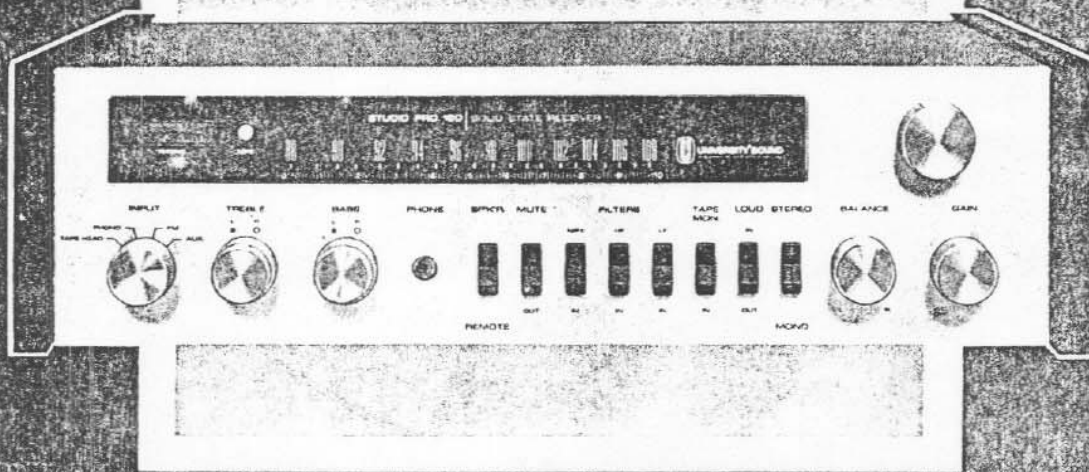


STUDIO PRO 120

SOLID STATE
FM/STEREO
RECEIVER

THE *Certified* RECEIVER

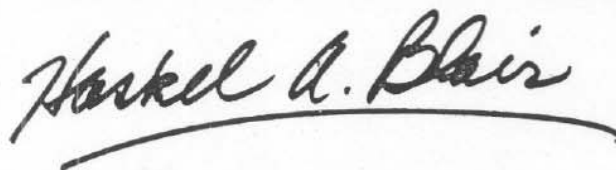


CONGRATULATIONS!

The Studio Pro 120 Receiver which you have purchased is the result of years of research and development on the part of University engineers. University Sound, for many years involved in the development and manufacture of electronics and amplifiers for military applications, ranging in power from a small one-Watt, one-transistor unit to giant 1800 Watt powerhouses, delayed the introduction of consumer electronics until developmental work was completed which would assure University's stepping into a position of leadership in the field. Not content with the techniques and circuitry currently in use, University embarked on a rigorous developmental program culminating in your Studio Pro 120 Receiver. This all-new unit combines engineering features in a compact package advanced far beyond current competitive models. Your Studio Pro 120 will maintain its position as the outstanding unit in its field for many years to come. Using the first integrated circuits truly designed for high fidelity applications, a MOSFET transistor front end, a new type of Power Module plastic output transistor, specially devised and fool-proof Power Programmer protective circuitry for the output stages, automatic FM stereo switching, and a host of other new features, your Studio Pro 120 truly represents the state-of-the-art in receiver building.

The culmination of years of research and development, your Studio Pro 120 Receiver is, however, merely embarking on a lifetime of reliable service to provide you and your family with years of virtually unlimited musical enjoyment and pleasure.

AN IMPORTANT SUGGESTION. Many weeks of work on the part of our engineers and technical writers have gone into making this instruction manual as complete and informative as possible. Thoroughly reading it will help you to get the best use out of your unit. Realizing that you are eager to put your new receiver into operation, we have begun this manual with an instruction and hookup section. We suggest that, with your equipment before you, you read this section carefully as you hook up your unit. It will be time well and profitably spent. We wish you many hours of happy listening!

A handwritten signature in black ink that reads "Haskel A. Blair". The signature is written in a cursive style and is underlined with a single horizontal stroke.

HASKEL A. BLAIR, PRESIDENT
UNIVERSITY SOUND

UNIVERSITY SOUND STUDIO PRO 120 INSTRUCTION MANUAL

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CONNECTION GUIDE

Realizing that you are eager to hear your new Studio Pro 120 in operation, we have prepared this opening section to allow you to start utilizing your equipment as soon as possible. We do suggest that you spend the few minutes necessary to read this opening section of this manual quite thoroughly. A few extra minutes spent now in installing your receiver correctly will avoid any needless disappointment later on and will assure you of years of trouble-free listening pleasure. To simplify the hook-up, we have provided a Rear Panel Diagram (Figure 1) which shows all the connections necessary to get your system in operation in the least possible time. After completing the installation as outlined in this section, you may proceed directly to the **Operating Guide**. We do recommend, however, that you read the entire manual at your earliest convenience to ensure that you derive the maximum possible performance flexibility and enjoyment from your receiver.

UNPACKING: After unpacking your receiver, examine it carefully for indications of damage caused by shipping. If, for example, the cabinet has been dented or parts broken, file a claim immediately with your carrier or dealer. Save the damaged packing carton as evidence to support your claim.

1. POWER REQUIREMENTS. Before you do anything else, make certain that the electrical power in your home is 60 Hz (cps) 110-120 Volts AC. If you are not sure about the type of power in your home, consult your local utilities company or dealer. **Do not connect your receiver power cord to an electrical outlet or turn on your receiver yet.**

2. LOCATION. Place your receiver on any conveniently located shelf or table. The shelf should be deep enough to permit at least two inches of space behind your receiver chassis for ventilation and ease of cable connections. Never place your receiver near radiators, heating ducts, or other sources of heat. Although your Studio Pro 120 is quite cool in its own operation, excessive external heat can shorten the life span of a number of its components.

For enhanced decorative appearance, if it is not custom mounted, your receiver may be equipped with walnut end panels. These panels are available, optionally, from your dealer. For information concerning installing your receiver in your own custom cabinet or console, or in the walnut end panels, refer to the **Custom Installation** section of this manual. Do not attempt such installations without first reading that section completely.

3. ANTENNA. Remove the FM dipole antenna from the accessories envelope and unfold it. Connect the spade lugs on its lead-in to the **local** terminals on the **FM antenna strip** on the rear of the chassis if you are in a strong signal area or to the **distort** terminals if you are at an average distance from the main stations in your area. Stretch the arms of the antenna horizontally and fasten them to a wall or to the rear surface of

your cabinet or shelf or to any convenient non-metallic surface. For more detailed information on antennas, refer to the **Antenna** section of this manual.

NOTE: Always turn the **gain control** all the way down or turn the **AC** completely off when connecting or disconnecting any cables from your Studio Pro 120. Failure to do this may result in possible overload or damage to your speakers. Under extremely adverse conditions, the power protective circuitry will come into play and cut off all power to the output stages of your receiver. This will protect your receiver from damage, but it might be too late to avoid overloading your speakers.

4. SPEAKERS. If you are using two speakers for conventional stereo reproduction, place them along a wall or on shelves facing your proposed listening position. At first, place them five to ten feet apart. (This is just a preliminary location; you may want to move the speakers closer together or further apart later on as you become familiar with the stereo effect in your home.)

If your speakers are less than 50 feet from your receiver, ordinary 18 gauge 2-conductor lamp cord (SPT or "Zip" cord) is recommended. If it is necessary to run your speaker leads under a rug, ordinary flat antenna twin lead is suitable. If your speaker line run is more than 50 feet, 16 gauge or heavier wire will be needed to avoid power losses. (The smaller the number, the heavier the wire.) Cut the cables to the approximate desired lengths, leaving enough slack to enable you to move the speakers later on, for cleaning behind them, etc. Do not be afraid to use 5 or 10 feet more cable than you require. When you get your speakers set into final position, you can always cut off the excess cable. Strip about one-half inch of insulation from the ends of each of the conductors of the cables for connection purposes.

In order to make sure that your speaker phasing is correct, use either a color coded cable (one with one red and one silver lead), a cable with a marker thread, or some other method of determining polarity. SPT lamp cord usually has a thin ridge molded into one of the conductors of the cord. This will help to obtain the proper speaker phasing.

One of the terminals on your left main speaker may be coded COM, GND, C, G, or color coded with a black dot. Connect this terminal to the common (-) terminal of your receiver's **left main speaker** terminals as shown in Figure 1. The other terminal on the speaker may be marked with the speaker's rated impedance (4, 8, or 16 ohms), a +, or a red dot. Connect this terminal to the positive (+) terminal of the **left main speaker** terminals. Connect the right main speaker to your receiver's **right main speaker** terminals in the same manner. Compare both speaker connections with the illustration. It is essential that they be connected this way for proper phasing to avoid cancelling of the bass tones. For further details on connecting additional speakers to your receiver, refer to the **Speakers** section of this manual.

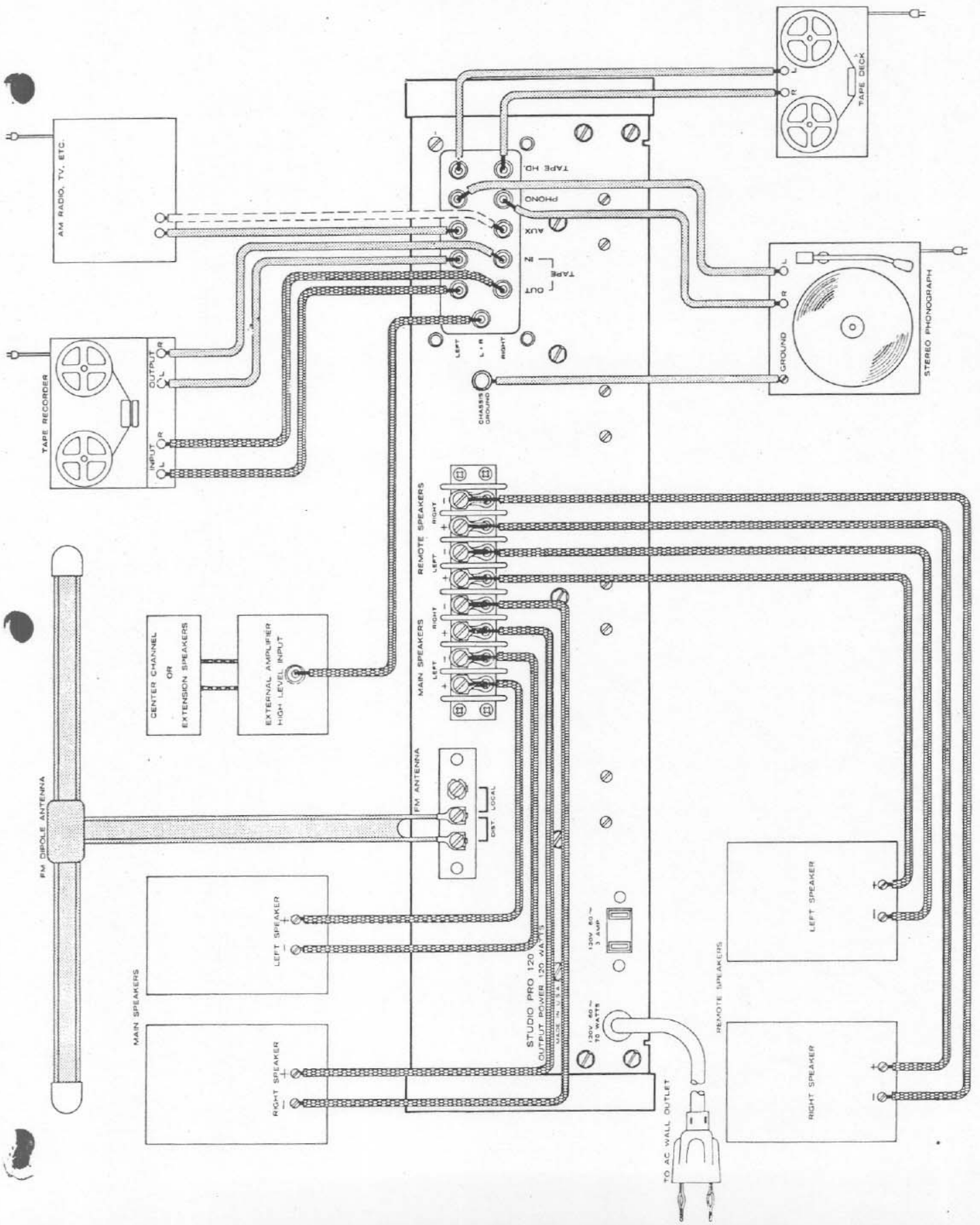


FIG. 1- REAR PANEL DIAGRAM

CONNECTION GUIDE (CONT.)

5. RECORD PLAYER. To connect a record changer or turntable to your Studio Pro 120, install it within 10 feet of your receiver to avoid high frequency cable capacitance losses, using Figure 1 as a guide to the proper connections. However, do not install it so close to your receiver that the cartridge is within 8 inches of the power transformer of your unit, to avoid induced hum pickup with some of the more lightly shielded cartridges. If your record player has a separate ground wire, connect it to the **chassis ground** binding post on the rear of your receiver. Consult your stereo record player's instruction manual to determine which of the player's shielded cables is for the left channel and which is for the right channel. Connect the cables to the appropriate stereo **phono** input jacks on your receiver as shown. Connect a mono-only changer cable to the left channel **phono** input. Connect your record player's power cord to a

standard wall outlet or to the switched 120 V. output on the rear panel of your receiver. When your record player is plugged into the 120 V. switched electrical outlet on the rear of the Studio Pro 120, make sure that you turn your record player off before turning off your receiver. If this is not done, there is the possibility that the receiver might be turned off while the record playing mechanism is still engaged. This could possibly lead to flat spots on the rubber idler wheel of your record player, eventually causing annoying rumble and thumps in the reproduction. The same precaution holds true for a tape recorder.

6. FINAL CHECK. Recheck all connections made to your receiver. Plug your receiver's power cord into a standard electrical wall outlet and proceed to the next section—**Operating Guide**.

OPERATING GUIDE

This section describes your receiver's controls and contains complete information on how to use them. Please note that the controls are illustrated in Figure 2 and are listed in the order in which you would normally operate them. Use the first four items as a handy step-by-step guide for the basic operations such as turning on your receiver, selecting the desired program source, etc. Once you have become familiar with these operations, you can experiment with the remaining controls and adjust them to suit your personal taste and listening conditions. You will find in a very short time that you will have mastered the complete operation of your receiver, greatly increasing your listening pleasure.

1. GAIN CONTROL/AC POWER SWITCH. To turn the receiver on, turn the **gain/ac off** control clockwise until it clicks. The tuning dial and tuning meter will light to indicate that power has been applied to the set. After you have selected the program source, mode, and speakers of your choice (Items 2 through 4), turn the volume control further clockwise to adjust the loudness level of your speakers. To turn the receiver off, turn this control completely counter-clockwise (to **ac off** until it clicks. The lights in the tuning dial and tuning meter will go out when the receiver is off.

2. INPUT SELECTOR SWITCH. Select the desired program source with the **input** switch. Whatever source you choose to listen to is also the source that is available for tape recordings at the **tape out** jacks and the **L + R** center channel jack on the rear of your receiver. Please refer to the **Additional Components** section of this manual for further details about making tape recordings from your receiver.

TAPE HEAD. Use this position to play pre-recorded tapes on a tape transport containing no preamplifier or other electronics. The tape head output of your transport should be connected to your receiver's **tape head** jacks on the rear of the chassis. This position automatically provides correct NAB equalization (tonal

correction or frequency compensation) for tapes played at 7½ ips (inches per second). However, you may also play 3¾ ips tapes and adjust the bass and treble controls (Item 6 of this section) for the most pleasing sound. Please read the **Additional Components** section before connecting a tape transport.

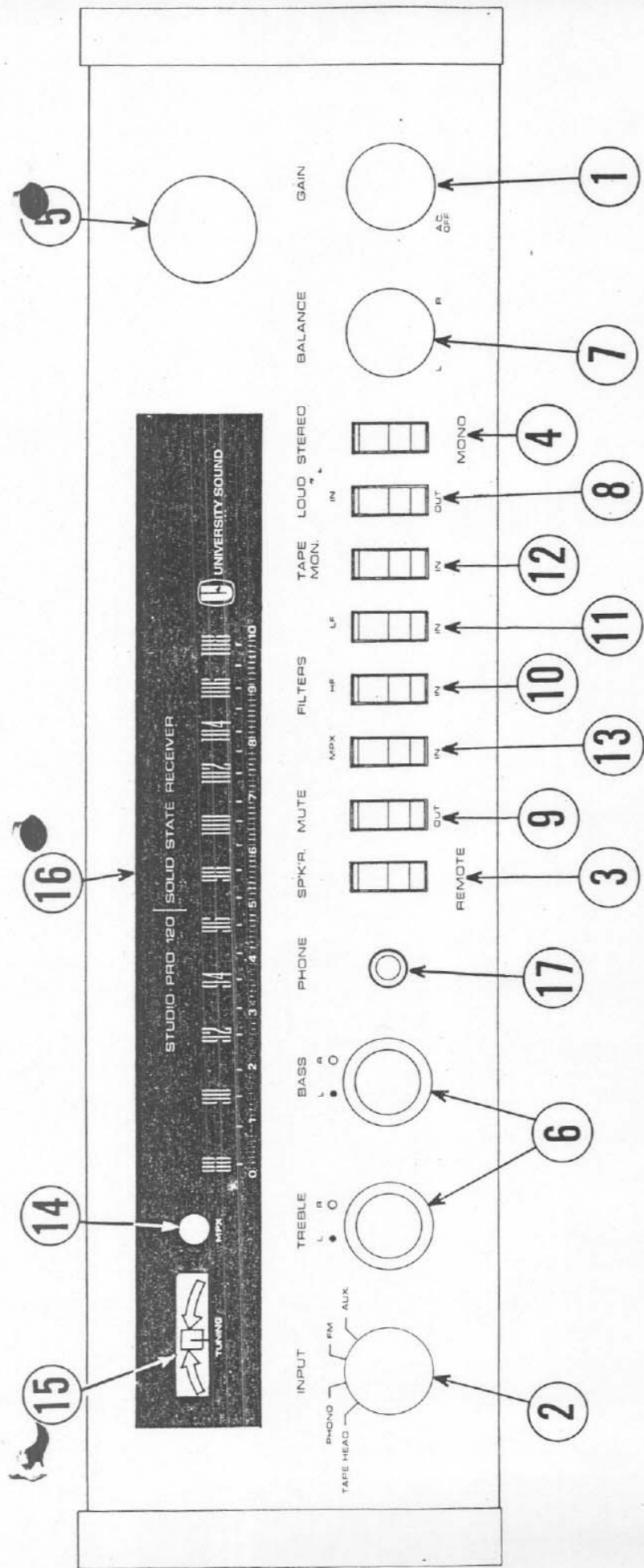
PHONO. This position plays phonograph records on a record player or record changer connected to your receiver's **phono** jacks on the back of the chassis. It automatically provides the standard RIAA equalization for modern stereo and mono recordings.

FM. This position connects the sensitive tuner section of your receiver to the amplifier section and plays it through your speakers. Your receiver will automatically switch from FM mono to FM stereo when a stereo signal is being received by the tuner. Extremely weak stereo broadcasts, from stations very far away and normally too noisy and too erratic for enjoyable stereo listening, are automatically switched to monophonic reception for less noise.

AUX. This position selects any auxiliary program source connected to the **AUX** jacks on the rear of the chassis. Please refer to the **Additional Components** section of this manual before connecting any such sources.

NOTE: You may have noticed that there are no provisions on the **input** switch for selecting a conventional tape recorder, tape deck, or tape player using playback electronics. Instead, we have incorporated this feature into the **tape mon** switch. See Item 12 below.

3. SPEAKER SWITCH. To hear the selected program as chosen by the **input** knob through your main speakers (connected to the **main speaker** terminals on the rear of your Studio Pro 120) set this rocker switch to **sp'k'r**. To hear the same material through remote-extension speakers (connected to the **remote speaker** terminals on the rear of your unit) set the rocker switch to **remote**. If there are no extension speakers presently



1. GAIN/AC OFF. Power on/off and loudness (gain) of both channels. Automatically boosts bass at low levels (if LOUD switch, No. 8 below, is thrown "in").
2. INPUT. Selects left and right channel inputs simultaneously.
3. SPK'R/REMOTE. Selects which set of speakers will provide sound. When only main speakers are hooked up, provides a means of cutting off the sound of the speakers for headphone listening.
4. STEREO/MONO. Controls whether a true stereophonic signal is being played over both speakers or a mono signal, the input from Channel 1 (Left Channel).
5. TUNING KNOB.
6. BASS AND TREBLE. Adjust the high and low tones of each speaker individually or simultaneously.
7. BAL. Controls left to right stereo balance.

8. LOUD IN/OUT. Normally "in". If "out", bass boost at low gain settings will be disconnected.
9. MUTE. Kills inter-station static when thrown "in".
10. HF FILTER. Rolls off high frequencies to eliminate tape hiss and record scratch when thrown "in".
11. LF FILTER. Rolls off low frequencies to eliminate turntable rumble when thrown "in".
12. TAPE MON. Plays output of tape recorder with playback electronics when thrown "in".
13. MPX FILTER. Eliminates store-casting interference when thrown "in".
14. MPX LIGHT. Lights when stereo FM broadcasts are being received.
15. TUNING METER. Tune for zero (center) indication.
16. DIAL SCALE. Channel frequencies and logging scale of FM stations.
17. STEREO HEADPHONE OUTPUT.

FIG. 2 - CONTROL LOCATIONS AND FUNCTIONS

OPERATING GUIDE (CONT.)

connected to your receiver, you may use the remote position as a convenient means of shutting off your main speakers when listening through stereo headphones or when you simply want to silence the system momentarily without shutting off your receiver or changing its volume control setting, for example when answering a telephone call. For further information on using remote speakers and headphones with your unit, refer to the **Additional Components** section of this manual.

4. STEREO/MONO SWITCH. This rocker switch controls the choice of a stereophonic or monophonic signal being fed to your speakers. If it is placed in the **stereo** position true stereophonic signals will be fed to your two speakers, provided you have a stereophonic source being fed through the unit. In the **mono** position, the left channel input of the selected program or a blended FM broadcast is fed equally to both amplifier channels.

5. TUNING. Turn the tuning control knob (the large knob to the right of the dial glass) until the dial pointer indicates the frequency of the station of your choice. The large scale, numbered from 88 to 108, is calibrated in the actual broadcasting frequencies of the FCC authorized FM stations in the 88 to 108 MHz FM broadcast band, while the small (logging) scale shows numbers ranging from 1 through 100 for tuning convenience. Use whichever scale is more convenient for you, but always tune for the center of the dial position on the sensitive d'Arsonval movement **tuning meter** at the left of the dial glass. This coincides with the optimum reception point called "center of channel" for that station. This is the only point at which you will obtain clear, undistorted reception and, in the case of FM stereo broadcasts, maximum audible stereo separation. When the tuning needle is centered in the small rectangle in the center of the **tuning meter** faceplate, you will know that your Studio Pro 120 is right on channel.

Remember that your receiver will automatically switch from mono to stereo when a stereo signal is being received. This will be indicated by the red **MPX** light lighting up between the tuning meter and the dial scale. However, remember that the **MPX** light will light up and you will hear stereophonic music only when the **stereo/mono** rocker switch is set in **stereo** position. The **MPX** lamp should remain lighted as long as the station that you are listening to keeps broadcasting in stereo. If, however, you're listening to a low power distant station, the lamp may start to blink on and off indicating that the receiver is picking up signals that are too weak to properly operate the sensitive multiplexing section of the receiver properly. If such is the case, push the **stereo/mono** rocker switch to the **mono** position. The blinking will stop and you can listen to the broadcast monophonically, but with considerably less noise.

6. BASS AND TREBLE CONTROLS. These controls will affect the tonal quality of the music to which you

are listening. Normally, these controls should be set in the center position of their rotation. These positions provide electrically flat frequency response, with less than ½ dB variation from straight line frequency response. Under normal conditions—especially with modern stereo recordings and FM multiplex broadcasts—these settings should reproduce sound that is as close as possible to the original live performance. Sometimes, the tonal quality may be altered at the recording or broadcasting studio or in the home by the response characteristics of different speakers, headphones, and listening rooms. In such cases, adjust the tone controls for the sound that seems most natural and pleasing to you. Remember that the controls for bass and treble have been designed into the receiver for your own personal enjoyment and use. The truly "correct" setting of these controls is the position that produces the most pleasing sound to your ears.

The concentric **bass** controls adjust the relative prominence of the bass (low) notes in relation to the rest of the musical spectrum. To emphasize the bass of both channels simultaneously, turn the friction clutched concentric **bass** controls clockwise to the right. To de-emphasize the bass range, turn the controls counter-clockwise, to the left.

Similarly, the **treble** controls in turn adjust the relative prominence of the treble (high) notes in relation to the rest of the musical spectrum. To emphasize the treble of both channels simultaneously, turn the friction clutched concentric **treble** controls clockwise to the right. To de-emphasize the treble range, turn the controls counter-clockwise to the left.

NOTE: Each of these controls has two parts; the inner knob controls the right channel and the outer knob controls the left channel. Normally, both parts of each control turn as one unit as they are friction clutched together. However, if you want to adjust the tonal quality for each channel separately (as you might, for instance, if you are using a different type of speaker in each channel or if one speaker is located in a corner and the other is located in the center of a wall, giving greater bass emphasis to the speaker in the corner), hold one section of the appropriate knob while turning the other until you achieve the effect that you want.

7. BALANCE CONTROL. Adjust the **balance** control so that the volume levels from both speakers sound about equally loud from your listening position. Ideally, this should occur with the control set to its center position. However, differences in room layout, imbalances in the program source, the speakers, or your listening position may make it necessary to turn the control either clockwise (to increase the sound level on the right channel and decrease the sound level on the left) or counter-clockwise (to increase the left channel sound level and decrease the sound level on the right). At the extreme settings for this control, only one speaker or the other will be heard. Be sure to adjust the **balance** control from your listening position or have some-

OPERATING GUIDE (CONT.)

one else do it while you judge the results from your listening position to obtain best results.

8. LOUDNESS SWITCH. The **loud** switch is meant primarily for use at low volume levels where the human ear does not respond to the extremely low bass tones as well as it does at normal high levels (the Fletcher-Munson effect). This will result in a somewhat thin sound quality. Pushing in the top half of the **loud** rocker switch automatically emphasizes the bass by a pre-determined amount at low volumes, thus restoring apparent normal balance. This emphasis varies proportionally with the setting of the gain control, with more emphasis being applied as the **gain** control is turned down and less emphasis being supplied as the **gain** control is turned up.

9. MUTE SWITCH. Keep this switch "on" to eliminate the hiss and static that would normally be heard between FM stations when tuning. The "on" position is determined by pushing in the top portion of the switch. Extremely weak stations are also muted when this switch is activated. However, these broadcasts are difficult to tune in, almost impossible to listen to in stereo, and do not provide the static-free reception that is possible only with stronger signals, so there is no great loss. On some of the stronger distant stations, a slight improvement in quality may be noted if the **mute** switch is turned off after the station is tuned in.

10. HIGH FILTER. The **HF** filter reduces annoying high frequency noise (such as scratch and hiss) on records, tapes, FM broadcasts, and other program sources, without appreciably reducing the crispness of the treble range. It may also be used to reduce noise on FM stereo broadcasts from weaker stations. Depressing the lower (in) half of the **HF** switch brings this filter into operation.

11. LOW FILTER. The **LF** filter reduces annoying low frequency noise such as turntable rumble. Generally, this low frequency rumble is caused by poorly designed record changers or by turntables in need of adjustment. Some phonograph records have rumble recorded right into the grooves due to the condition known as mold grain. Depressing the lower (in) half of the **LF** switch will greatly reduce these low frequency noises.

12. TAPE MONITOR. To listen to the playback of a pre-recorded tape from a tape recorder or tape deck with built-in preamplifiers that has been connected as described in the **Additional Components** section of this manual, simply depress the lower (in) half of the **tape mon** switch. In this position it automatically bypasses the **input** switch and permits you to listen to tape only. When you are finished with the tape, immediately return the switch to the "out" position, depressing the upper half of the rocker switch. Otherwise, you will be unable to hear any other program material. If your tape recorder incorporates a separate

playback head (with playback electronics), it is possible to listen to a recording that you're making a fraction of a second after it is made, as a quality check. Let us assume that a recording is being made off the air from an FM program or from a record. The **input** switch will either be in the **FM** or **phono** position. With the **tape mon** switch in the "in" position, the system will now be playing the tape recording of the broadcast just after it has been recorded. By moving the **tape mon** switch back and forth, it is possible to hear whether the recording is equivalent to the actual broadcast. Remember, this is only possible with recorders that are equipped with separate record and playback heads and playback electronics.

13. MULTIPLEX FILTER. Many stereo FM stations have been authorized by the FCC to broadcast background music to stores and businesses on a subcarrier of their main frequency. Occasionally, due to improperly adjusted equipment at the FM transmitter, local reception conditions, etc., this 67 kHz store-casting sub-channel may beat against the main frequency spectrum in a process known as heterodyning. This may give rise to high frequency distortion or strange whistlings and beeping at extreme high frequencies, all at a very low level. If environmental and reception conditions are such in your area that such a store-casting sub-carrier is affecting your stereophonic FM reception in this way, simply depress the lower half of the **MPX** filter. Turning on this switch inserts a special filter network into the multiplex section of your receiver, completely eliminating the store-casting sub-carrier and eliminating any possible store-casting interference.

The **MPX** filter does have the effect of slightly reducing the stereo separation at the very high frequencies, so the **MPX** filter is normally left in the "out" position, with the upper half of the rocker switch depressed, unless needed. However, you can leave this filter in at all times with no fear of audibly degrading the performance of your Studio Pro 120.

14. MULTIPLEX LIGHT. The red **MPX** light between the tuning meter and the dial scale normally will light up only when a stereo signal is being broadcast by an FM station.

If the **MPX** light starts blinking while tuned to an FM station, with the **tuning** needle in the center of the small rectangle, this means that the signal that you are receiving is too weak to fully operate the sensitive multiplexing circuitry in your Studio Pro 120 and that you should depress the **mono** portion of your **stereo/mono** rocker switch, as explained in Section 5, **Tuning**.

NOTE: The rocker switches have been designed so that the normal operating position of all switches is with the top half depressed. This provides a means of making a quick visual check of all these controls by observing if these switches present a uniform appearance.

SPEAKERS

Your Studio Pro 120 receiver is rated at a maximum usable output of 120 watts, IHF standard, at 4 ohms. At 8 ohms, this figure is somewhat less. Because of the efficiency factors of modern speakers, the characteristics of recorded music, and the listening levels normally encountered in the home, any speaker with a 20 watt power handling capacity or greater and an impedance of 4 to 16 ohms is acceptable for use with your Studio Pro 120. Naturally, with speakers of low power handling capacity, it is recommended that no attempt be made to drive the speakers with the full output of your receiver. Such an attempt could quite possibly permanently damage your speakers.

University Sound speakers and speaker systems are carefully designed and engineered to be compatible with today's modern transistorized equipment such as your Studio Pro 120. You may safely use any University speaker or speaker system with your Studio Pro 120 without the slightest fear of a mismatch between your speakers and your receiver and with the guarantee of achieving the highest possible audible performance that your high fidelity system is capable of delivering.

ADDING ADDITIONAL SPEAKERS: Under no circumstances should an impedance of less than 4 ohms be connected to the speaker terminals of your Studio Pro 120. An impedance of less than 4 ohms will cause the circuit breakers leading to the output stages to open

intermittently, leading to possible permanent damage to your receiver.

Combinations of 4, 8, and 16 ohm speakers can be connected as shown in the speaker connection diagrams of Figure 3. Any other combinations than those shown are not recommended.

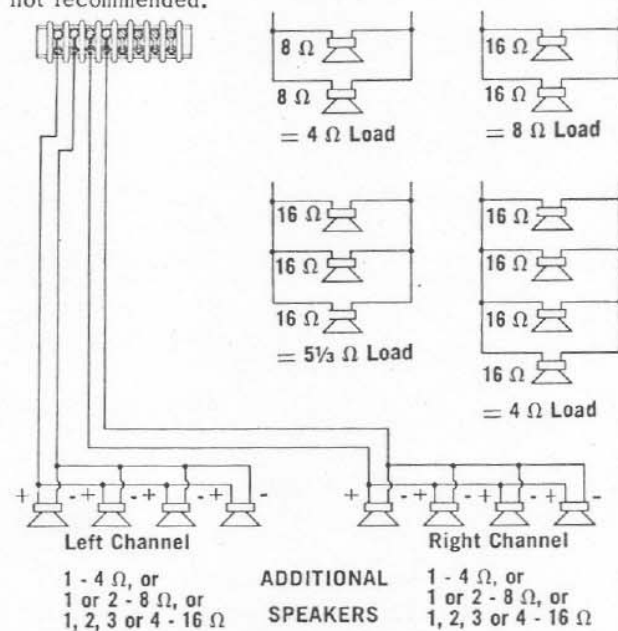


Figure 3: Multi-Speaker Hookups

ANTENNAS

Good FM stereo reception depends not only on your receiver's ability, but also on the quality and strength of the signal that is being fed into it. Optimum performance is assured only when your antenna system is adequate for the signal conditions in your area.

An FM dipole antenna is supplied with your Studio Pro 120 receiver. The two short arms of the T-shaped antenna should be mounted horizontally at the back of your cabinet or shelf, away from any electrical power wiring and large metallic objects. The connecting spade lugs on the long leg of the T should be attached to the correct FM antenna terminals on the rear of the chassis. The dipole should be fully opened and positioned to give the clearest audible signal. If you are located in a city, the dipole antenna should be connected to the right and center terminals of the antenna strip, marked **local**. If you are in a fringe area, connecting the antenna to the left and center terminals, marked **distant**, will significantly improve the reception.

The dipole may have to be shifted slightly when trying to receive stations at different directions from the listener. A compromise position can usually be found that will work best for most of the stations desired. Generally, the higher the dipole can be placed, the stronger the signal strength will be. If you wish to place the dipole further away than its present lead length permits, your dealer can supply additional lengths of 300 ohm antenna twin

lead wire to connect the dipole and the antenna terminals. When tacking down the antenna or lead-in, be careful that the tacks do not cut through the conductors in the edge of the antenna wire, and also that the tack head or staple does not cause a short from one conductor to the other.

Because the signal is normally stronger near an outside window, it is sometimes advisable to position the antenna near such a window, extending the length of the lead-in by means of 300 ohm twin lead antenna wire. The dipole packed with your University receiver will prove to be fully effective under most normal reception conditions. In strong signal areas, such as near an FM station and in a city where distortion may be caused by signal reflection from other buildings, towers, or hills, it is advisable to use an adjustable directional indoor antenna. (Such signal reflection is termed multipath distortion and is similar to the ghosts which sometimes mar television reception.) Special rabbit ear or telescoping dipole antennas are usually available in areas where such reception problems occur. As is the case when such an antenna is used with a TV set, the multipath ghosts and distortion can usually be audibly eliminated by careful orientation of the antenna and adjustment of the length of the 2 dipole arms.

If you already have an outdoor VHF television antenna, (Channels 2-13), it may also be suitable for FM reception. Connect it temporarily to the appropriate terminals of your receiver. If the results are satisfactory, obtain a 2-

ANTENNAS (CONT.)

set antenna coupler from your dealer or a TV parts supply house so that both your receiver and the television set can be operated from the same antenna with no impedance matching problems.

In weak signal fringe areas, an outdoor antenna is almost a necessity, especially for the optimum reception of stereo broadcasts. Although an omnidirectional antenna may be satisfactory, directional antenna arrays are usually advisable. The log-periodic type has broad band pickup and more uniform gain of all stations, as well as good multipath and off-axis signal rejection and is recommended. In localities where FM broadcasts come from several different directions or where multipath distortion is particularly severe, a remotely controlled antenna rotator is a useful and recommended accessory. When an outdoor FM antenna is used, it is usually connected to the receiver by a standard 300 ohm twin lead antenna wire.

Your Studio Pro 120 is equipped with special noise

suppression circuitry to eliminate most outside electrical interference. Sometimes, however, in areas of extremely high electrical noise, such as those located near a busy highway, an industrial area, or in an apartment house, it may be necessary to use a shielded lead-in cable to prevent interference caused by ignition systems or electrical machinery, such as elevators. Coaxial cable of 72 ohm impedance may be used. This type of cable necessitates the use of impedance matching transformers (baluns) both at the antenna and at the input of your receiver. Shielded 300 ohm twin lead antenna wire is also available from major electronic parts dealers and can also be used wherever electrical interference noise becomes a problem. The two signal conductors of such cable are connected to the distant terminals in the usual manner, and the shield is attached to the chassis ground used for grounding the record player.

ADDITIONAL COMPONENTS

CENTER CHANNEL SPEAKER AND EXTERNALLY POWERED MONO EXTENSION SPEAKERS. In stereo installations where the spacing between the two main speakers is very large, it is sometimes advisable to use a center channel speaker to fill in the "hole in the middle" that sometimes results. The best way to do this is to use the center channel L + R output jack on the rear of your Studio Pro 120 receiver chassis. The use of this center channel output requires an auxiliary amplifier.

Connect a shielded audio cable from the L + R output jack on the rear of your Studio Pro 120 receiver to the input of a separate power amplifier. Use the high level input on the second amplifier, such as the **tuner, extra, aux,** etc. The center channel is not controlled by the front panel controls of your receiver, which requires that the auxiliary amplifier have a volume or level control to be able to obtain the proper balance. When using your center channel to fill in a hole in the stereo spread of sound, adjust the level control on your auxiliary amplifier so that the center channel's sound is equal to or somewhat lower in volume than the left and right stereophonic speakers. This will give you your most realistic curtain of sound. It is essential that the center channel speaker be in phase with the right and left channel speakers for proper operation.

An alternate possibility is to use a derived center channel speaker which is wired directly to your main speaker output taps and does not require a separate amplifier. This center channel speaker receives the sum of the signals being fed to both the right and left channels and should be connected as shown in Figure 4. When using this hookup, the total power available from the amplifier will be somewhat less than its rated power but this is of little consequence at the listening levels normally found in the home. This method has the virtue that the level of the center speaker is controlled by the gain control of your receiver and it is

not necessary to adjust any second amplifier level.

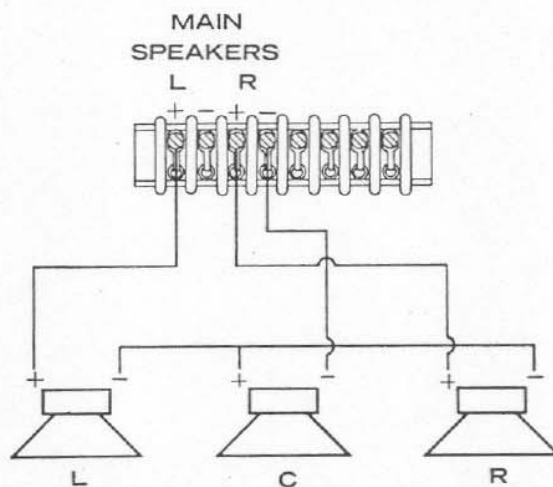


Fig. 4 Center Channel Connection

RECORD PLAYER. Your Studio Pro 120 receiver is designed for use with a record player or turntable using a magnetic cartridge. The use of a ceramic cartridge is also permissible, providing proper adaptors are used.

Your record player should not be mounted on your speakers so that acoustic feedback (howling or squealing or extreme garbling of the low notes) results. If your turntable is mounted in a cabinet that has integral speaker enclosures, make certain that you follow your record player manufacturer's recommendations concerning shock mounting.

TAPE RECORDERS, TAPE DECKS, TAPE PLAYERS AND TRANSPORTS. Your Studio Pro 120 receiver contains complete facilities for making and playing back both stereophonic and monophonic tape recordings. Depending on your connections and control settings, it is possible to make tape recordings of FM broadcasts, phonograph records, auxiliary sources, even other tape recordings.

ADDITIONAL COMPONENTS (CONT.)

A **Tape Recorder** is a complete self-contained recording and playback device. It has the recording amplifiers necessary for making tape recordings direct from the **tape out** jacks on the rear chassis of your receiver. It also has its own playback amplifiers and speakers, but in most cases can also be connected to the **tape in** jacks on the rear of your receiver for improved fidelity using your receiver's amplifier and your main system speakers.

A **tape deck** contains recording amplifiers and playback pre-amplifiers only. Like a complete tape recorder in the above paragraph, it can make tape recordings directly from the **tape out** jacks on the rear of the chassis. However, unlike a tape recorder which has its own speakers, it must be connected to the **tape in** jacks on the rear of your receiver in order to play back the tapes.

Tape Players and Tape Transports are designed for playing back pre-recorded tapes, either commercially made or made on another tape machine. The tape player usually has self-contained playback pre-amplifiers that should be connected to the **tape in** jacks on the rear of your receiver for playback. A tape transport, on the other hand, contains no electronics. As its name implies, it is merely designed to transport the pre-recorded tape in front of the playback heads of the machine. Since it contains no electronic amplification of its own, it must be connected to the **tape head** inputs of your receiver to obtain the extra amplification necessary to produce audible playback levels.

TAPE RECORDERS and TAPE DECKS. To make tape recordings and play them, as well as pre-recorded tapes, back through your receiver, the following interconnections should be made. If your tape recorder or tape deck is equipped to make stereo recordings, connect your Studio Pro 120 **tape out** jacks to your tape unit's left and right channel high level inputs. These inputs will be marked **high level**, **line input**, **phono**, etc. The left **tape out** jack should be connected to the left channel, (Channel A or Channel 1), **high level** input on your tape recorder. If your tape recorder is equipped to make monophonic tape recordings only, connect the L + R jack on the rear of your receiver chassis to the tape unit's single **high level** input. In any case, do not connect your receiver to any input on your tape recorder marked **mic.**, **microphone**, **radio**, etc. These are low level inputs and the impedance mismatch between the tape recorder input and the receiver output will be such as to make poor or no recordings at all.

If your tape unit is stereophonic, connect its left and right channel outputs to your receiver's left and right channel **tape in** jacks on the rear of the receiver's chassis. The tape recorder's left channel, (Channel A or Channel 1), output should be connected to the left channel **tape in** jack on the receiver and your tape recorder's right channel output, (Channel B or Channel 2), should be connected to the right channel **tape in** jack on your receiver. The outputs on your tape recorder may be marked **line output**, **monitor**, **cathode follower**, **external amplifier**, etc. If your tape recorder is monophonic only, con-

nect its single output to the left **tape in** jack on your receiver only.

To make tape recordings, choose the desired program source with your receiver's **input switch**. This can be an FM mono or stereo broadcast, phonograph record, any auxiliary source, or any tape playback unit that is plugged into the **tape head** input on the rear of your receiver. Whatever source your **input switch** is set to is the source that will be recorded. The **gain control**, **bass** and **treble** controls, etc., on your receiver will only affect the sound that you hear through your speakers. They will have no effect on the tape recording.

When the proper connections have been made and the **input switch** set correctly, follow the instruction manual included with your tape recorder and make a trial recording to adjust the level. Use the tape recorder's volume or level controls to obtain a satisfactory recording level indication. Remember, the **gain control** on your receiver will have no effect on the level being recorded by your tape recorder. Only your tape recorder's level control will affect the recording as it is being made.

To play back tape recordings through the receiver using the connections described above, set the **stereo/mono switch** to **stereo** if you are playing back a stereo tape recording and to **mono** if you are playing back a mono recording. Depress the **tape mon** switch to the "in" position. This will bypass the **input selector switch** on your receiver and bring the output of your tape recorder directly into your receiver. All other applicable receiver controls may be adjusted normally to suit your listening preferences.

Playing back recorded tapes through the **tape mon** circuit of your receiver is only possible with those tape recorders or tape decks that have true tape monitor facilities (separate record and playback amplifiers and heads). Do not attempt to use this facility with any tape unit that does not have this feature.

While tape recording with a tape recorder that has the facilities for tape monitoring and is connected correctly as described in the beginning of this section, it is possible to switch back and forth between the source that you are recording and the recording that you are making, as a quality check on the recording as you are making it. To do this, simply switch the **tape mon** switch in and out. When the **tape mon** switch is "out", you will hear the source that is being recorded. When the tape monitor switch is "in", you will hear the very same material, a fraction of a second later, as it sounds on the tape. Such monitor switching will not affect or interrupt the recording process in any way.

TAPE PLAYERS and TAPE TRANSPORTS: To play back pre-recorded tapes from a tape player equipped with playback electronics, proceed as follows:

If your tape player is stereophonic, connect its left channel (Channel A or Channel 1) and right channel (Channel B or Channel 2) outputs to your receiver's left and right channel **tape in** jacks, respectively. These outputs on your tape recorder will be marked **line out-**

ADDITIONAL COMPONENTS (CONT.)

put, cathode follower, external amplifier, etc. If your tape player is monophonic, connect its single output to your receiver's left channel tape in jack only.

With a stereo tape playback unit, set your receiver's **stereo/mono** switch to the **stereo** position. With a monophonic tape playback unit, set the **stereo/mono** switch to **mono**. To hear the pre-recorded tape, switch the **tape mon** switch to the "in" position. All applicable receiver controls can still be operated to adjust the sound to your own personal preferences.

To play back pre-recorded tapes from a tape transport without playback electronics, proceed as follows:

If your tape transport is stereophonic, connect its left channel (Channel A or Channel 1) output to the left channel **tape head** jack of your receiver and the tape transport's right channel (Channel B or Channel 2) output to the right channel **tape head** jack of your receiver. If your tape transport is monophonic, connect its output to the left channel **tape head** jack only.

Set your Studio Pro 120 **input** switch to **tape head**. If your transport and tape are stereophonic, set your **stereo/mono** switch to **stereo**. If either the transport or the tape is monophonic, set the **stereo/mono** switch to **mono**. Follow the directions in the transport's instruction manual to play a tape and adjust your receiver's **gain** control to a comfortable listening level. All other applicable receiver controls can be adjusted in the usual manner to suit your personal tastes and listening conditions.

AUXILIARY INPUT SOURCES. Your Studio Pro 120 receiver contains the inherent versatility to provide you with the control center of a complete home entertainment system. You may take advantage of this versatility by connecting an additional **high level** stereo or mono program source to the **aux** jacks on the rear of your receiver chassis.

To connect an auxiliary source to your receiver, proceed as follows:

1. If the auxiliary source is stereophonic, connect its left channel and right channel outputs to the receiver's left and right channel **aux** inputs jacks, respectively.

If the auxiliary source is monophonic only, connect its single output to the receiver's left channel **aux** jack.

2. Set your receiver's **input** switch to **aux**. If the auxiliary source is stereophonic, set the **stereo/mono** switch to **stereo**. If the auxiliary source is monophonic, set this switch to **mono**. With your Studio Pro 120 **gain** control at a fairly low level, turn on the auxiliary source and play program material over it. Adjust the Studio Pro 120 **gain** control for a comfortable listening level.

3. If the external source has a volume or level control that will affect the **aux** volume as heard through your Studio Pro 120 receiver, adjust it to equalize the volume levels with that of your Studio Pro 120's normal controls. You can do this by simply switching your receiver's **input** switch back and forth between **aux** and **FM** and listening to the relative volume levels of the two program sources. Adjust the level control of the auxiliary source until the levels of the **FM** section of the receiver and the auxiliary source are approximately equal when played over your Studio Pro 120.

NOTE: If your auxiliary source is an AC/DC or "transformerless" device, have your University dealer or service technician make the necessary provisions to prevent shock or hum caused by a "hot" (electrically unisolated) chassis. Do not connect any auxiliary device to your receiver if you are in any doubt whatsoever about the safety characteristics of the device.

HEADPHONES. For private listening to your Studio Pro 120 receiver, high quality, low to medium impedance stereo headphones may be plugged into the **phone** jack on the front of your receiver. The **phone** jack operates from all input sources. Nearly all commercially available stereo headphones are equipped with the proper type of plug to fit this jack.

Do not leave your headphones plugged in when playing your main or remote speakers at high volume levels when not listening to the headphones. Headphones are low level devices and the power levels that your receiver produces at high audio volume levels can permanently damage them.

CUSTOM INSTALLATION

INSTALLING THE OILED WALNUT END CAPS: Available optionally from your University dealer are two oiled walnut end caps that may be installed on your receiver at any time, should you desire to position the receiver on a bookshelf or out in the open. Installation of these end panels is extremely simple. You will notice that the chassis and case of your receiver is equipped, on the ends, with keyhole shaped slots. The positioning of these slots corresponds with the location of screws in the oiled walnut end caps. Line up the screws in the end caps with the holes in the ends of the chassis. You will note that there is a vertical slot cut out in each of the end caps. The front mounting plate of your Studio Pro 120 receiver fits into these slots, so that there is only one correct way for each end cap to fit onto the re-

ceiver. Insert the screw heads on the end caps into the holes on the chassis and slide the end caps to the rear of the chassis. The beveled head of the screws in the end caps will fit into the slotted portion of the keyhole shaped slots in the chassis, automatically tightening the end caps into position. To remove the end caps, simply slide them forward and pull them straight out when the screw heads clear the slots.

CABINET INSTALLATION: For either vertical or horizontal mounting in a custom cabinet, it will be necessary for you to remove the chassis cover and the feet on the bottom of the unit. The feet can be removed simply by unscrewing them. It is suggested that you save the feet, in case you decide to remove your receiver from the cabinet and place it on an open shelf or table at some later

CUSTOM INSTALLATION (CONT.)

date. These feet must be reinstalled in such a case. The chassis cover may easily be removed by unscrewing the six self-tapping metal screws that hold it in place, three on either end of the chassis. It is suggested that these screws be retained for later use, in the same manner as the feet that you have just removed.

Your Studio Pro 120 receiver has been specially designed to be exceptionally cool running in operation. However, heat, per se, is the greatest enemy of electronic equipment. Heat from a nearby high fidelity component, hot air duct, or radiator, could be great enough to degrade the performance of your receiver, or cause premature component failure. For this reason it is essential that your receiver or custom cabinet should not be placed near a source of heat. To permit ventilation of the Power Module output transistors, allow at least two inches of space between the rear of the receiver and the nearest wall or cabinet side. If another heat producing component, such as a television set, is installed in the same cabinet as your Studio Pro 120 receiver, mount it beside or above your receiver. Never mount any heat producing component below your Studio Pro 120 receiver.

INSTALLATION: Figures 5a through 5c provide front, side, and top views of the requirements for both horizontal and vertical installation of your Studio Pro 120. We suggest that you study them carefully so that you get a clear idea of the general requirements of the installation. Notice that we have indicated no method of attaching the mounting board to the custom cabinet. This installation is left up to the discretion of the installer. We would suggest the use of wooden cleats, angle iron braces, shelf brackets, or some similar means of fastening the mounting board to the main body of the cabinet. Notice that the mounting board is installed flush with the edge of the cut-out made in the front or top of the cabinet. This is so that the bottom of the receiver chassis will slide in the mounting cut-out and rest firmly on the mounting board.

The mounting board should be constructed of 1/2-inch plywood. Drill the indicated holes with precision, as these line up with the holes in the bottom of the chassis of your receiver into which the receiver feet were originally fastened. Number 6, 5/8-inch, self-tapping metal screws and washers, supplied in your accessory bag, are fitted through the holes in the mounting board and into the holes in the bottom of the chassis, anchoring the chassis down and keeping it from shifting. These screws are designed for use with a 1/2-inch mounting board only. If a thicker board is used, longer screws will have to be procured. If a thinner board is used, additional washers will be needed to shim up the screws so that no more than 1/4-inch of the screws project into your receiver chassis. If more than 1/4-inch of any screw projects into the chassis,

you stand the chance of shorting out components and voiding your warranty.

The general plan of installation is as follows:

1--Using the template supplied, saw a cut-out through the front or top panel of your custom cabinet to the dimensions shown in the dotted lines of Figure 5a.

2--Referring to the top view of the custom installation, Figure 5c, cut out a mounting board of 1/2-inch wood to at least the size indicated and drill four 1/2-inch holes at the positions indicated on the mounting board.

3--Fasten the mounting board to the rear of the front or top panel of your custom cabinet, making certain that the top of the mounting board is flush with the bottom edge of the cut-out in the front panel.

4--Make sure that the feet and top cover have been removed from your receiver. Slide the receiver chassis into the custom cabinet cut-out until the receiver's front panel is tight against the cabinet's front panel and is hiding the rough edges of the cut-out. Adjust the position of the receiver, shimming it up with washers if necessary, until all rough edges of the cut-out are hidden.

5--The four mounting holes in the mounting board have deliberately been drilled slightly oversize to give you necessary clearance to adjust the position of your receiver to cover the rough edges of your mounting board cut-out. Insert the four Number 6 machine screws into the holes on the underside of the mounting shelf, using the four washers to prevent the screws from slipping through the holes in the mounting board. Tighten down the receiver chassis into place by means of these screws.

If another heat producing component is installed in the same cabinet as your Studio Pro 120, and you're using a cooling fan, make certain that the fan is oriented so that it blows cool air over the receiver chassis and does not draw the hot air from the heat producing component towards the chassis of your Studio Pro 120. This fan must be connected to the switched outlet on the rear panel of your receiver, or better still, connected to a switched outlet on the heat producing component in your cabinet if possible. In any case, the fan must be connected to a switched outlet so that the fan will go on when your receiver or other component is switched on. If the fan has its own power switch, make sure that it is permanently switched on.

Your Studio Pro 120 receiver is designed to be mounted vertically by hanging it from its front panel. The mounting board shown in Figures 5 through 5c (on a separate sheet) supplies some strain relief to the front panel of your receiver, but is mainly designed to keep the receiver from shifting once it is mounted in your custom cabinet. The front plate is not strong enough to allow the unit to be shipped with the receiver hanging in the vertical position. Shipping a custom cabinet requires either a strong and sturdily fastened mounting board be used or that the receiver be taken out of the cabinet and shipped separately.

CARE OF YOUR RECEIVER

CLEANING YOUR UNIT. The brushed gold finish on your receiver will retain its color and brilliance permanently. However, it is possible over a period of time, particularly in city environments, that a film from atmospheric contamination may dull the gold surfaces. If such happens, a clean, soft, freshly laundered cloth dampened with plain lukewarm water will wipe it clean and regain the new look it had when it was purchased. Do not use any household cleaning agents, any liquid cleaner, any abrasive cleaners, or any cloth that has been used to apply such cleaning agents. The same procedure holds true for cleaning the front of the dial glass.

SERVICING THE DIAL LAMPS AND MPX LIGHT. These lamps are long-life devices that are conservatively rated for 10,000 hours of use and should not require replacement during the normal lifetime of your receiver. However, in the rare event that these lamps

should require replacing, do not attempt to replace them yourself. They are not customer serviceable. Have your dealer or a qualified technician service these lamps.

CARE OF THE WALNUT END CAPS. The end caps of your Studio Pro 120 receiver are constructed of furniture-grade walnut veneers over a hardwood or flake-core center. Simple dusting will keep them in excellent condition. Like all oiled walnut finishes, the end caps should not be treated with spray wax or any other type of wax polishing agent. However, should refinishing become desirable, they should be retreated with lemon oil or any of the commercially available oiled walnut oil treatments available from your high fidelity dealer or furniture store. These end caps should be removed from the chassis for re-oiling. Remove them according to the instructions given in the **Custom Installation** section of this manual. Apply the oil treatment as recommended on the bottle instructions.

FIG. 6 - TROUBLE SHOOTING CHART

SYMPTOM	Possible Causes & Solutions	SYMPTOM	Possible Causes & Solutions
No sound & dial is not lighted	Power cord has accidentally become detached from the wall socket. Check all AC connections. If the unit is plugged in and still does not light up, turn power off and refer to a qualified serviceman.	Distorted sound on FM	If changing the position of the antenna results in a change in the sound, a better antenna system is called for. FM multipath reception might be suspected. See your local dealer for suggestions.
No sound but dial is lighted	The SPEAKER/REMOTE switch is in the REMOTE position. (Make sure that the SPEAKER/REMOTE switch is in SPEAKER position). The TAPE MON switch has accidentally been thrown in. (Be sure that the TAPE MON switch is off).	Hum or buzz on PHONO	The PHONO cables are not connected properly. Check for loose shield connections or lack of phono chassis ground wire. Move the tone arm on its pivot. If the hum changes, the phono cartridge is not properly shielded or should be moved further away from the receiver power transformer.
Intermittant Sound	Speaker leads are shorted. Shut unit off and check connections. If still intermittent, refer to qualified serviceman.	Dial pointer does not accurately log the station	The dial pointer may easily be moved in either direction by holding the cable and adjusting the pointer to correct for minor logging errors with the case removed.
Receiver operates in PHONO or TAPE modes only; no FM reception	The FM antenna has become disconnected. Reinstall the antenna.		

UNIVERSITY[®] SOUND TWO-YEAR WARRANTY

UNIVERSITY[®] SOUND guarantees that all high fidelity electronics products are thoroughly inspected and tested in strict quality control procedures at the factory prior to packaging and shipment. UNIVERSITY SOUND high fidelity electronic products and components are guaranteed to be free of all defects in material and workmanship (except where specifically noted and, also, with the exception of wood cabinetry and housings) for a period of two years from the date of sale to the original using purchaser, providing that a fully and properly filled out warranty-registration card is received by UNIVERSITY SOUND within ten days from the date of purchase. This guarantee covers the repair and/or replacement of any part found to be defective by the manufacturer or his authorized agent. This warranty does not apply to any UNIVERSITY electronic product which has been subjected to abuse or accident; tampered with; or installed, altered or repaired at variance with factory designated procedures; subjected to neg-

ligence, misuse or accident; damaged by excessive line voltage or insufficient ventilation; or which has been repaired or altered outside of our factory; or had its serial number altered, defaced, or removed. Any component, which under normal installation and use becomes defective, will be repaired or replaced at the company's option at no charge for the full two-year period of this warranty. During the first six months of this warranty, there will be no charge for labor costs required for the replacement of said components. After the first 6 months a nominal labor service charge will be made. Defective parts or equipment must be returned properly packed, in the original carton if possible, transportation prepaid at the customer's expense via Railway Express Agency (do not ship via parcel post) and insured for full value, after written authorization for return is requested from the factory and is received. Return equipment to the UNIVERSITY SOUND factory in Oklahoma City. All equipment repaired will be returned to the

customer F.O.B. the service center at the UNIVERSITY SOUND factory. This warranty is in lieu of all warranties, expressed or implied, and all other obligations or liabilities on the part of UNIVERSITY SOUND. UNIVERSITY SOUND products are constantly being improved; therefore, UNIVERSITY SOUND reserves the right to change any circuit, part, or specification; trim or design; without notice and/or obligation. Contact the Customer Service Department, UNIVERSITY SOUND, Box 26105, Oklahoma City, Oklahoma, 73126, before returning any equipment to the factory for repair. In many instances, the trouble may not be in your UNIVERSITY SOUND high fidelity electronic product, and the UNIVERSITY SOUND Customer Service Department may save you an unnecessary return to the factory if they have a full account of the difficulty. Furthermore, any equipment returned to the factory without an authorized return label may be subject to delays in servicing.