NAD

7140

STEREO RECEIVER

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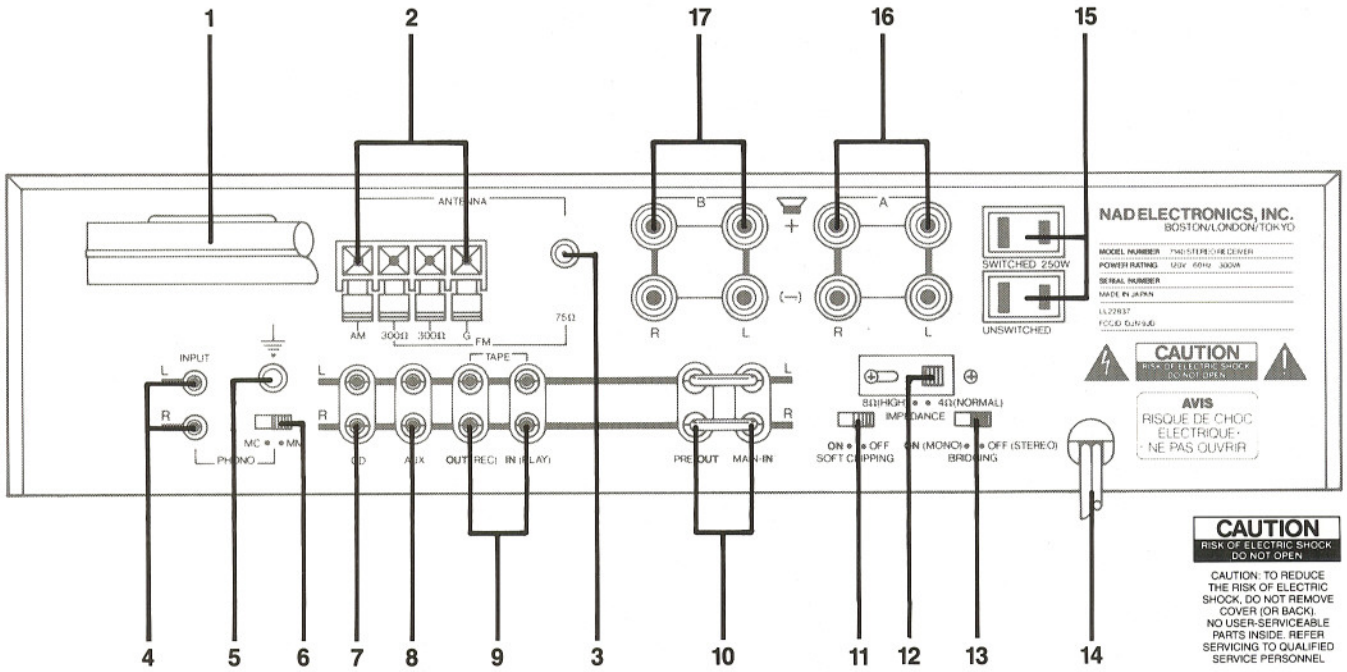

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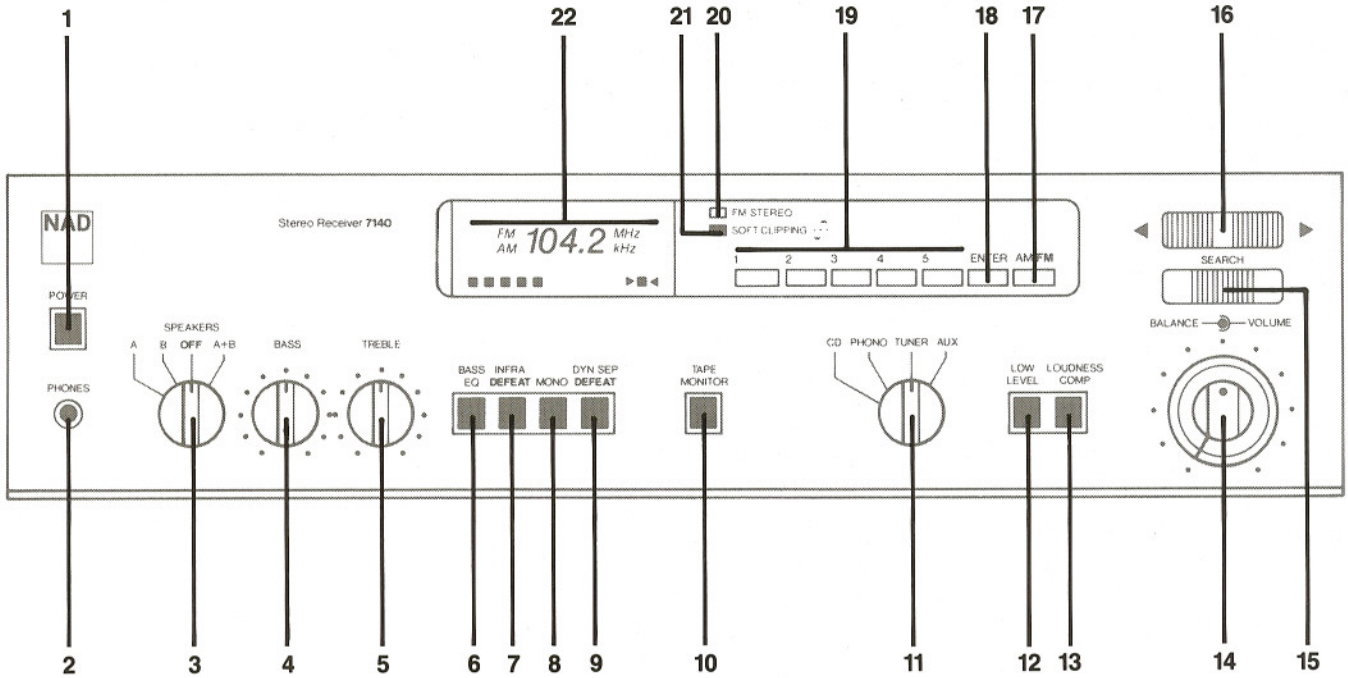


REAR PANEL CONNECTIONS

1. AM ROD ANTENNA. The ferrite rod antenna provides effective reception of local AM radio broadcasts. The rod is mounted on a pivot. For best reception, swing it away from the metal chassis of the receiver.

2. ANTENNA TERMINALS. If you are using an external FM antenna with a coaxial cable, it should be plugged into the 75-ohm coaxial socket (discussed below). Other types of antenna wires, including the twin-lead FM antenna supplied with the receiver, may be attached to the four antenna terminals.

Remove any connector that is fitted on the antenna wire, strip off 1 cm of insulation from each conductor, and in each conductor twist together the exposed wire strands. Lift up the plastic tab below the terminal, insert the bared wire into the small hole in the terminal, and press the tab firmly down. The terminal will grasp the wire and hold it in place.

AM. Since the receiver is equipped with a ferrite rod antenna, no external antenna will be needed for satisfactory reception of most local broadcasting stations. But if you wish to improve reception of distant AM stations, attach a long-wire outdoor antenna to the AM terminal. As its name implies, a "long-wire" antenna is a simple, straight wire whose length may be anything from a few feet up to about 100 feet (30 meters), mounted parallel to the earth and as high as is convenient.

In some cases the effectiveness of a long-wire antenna will be improved by connecting a second wire from the Ground (G) terminal to a true earth-ground, i.e., a copper-plated rod driven several feet into the earth. A substitute electrical ground may also prove effective: a cold-water pipe, a steam radiator, or the third hole of a modern electrical wall socket.

FM. Some form of antenna must be connected to the tuner for effective reception of stereo FM broadcasts. A ribbon-wire "folded dipole" antenna is supplied with the receiver to get you started. When you stretch out the ribbon-wire antenna you will note that it is in the form of a "T". The "crossbar" portion of the T should be stretched out horizontally and tacked in place—on a wall, on the back of a cabinet, or on the floor. The "vertical" section of the T goes to the receiver's 300Ω antenna terminals.

FM ANTENNAS. In view of the exceptional sensitivity of this receiver, you may find that the ribbon-wire dipole antenna is all you need for reception of strong local stations. But it is not very efficient at rejecting "multipath" and other forms of FM interference, and it cannot easily be rotated to optimize its pickup pattern for best reception of stations in different directions. Therefore, in most cases you should use a better antenna. The recommended options, in order of increasing cost, are as follows:

1. A basic "rabbit-ears" indoor TV antenna without auxiliary coils or tuning switches. Electrically, such an antenna is just another dipole (similar to the ribbon-wire antenna) with its tuned elements made of solid metal, but with the advantage that it can be rotated. Stretch out each of its two arms to a length of 30 inches (75 cm), and orient them horizontally or at a shallow angle upward (less than 45 degrees). The ribbon wire emerging from the antenna's base should be connected to the tuner's two 300Ω terminals in place of the ribbon-wire antenna supplied with the tuner. Now, for each station in turn, after you tune the station you can rotate the antenna for best reception.

2. A more elaborate rabbit-ears indoor TV antenna with a tuning switch. This type of antenna does NOT have greater sensitivity than the simpler rabbit-ears unit, so if your problem is that the signals you want to receive are weak (as shown on the signal-strength indicator), then an outdoor antenna is the only effective solution. But in cities and in large buildings where signals are strong but are contaminated by reflected "multipath" signals that interfere with good reception, the tuning switch on an elaborate indoor antenna may improve reception by reducing the interference.

3. An electrically tuned indoor antenna, such as the Technics Wing or B.I.C. Beam Box. Again, such antennas usually do not provide any advantage over the simplest type of "rabbit-ears" unit for receiving weak signals. But where a strong signal is contaminated by interference, the antenna's aiming and tuning controls can reject the interference and yield cleaner reception.

4. An outdoor antenna. Even the finest indoor antenna, no matter how elaborate, cannot fully exploit the capabilities of a good FM tuner. For the lowest noise, minimum distortion, and largest choice of well-received broadcasts, an outdoor antenna is the best complement to a fine tuner.

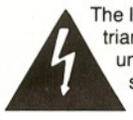
A roof-mounted antenna has three fundamental advantages. First, its large size yields better sensitivity (pulling in a stronger signal from the desired station) and a narrower directional pattern for more effective rejection of multipath reflections arriving from other directions. Second, its location on a roof or tall mast places it above many sources of interference—passing cars and buses, other buildings, etc. Third, the strength of received FM signals is directly proportional to the height of the antenna above the ground.

If you already have an outdoor television antenna, using a splitter to extract FM signals from it may produce excellent results. However, many TV antennas are deliberately designed to be relatively weak at FM frequencies in order to minimize potential interference with TV signals at nearby frequencies (Channel 6 in the U.S.). You may be able to use a splitter to extract FM signals from an apartment building's master TV antenna system, but usually this yields poor results because many master antenna systems have "traps" to stop FM signals.

The best choice is a directional FM-only antenna, mounted as high above ground as is practical, and separated by at least two meters (7 feet) from other antennas, vertically and horizontally. Brand names of good FM antennas in the U.S. include Jerrold, Finco, Wineguard, Antennacraft, and Archer (Radio Shack). A shielded lead-in cable will be desirable in most locations, both to minimize interference and to preserve strong signals during years of weathering. The cable may be either 75-ohm coaxial or a shielded 300-ohm type. If desired stations are located in different directions (more than 90 degrees apart), a rotor will also be needed in order to aim the antenna.

3. 75Ω COAXIAL ANTENNA INPUT. This socket provides a convenient means of connecting a 75-ohm coaxial cable from your antenna or from a community cable system.

If you are using a coaxial antenna cable to which a connector has already been fitted, simply plug it into the 75Ω socket, and disconnect any other wires from the 300Ω antenna terminals. If the cable has no connector, you may attach its center conductor to one of the 300Ω antenna terminals,



The lightning flash with arrowhead, within an equilateral triangle, is intended to alert the user of the presence of uninsulated "dangerous voltage" within the product's enclosure; that may be of sufficient magnitude to constitute a risk of electric shock to persons.

The exclamation point within an equilateral triangle is intended to alert the user of the presence of important operating and maintenance (servicing) instructions in the literature accompanying the appliance.

and connect its cable shield to the Ground (G) terminal. But the better approach is to install a connector on the coaxial cable, and plug it into the 75Ω socket.

The antenna terminals are connected to the FM tuner circuit through an internal "balun" transformer that allows the use of either a "balanced" 300-ohm twin-lead antenna cable (connected to the two 300Ω terminals) or an "unbalanced" 75-ohm coaxial cable (with its center conductor connected to one of the 300Ω terminals and the cable shield connected to the Ground (G) terminal. However, a slight signal loss can occur in such a transformer. The 75Ω coaxial socket is connected directly to the FM tuner circuit, bypassing the transformer, and so this is the preferred input when the best possible input sensitivity is required.

4. PHONO INPUT. Plug the signal cables from your turntable into these jacks. If the cables or plugs are color-coded, refer to your turntable's instruction manual to learn which cable or plug is for the Left channel (upper jack) and which for the Right (lower jack). Be careful to insert each plug fully into the socket so that the plug's metal skirt fits tightly over the exterior of the socket. If necessary, crimp the plug's metal skirt slightly so as to obtain a tight fit with the socket.

5. PHONO GROUND. If your turntable is equipped with a grounding wire (usually a green wire terminating in a U-shaped spade lug), connect it to this terminal. Turn the thumb-nut counter-clockwise, place the spade lug under the nut, and tighten the thumb-nut clockwise to secure the lug. If the grounding wire has no terminal lug, strip off a half-inch (1 to 2 cm) of insulation to expose the bare wire, twist the wire strands tightly together, insert the wire through the small hole in the shaft of the Ground terminal, and tighten the thumb-nut to fasten the wire in place.

If you encounter a persistent low-level hum or buzz in the sound, connect a wire from the Ground terminal to a true earth-ground, i.e., a copper-plated rod driven several feet into the earth. A substitute electrical ground may also prove effective: a cold-water pipe, a steam radiator, or the third hole of a modern electrical wall socket.

6. MM/MC PHONO SELECTOR. This switch sets the input sensitivity and gain of the phono preamplifier circuit. Set it according to the output level of your phono pickup cartridge. Set the switch at MM for cartridges of the moving magnet, induced magnet, moving flux, and moving iron (variable flux) types, and for "high output" moving-coil pickups, i.e., those with a rated output of 1.0 mV or greater. If your cartridge is a low-output moving-coil pickup (with a rated output less than 1.0 mV), set the switch at MC.

Here is another way to determine the correct setting of the MM/MC switch. Begin by setting it to MM. After you have completed the installation and wiring of the receiver, play a record. You should obtain a satisfyingly loud volume level at VOLUME control settings between 9 o'clock and 3 o'clock. If you have to turn up the VOLUME control beyond 3 o'clock to get adequately loud sound, turn the volume back down and re-set the MM/MC switch to MC.

7. CD INPUT. Connect the audio signal cables from a digital Compact Disc player to these jacks. The input signal will be fed to the VOLUME control before reaching any active circuitry, so the amplifier's circuits cannot be overloaded by high-level signals from the digital player.

If you don't have a CD player, any other line-level signal source (such as a spare tape deck) may be connected to the CD input.

8. AUX INPUT. These auxiliary jacks are for any "line level" signal source, such as a spare tape deck, the audio line output from a videocassette or videodisc player, or a television sound tuner. As with all of the other input/output jacks on this amplifier, the upper jack in each pair is for the Left channel and the lower jack is for the Right channel.

9. TAPE REC/PLAY. The tape connections may be used with recorders of all types: cassette, micro-cassette, open-reel, digital, etc. To make recordings, connect a stereo patch cord from the amplifier's TAPE OUT (RECording) jacks to the recorder's LINE INPUT jacks (not to its microphone inputs). To play back tapes, connect a stereo patch cord from the recorder's LINE OUTPUT jacks to the amplifier's TAPE IN (PLAYback) input jacks.

The TAPE REC/PLAY jacks may be used for connecting a signal-processing accessory instead of a tape recorder. Examples of such accessories include a dynamic range processor, a dynamic noise filter, a DBX disc decoder, or any other device whose operation depends on the setting of a signal threshold. Connect a patch cord from the TAPE OUT (REC) jacks to the processor's inputs, and another patch cord from the processor's outputs to the TAPE IN (PLAY) jacks.

Other signal processing accessories, such as a graphic equalizer or the special equalizer supplied with some loudspeakers, may be connected either to the TAPE jacks or at the Preamp Out jacks. The choice is a matter of convenience.

10. PREAMP OUT, MAIN IN. Each channel of the amplifier is composed of two independent sections or stages: the control preamplifier (including the phono preamp and most front-panel controls), and the power amplifier (which provides the power to drive loudspeakers). In normal operation the preamp and power amp are connected together via factory-installed U-shaped metal jumpers that bridge the PRE-OUT and MAIN-IN jacks. Check to be sure that the jumpers are fully inserted into the jacks and that nothing is touching them.

By removing the metal jumpers (after first switching OFF the POWER), you can connect various signal-processing accessories in the path between preamp and power amp: an equalizer, a time-delay ambience reproducer, a stereo image enhancer, an electronic crossover, etc. To use a signal processor, connect a stereo patch cord from the PRE-OUT jacks to the processor's line-level input jacks, and a second patch cord from the processor's output jacks to the amplifier's MAIN-IN jacks.

NOTE: any signal processor whose operation depends on the setting of a threshold, such as a dynamic noise filter, should be connected to the TAPE REC/PLAY jacks—where the signals are unaffected by the amplifier's volume and tone controls—rather than the PREAMP OUT jacks.

If you remove the metal jumpers, save them in case you may want to disconnect the signal processor and return to normal operation at a later time. If the jumpers should be lost, a conventional stereo patch cord can be used to connect PRE-OUT to MAIN-IN in each channel.

This amplifier can be used as the heart of an elaborate audiophile sound system. The preamp output is capable of driving several power amplifiers simultaneously, or of driving the long signal cables required to connect to power amps which are located near the speakers (or to "powered" active loudspeakers with built-in power amplifiers).

11. SOFT CLIPPING. When any amplifier is overdriven beyond its specified power output it normally produces "hard clipping" of the signal with harsh distortion and power-supply buzz as the output transistors saturate. The NAD Soft Clipping circuit gently limits the output waveform and minimizes audible distortion when the amplifier is overdriven. If your listening involves moderate peak power levels, the Soft Clipping may be left OFF. But we recommend that it be switched ON when playing music at very high levels that might exceed the amplifier's power capacity.

12. IMPEDANCE. The impedance of a loudspeaker varies with frequency, and in many loudspeakers the impedance is lowest at the frequencies where the highest power demands occur in music. In the majority of "8 ohm" loudspeakers this

minimum impedance is from 4 to 6 ohms, and in "4 ohm" speakers the minimum is typically 3 ohms. If you connect two sets of speakers to the amplifier, their combined impedance is approximately half the impedance of either. For these reasons, all NAD amplifiers and receivers are designed to produce maximum power output into impedances of 2 to 6 ohms.

If you are not sure of the true impedance of your speakers, or if you are connecting two pairs of speakers, leave the impedance switch in the 4Ω (NORMAL) position.

If you are using a single pair of loudspeakers whose impedance is 8 ohms or higher, you can re-set this switch to 8Ω (HIGH), re-optimising the amplifier for maximum power delivery at this higher impedance. First, switch OFF the POWER. Note that the Impedance switch is held in place by a plastic bracket which is fastened by a screw. Use a small screwdriver to loosen the bracket screw, turning it about a half-turn counter-clockwise, and slide the switch to the left. (The bracket will move with the switch.) Re-tighten the screw to secure the switch to the 8Ω (HIGH) position.

If the Impedance switch is set to 8Ω (HIGH) with speakers whose true impedance is lower than 6 ohms, or with two pairs of speakers connected, the amplifier may overheat and shut down when operated at continuously high output levels. Normally the amplifier will resume normal operation after it cools down. But a severe, sustained overload could cause internal fuses to blow in order to protect the amplifier; in that case you should return the amplifier to your dealer for service.

13. BRIDGING. This switch "bridges" the two power amplifier channels to form a monophonic amplifier with more than double the output power. To convert to bridged operation, the following procedure should be followed.

1. Switch OFF the POWER.

2. Be sure that the IMPEDANCE switch is set to 4Ω (NORMAL). If it is at 8Ω (HIGH), re-set it to 4Ω (NORMAL) and tighten the bracket to prevent the Impedance switch from being moved accidentally.

3. Disconnect the metal jumper or signal cable from the Left-channel Main input to the power amplifier section of the 7140. Leave the Right-channel jumper in place from PRE-OUT to MAIN-IN. In the bridged mode the amplifier is driven only through its Right-channel Main input. (If you need stereophonic reproduction, the Left-channel PREAMP OUT signal can be used to drive a second, separate power amplifier.) When two bridged amplifiers are used for stereo, this 7140 receiver normally becomes the "Right channel" amplifier, and the other amplifier is connected to the "Left channel" speaker. If another NAD amplifier in bridged mode is used for the second stereophonic channel, it too will be driven through its "Right" Main input, even though it is connected to the Left speaker.

4. Disconnect any speaker wires from both the SPEAKERS A and SPEAKERS B terminals. From the speaker which is to be driven by this bridged 7140, connect its "positive" lead to the R+ terminal and its "negative" lead to the L+ terminal (i.e., to the two red terminals in the "A" group. DO NOT connect any wires to the black terminals (R– and L–).

If you want to drive two speakers in parallel, connect the second speaker's leads to the red (R+ and L+) terminals in the "B" group. Do not connect any wires to the black (R– and L–) terminals.

NOTE: In the bridged mode the loudspeaker's impedance is effectively halved as "seen" by the amplifier. An 8-ohm load looks like 4 ohms, a 4-ohm load looks like 2 ohms, and a pair of 4-ohm speakers operated in parallel will look like a 1-ohm load. Driving a pair of such speakers to high levels will cause the amplifier to overheat and shut down, or may cause internal fuses to blow in order to protect the amplifier. For best results the bridging mode should be used with only a single 4-ohm or 8-ohm speaker in each channel.

CAUTION: In the bridged mode the speaker wires must be "floating" with respect to the circuit ground. Do NOT connect the speaker wires to anything which shares a common ground between stereo channels (such as a speaker switch or an adapter for electrostatic headphones), nor to anything which shares a common ground with the amplifier's inputs (such as a switching comparator or a distortion analyzer).

5. After the preceding conditions have been satisfied, re-set the Bridging switch. It is held in place by a plastic bracket and a screw in a slot. Use a small screwdriver to loosen the bracket screw, turning it about a half-turn counter-clockwise; then slide the switch to the left, to ON (MONO). The bracket will move with the switch. Re-tighten the screw to secure the switch in its new position. Finally, turn the amplifier's power on.

6. To return the amplifier to normal stereo operation at a later date, first turn off the power. Loosen the bracket screw, re-set the Bridging switch to OFF (STEREO), and tighten the bracket screw to prevent the switch from being moved accidentally. Restore the connection from PRE-OUT to MAIN-IN in the Left channel, and connect loudspeaker wires to the appropriate terminals as described below under SPEAKERS A and SPEAKERS B.

14. AC LINE CORD. Plug the AC line cord into a "live" wall socket.

15. AC CONVENIENCE OUTLETS. (Not in U.K. model.) The AC power line cords of other stereo components may be plugged into these accessory outlets. The SWITCHED outlet is intended for all-electronic products (e.g., an equalizer or other signal processor), and will be switched on and off by the amplifier's main POWER button. The UNSWITCHED outlet should be used to power products involving mechanical operations (e.g., a turntable or tape deck); such products should be switched on and off with their own power switches. The UNSWITCHED outlet can also be used to power any device containing a clock timer.

16. SPEAKERS A. If the wiring to each loudspeaker will not be longer than about 6 meters (20 feet), then connections should be made using 18-gauge wire such as common lamp cord ("zip" cord), available from hardware and electrical-supply stores in either white, black, or brown insulation. If the wiring to the speakers will be longer than about 6 meters, heavier 16-gauge or 14-gauge wire is preferred. Heavy-duty wiring is especially desirable if you are using speakers of low impedance or two pairs of speakers wired in parallel.

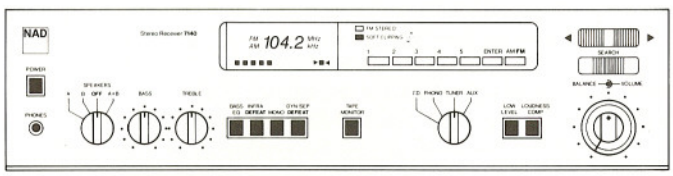
To make connections, separate the two conductors of the cord, strip off about a half-inch (1 cm) of insulation from each, and in each conductor twist together the exposed wire strands. Unscrew the red or black cap on the terminal, in order to open up the small opening in the base of the terminal. Insert the bared wire into the hole in the base, and screw the cap down tight until it grasps the wire and holds it securely in place. Repeat for each conductor, connecting the wires from the left-channel speaker to the (L+) and (L–) terminals and the wires from the right-channel speaker to the (R+) and (R–) terminals in the "A" group. In each channel the "+" terminal has a red cap and the "–" terminal a black cap.

PHASING. Stereo speakers should operate in phase with each other in order to yield a good stereo image and to reinforce rather than cancel each other's output at low frequencies. If your speakers are easily moved, phasing can easily be checked. Make the connections to the speakers, place the speakers face-to-face only a few inches apart, play some music, and listen. Then swap the connection of the two wires at the back of ONE of the speakers, and listen again. The connection which produces the fullest, boomiest bass output is the correct one. Connect the wires securely to the speaker terminals, being careful to avoid leaving loose strands

of wire which might touch the wrong terminal and create a partial short-circuit, and then move the speakers to their intended locations.

If the speakers cannot easily be set face-to-face, then phasing must rely on the "polarity" of the connecting wires. Note that the SPEAKERS terminals on the amplifier are color-coded: in each channel the red terminal has positive "+" polarity and the black terminal is negative "–". The terminals at the rear of the speakers are also marked for polarity, either via red and black connectors or by labels: "+", 1, or 8 ohms for positive, "–", 0, or G for negative. As a general rule the positive (red) terminal on the receiver is to be connected to the positive terminal of the speaker, in each channel.

To facilitate this, the two conductors comprising the speaker wire in each channel are different, either in the color of the wire itself (copper vs. silver) or in the presence of a small ridge or rib pattern on the insulation of one conductor. Use this pattern to establish consistent wiring to both speakers of a stereo pair. Thus if you connect the copper-colored wire (or ribbed insulation) to the red amplifier terminal in the Left channel, do the same in the Right channel. At the other end of the wire, if you connect the copper-colored wire (or the ribbed insulation) to the red or positive terminal on the left-channel speaker, do the same at the right-channel speaker.



FRONT PANEL CONNECTIONS

1. POWER. Depress this button to switch on the receiver and any other equipment plugged into the SWITCHED convenience outlet on the rear panel. The digital frequency display will illuminate when the power is on. To switch the power off, depress the button again and release it.

If you prefer, you may leave the receiver's POWER switch permanently engaged and use an external switch (such as a clock timer) to turn the power on and off.

2. PHONES. Plug stereo headphones in here. The circuit will provide proper drive signals for all conventional stereo headphones regardless of their impedance, with just one exception: electrostatic headphones usually are supplied with an adapter unit which must be connected directly to the speaker terminals on the rear panel.

Before plugging conventional headphones into the PHONES jack, turn down the VOLUME control for safety. And when you are not listening to the headphones it is wise to unplug them from the PHONES jack. Otherwise, when listening to loudspeakers you might turn up the volume to a level that would feed excessively strong signals to the headphones and damage them.

You may freely use headphone extension cables. If you want to use a headphone Y-connector to drive two headsets simultaneously, they should be identical models. Connecting together two headphones which differ widely in impedance usually will produce a substantial loss of volume in the headset having the higher impedance (or in both).

3. SPEAKER SELECTOR. When this switch is set to "A", sound is heard only from the loudspeakers connected to the SPEAKERS A terminals on the rear panel. When the switch is set to "B" the SPEAKERS A terminals are shut off and sound is heard only from the loudspeakers connected to the SPEAKERS B terminals. At the "A+B" setting the amplifier's output power is fed to both pairs of speakers in parallel. At the "OFF" setting both pairs of speakers are silenced.

Thus if you have your main stereo speakers wired to the "A" terminals and a set of extension speakers wired to the "B" terminals, you can choose to hear only the main speakers (A), only the extension speakers (B), or both (A+B).

The amplifier's output signal is present at the PHONES jack at all settings of the SPEAKERS selector switch. When using headphones it normally is advisable to switch OFF the loudspeakers. Then the VOLUME control may freely be used to adjust the loudness level in the headphones with no fear of overdriving the speakers or disturbing neighbors.

If you have connected an adapter unit for electrostatic headphones to the SPEAKERS B terminals, you can use the SPEAKERS selector to switch between your main stereo speakers (A) and the headphones (B).

If you have connected speakers wired for "ambience recovery" to the SPEAKERS B terminals, you can use the SPEAKERS selector to listen to conventional stereo (A), to switch off the main speakers and listen only to the stereo L–minus–R "difference" signal in the rear speakers (B), or to listen to spatially enhanced stereo (A+B). You will find that the stereo difference signal is usually lacking in bass. If the difference signal is very weak, the recording lacks stereo separation.

4. BASS. The Bass control adjusts the relative level of the low frequencies in the sound. The electrical response of the amplifier is flattest when the control is set in the detent at the 12 o'clock position. Rotation of the knob to the right (clockwise) increases the level of low-frequency sounds, and rotation counter-clockwise decreases their level. Adjust it to achieve the tonal balance that sounds most natural to you.

You will note that at moderate rotations away from center, the effect of the Bass control tends to be subtle because its action is confined to the lowest audible frequencies where significant energy is seldom found in recordings. Only at large rotations away from center is there a substantial boost or cut at the mid-bass frequencies that are common in music.

5. TREBLE. The Treble control adjusts the relative level of the high frequencies in the sound. The response of the amplifier is flattest when the control is set in the detent at the 12 o'clock position. Rotation of the knob to the right (clockwise) increases the level of high-frequency sounds, and rotation counter-clockwise decreases their level. Adjust it to achieve the tonal balance that sounds most natural to you.

You will note that boosting the Treble increases the brilliance and clarity of details in the sound, but also makes any noise more prominent. Turning down the Treble makes the sound mellower while suppressing hiss and record surface noise, but too much Treble roll-off will make the sound dull.

6. BASS EQ. This circuit boosts the lowest bass frequencies, those below 60 Hz. In virtually all loudspeakers the useful output rolls off at frequencies below the woofer/cabinet resonance (which typically occurs between 40 and 70 Hz). The BASS EQ circuit compensates for this rolloff, extending the useful response of the speakers significantly lower in frequency.

The BASS EQ circuit includes additional infrasonic filtering that rolls off the amplifier's response below 25 Hz to prevent inappropriate amplification of non-musical signals below the audio range.

Of course very low frequencies are not found in all music, nor in all recordings, so the effect of the bass equalization often won't be obvious. Sometimes you may find that switching it in and out does not produce any noticeable change in the sound whatsoever, simply because the recording contains no energy at very low frequencies. But if your loudspeakers are capable of reproducing low bass, and if you play recordings in which low bass does have an important role, the BASS EQ will make an audible (and occasionally dramatic) difference.

If your loudspeakers already have extended and powerful deep-bass response, the BASS EQ will still be useful to correct for the bass rolloffs engineered into some recordings. It also may be used to provide a subtle form of "loudness" compensation to restore subjectively flat frequency response when you listen to music at low volume levels.

Three CAUTIONs should be observed when using the BASS EQ feature:

1. This circuit is intended for use with loudspeakers having woofers eight inches (20 cm) or larger in diameter, preferably those with "long-throw" voice-coils and acoustic-suspension enclosures. It is not recommended for use with small "mini" speakers having woofers smaller than six inches; in most cases they are not designed to accept high power input at low frequencies and will only distort or suffer damage as a result.

2. Be prepared to switch off the equalization when playing recordings (especially digitally mastered discs) that contain unusually potent recorded bass. The BASS EQ boosts deep bass levels by 6 dB, i.e., by a factor of four in power. If this boost is combined with high-volume playback levels, a bass-heavy input signal may overdrive the amplifier into clipping or overdrive your woofers beyond their safe excursion limits, causing the voice-coils to clatter against the magnet backplates. As long as the speakers sound good they probably are OK; but distorted or unmusical sounds, such as clattering noises, are a sign of distress in a woofer.

3. Be alert for signs of acoustic feedback (in which the low-frequency vibrations from the speakers are picked up by the record-playing stylus and are re-amplified). If you encounter a sustained low-frequency roar, or frequent groove-jumping, immediately turn down the Volume and switch off the BASS EQ until a more nearly vibration-free mounting for the turntable is found.

7. INFRA DEFEAT. When this button is depressed it bypasses the infrasonic filter. When the button is OUT, the filter is active in the amplifier circuit.

The output signal from a record player usually contains strong but inaudible infrasonic impulses (due to disc warps, stylus/tonearm resonance, and vibrations reaching the turntable). If these are amplified at full strength, they will waste amplifier power and produce excessive woofer cone excursions, muddying the sound.

The amplifier contains an infrasonic filter that rolls off steeply below 20 Hz to attenuate these unwanted signals. The filter is normally in-circuit, and it is especially desirable to keep it in-circuit (with the button OUT) when a large low-frequency boost is being applied via the BASS control. The infrasonic filter can be bypassed, when desired, by depressing the INFRA DEFEAT button.

8. MONO. Engaging this button combines the two stereo channels together to produce monophonic sound. This blend minimizes vertical rumble and surface noise when listening to old monophonic records. The button must be OUT for normal stereo listening.

The MONO button also disables the FM stereo circuits in the tuner. Normally the tuner receives monophonic transmissions in mono and automatically switches on the stereo decoding when a stereo FM broadcast is received (as shown by the illuminated FM STEREO indicator). But when a very weak FM stereo signal is received it may be excessively noisy because of the multiplex encoding technique used for stereo broadcasting. In that case, depress the MONO switch to lock the tuner in the mono mode, in order to obtain consistently quieter and cleaner sound.

Remember to disengage the MONO button when you re-tune to a stronger signal. As long as the MONO button is engaged, no broadcasts can be received in stereo.

9. DYN SEP DEFEAT. The tuner contains a "dynamic separation" circuit that reduces the noise in weak FM stereo signals by selectively reducing the high-frequency stereo separation at times when there is little or no actual stereo information in the signal. Wide stereo separation is restored instantly in the tuner whenever significant stereo separation occurs in the broadcast signal.

The dynamic separation circuit affects only those weak stereo FM signals that would be noisy without it. It does not affect the reception of strong signals.

If you wish to turn off the dynamic separation circuit, restoring constantly wide stereo separation with no noise-reduction, press the DYN SEP DEFEAT button. Normally you will hear no audible difference with the switch in or out, because most broadcast signals are strong enough to disengage the circuit automatically.

10. TAPE MONITOR. When this button is pressed it lets you hear the playback signal from your tape recorder (or any other device connected to the TAPE IN (PLAY) jacks on the rear panel). If you have a signal-processing accessory (such as a graphic equalizer or dynamic expander) connected to the TAPE jacks, pressing TAPE MONITOR allows you to hear the processed signal.

The TAPE monitor button affects only what you hear, not what is being recorded. The program source chosen by the INPUT SELECTOR is always fed to the REC jacks for recording or processing, regardless of any other controls.

CAUTION: If you have nothing connected to the TAPE REC/PLAY jacks, or have a tape deck connected but not running, then when you press TAPE MONITOR you will hear nothing but silence—regardless of what other buttons you may press! To disengage the Tape Monitor circuit and restore the normal signal path, press the TAPE MONITOR button again and release it.

The standard purpose of the TAPE MONITOR is to allow you to listen to recorded tapes, and also to check on tape recordings as they are being made. If you have a three-head tape deck that allows off-the-tape monitoring during recording, engaging the TAPE MONITOR switches on both the receiver and the tape deck will let you hear the playback signal from the tape immediately after it is recorded, so that you can check on its quality.

To make tape recordings on a recorder attached to the TAPE REC/PLAY jacks, simply use the INPUT SELECTOR switch to select the program source that you want to record from (CD, PHONO, TUNER, etc.). The recording will not be affected by any control but the INPUT SELECTOR; thus you may vary the volume and tone controls, the TAPE MONITOR switch, etc., without altering the recording that is being made.

Copying Tapes: If you want to copy a recording from one tape deck to another, connect the playback cable from the "source" deck (the machine containing the tape to be copied) to the 7140's AUXiliary inputs, and connect the "copying" or "dubbing" recorder to the 7140's TAPE REC/PLAY jacks. Select AUX on the INPUT SELECTOR to hear the source tape and feed its signal to the copying recorder. If you then press the TAPE MONITOR button, you will hear the signal after it has passed through the copying recorder's electronics.

If you need greater flexibility in connecting and copying among multiple tape decks, purchase an inexpensive switch-

box, and connect it to the TAPE REC/PLAY jacks, and connect the tape decks to the switch-box. (Example: the Radio Shack #42-2105 switch-box contains switches for monitoring and copying among three tape decks.)

11. INPUT SELECTOR. This switch selects the input signal for the receiver. The selected input signal will be heard through the loudspeakers or headphones as long as the TAPE MONITOR button is disengaged. The selected input signal will also be fed out through the TAPE OUT (REC) jacks for tape recording or signal processing.

12. LOW LEVEL. This button reduces the volume of the amplified sound by approximately 20 decibels (but has no effect on the signal fed to the RECord jacks for taping). The LOW LEVEL switch has several practical uses:

• It extends the useful range of the Volume control. With high-output signal sources, with efficient loudspeakers, or with sensitive headphones, you may find that the sound is too loud over most of the range of the Volume control, so that you are restricted to using only settings near the lower end of the control range. In this case, engaging the Low Level switch to reduce the output level will allow you to use the full range of the Volume control for normal listening.

• It provides optimum signal-to-noise ratio for low-level listening in quiet environments. For example, if you are listening to soft music late at night when the surroundings are quiet, the Low Level switch minimizes the already-low residual noise of the preamplifier and tone-control circuits, ensuring noise-free listening.

• It provides a convenient temporary cut in volume, to be used while answering the telephone for instance. When the button is pressed again and released, it restores the volume precisely to the pre-set level.

13. LOUDNESS COMPENSATION. Pressing this button engages a "loudness compensation" circuit which, at low-to-medium settings of the Volume control, boosts the bass response of the amplifier to compensate for the human ear's reduced sensitivity to low-frequency sounds at low loudness levels. It also boosts the high treble slightly, to compensate for "masking" of subtle high-frequency details by environmental noise.

Instead of using the Loudness switch, you may prefer to use the BASS EQ circuit or the Bass control to tailor a loudness compensation that sounds most natural to you.

14. VOLUME/BALANCE. The knurled outer ring of this two-section knob is the Volume control, which adjusts the overall loudness of the sound. The inner portion of the dual knob is the Balance control, which adjusts the relative levels of the left and right channels.

The Volume control has no effect on the level of the signals fed to the tape jacks for recording. The control is designed for accurate tracking of its two channels, so that the stereo balance will not shift noticeably as the Volume control setting is varied.

The Balance control has a detent at the 12 o'clock position which marks the point of equal balance. Rotation of the knob to the right (clockwise) decreases the level of the left channel so that only the right channel is heard, thus shifting the sonic image to the right. Rotation of the knob to the left shifts the sonic image toward the left speaker. The Balance control, like the Volume control, has no effect on recordings being made.

Ideally the detented center position of the Balance control will be the normal setting. But several common circumstances may cause an unequal balance between the channels, requiring a compensatory off-center setting of the Balance control to restore the most uniform spread of stereo sound between the speakers. Examples include unequal output from the two channels of the phono cartridge, different acoustical environments around the two loudspeakers, or simply a listening position that is closer to one speaker than to the other.

Adjust the Balance control to produce a natural spread of sound across the space between the speakers, with any monophonic sound (such as a radio announcer's voice) appearing as a phantom image centered midway between the speakers.

15. SEARCH. When the SEARCH button is engaged, the tuner scans in a station-by-station mode rather than in small frequency increments. When the Up/Down Tuning rocker is tapped, the tuner scans up or down in frequency and automatically stops at the next station whose signal is strong enough for good reception.

If you want to tune to a weak station, or if you want to fine-tune the tuner manually, disengage the SEARCH mode (button OUT), allowing the Up/Down Tuning rocker to tune in small increments.

16. UP/DOWN TUNING. The Up/Down Tuning control is a "rocker" switch that allows you to tune up and down the AM or FM radio spectrum. Depress the right-hand section of the rocker in order to tune to higher frequencies, and the left-hand section to tune to lower frequencies.

When the Tuning rocker is pressed momentarily, the tuned frequency is shifted up or down by one step, unless SEARCH has been engaged. (If SEARCH is engaged, the tuner will scan in a station-by-station mode rather than in fixed tuning steps.)

In North America the size of this tuning step is 10 kHz on the AM band. In Europe and elsewhere the tuning step is 9 kHz on AM. In either case the tuning step for the FM band is 0.05 MHz. Each time the Tuning rocker is tapped, the tuned frequency will shift up or down by this minimum tuning increment, as shown on the digital frequency display.

If the Tuning rocker is held down with continuous pressure rather than just tapped, the tuning pauses briefly and then scans rapidly up or down in frequency.

Thus, to manually tune a station, the procedure is to press continuously on either side of the Tuning rocker until the tuned frequency is close to the desired broadcast frequency, and then fine-tune by tapping the Tuning rocker until the digital frequency display exactly matches the station's broadcast frequency as listed in a local newspaper or broadcasting guide. If you know the exact broadcast frequency, simply set the tuner to that frequency. If you know only the approximate frequency, tune to the vicinity of the station and then observe the signal-strength and center-tuning indicators while fine tuning. (Refer to the TUNING DISPLAY instructions.) For AM broadcasts, fine-tune to obtain maximum signal strength. On FM, fine-tune until the center-tune indicator (between the triangular off-tune indicators) is illuminated.

17. FM/AM. This button switches between the two tuning bands: FM or medium-wave AM. The digital tuning display shows the tuned frequency in MHz (for FM) or kHz (for AM).

The tuning circuit has a "last station selected" memory. When you switch between tuning bands, the circuit automatically re-tunes the last station that you were tuned to when you previously used that band.

18. ENTER. This button is used to enter the frequencies of your favorite stations in the receiver's ten memory pre-sets (five pre-sets on the FM band and five pre-sets on AM). The procedure is as follows.

1. Decide which station you want to assign to each pre-set. On each band you may arrange the stations in any order that you find convenient (or easy to remember): alphabetical (1=WABC, 2=WCBS, 3=WNYC . . .), numerical (1=BBC1, 2=BBC2 . . .), or in order of increasing frequency (1=89.7, 2=90.9, 3=95.3, etc). If you are not certain of the frequencies of the stations, check the station/frequency directory in a local newspaper or broadcasting guide.

2. Select the AM or FM band, as appropriate. Using the Up/Down Tuning rocker (with the SEARCH button OUT), manually tune to the first station on your list. Check the Signal Strength meter (AM) or center-tuning indicator (FM) to be sure that you have tuned to the center of the station's broadcast channel. Press the ENTER button, then press Pre-set #1 to store the first station.

3. Manually tune to the second station on your list. Press the ENTER button and press Pre-set #2 to store the second station.

4. Manually tune to the third station on your list, press ENTER, and press Pre-set #3 to store the station. Continue in this manner with any other stations that you want to store in the remaining pre-sets. Then switch to the other tuning band (FM or AM) and repeat the process for the second set of five pre-sets.

Incidentally, if you make a mistake or change your mind, it is not necessary to re-program all five pre-sets in sequence. You can re-program any pre-set simply by tuning to the desired frequency, pressing ENTER, and pressing the pre-set that you want to re-program.

After you finish programming the pre-sets, you may wish to post your list of stations and associated pre-set numbers near the receiver for reference.

CAUTION: When using the receiver, be careful not to touch the ENTER button by accident. Doing so will activate the ENTER mode, and if you then press any of the pre-set buttons you will unintentionally re-program that pre-set. For example, if you intend to listen to station #5 but accidentally hit ENTER instead and then, discovering your error, proceed to press #5, the frequency that you had previously programmed into Pre-set #5 will be replaced by the currently-tuned frequency. You will then have to manually re-tune to the station you wanted, and re-ENTER it into Pre-set #5.

To avoid this inconvenience, if you accidentally press ENTER, either wait for ten seconds for the ENTER mode to disengage automatically, or immediately press the Up/Down Tuning rocker to change the tuned frequency. This forces the tuner out of the ENTER mode.

19. PRE-SETS. To tune your favorite stations from day to day, just touch the appropriate Pre-set button.

The receiver has a "last station" memory. When the power is switched on, the receiver comes on tuned to the same station that it was tuned to when it was switched off.

The Pre-sets preserve their frequency assignments when the receiver is switched off or unplugged from the AC wall socket, for a period of up to two weeks. Thus you can rearrange your stereo system, or move the receiver from room to room, without losing the pre-set frequencies.

20. FM STEREO INDICATOR. This amber LED illuminates when a stereo FM broadcast is being received and decoded by the receiver's multiplex decoder circuit. If a station is broadcasting in mono, or if a stereo broadcast signal is too weak for reasonably noise-free reception in stereo, then the receiver will automatically switch into mono and this light will not illuminate. Also, if you have mistuned the receiver away from the center of a station's broadcast channel, the stereo decoding circuits may not lock onto the signal and it may be received in mono.

21. SOFT CLIPPING INDICATOR. This green light-emitting diode illuminates when the Soft Clipping switch (on the rear panel) is engaged.

22. TUNING DISPLAY. This display is in three parts: frequency, signal strength, and FM center-tuning.

Frequency. The display shows the tuning band and the frequency to which the receiver is set, for example "FM 103.7$_0$ MHz" or "AM 1290 kHz." The fifth digit of the FM frequency display is reduced in size; it will be either 0 or 5 since the smallest tuning increment is 0.05 MHz.

Signal strength. The signal strength meter is a series of five bars. The number of illuminated bars increases with the strength of the received signal. If only one or two bars illuminate, the signal is too weak for noise-free reception in stereo, but reception may be satisfactory in mono. Strong signals are indicated by four or five illuminated bars. If fewer than four bars are illuminated when you are correctly tuned to a station, then you are not getting all of the noise-quieting in stereo that the receiver is capable of, and a better antenna (or a re-aiming of your present antenna) is desirable in order to pull in a stronger signal.

FM Center Tuning. The center tuning indicator, at the lower-right corner of the display window, is a rectangular bar between two triangular pointer (arrows). When the receiver is slightly mistuned, one of the triangular pointers glows to show the direction in which the tuning should be changed; i.e., if the arrow points to the right, the right-hand portion of the Up/Down Tuning rocker should be tapped to increase the tuning frequency slightly. When an FM station is correctly tuned, the triangular pointers will vanish and the center-tune bar will glow.

A Note on Overload Protection. This amplifier sounds so clean and musical when driven beyond its nominal power rating, and when used to drive low-impedance loudspeakers, that you may be tempted to stress it beyond its design capacity. For example, this receiver can safely and cleanly drive speaker impedances as low as 2 ohms with wide-range musical signals whose peak level is 60 watts or more. Thus it is permissible to play music at volume levels which cause the transient peaks and climaxes to exceed the receiver's rated power by a considerable margin (and if you use Soft Clipping the music will continue to sound good at those high peak levels).

But if you overdrive the receiver *continuously* rather than only on brief musical peaks, the output transistors may overheat. This is particularly likely if you set the IMPEDANCE switch to 8Ω (HIGH) and then try to drive very low impedances at high volume levels. There are thermal circuit breakers in the receiver which are activated if the output transistors become dangerously hot, and when this occurs in either channel the amplifier will automatically shut down to protect itself. Severe and sustained abuse of this type could also cause internal fuses to blow in order to protect the amplifier.

If both channels of sound go silent while the digital frequency display remains illuminated (indicating that the power-supply fuses are intact), the thermal circuit breaker may have been activated. To resume operation, simply turn off the amplifier and wait a minute or two for the output stage to cool; the circuit breaker will re-set automatically.

If the protective circuit breaker interrupts the sound often, you should examine whether a pattern of unintended abuse may be contributing to the failure. For example, you may have a loose strand of speaker wire causing a partial short-circuit either at the speakers or at the receiver's speaker terminals. The impedance of your speakers may be lower than you think; if you are not sure, set the IMPEDANCE switch to 4Ω (NORMAL). You may be combining maximum bass boost with high volume settings. Or you may simply be playing the music at continuously high power levels that demand a larger amplifier with high-power transistors and bigger heat-sinks. A very slight reduction in volume level may be all that you need to restore reliable operation of the receiver.

NAD ELECTRONICS

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