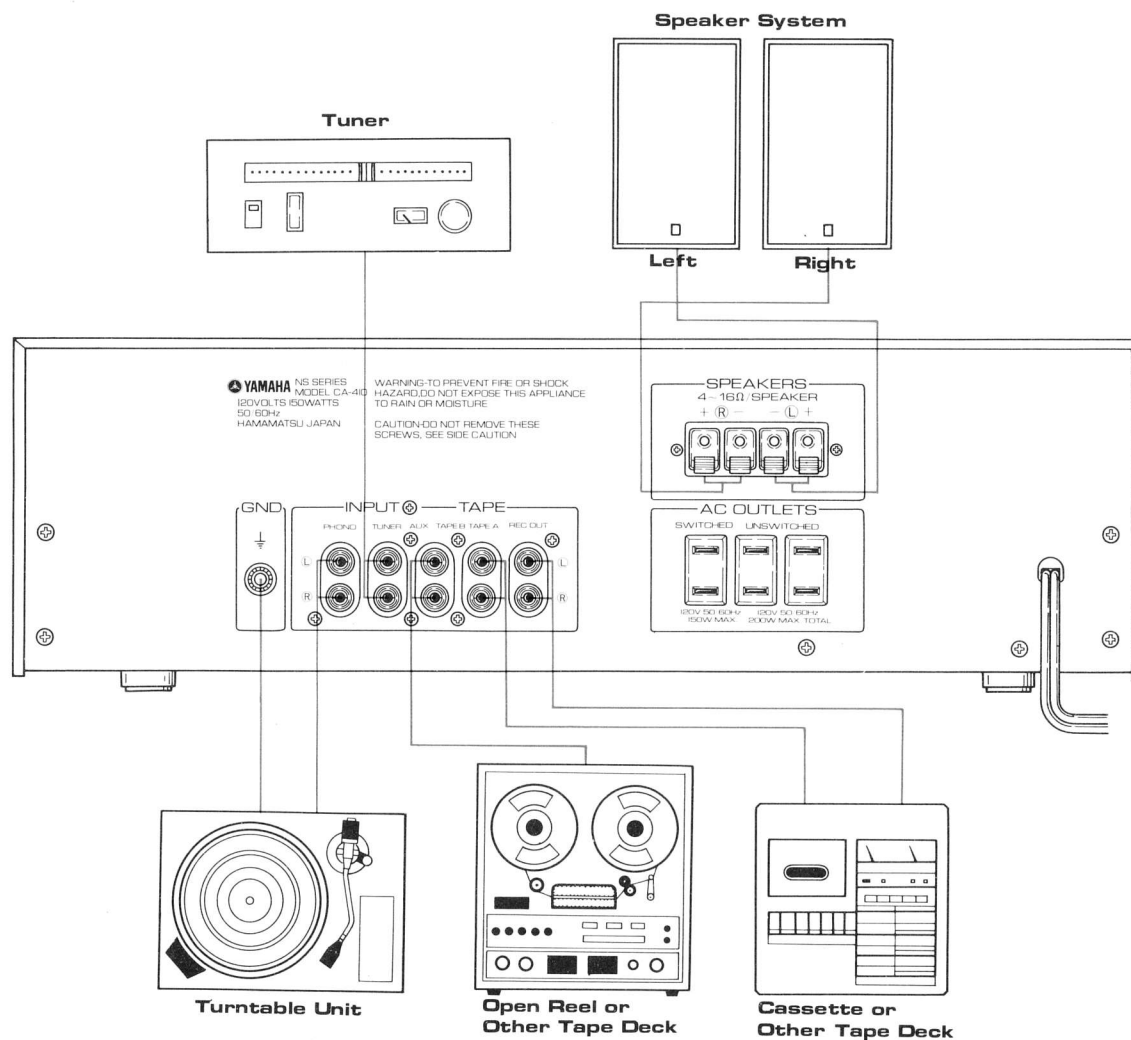
Note carefully the '+' and '-' signs on these terminals, and ensure that connections are made to the corresponding terminals on your speakers.

8 Spare AC OUTLETS

If your CA-410 is provided with spare AC OUTLET sockets (these cannot be fitted to models for Europe) you can plug in other items of audio equipment. One socket is switched by the CA-410 POWER switch, and is suitable for tuners and other low power units requiring up to 150 Watts. The other two are unswitched, and can only deliver a total of 200 Watts. *Do not* exceed these limits.

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CONNECTING AND OPERATING THE CA-410 WITH OTHER COMPONENTS



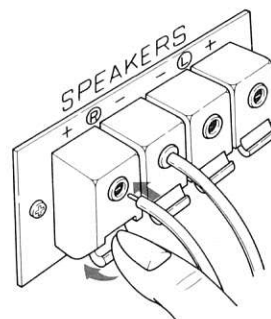
SPEAKER CONNECTIONS

The CA-410 is designed for speakers with impedances between 4 and 16 ohms. Use only speakers which are rated to take the full 25 Watts of CA-410 output power, or set the VOLUME so that the rated maximum speaker input power is not exceeded, as indicated on the meter readings. Speakers can be seriously damaged by even brief overloads. Remember that with 4 ohm speakers the reading must be doubled (i.e. if the meters read 20 Watts, the real power is 40 Watts), and halved for 16 ohm speakers.

Making the Speaker Connections

1. Strip the insulated covering from the speaker connecting cable for approximately half an inch, and twist any stray ends together. If possible, apply solder to the exposed half inch: stray ends can cause short-circuiting of the output terminals, with possible damage to the CA-410 (although it is well protected by safety relay). Push the lever beneath the terminal as shown in the diagram, and align the inner and outer terminal holes. Then insert the wire fully home. Release the lever, and the wire end will be fully and firmly gripped, making a perfect connection.
2. Be careful that the terminals identified by the + and - signs above them are connected with the + and - terminals on the speakers. A mistake in this polarity can result in poor bass response

and defective stereo image. Also be sure to connect the left-hand speaker to the LEFT speaker terminals and the right-hand to the RIGHT terminals.



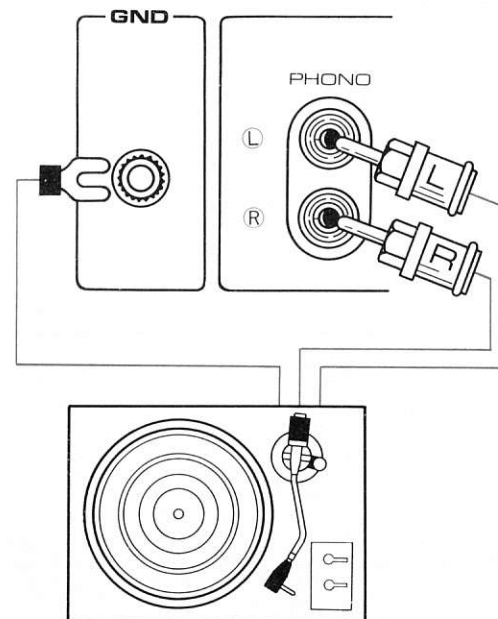
CONNECTING A TURNTABLE AND TONE-ARM UNIT

The output cable from the turntable unit should be connected to the PHONO terminals. Plug the pin jacks attached to the cables firmly into the terminal sockets, making sure that the left-hand cartridge output is connected to the LEFT (upper) socket, and the right-hand to the RIGHT (lower) socket. Turntables are usually provided with a third, GROUND, line. Be sure to connect this to the GND terminal, screwing down the retaining nut firmly.

To enjoy record audition, turn the INPUT SELECTOR switch to PHONO, turn the VOLUME well down, and gently lower the cartridge stylus to the record surface. Raise the volume to the normal listening level, and note the setting. *A/ways* lower

the VOLUME well below this setting when lowering the cartridge: at normal or high volumes the shock may damage your speakers despite the protective relay.

Use the BASS and TREBLE controls to give the most pleasant tonal balance. At low listening volumes, the LOUDNESS switch will give a more natural tonal balance in the ON position. On the other hand, at higher volumes, the ON position gives unnaturally exaggerated bass and treble response.



LISTENING TO A TUNER

Connect the tuner output terminals to the CA-410 tuner input jack sockets using the pin-plug cable provided. Make sure that the left- and right-hand outputs are connected to the proper input sockets.

To enjoy tuner audition, turn the INPUT SELECTOR switch to TUNER, and operate the tuner to receive FM or AM broadcasts. If your tuner generates noticeable hiss noise (particularly when listening to stereo broadcasts), the TREBLE control may be turned down slightly to reduce it.

If your tuner is provided with output level adjustment, use this control so that there is no significant change in listening volume when switching the INPUT SELECTOR between the TUNER and PHONO settings.

USING THE AUX/TAPE B INPUT

This input doubles as a spare for any stereo source, being suitable for nominal 150 mV inputs (the same as the TUNER and TAPE A inputs), and as a second TAPE playback input. Use it for Hi-Fi reproduction of TV sound, for 8-track stereo cartridge tapes, for short-wave radio reproduction (although this will never give Hi-Fi results), or for high output level PHONO cartridges (ceramic or other types — your dealer will advise). Alternatively, use it to play back tapes from a second or 'B' reel-to-reel or cassette tape deck, particularly any that you may want to record on your main, 'A,' deck. Note, however, that these terminals cannot be used for *recording*, but only for playback of the tape *to be* recorded.

TAPE DECK CONNECTIONS PLAYBACK/RECORDING

Two tape decks, A and B, can be connected to the CA-410 at the same time. Your main deck should be connected to the TAPE A and REC OUT terminals, and any second deck to the AUX/TAPE B input terminals for playback. Playback will be possible from A and B, copying from B to A, and recording on A only. At any time you can listen to sources you are not recording, and if you have a three-head deck, you will be able to monitor recordings.

Using standard pin-plug cables, connect the LINE OUTPUT terminals on your 'A' tape deck to the TAPE A terminals, and the LINE INPUT terminals on the tape deck to the REC OUT terminals. Be careful to connect left- and right-hand channels correctly. Connect the LINE OUTPUT terminals on your 'B' tape deck to the AUX/TAPE B terminals.

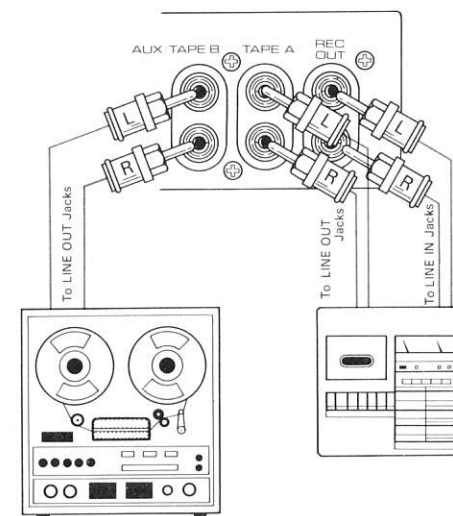
Only LINE INPUT and OUTPUT pin-jack connections are shown, but where the DIN REC/PB connector sockets are provided (on models for Europe), they may be used instead in the same way, with the one DIN plug replacing all four pin plugs.

To enjoy tape audition, set the INPUT SELECTOR to TAPE A (or TAPE B/AUX as the case may be), and operate your tape recorder for playback. All tone and other controls on the CA-410 can be used to give the most acceptable tonal balance.

To make a tape recording on deck A, set the REC OUT SELECTOR to the program source you

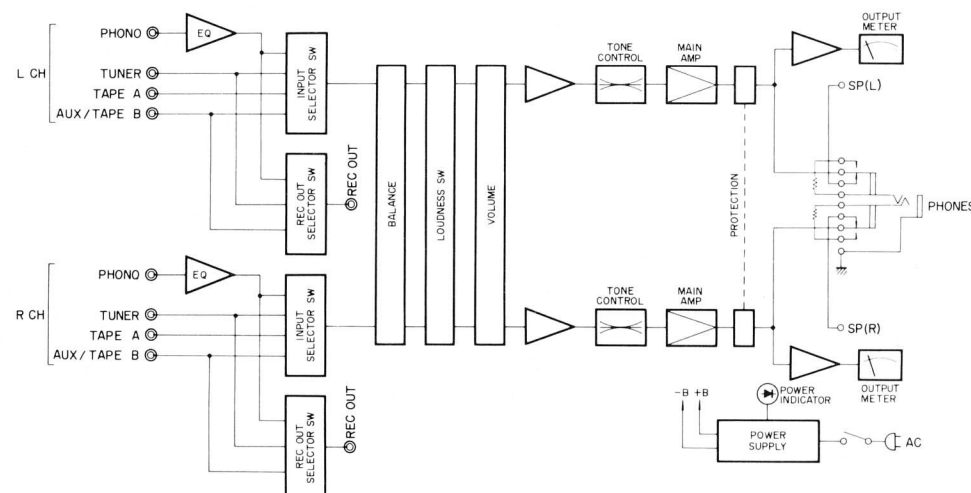
wish to record. Recording will then be possible on deck A. To dub (that is copy) a recording from tape deck B to deck A, set the REC OUT SELECTOR to TAPE COPY B/AUX ► A. The signal played back from B will be recordable on A. It is not possible to dub from deck A to deck B.

Tone and other controls have no effect upon the signal being recorded. Corrections to tonal balance, etc., must be made during playback.



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BLOCK DIAGRAM AND SPECIFICATIONS



SPECIFICATIONS

Continuous Min. RMS Power (both channels driven, at rated 0.05% distortion, 20–20,000 Hz)	25 + 25 Watts (8 ohms)
Total Harmonic Distortion (THD) Aux to Speaker Out terminals	0.05% or less (at rated 25 Watt output)
Phono to Rec Out terminals	0.05% or less
Intermodulation Distortion	0.05% or less
Power Bandwidth (IHF 0.05% THD)	10–50,000 Hz
Damping Factor (8 ohms, 1 kHz)	Better than 50
Speaker Impedance	4 to 16 ohms
Frequency Response (Aux → Sp Out)	20–20,000 Hz ±0.5 dB
RIAA Deviation	20–20,000 Hz ±0.5 dB

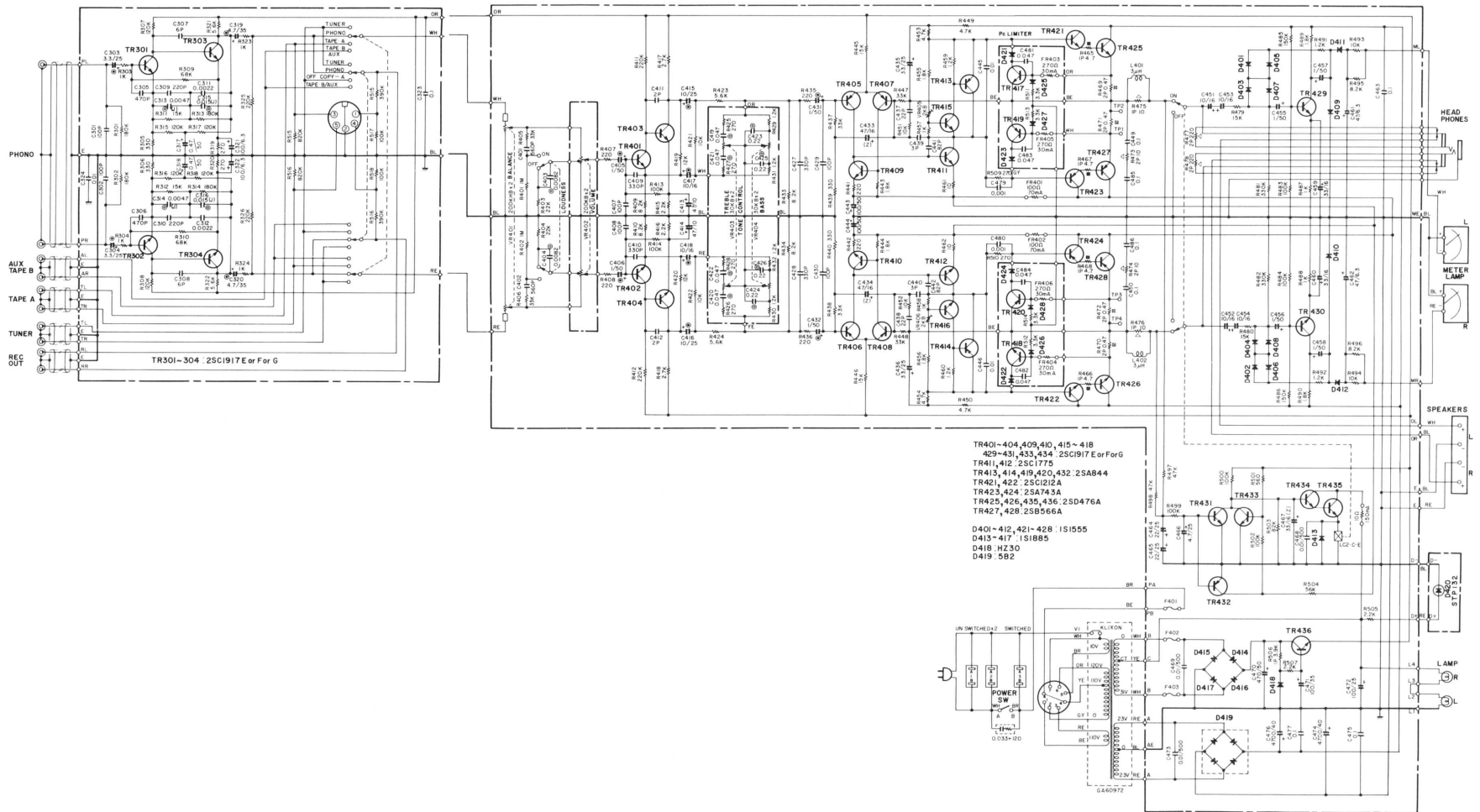
Signal-to-Noise Ratio (IHF-A Network)	
Aux to Speaker Out terminals	100 dB
Phono to Speaker Out terminals	77 dB
Residual Noise	0.13 mV
Channel Separation (8 ohms, 1 kHz, at rated output)	Better than 60 dB
Input Sensitivity/Impedance	
Phono	2.5 mV/50 kΩ
Aux, Tuner, Tape PB	150 mV/50 kΩ
Phono Dynamic Margin (1 kHz, 0.05% THD)	150 mV rms
Output Level/Impedance	
Tape Rec Out	150 mV/1 kΩ
Tone Controls	
Bass	±10 dB boost/cut at 50 Hz
Treble	±9 dB boost/cut at 10 kHz
Loudness Control	50 Hz; +9 dB; 10 kHz; +6.5 dB (vol. -30 dB)

Other Features	
Output Level Meters	100 mW (0.01 Watt) to 50 Watts (log scale)
Rec Out Selector	With Off position isolating tape connections
Speaker Protection Semiconductors	By self-resetting relay 34 Transistors, 21 Diodes, and 1 Zener Diode
Power Source	120 V AC, 60 Hz (USA and Canada) 110-130/220-240 V AC, 50/60 Hz (Other areas)
Power Consumption	80 Watts
Spare AC Outlets (USA and Canada)	
Switched	1 rated 150 Watts
Unswitched	2 rated 200 Watts (total)
Dimensions (WxHxD)	435 x 137 x 350 mm 17 ¹ / ₈ " x 5 ³ / ₈ " x 13 ³ / ₄ "
Weight	8.5 kg (18 lb 11 oz.)

Specifications subject to change without notice.

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SCHEMATIC CIRCUIT DIAGRAM



Before assuming that your CA-410 is faulty, check the following trouble-shooting list, which details corrective action you can take yourself, without having to call a service representative.

Fault	Cause	Cure
No power although POWER switch is ON (POWER LED unlit)	AC power line not plugged into supply socket	Plug firmly into the supply socket
	AC main fuse has blown.	In this case contact service representative*
No sound although power is connected	Volume set to 0	Turn up volume
	INPUT SELECTOR in wrong position	Check and change as necessary
	Input plugs incorrectly inserted, loose, or disconnected	Check and insert fully in the correct positions
	Speaker connections faulty	Check and make good
Sound comes only, or mainly, from either L or R speaker	Speaker connections faulty	Check and make good
	Input connections faulty	Check and make good
	Balance control not properly adjusted	Set to give correct stereo balance
Sound suddenly ceases during audition	The protective circuit has detected ± 2 V DC at the speaker terminals, and disconnected them.	Sound will be restored as soon as the fault clears If the fault persists, switch OFF and wait briefly before switching ON again.
	AC main fuse has blown	In this case contact service representative*
Poor bass response and badly defined stereo image	Speaker phase polarity ($\pm$ connections) incorrect	Reverse the connections to one speaker (not both)
A loud 'humming' is heard instead of the record when attempting phono audition	Either the pin-plugs from the phono cartridge are not firmly plugged into the input sockets, or the braided shielding wire is defective	Plug in firmly, replacing the faulty shielding if necessary
		Check and make good the GND (ground) wire
The VOLUME cannot be raised during record audition without a loud "booming" noise	This is caused by sound from the speakers reaching the phono cartridge stylus	Increase the separation between turntable unit and speakers avoiding locations directly in line with the speakers
Amateur radio transmissions are heard mixed with program material	Amateur transmissions are taking place in the very near neighborhood	Inform your local radio licensing authority Consult with a technical rep. at your local Yamaha retailer.
Bass and treble frequencies are unnatural and exaggerated	The LOUDNESS switch is ON	Switch OFF except at low listening levels
Recording is impossible	The REC OUT OFF switch is at OFF	Set to the appropriate source

* Note: The fuse is not user-accessible: leave replacement to a service rep.