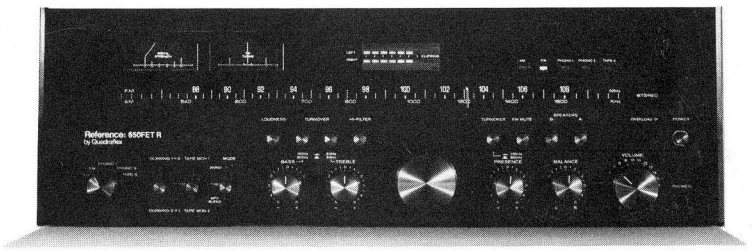
Reference:

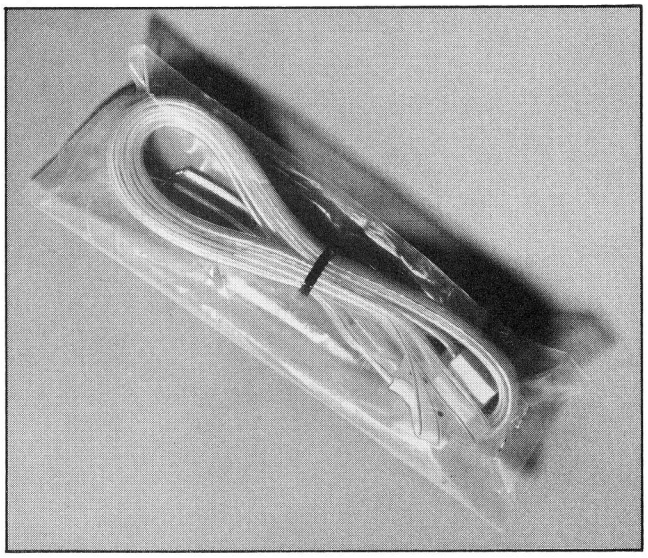
Owner's Manual

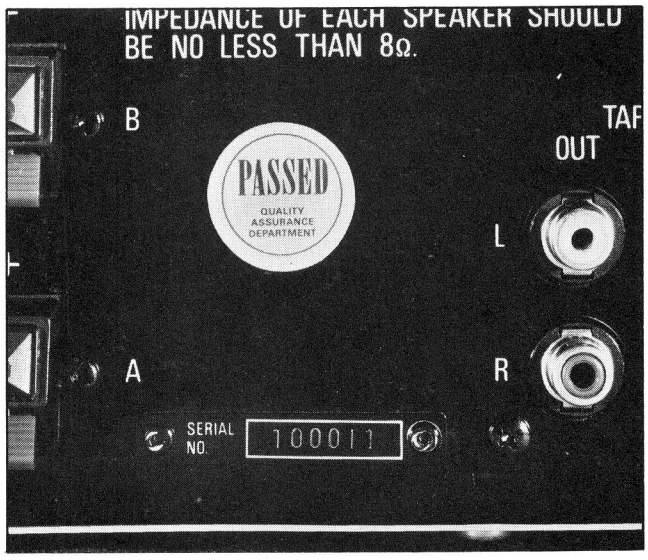


Reference: 650FET R
by Quadraflex

AM/FM Stereo Receiver

The Sound Answer.





Reference: 650FET R
by Quadraflex

AM / FM Stereo Receiver

Congratulations!

Your new Reference: by Quadraflex 650FETR is the first stereo receiver to utilize special MOSFET power transistors. These advanced devices reduce high frequency distortion to a fraction of that found in conventional receivers. The absence of distortion at frequencies far beyond the range of hearing assures a purity and clarity of sound that is unprecedented.

Introduction

Your new Reference: 650FETR has been engineered by Quadraflex to provide years of satisfaction. Proper installation, connection and use of its controls are essential for you to take full advantage of its quality and versatility. This manual is organized for your rapid understanding and enjoyment of your Reference: 650FETR.

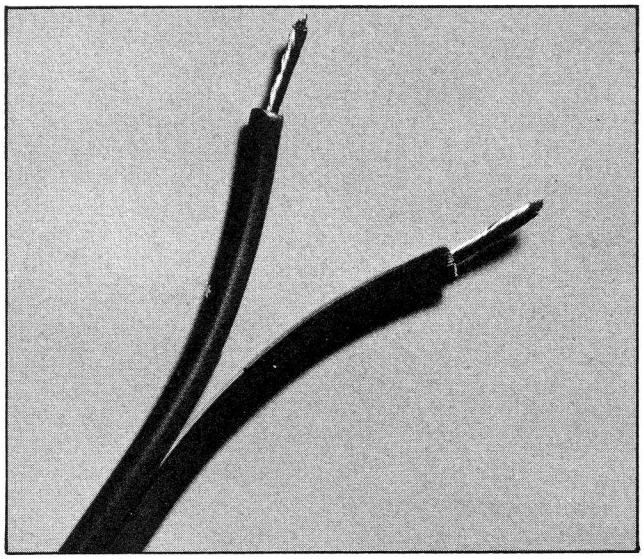
Unpacking

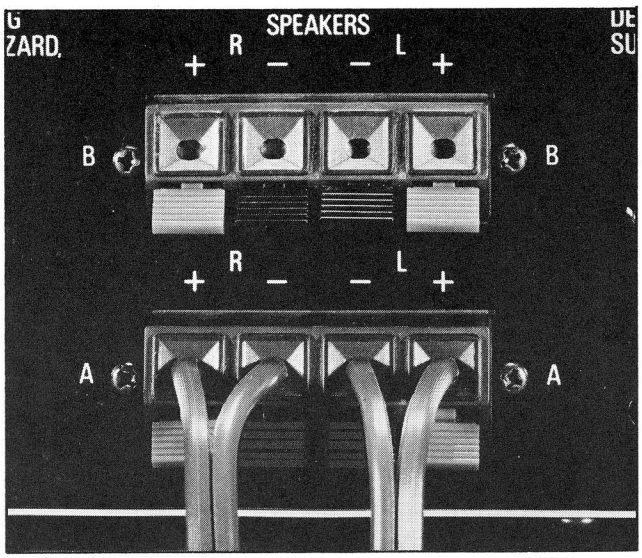
Carefully remove the Reference: 650FETR from its carton. Avoid lifting by the AM antenna mounted on the rear. It cannot support the weight of the receiver. Save all styrofoam packing; it is essential for secure shipping or moving. There is also a small plastic bag containing a light colored wire. This is the FM antenna so don't throw it away. Look on the rear panel of the 650FETR and locate the serial number. Make sure it is marked on your dated purchase receipt. Save this to validate ownership if your Reference: 650FETR ever requires service or is stolen.

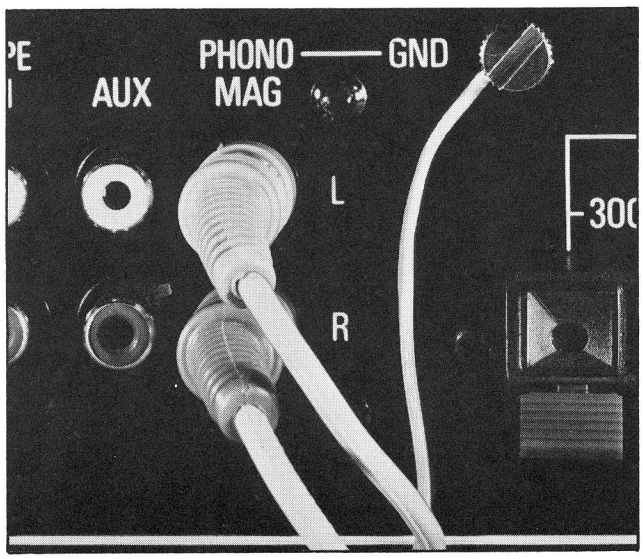
Placement

Place your 650FETR on a sturdy table or shelf, leaving enough space to get at its rear panel connections. You must allow several inches for ventilation and avoid putting it on a rug that might impede air circulating into vent openings on the bottom. Keep the 650FETR away from direct sunlight or other sources of excessive heat. Avoid placing it where it might be exposed to rain or moisture.

Before making connections, make sure the 650FETR is not yet plugged into the wall. This must wait until all connections are made.







Speaker Connections

For the best performance we recommend the use of 18-gauge "lamp" or "zip" cord. Use of thinner wire will impair power transfer to your speakers. Prepare the speaker wire by cutting two approximately equal lengths and running them where they are safe. At each end separate the paired wire for several inches and strip about ¼ to ½ inch of insulation at each end. You can do this by slightly cutting the insulation with a knife or razor, being careful not to cut into the wire strands. Then pull off the unwanted insulation. Twist the exposed strands tightly.

You should now examine the wire closely. One side of the pair will either have a ridge on its insulation or a different color wire if the insulation is transparent. When you connect your speakers make sure the wire with the ridge or copper color goes to the positive terminal, usually marked +, 8 ohm, or positive, and the other wire to the negative terminal usually marked –, 0, or negative. *Make sure each speaker is wired the same way.* Locate the bottom row of speaker terminals marked *A.* The two left-hand terminals are for the wires going to the speaker on your right (as your face the front of the receiver). The two right-hand terminals are for the speaker on your left (facing the receiver). Connect each, remembering to insert the coded wire into the + terminal marked in red on your 650FETR. To make connection, push on the tab below each terminal, insert the wire into the exposed hole and release the tab. At this point inspect your connections to make sure that there are *no* strands touching between wires or terminals either at your receiver or speakers.

You may connect a second pair of speakers to the upper row of terminals marked *B.* Use the same procedures. Your Reference: 650FETR can safely operate two pair of speakers whose impedance is 8 ohms or higher. If either pair of speakers is rated below 8 ohms, then only one pair may be operated at a time to avoid overloading the amplifier section.

Caution: Never make any speaker connections that join two red speaker terminals on your 650FETR. This will cause serious damage and will not increase power output. If you connect only one speaker, use either the L or R terminal, but not both.

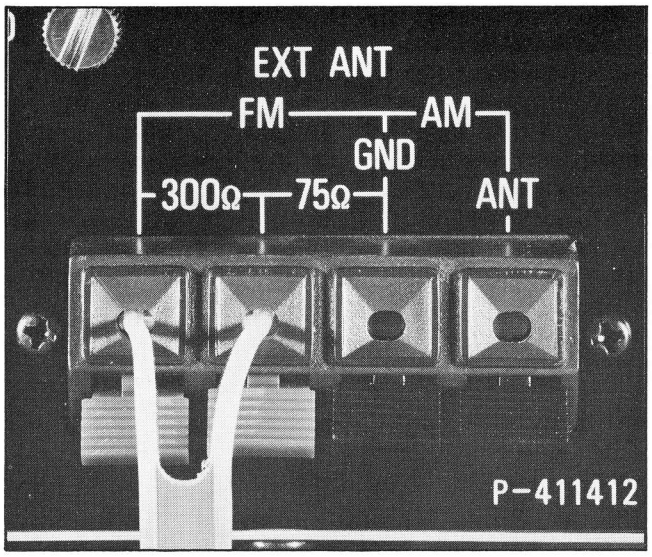
Turntable Connection

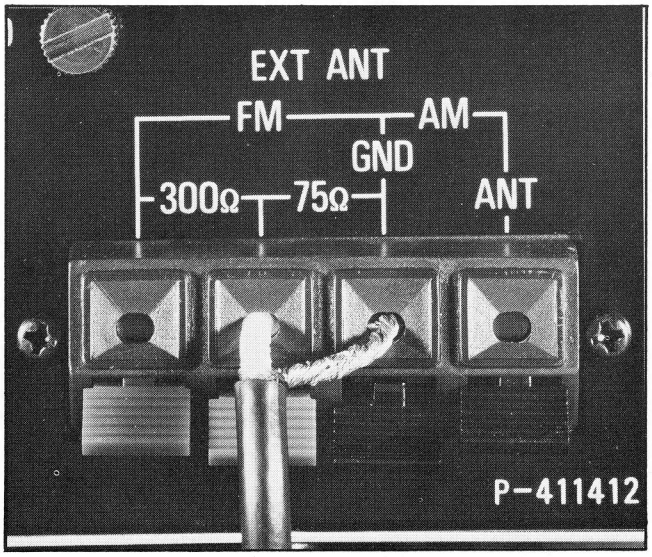
Make certain your turntable is equipped with a high quality *magnetic* cartridge. The two audio cables attached to the turntable will have different color plugs to identify L and R channels. Push the right channel plug firmly into the bottom jack *(R)* on the 650FETR marked *Phono 1* and the left channel plug into the top jack *(L).* Make sure they are pressed as far as they can go. Slight twisting of the plug as it is being inserted may be required if it is very tight.

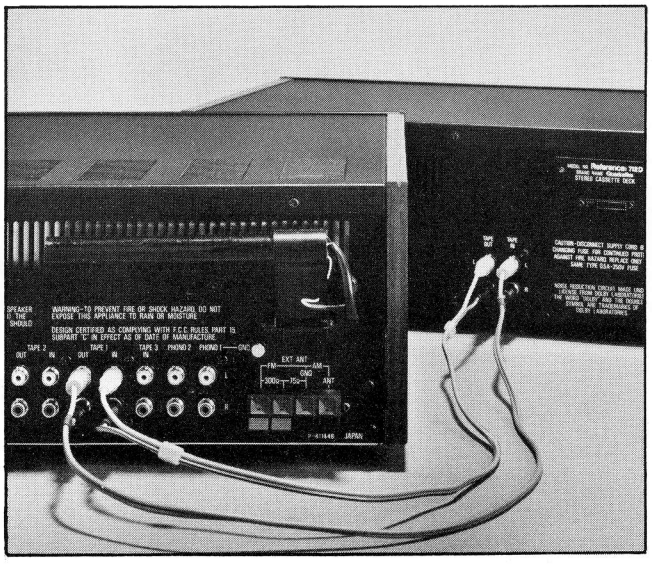
Many turntables also have a separate wire that is for grounding it to the receiver. Loosen the metal nut marked *Gnd* on the 650FETR, slip the end of the ground wire under it, and retighten the nut.

A second turntable can be connected to the *Phono 2* jacks and ground using the same procedure.

The power cord from the turntable can be plugged directly into the wall or into the outlet at the rear of the 650FETR marked *Unswitched.* This outlet is "live" whenever the 650FETR is plugged into the wall.







Antenna Connections

Proper antenna placement is essential for good FM reception. In most areas the T-shaped "folded dipole" wire supplied with your 650FETR is adequate. Insert the two bare ends into the *Antenna* terminals with the red tabs marked *300 ohms.* Stretch out the top section of the "T"; you may find that you will have to reposition it later for optimum reception. In difficult reception areas it may be necessary to utilize an outdoor antenna instead. Your 650FETR can often "share" with a TV antenna by using an inexpensive antenna splitter or 2 set-coupler, available from your dealer.

Connections made from flat wire are made at the red terminals. So are connections made from the flat wire coming out of a matching transformer if your antenna uses rounded coaxial-type cable.

You may make direct coaxial cable connections by separating the inner wire from its surrounding braided shield wire. The stripped inner wire attaches to the right hand red terminal; the outer braid is twisted firmly and inserted in the adjacent black terminal marked *Gnd.*

A ferrite bar AM antenna is attached to the rear of your Reference: 650FETR. For adequate reception you must swing it away from the chassis, clear of wires and cords. It may require repositioning depending on the direction a station is broadcasting from.

Better reception of distant AM stations is possible if you connect a single long wire to the AM antenna terminal. This wire should be 20 to 50 feet in length and run mostly horizontally.

Connecting A Tape Deck

The Reference: 650FETR has two separate tape monitor circuits. You may connect two tape decks, or one tape deck to either circuit. The *line inputs* to your tape deck plug into either set of *tape out* jacks on the 650FETR. The output jacks on the tape deck connect to the *tape in* jacks on the 650FETR.

Make certain that *L* and *R* connections are consistent for *Tape Out* and *Tape In* so channels are not reversed from recording to playback. A third tape deck may be used for playback only by connecting its output to the *Tape 3* jacks on the 650FETR.

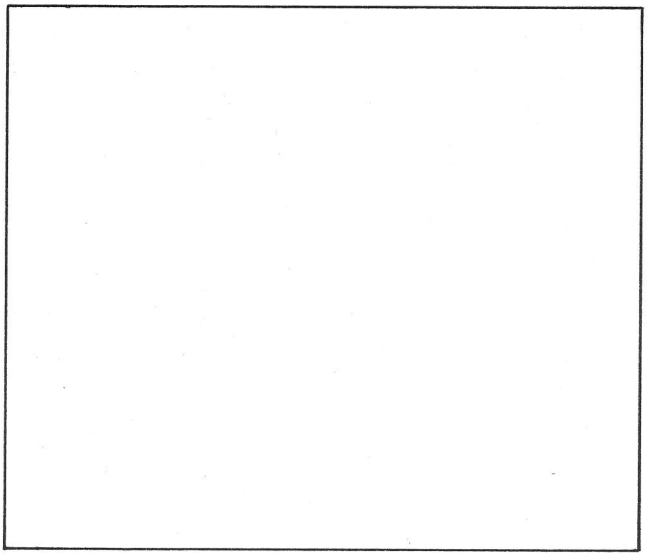
You may plug your tape deck's power cord either directly into the wall or into the *Switched* AC outlet on your Reference: 650FETR.

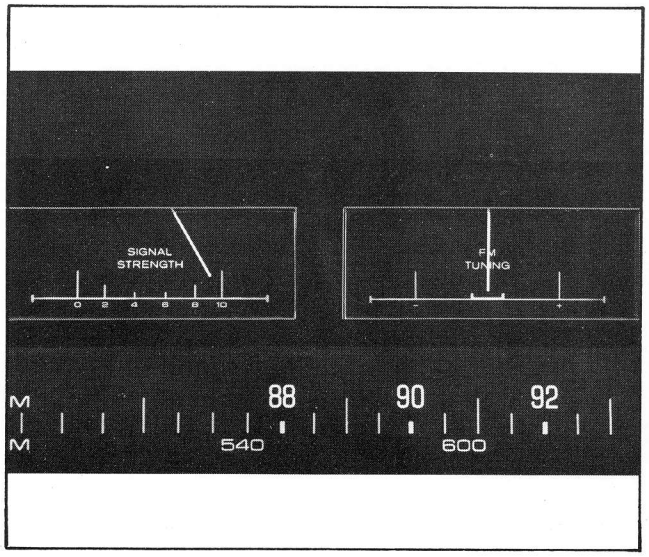
Connecting Other Components

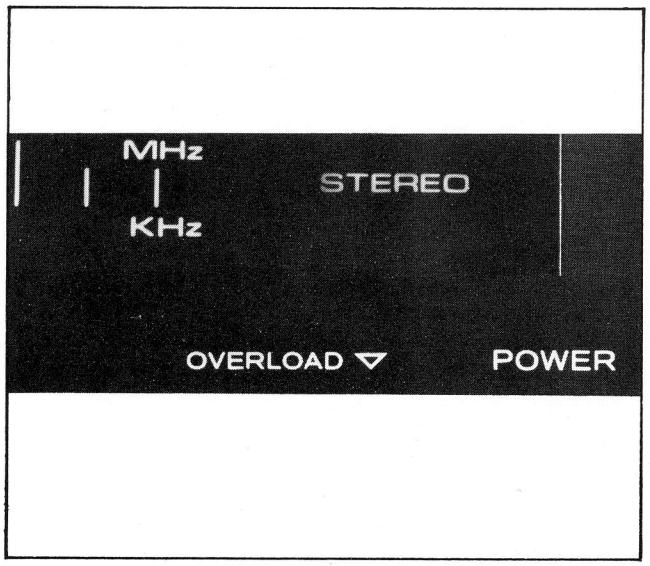
The *Tape In* or *Tape 3* jacks may be used with sources other than a tape deck as long as they have similar signal levels. The audio output of a television or short wave tuner are just two possibilities. You should consult your dealer if you are considering connecting such equipment.

Connection Summary

At this point double-check all your connections to make sure all plugs are inserted firmly and speaker wires do not have any







touching strands at either end. Make sure the power switch is in its off position and plug the Reference: 650FETR into a nearby wall outlet or extension cord.

Whenever you move the receiver or change connections on the back panel make certain the power is switched *off.*

Operating the Reference: 650FETR

The front panel controls of your Reference receiver provide tremendous flexibility when used together. Please read this section so that you will understand how to best use them. Before starting, turn the volume control counterclockwise to its minimum position.

To Receive FM Broadcasts

1. Set the far left selector knob to the *FM* position.
2. Set the *Tape Mon* switch to *Source* and the *Mode* switch to *Stereo.*
3. Set *Bass, Treble, Presence,* and *Balance* knobs at their center (12 o'clock) settings.
4. Push the *Speaker A* button.
5. Release the *Loudness* and *FM Mute* buttons.
6. Release the *Hi Filter* button.

Now push the power button and slowly advance the *Volume* knob. Tune to the desired station until the *Tuning* meter is in its center position. A quick check of the stations you like may indicate the need to reposition the FM antenna.

The *Signal Strength* meter can be used to check the effectiveness of antenna position. Its needle should read steadily as far to the right as possible. With insufficient signal strength readings you will not be able to receive clear broadcasts. When you reach a station broadcasting in stereo the red *stereo* indicator at the right side of the dial scale will illuminate.

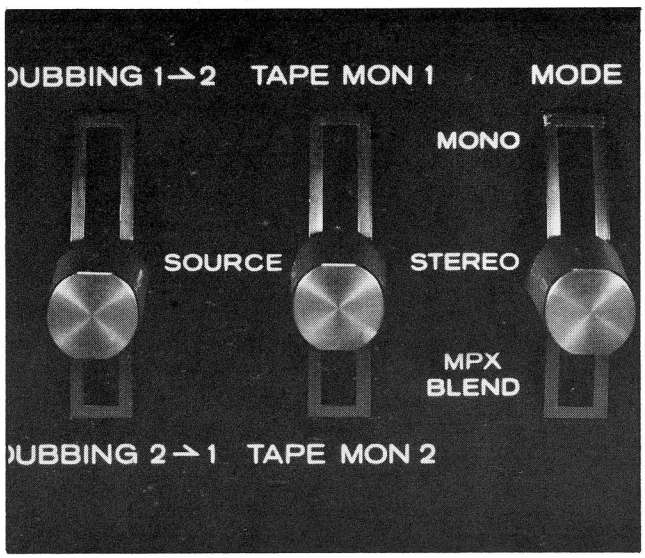
Push the *FM Mute* switch to reduce noise and "hiss" between stations. The muting circuit blocks all signals below a certain strength, including weak stations. Release the *FM Mute* button to receive these broadcasts.

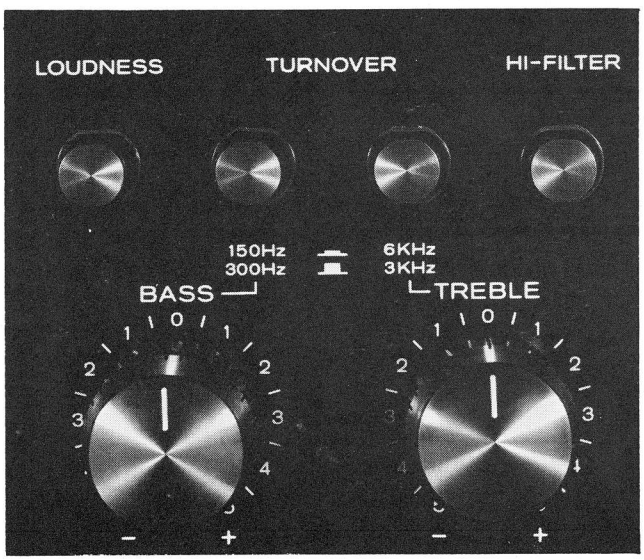
The Reference: 650FETR incorporates a special *MPX Blend* position on its *Mode* switch. This effectively reduces background noise on many broadcasts without inhibiting high frequency response. It works by altering the separation characteristics of the stereo multiplex circuit, reducing its vulnerability to noise.

If the signal is still too noisy it may be necessary to set the *Mode* switch to the *Mono* position where the 650FETR is least susceptible to noise. Further experimentation with antenna position may also be required to receive certain stations.

To Receive AM Broadcasts

The procedure is similar with several significant exceptions. Set the selector knob to the *AM* position. Tune stations so that the *Tuning* meter deflects to its highest rather than center position. There is no muting for AM.





Phono Operation

Set the selector to *Phono 1* or *Phono 2* depending on which one you have attached your turntable to. Make sure your turntable is located far enough away from your speakers to prevent feedback.

Tape Deck Operation—Playback

The *Tape Mon* switch normally controls selection of playback for two decks. If your deck is a three-head design (usually open-reel), the *Tape* position allows you to hear the tape deck's output whether it is in its record or playback mode. Switching the *Tape Mon* lever to its *Tape 1* or *Tape 2* position overrides the selector switch for the sound you will hear. If no tape deck is attached to either the *Tape 1* or *Tape 2* position, no sound will be heard.

Tape Deck Operation—Recording

Set the selector for the source you wish to record. Adjust recording controls on your tape deck according to the manufacturer's instructions. The recording will not be affected by the 650FETR's settings of *Volume, Balance, Loudness, Hi Filter* or any of the tone controls.

You can quickly check to see that the deck is receiving the proper signal by switching the *Tape Mon* lever to its appropriate *Tape* position.

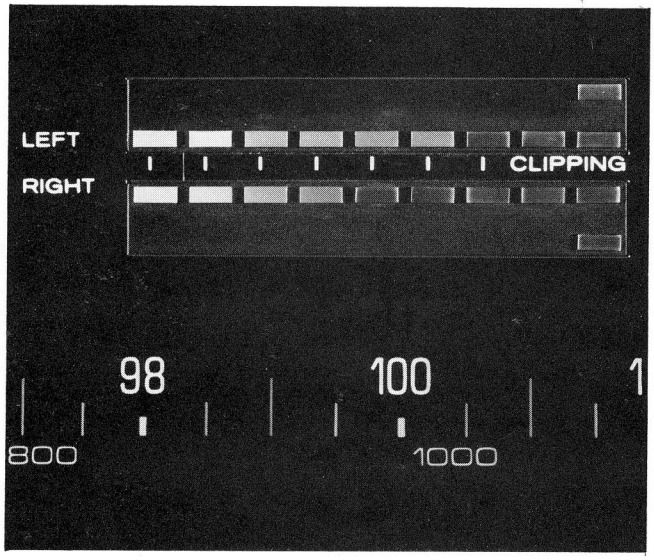
Copying Tapes

Copying tapes requires two tape decks. Your Reference: 650FETR is equipped with special *Dubbing* circuits which allow decks to copy from either one to the other independent of the selector switch. This means that you can listen to any source while the decks are copying. This is done by setting the *Dubbing* switch in the 1►2 position if you wish to play a tape on Deck 1 and copy it on Deck 2. Use the 2►1 position to reverse the procedure. To listen to either deck at any time use the *Tape Mon* switch. Thus you have the choice of listening to the deck playing, the deck recording, or an entirely separate source without interfering with the recording.

Adjusting Tone

The Reference: 650FETR receiver has controls to adjust *bass, treble,* and *loudness* compensation. The bass and treble controls have no affect on the sound in their center (12 o'clock) position. These controls should be set to taste. There are detents at each 2 dB increment for easily repeatable settings. Avoid turning the bass all the way up at high volume. This may distort the sound and damage your loudspeakers.

The Reference: 650FETR has an additional *Presence* control to boost or cut critical midrange frequencies. It is especially useful to isolate a solo voice, piano, guitar, etc. and make it more or



less prominent. It also helps adjust to deficiencies in your loudspeakers or listening environment.

Further flexibility is provided by the *Turnover* buttons. These alter the frequencies which the bass and treble controls affect. The outer position of each selects control over frequencies closer to the midrange where your ears are more sensitive; making the effects of the bass and treble controls more noticeable. The inner position selects more extreme frequencies where your ears are less sensitive and the effect is more subtle.

The *Loudness* button activates a circuit that slightly boosts extreme bass and treble frequencies. Because your ears are less sensitive to these extremes at low volumes, this circuit compensates so that you hear all the music. Avoid excessive bass control boost when the *Loudness* button is pushed.

The *Hi Filter* reduces the high frequency content of the sound. It will reduce "hiss" in tapes and broadcasts. Use only as needed.

The *Balance* control adjusts relative volume between the Right and Left channels. Use it if you sit closer to one speaker than the other so that the sound source is "centered".

Headphones

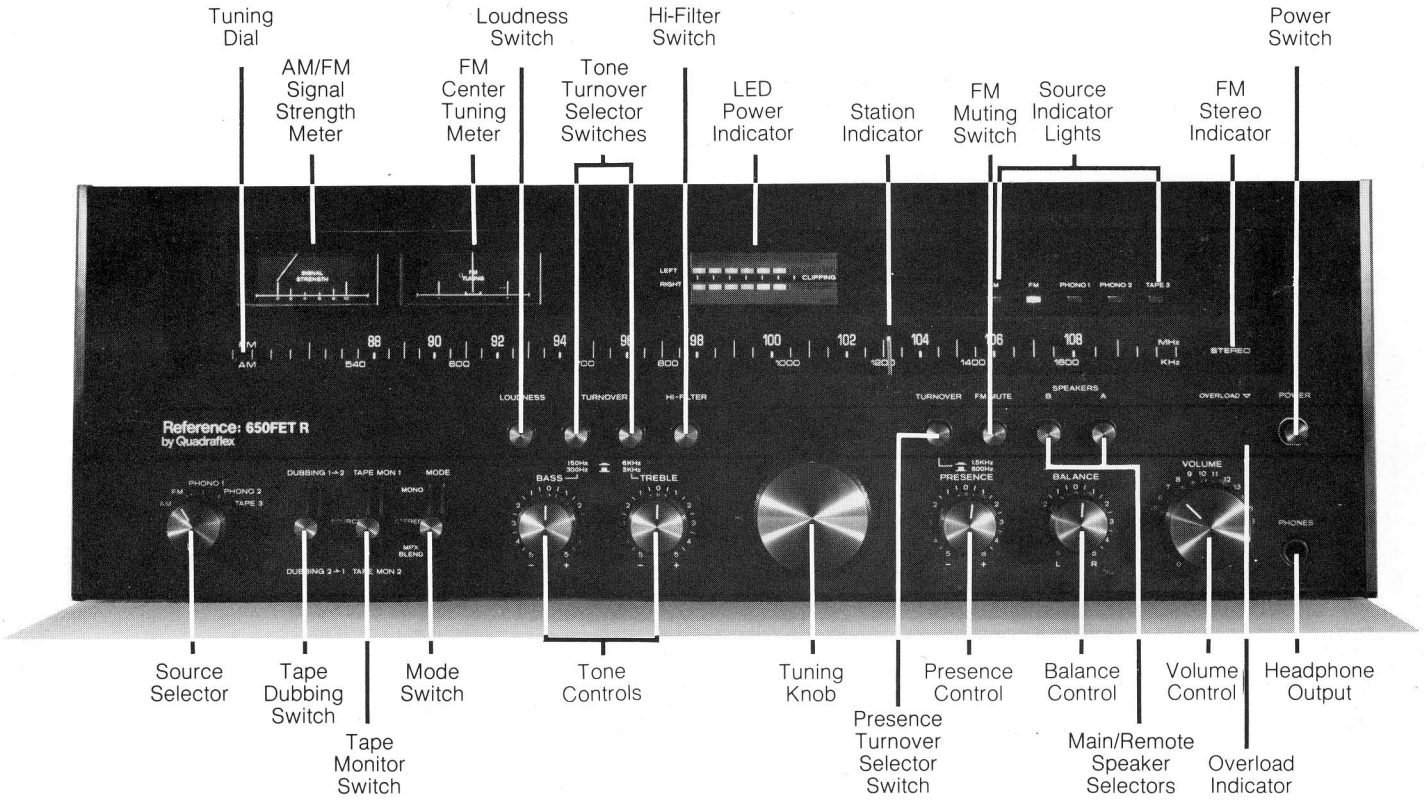
This is the output for stereo headphones. Plug in your headphones for private listening; you can elect to have speakers on also if you wish. However, unplug headphones when you aren't using them; high power surges could damage them.

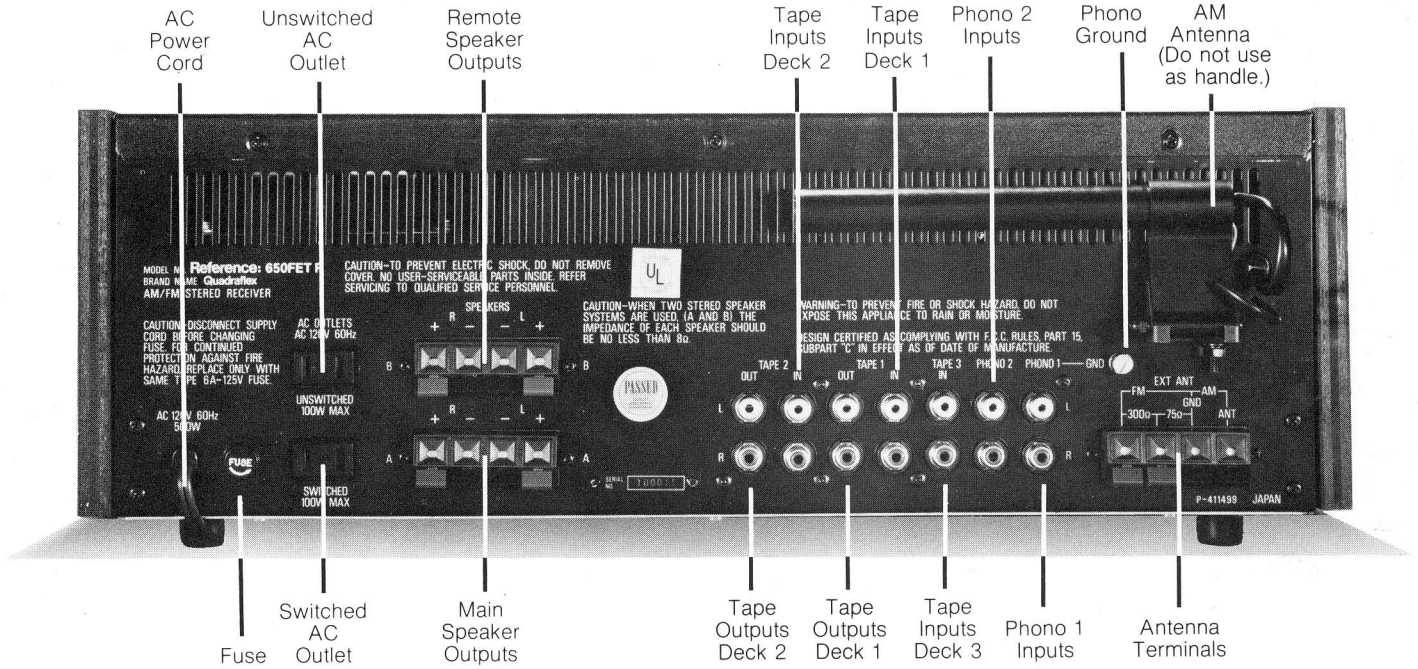
Overload Indicator

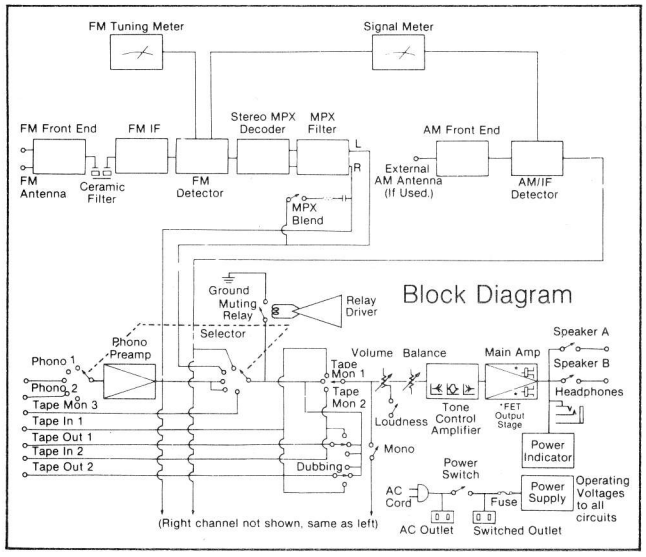
The Reference:650FETR has a small red LED located next to the power button. It lights to indicate a short-circuit or overload condition and the sound shuts off. This protects critical circuit components from damage. If the LED lights, turn off the power and check all your speaker connections. Normal operation may be resumed by waiting 15 seconds before turning power on again.

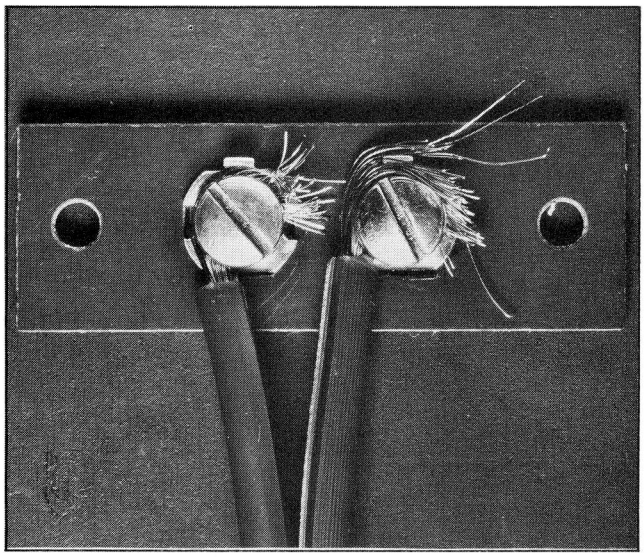
Power Meters

The Reference:650FETR has two unique 9-position LED power indicators. They enable you to relate the power function of the amplifier sections to your desired listening level. The last section of these indicators marked *Clipping* will flash when the amplifier approaches its maximum undistorted capacity. If the last LED's stay lit you are operating at or beyond the limits of the 650FETR. This could cause sustained speaker damage from overload.


Tuning Dial
AM/FM Signal Strength Meter
FM Center Tuning Meter
Loudness Switch
Tone Turnover Selector Switches
Hi-Filter Switch
LED Power Indicator
Station Indicator
FM Muting Switch
Source Indicator Lights
FM Stereo Indicator
Power Switch
Reference: 650FET R
by Quadraflex
Source Selector
Tape Dubbing Switch
Tape Monitor Switch
Mode Switch
Tone Controls
Tuning Knob
Presence Turnover Selector Switch
Presence Control
Balance Control
Main/Remote Speaker Selectors
Volume Control
Overload Indicator
Headphone Output


AC Power Cord
Unswitched AC Outlet
Remote Speaker Outputs
Tape Inputs Deck 2
Tape Inputs Deck 1
Phono 2 Inputs
Phono Ground
AM Antenna (Do not use as handle.)
Reference: 650FET R
AM/FM STEREO RECEIVER
Fuse
Switched AC Outlet
Main Speaker Outputs
Tape Outputs Deck 2
Tape Outputs Deck 1
Tape Inputs Deck 3
Phono 1 Inputs
Antenna Terminals





Reminder

Get into the habit of turning down the volume control on your Reference: 650FETR when you turn your system on or off. This eliminates the possibility of inadvertently damaging your speakers if the power is switched on with the volume control advanced.

Troubleshooting

Usually problems that occur are not the fault of your Reference receiver and are easily cured. If you cannot solve a problem in the manner described below, consult your Reference dealer.

No sound and the receiver does not light up.

Make sure the Reference: 650FETR is plugged into a working AC outlet or extension cord. Check the AC line fuse at the back of the receiver. If the fuse is blown, replace it only with the same type. A larger fuse will create internal damage to the circuit. If the new fuse blows again, consult your dealer.

The receiver lights but produces no sound.

Make sure the *Tape Mon* lever is in the *Source* position. Speakers switched on. If *Overload* light is on, switch power off, check all connections and wait 15 seconds before turning on. Make sure there is adequate ventilation to prevent overheating. If light comes on again, you may have a shorted speaker or section of speaker wire.

No sound from one channel.

Recheck connections and *Balance* control. If this occurs only with *Phono* or a tape deck, switch the L and R input leads. If the sound then comes out of the *other* channel, you can be certain the problem is with the source or its cable and not your receiver.

Poor bass response.

Check speaker phasing by switching to mono and back to stereo. If the bass is *weaker* in mono, turn off the power and reverse the + and − wires for *one* speaker only.

Hum sound.

Make sure audio cable plugs are inserted firmly and that the phono ground wire is attached to the receiver. Occasionally *removing* the ground wire will eliminated hum. Move receiver away from TV set or fluorescent light.

Poor reception

Almost always the fault of the antenna. Dense urban and hilly areas present a greater challenge from multipath or reflected signals like those which cause "ghosts" with TV reception. Your dealer can provide assistance.

Cleaning.

Use a slightly damp cloth. Avoid use of any cleaners or solvents; they might scratch the panel or cloud the dial window.

Reference: 650FETR Performance Data

Amplifier Section:

Power Output: 65 watts continuous power per channel minimum RMS, both channels driven into 8 ohms with no more than 0.1% total harmonic distortion. (18.13 dBw)
Frequency Response at 1 watt: 5-65,000 Hz ± .5 dB
Total Harmonic Distortion at 1 watt: .01%
IM Distortion at 1 watt: .02%
Crosstalk at 1 kHz: − 60 dB
Output Type: MOSFET

Preamplifier Section:

Signal-to-Noise Ratio: Phono 1, 2 80 dB; Tape Mon 1, 2 85 dB; Tape 3 85 dB
Input Sensitivity: Phono 1, 2 2.0 mV; Tape Mon 1, 2 160 mV; Tape 3 160 mV
Phono Overload: 200 mV
RIAA Equalization: ± .25 dB
Tone Control Range: Bass ± 10 dB at 50 Hz with 150 Hz turnover
± 10 dB at 100 Hz with 300 Hz turnover
Treble ± 10 dB at 20 kHz with 6 kHz turnover
± 10 dB at 10 kHz with 3 kHz turnover
Presence ± 6 dB at 800 Hz or 1.5 kHz turnover
Loudness Contour (at − 30 dB): + 8 dB at 100 Hz; + 6 dB at 20 kHz
High Filter: − 3 dB at 10 kHz

FM Section:

IHF Sensitivity:
for 30 dB quieting: mono 1.7 μV (9.8 dBf); stereo 4.2 μV (17.7 dBf)
for 50 dB quieting: mono 2.6 μV (13.5 dBf); stereo 34 μV (35.9 dBf)
Channel Separation at 1 kHz: without MPX Blend 44 dB; with MPX Blend 24 dB
THD: mono .1%; stereo .15%
Signal-to-Noise Ratio: 72 dB
Capture Ratio: 1 dB
Alternate Channel Selectivity: 72 dB
IF Response Ratio: 95 dB
Image Rejection Ratio: 60 dB
Muting Threshold: 8 μV (23.3 dBf)

AM Section:

IHF Sensitivity: 200 μV/m
THD: .5%
Signal-to-Noise Ratio: 50 dB
Image Rejection Ratio: 50 dB

Reference: by Quadraflex Limited Warranty

Your Reference: by Quadraflex receiver is covered by a limited warranty against defects in materials and workmanship for a period of two years from the date of purchase. Reference warranty repair will be performed only when your purchase receipt is shown as proof of ownership. Defective parts will be repaired or replaced without charge if this Reference receiver is returned to your dealer's store, as shown on your purchase receipt, or to any branch of that store where, in all cases, authorized service will be available. Check the yellow pages or white pages of your telephone directory for the location nearest you. If additional assistance is required, please write to Reference at the address provided below describing the malfunction. Reference will send directions in writing.

Charges for unauthorized service and transportation costs are not reimbursable under this warranty. Any damage or defect resulting from unauthorized parts or services is not covered by this warranty. Any services performed by other than a dealer authorized to perform such services are not reimbursable under this warranty.

This warranty becomes void if the serial number is defaced or removed, or the product has been damaged by alteration, misuse, accident or neglect. *THE WARRANTOR ASSUMES NO LIABILITY FOR PROPERTY DAMAGE OR ANY OTHER INCIDENTAL OR CONSEQUENTIAL DAMAGE WHATSOEVER WHICH MAY RESULT FROM THE FAILURE OF THIS PRODUCT.* Any and all warranties of *MERCHANTABILITY* and of *FITNESS* implied by law are limited to the duration of this expressed limited warranty.

Some states do not allow limitations on how long an implied warranty lasts, so the above limitations may not apply to you. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.

This warranty gives you specific legal rights and you may also have other rights which vary from state to state.

Service Manager
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CBS Inc.
1301 65th Street
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Reference: by Quadraflex

CBS Inc.
1301 65th Street
Emeryville, California 94608

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