

# Operating Instructions

Panasonic  
HI-FI COMPONENTS  
Panasonic



MODEL **SH-3433**

Before operating this set, please read these instructions completely



Thank you for selecting our Panasonic 4 Channel Audio Scope SH-3433.

The SH-3433 is the latest of the many audio products designed and developed by Panasonic engineers in their constant endeavour for perfection.

This instruction booklet is intended to enable you to make the best use of your SH-3433, to obtain complete satisfaction in your daily "audiolife" from the first time you use it.

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## HELPFUL HINTS

The cabinet of your unit should be given the care which you would give any piece of fine furniture.

The front panel should be cleaned with a soft cloth moistened with a mild soap and water solution.

To ensure that the best results are always obtained the following precautions should be carefully observed.

### Positioning

Keep the unit away from sources of heat and do not leave it for long in direct sunlight. Avoid using it in dusty places, in places where humidity or magnetic field (e. g. Color TV, Speaker Units etc.) are high, or where there is excessive vibration. Do not place anything on top of the main amplifier as this can lead to overheating.

### Power Source Voltage

Voltage inside this unit can be as high as 1100V; it is, therefore, extremely dangerous to touch the inside while the unit is connected. In the rare event that it may be necessary to remove the top or bottom cover, make sure to disconnect the unit from the power source.

## STAR FEATURES

The SH-3433 enables visualization of a reproduced 4-channel acoustic field; furthermore, it can be used as a simple oscilloscope to visualize the wave form of an individual channel or an FM-multipath wave form.

### ■ Complete Visualization of Any 4-Channel Acoustic Field

By connecting the audio scope to the speakers' output terminals of a 4-channel amplifier, a 4-channel decoder, or a 4-channel tape deck—whether discrete 4-channel or matrix 4-channel—the composition of the reproduced 4-channel acoustic field can be accurately visualized.

### ■ Simple Oscilloscope Operation:

Not only can the composition of a reproduced 4-channel acoustic field be visualized, but a check on the wave form of the output of each channel can be made, as well. Furthermore, if connected to the FM-Multipath out terminals of a Panasonic receiver SA-6800X, the FM-multipath wave form can be visualized, and the optimal positioning of an FM antenna ascertained.

### ■ Perfect Front and Rear Phase Check:

Correct front-to-rear phase relation is very important in 4-channel reproduction. Phase relation is something which was hitherto hardly touched, but with the establishment of 4-channel reproduction it has become a large problem. With the SH-3433, front-to-rear phase relation can be simply checked, and if it is out of phase, the correctly phased 4-channel acoustic field can be visualized by the use of a single control.

For a detailed description of phase checking see p. 6.

### This unit uses ISO threaded products (screws, etc.)

- \* ISO threaded products are universally used throughout the world. Note that the 3-mm, 4-mm and 5-mm size screws are different from former threaded dimensions.
- \* The ISO screw has an indentation on the top to distinguish it from others.

# SWITCHES AND CONTROLS

## Focus Control:

This control enables a clear scope picture to be obtained. When the source voltage fluctuates and the BRIGHT control is altered, fading of the picture sometimes occurs. If this happens adjust the focus by this control.

## Position Controls:

These controls move the position of the center of the acoustic field pattern shown on the scope screen in the respective directions (↙) and (↘). Adjust the controls so that the light spot showing the center of the acoustic field is at the center of the scope.

## Power Switch:

The power ON-OFF control is a push-button type. On pushing the button the pilot lamp above it, lights up. On pressing a second time, it springs back, and the power is cut off.

## Balance Control:

This is for balancing the sensitivity of the 4-channel acoustic field pattern in the (↘) and (↙) directions. Using an FM monaural broadcast or a monaural announcement during a stereo broadcast, and with the sound being heard centrally in front, adjust the control so that the scope image is similar to the center picture shown in Fig. 3.



Over-adjusted in the (↘) direct

Perfectly adjusted

Over-adjusted in the (↙) direction

Figure 3

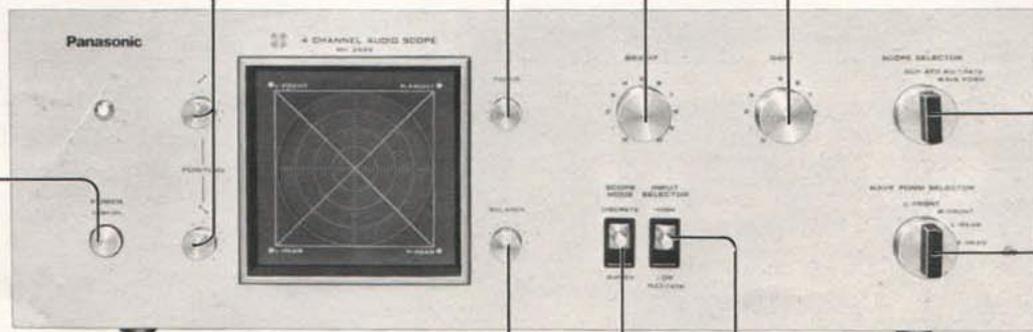
## Scope Mode Switch:

For observing a discrete 4-channel signal, set this switch to the DISCRETE (up) position; for observing a matrix 4-channel signal, set the switch to the MATRIX (down) position. For further details see Scope Principles on p. 8.

## Bright Control:

This adjusts the brightness of the scope field. When the brightness is changed the image sometimes becomes dim; if this occurs the image can be restored by adjustment of the FOCUS control. If the instrument is used for long periods with the screen very bright, the luminosity of the Cathode-ray tube will eventually deteriorate. It is, therefore, recommended that the screen is kept at a moderate brightness when in use; this also gives a sharper image.

Figure 1



## Input Selector Switch:

When observing signals from connections to the LOW terminals on the back panel, set this switch to LOW; when observing signals from the HIGH terminals, set it to HIGH.

## Wave Form Selector Switch:

When the SCOPE SELECTOR switch is at the WAVE FORM position, each of the four signals—L-FRONT, R-FRONT, L-REAR, and R-REAR—may be selected for observation. The channel indicator lamps at the corners of the scope screen light up according to which signals is selected, e.g., if L-FRONT is selected, the lamp at the upper left corner of the screen is illuminated.

## Scope Selector Switch:

**4 CH AFD:** Set to this position when the instrument is used as a 4-channel audio-scope for observing a reproduced acoustic field. In this case all four channel indicator lamps at the corners of the scope screen light up.

**WAVE FORM:** Set to this position for use as a normal oscilloscope for observing the wave form of an individual channel signal.

### Gain Control:

This control regulates the size of the pattern or wave form on the scope screen. Be careful not to set the gain too high; otherwise, saturation will occur and the image becomes squashed at the edges of the screen. Turning the knob clockwise increases the gain; turning counter-clockwise decreases it.



Figure 2

### Input Terminals:

There are two sets of input terminals, LOW and HIGH. Which of these is used depends upon the signal being observed.

**LOW:** The pre-amplifier output terminals of a 4-channel tape deck or a 4-channel decoder are connected to these terminals. Use the shielded connecting wires provided, taking care not to short out the channel connections. Use these terminals also for FM-multipath wave form visualization.

**HIGH:** The speaker output terminals of a receiver's main amplifier (+ side), or the connecting terminals of a speaker system (+ side) are connected to these terminals. Use the simple connecting wires provided, taking care not to short out the channel connections. If these wires are not long enough, wires of the same kind may be used.

**Caution:** When making the connections take special care not to allow adjacent wires to touch each other or the chassis; otherwise, fusing of the main amplifier will occur and damage may be caused to the equipment.

### Power Supply Plug:

Connect the power plug (AC 120V) only after making all of the terminal connections and making sure they are correct.

### AC Outlet (Unswitched):

Independent of the power supply switch on the front panel, this socket is available as a power source (capacity 150W).

### Horizontal Adjustment Control:

This control is to adjust the horizontal axis when this unit is used as an oscilloscope.

### Rear Phase Switch:

For visualization of the acoustic field of 4-channel reproduction, the correct wave form can only be observed if the front and rear signals are in-phase. If this is not the case, the correct wave form can be seen by simply setting the REAR PHASE switch to REVERSE, no changing of the lead connections is necessary. Checking of the front and rear phase will be explained later.

# CONNECTION AND OPERATION

## 4-CH ACOUSTIC FIELD OBSERVATION

### Low Input Terminals:

These terminals are used when this unit is to be connected to the output terminals of a CD-4 DISK DEMODULATOR, 4-CH TAPE DECK, or a 4-CH DECODER.

Fig. 4 shows the unit wired to a Panasonic 4-CH RECEIVER SA-6800X.

**Caution:** Be careful to connect each channel to its correct terminal.

1. Set the SCOPE SELECTOR to 4 CH AFD, and set the INPUT SELECTOR to LOW. Press the POWER switch. After a short while a light spot will appear on the scope (The BRIGHT control should be set beforehand at setting "6". Next, by fine adjustment of the POSITION controls (↙) and (↘), center the light point on the scope.

When observing matrix 4-channel, set the SCOPE MODE to MATRIX; when observing discrete 4-channel, set it to DISCRETE.

2. Switch on the source, and at the same time increase the GAIN slightly. The 4-channel acoustic field patterns appear on the screen. If the patterns become blurred, adjust the FOCUS control; if it becomes distorted, adjust the BALANCE.

### High Input Terminals:

Connect the terminals to the positive side of the speakers' output terminals of a 4-CH RECEIVER or a 4-CH INTEGRATED AMPLIFIER. In connecting a speaker's output (negative side) terminal to the GND terminal, it is only necessary to connect one of the negative terminals. Next, apart from setting the INPUT SELECTOR to HIGH, the procedure is exactly the same as when using the LOW terminals.

When the HIGH terminals are used, the composite characteristics provided by the speakers can be seen; also it can be checked whether or not the settings of the volume, balance, and tone controls of the amplifier, and the connections between the various parts are correct or not.

### Phase Verification:

When observing a 4-channel performance or a 4-channel reproduction's acoustic field, it is very important that the front and rear signals are in-phase.

When making a phase check, connect the speakers' output terminals to the HIGH INPUT terminals, and set the SCOPE MODE switch according to the kind of input signal. A phase check of a discrete 4-channel signal is shown in Fig. 6, and that of a matrix 4-channel signal in Fig. 7. In either case, the respective A figure

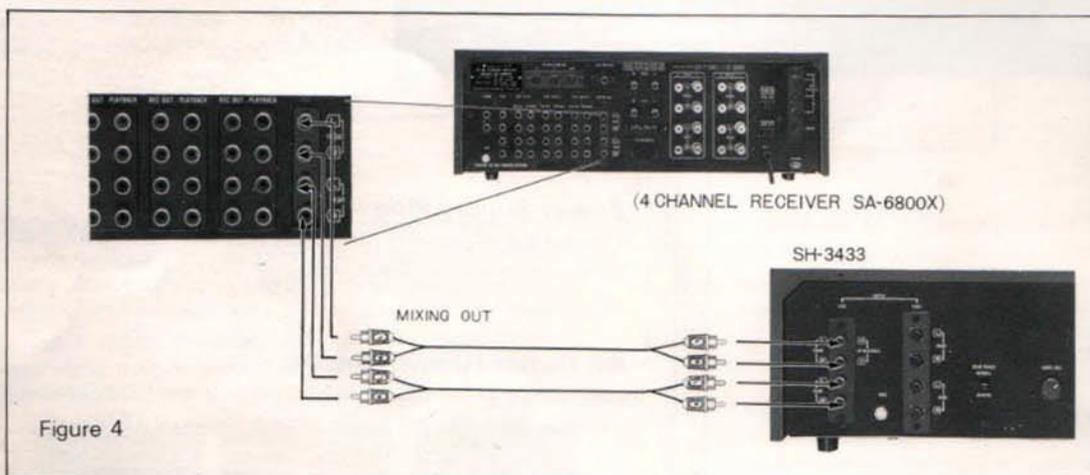


Figure 4

Figure 6



A. In-phase

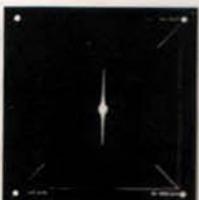


B. Out-of-phase

Figure 7



A. In-phase



B. Out-of-phase

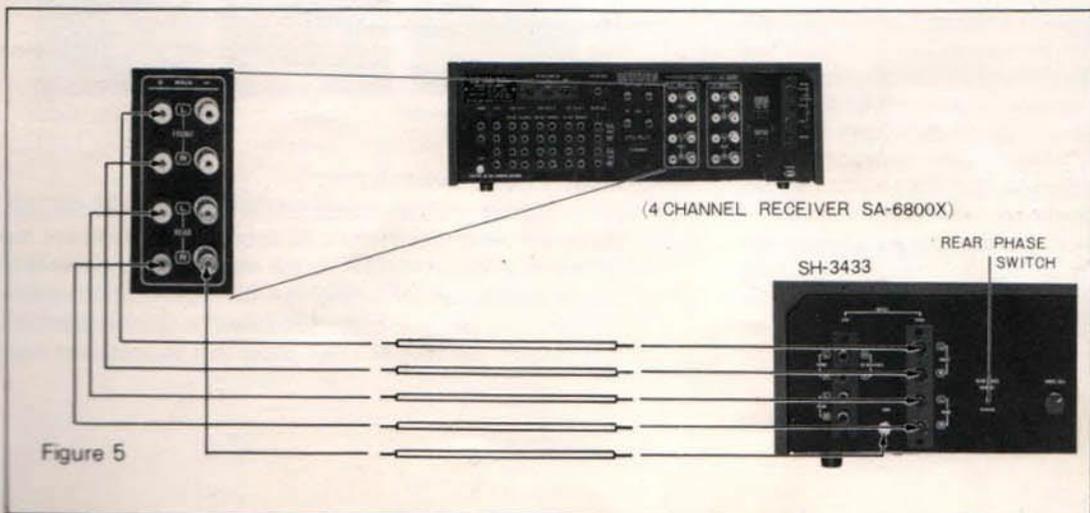
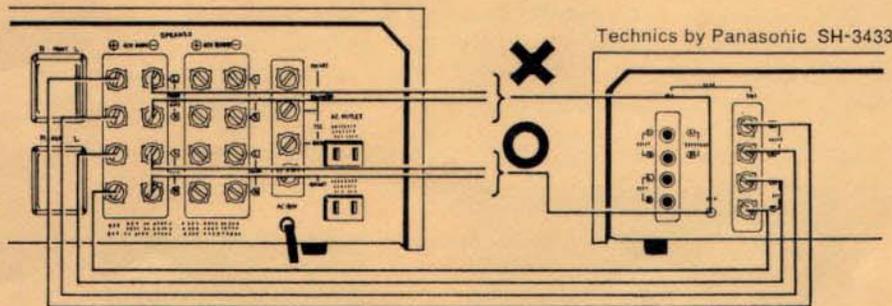


Figure 5

# NOTE

When using the SH-3433 "Technics by Panasonic" Audio Scope together with this unit, if the minus terminal of the left-front or right-front speaker terminals of this unit and the ground terminal of the SH-3433 are connected for grounding, as shown by the "X" in the figure below, the circuit-protection fuse of this unit may fail when the speaker selector is set to the "2 CH BTL" position.

For this reason, use the left-rear minus terminal or right-rear minus terminal, as shown by the "O" in the figure below, to make the ground connection.



SQXA4123  
Printed in Japan

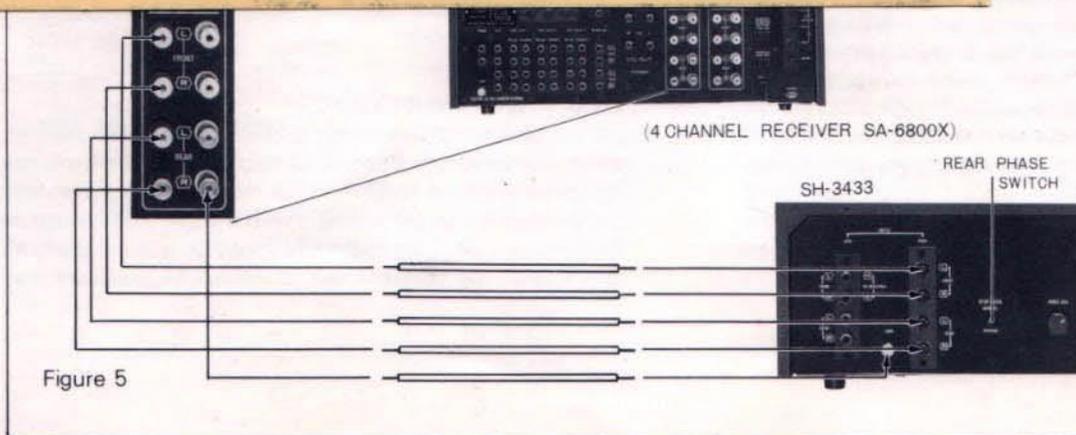


Figure 5

positive side of the speakers' output terminal or a 4-CH INTEGRATED AMPLIFIER's output (negative side) terminal. It is only necessary to connect one of the terminals to ground from setting the INPUT SELECTOR switch. This is exactly the same as when using

When used, the composite characteristics can be seen; also it can be checked whether the volume, balance, and tone are correct. The connections between the various

performance or a 4-channel reproduction is very important that the front and rear

connect the speakers' output terminals, and set the SCOPE MODE switch to the correct input signal. A phase check of a signal is shown in Fig. 6, and that of a matrix signal is shown in either case, the respective A figure

Figure 6

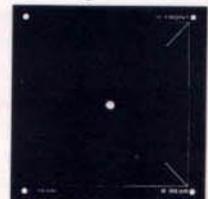


A. In-phase



B. Out-of-phase

Figure 7



A. In-phase



B. Out-of-phase

shows the pattern when the signals are in-phase. If the pattern obtained is like that shown in B, the signals are not in-phase and the REAR PHASE switch should be set to REVERSE to obtain the correct 4-channel pattern. However, when this switch is set to REVERSE, it is necessary to reverse the connections of the (+) and (-) output terminals on either the front or rear speakers.

When phasing for either discrete or matrix, it is only necessary to change one side, the other side will automatically be corrected. When the phasing has been set with the signals from the speaker output terminals, a phase check made on the signals from the pre-amp output should give the same kind of pattern; if this is not the case, then the front and rear amplifiers are out of phase, and the setting of the REAR PHASE switch should be reversed.

#### 4-Channel Acoustic Field Patterns:

The patterns shown in Figs. 8, 9 and 10 below were obtained with the output from Panasonic 4-CHANNEL RECEIVERS SA-6800X and SA-6400X. Since the SA-6800X and SA-6400X employ a special Panasonic AFD control and since the rear phase of the PHASE SELECTOR can be selected at 90°, 0°, or 180° many 4-channel effects can be obtained.

Figure 8 Effects of AFD control on discrete 4-channel reproduction.

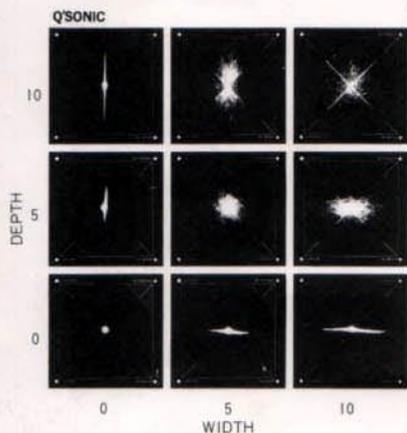


Figure 10 Effects with a 4-Channel Balancer (Panasonic SH-1010)

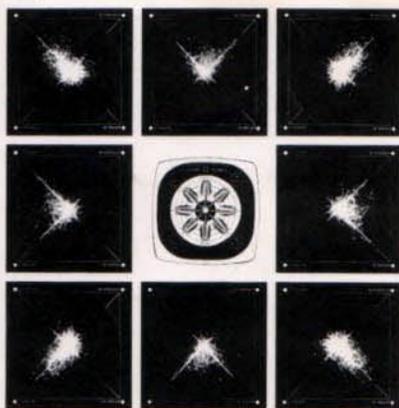
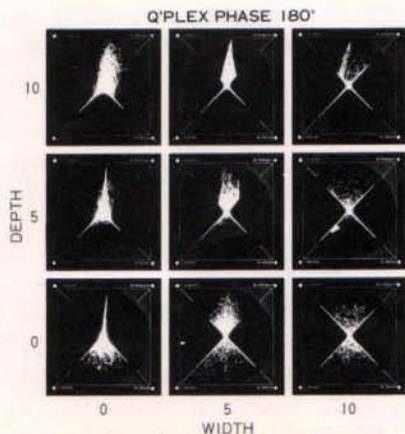
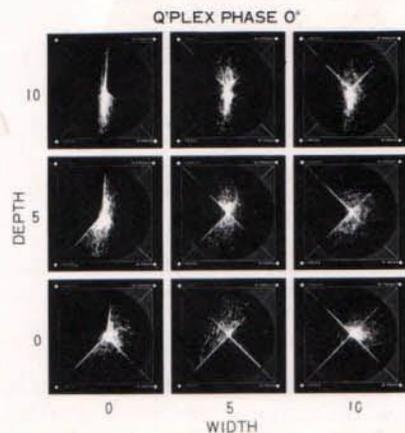
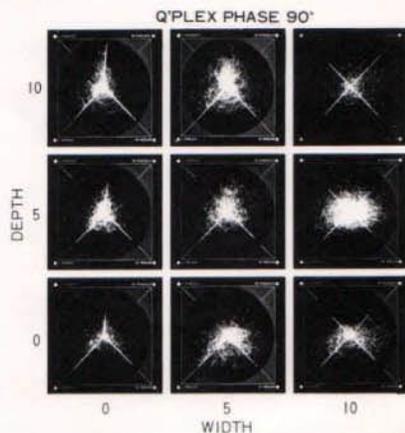


Fig. 8 shows the discrete 4-channel acoustic field patterns obtained with various settings of the AFD control.

Fig. 9 shows various matrix 4-channel acoustic field patterns obtained on changing the AFD control and the PHASE SELECTOR setting. Fig. 10 shows the effects obtained with a Panasonic 4-CHANNEL REMOTE BALANCER SH-1010.

Figure 9 Effects of AFD control and Phase Selector on matrix 4-channel reproduction.



## FM-MULTIPATH, WAVE-FORM OBSERVATION

Having the same property of travelling in straight lines as light waves, FM radio waves are reflected by obstacles. Because of this property, if an external antenna is used and if there are nearby obstacles such as buildings or hills, the wave reflected from the obstacle and the wave arriving directly from the broadcasting station enter the antenna at almost the same time, and their mutual interference give rise to multipath distortion. To obtain the best FM reception, the external antenna must be positioned in the direction which gives the least multipath distortion.

With the SH-3433, multipath distortion can be detected and the optimum position of the antenna easily pinpointed.

### Connections:

Using the connecting wires provided, connect the FM-MULTIPATH terminals of the tuner-receiver with the FM-MULTIPATH terminals of the audioscope, making sure to connect the V and H terminals correctly. If the tuner-receiver has screw type terminals, use SJPA 3 type connecting wires. Fig. 11 shows connections made to a Panasonic Receiver SA-6800X.

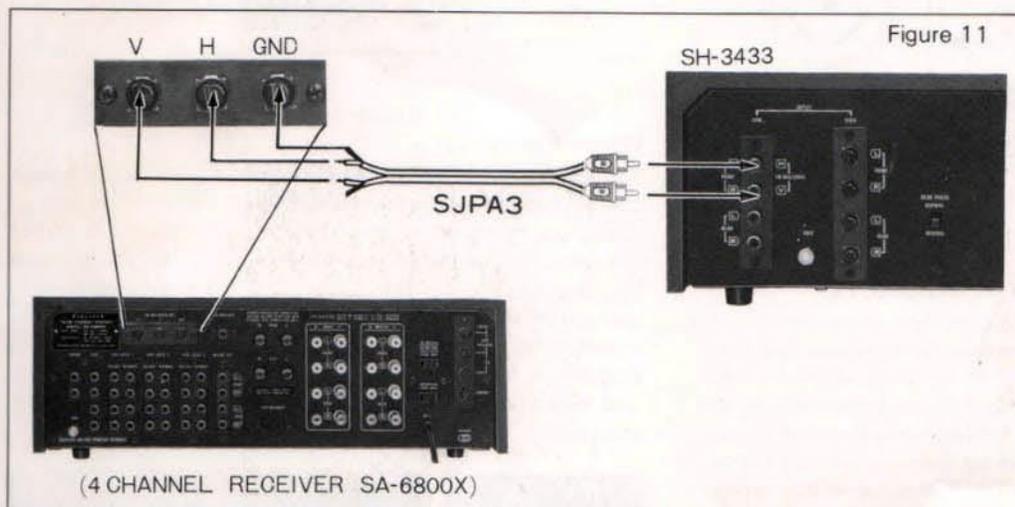
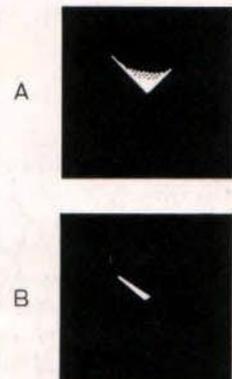


Figure 12



### Procedure:

1. Set the SCOPE SELECTOR to 4-channel AFD, and set the INPUT SELECTOR to LOW. Set the BRIGHT control to "6" and press the POWER button. After a short while a light spot will appear on the scope screen. Next, center the light spot on the screen by fine adjustment of the POSITION ( $\nearrow$ ) and ( $\searrow$ ) controls.
2. The setting of the SCOPE MODE switch at DISCRETE or MATRIX is irrelevant.
3. Switch on the tuner-receiver to an FM broadcast and increase the gain slightly; the FM-multipath wave form will appear on the screen. If the wave-form pattern is like that shown in Fig. 12A, it can be considered that a reflected wave is also being received. By turning the antenna horizontally and moving it up and down, left to right, find the position which gives a wave-form pattern similar to that shown in Fig. 12B. When this pattern is obtained there is no influence from reflected waves, and the antenna is at the optimum setting.

## OSCILLOSCOPE OPERATION

With the SH-3433, eight kinds of signals can be selected and observed. Signal selection is made by the WAVE FORM and INPUT SELECTOR switches on the front panel.

### HIGH Input Terminals:

When the HIGH INPUT terminals are used, connect the (+) side of the signal being observed to one of the input terminals L<sub>F</sub>, R<sub>F</sub>, L<sub>R</sub>, and R<sub>R</sub>; and connect the (-) side to the GND terminal.

1. Set the SCOPE SELECTOR to WAVE FORM, and set the INPUT SELECTOR to HIGH.

Press the POWER switch and wait a little while for a light line to appear on the scope screen (BRIGHT control should be pre-set to "6").

By fine adjustment of the HORIZONTAL ADJUSTMENT control on the back panel of the unit, make the light line correspond in position with the horizontal line on the scope screen.

2. Select the signal to be observed with the WAVE FORM SWITCH.
3. After switching on the signal to be observed, increase the GAIN slightly; the wave form appears on the scope screen. Adjust the BRIGHT and FOCUS controls so that the wave form is clearly seen.

### LOW Input Terminals:

When the LOW INPUT terminals are used, connect the core of the connecting cord provided to the (+) side of the signal source to be observed, and connect the meshed wire to the (-) side. Insert the jack plug into one of the sockets L<sub>F</sub>, R<sub>F</sub>, L<sub>R</sub>, R<sub>R</sub> on the audioscope. Next, except that the INPUT SELECTOR is set at LOW, the procedure is exactly the same as when the HIGH terminals are used.

# SCOPE PRINCIPLES

## PRINCIPLE OF A 4-CHANNEL SCOPE

### (A) Scope Mode Switch at MATRIX:

Each 4-channel signal in Fig. (13) is amplified and rectified. The  $L_F$  and  $R_R$  signals and the  $R_F$  and  $L_R$  signals are then mixed and fed to the  $+Y$  and  $+X$  deflecting plates, respectively. The  $-Y$  and  $-X$  plates are grounded. For example, if there is a signal at  $L_F$ , the  $+Y$  plate acquires a positive potential from the positive half cycle of the signal, and the electron beam is deflected ( $\nearrow$ ). If there is a signal at  $R_R$ , the  $+Y$  plate acquires a negative potential from the negative half cycle and the electron beam is deflected ( $\nwarrow$ ). In the same way the beam is deflected ( $\swarrow$ ) and ( $\searrow$ ) by  $R_F$  and  $L_R$  signals respectively. In this way the electron beam is deflected in the direction of the signal, and the direction and size of the sound source are shown on the fluorescent surface of the scope.

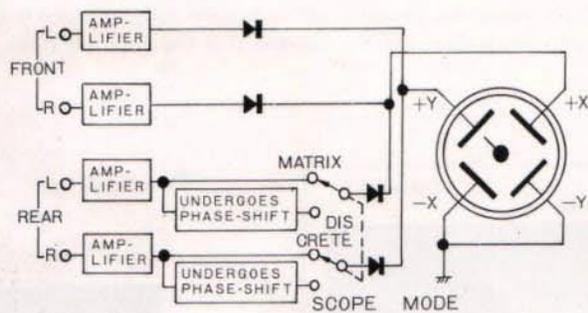


Figure 13

### (B) Scope Mode Switch at DISCRETE:

The two rear signals are amplified after their phases have been reversed. Because of this phase reversal, both the rear and front signals deflect the electron beam in the same way—by their positive half cycles; thus the 4-channels are shown equally on the scope. In the case of MATRIX mode, while the front signals ( $L_F$ ,  $R_F$ ) deflect the electron beam by their positive half cycles, the rear signals ( $L_R$ ,  $R_R$ ) deflect with their negative half cycles; thus the 4-channels are not represented equally on the scope. This means that though the MATRIX mode is suitable for representing a matrix 4-channel acoustic field, it is not convenient for representing discrete 4-channel signals.

### Reproduced Acoustic Fields:

When two or more channels are producing signals at the same time, a sound image is formed in the air space between the two speakers. When there are four speakers, the sound image reproduced in the space between them is referred to as a 4-channel acoustic field. In the space between the 4 plates of the Cathode-ray tube an electric field is generated. The 4 plates can be regarded as the four speakers, with the electric field (which depends on the rectified potentials) replacing the acoustic field; the field in the Cathode-ray tube reacts to the acoustic field in the listening air space. As the electron beam is deflected in accordance with this electric field, the patterns shown on the scope screen can be considered as representing the acoustic field.

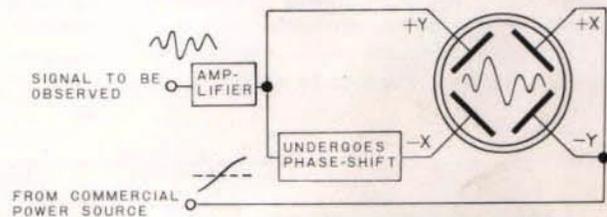
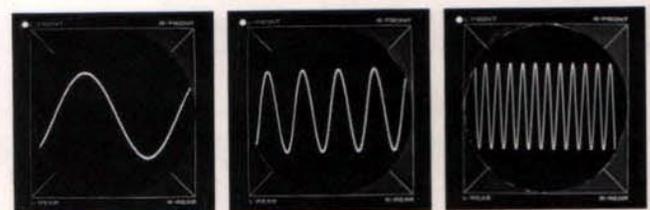


Figure 14

### Wave Form:

The principle is basically the same as that for a usual oscilloscope. Current from an ordinary power supply is fed to the  $+X$  and  $-Y$  plates, and by this the electron beam is deflected in a horizontal direction, i.e., it is pulled into the time axis of the oscilloscope. The amplified signal is then put onto the  $+Y$  plate, and the same signal with its phase reversed is put onto the  $-X$  plate. This causes deflection of the electron beam in a vertical direction in response to the signal potential. The synthesis of the horizontal and vertical deflections results in a wave form on the scope screen.



f=300Hz

f=1kHz

f=3kHz

Figure 15

## TECHNICAL SPECIFICATIONS

### 4-CH AFD

Position	±10 min
Input Sensitivity & Impedance	
LOW	15mV/cm 25kΩ
HIGH	800mV/cm 47kΩ
Max. Input Voltage	
LOW	2V
HIGH	35V

### WAVE FORM

#### Input Sensitivity & Impedance

LOW	15mV/cm 100kΩ
HIGH	800mV/cm 47kΩ

#### Max. Input Voltage

LOW	2V
HIGH	35V

### POWER SUPPLY:

AC 120V, 60 Hz

### POWER CONSUMPTION:

10W

### DIMENSIONS (W×H×D)

16 $\frac{1}{8}$ "×5 $\frac{1}{2}$ "×13 $\frac{3}{8}$ "

### WEIGHT:

14.6 lbs.

Pan-Am Bldg., 200 Park Ave. New York, N.Y. 10017

**MATSUSHITA ELECTRIC OF HAWAII, INC.**

320 Waiakamilo Road, Honolulu, Hawaii 96817

**MATSUSHITA ELECTRIC OF CANADA LTD.**

40 Ronson Drive, Rexdale, Ont.

## **MAINTENANCE**

### **Caution:**

Don't remove the cover. This unit should be serviced by qualified technicians only. No service information is provided for customers.

### **Product Service:**

Should your Panasonic product ever require servicing, refer to the Directory of Authorized Service Centers, or your franchised Panasonic dealer, for detailed instructions.

### **Warranty:**

TWO YEARS PARTS AND LABOUR, SUBJECT TO THE TERMS OF THE WARRANTY. READ YOUR WARRANTY CARD CAREFULLY.

### **Location of Serial Number:**

You will find the serial number located on the bottom of the unit.