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TECHNICS SH-8066 EQUALIZER

Manufacturer's Specifications

Equalizer/Analyzer

Frequency Response: 10 Hz to 50 kHz.
THD: 0.003% at 1 V output.
S/N: 107 dBA, re: 1 V.
Input Impedance: 22 kilohms.
Input Sensitivity: 150 mV.
Maximum Input/Output Voltage: 8 V.
Band-Level Control Range: ±12 dB, in 2-dB steps.
Center Frequencies: 25, 40, 63, 100, 160, 250 and 500 Hz; 1, 2, 4, 8 and 16 kHz.
Display Range of Spectrum Analyzer: 30 dB.

Microphone

Type: Back-electret condenser.
Pattern: Nondirectional.
Sensitivity: −72 dBV, re: 1 μbar.
Maximum Input Level: 110 dB SPL.
Frequency Response: 20 Hz to 20 kHz.

General Specifications

Dimensions: $16^{15}/_{16}$ in. W × $4^{11}/_{16}$ in. H × $10^{11}/_{16}$ in. D (430 mm × 119 mm × 272 mm).
Weight: 8.4 lbs. (3.8 kg).
Price: $525.
Company Address: One Panasonic Way, Secaucus, N.J. 07094.

For literature, circle No. 93

The Technics SH-8066 is one of a growing number of stereo equalizers which include not only a spectral display but a means for performing room equalization automatically. There is a built-in pink-noise source, of course, and with the supplied microphone placed at a preferred listening position, a couple of button pushes gets the job done. There are some constraints, which we'll get to later.

More unusual is the direct-touch method that the SH-8066 uses for making manual EQ selections. The 12 filters are adjusted not by moving sliders, but by touching the desired boost or cut setting as presented on the 156-point array. There are a total of eight EQ-memory positions: Four are open for user-set curves, one is reserved for the Auto EQ mode, and three are fixed with preset curves for rock, jazz and vocal. The overall combination of options sounded good, but I was a little wary of the preset curves; more on that later.

Like other recent-vintage equalizers from Technics, this unit uses constant-Q filters. There *are* some advantages to this, but also some precautions (given later in this review).

Supplied with the SH-8066 is a measurement microphone, the RP-3800E. It is an electret type, powered by a single AA-type battery which is adequate for up to 2,000 hours of operation. With use of the case-mounted on/off switch, the battery life should be close to the shelf life of the cell. The cord length of 13.2 feet would be plenty for some users, but marginal for others—so extend it as needed. Also included are a handy mike clip and desk stand which facilitate placing the microphone for tests.

Control Layout

The large, square "Power" button is at the left end of the front panel; the "Stand By" label for its off position indicates that minor power consumption is necessary to maintain the user equalizations stored in memory. However, a high-quality capacitor in the memory circuit will retain the stored information for up to a week if the unit is unplugged.

Below the power switch is the microphone jack, and to the right is the spectrum analyzer/equalizer level display. The spectrum analyzer display has an indicated range of "0" to "30" dB for each of the 12 filter bands and also for the entire band, which is twice as wide as the others and labelled "Full Range." Without an incoming signal, the bottom segment of each of the 13 positions is illuminated by bluish white bars, each made up of three parallel horizontal lines. Each of the 12 steps to the maximum value is 2.5 dB; this is acceptable resolution for general music monitoring. There is no level-set control for the display, which I would have liked, but the unit automatically increases the displayed level by 10 dB when the overall level is below "5" and decreases the display the same amount when the overall level is greater than "25." The spectrum levels are displayed in bar-graph form, much to be preferred, in my view.

When the "EQ Level" is displayed, there is no full-range level to be shown, and each of the EQ band level settings is indicated by triple-line bars. The display can show either left- or right-channel EQ, or both at the same time. Normally, all of the bars have the same high brightness, but in left/right mode the EQ indicators for the right channel are just half as bright as those for the left, so it is immediately apparent what each of the settings is. The range of EQ level is from "−12" to "+12," with 2-dB increments.

To the right of the display, and dominating the center of the front panel, is the "Direct EQ Level Control" with its matrix of 156 touch points for setting EQ from "−12" to "+12" for any of the 12 bands. A fairly gentle push with a finger achieves an EQ change, confirmed by the display to the left. It is possible to "draw" a curve by simply running a finger across the matrix. I wasn't certain of the real value of this, but it does allow the effect of EQ changes to be assessed very quickly.

Below the display are large, angled channel-select pushbuttons which control both the action of the matrix switches and the EQ display; in other words, the channels can be adjusted together or separately, with simultaneous display of the EQ choices being made. Above the channel-select buttons are yellow indicators that show whether one has chosen the "L," "R," or "L.R" mode.

There are four other large, angled pushbutton switches to the right of the channel-select buttons: "EQ Rec" (in/out), "Tape 1/T1 to T2," "Tape 2/T2 to T1," and "Source." "EQ Rec" can be used at any time to insert any selected EQ in the signal paths to the two recorder outputs; a red LED then reminds the user that the EQ is becoming part of the recording. The other three switches constitute the input selector, and also can control dubbing connections.

Just to the right of the EQ-control matrix are three small buttons, flush-mounted to help ensure against accidental turn-on. "Lock" at the top will lock in an EQ adjustment so that an inadvertent touch on the matrix will not change the setting. It has a red indicator to show when it is in use, as does "Auto EQ" just below. For automatic EQ to work, the microphone must be plugged in and turned on, pink noise turned on (via the button just below "Auto EQ"), "EQ" turned

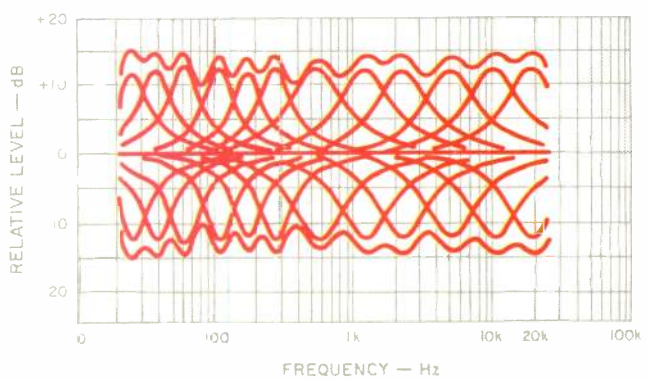

Fig. 1—Swept-frequency responses of each filter section at maximum boost and maximum cut, and of all sections combined, at maximum boost, maximum cut, and zero.

One can "draw" an EQ curve simply by running a finger across the SH-8066's matrix. This allows adjustments to be very quickly assessed.

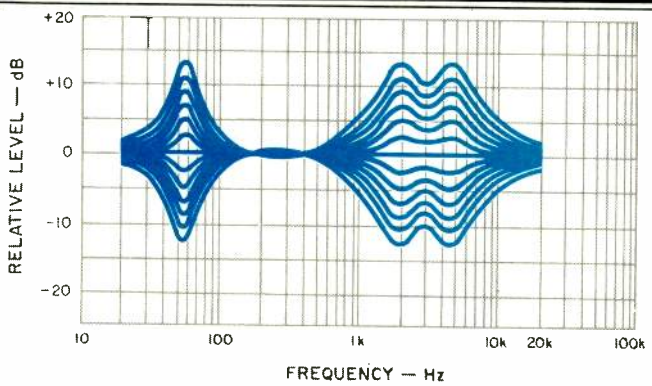

Fig. 2—Swept-frequency responses with 63-Hz, 2-kHz, and 4-kHz filters set successively for 2-dB steps from −12 to +12 dB.

off, and the amplifier volume set high enough for a spectrum analyzer display reading of at least "15." The left channel is corrected first, then the right channel; each band is sampled and corrected a maximum of 16 times, all within 50 S. To ensure that the system won't accidentally overdrive speakers, the Auto EQ function does not adjust the 25-Hz filters, even though many systems have very little acoustic output in this region. The user can always adjust this (or any other) band manually, afterwards. The curve set by the Auto EQ is always entered automatically into preset memory number 5, whose button is labelled "Auto/Room Acoustic."

There are eight memory buttons at the upper right of the front panel, each with a red indicator. The top row of four ("1" to "4") are used for storing any desired user-set EQ. In the second row, the button labelled "5" is used with Auto EQ, as stated above; "6" activates the internally stored EQ for "Rock"; "7" is for the stored "Jazz" EQ, and "8" is for the stored "Vocal" EQ. Below the memory presets are two large buttons for "Memory" and "EQ Plus." After an EQ has been set, a push of the "Memory" button starts its indicator flashing until one of the first four numbered buttons is pressed to store that curve for recall later.

Pressing "EQ Plus" adds whatever equalization curve is on the display to as many memorized curves as desired; you can, for example, add the "Rock" curve to whatever curve you have set, manually or automatically, to match your room and system. Initially, I had misgivings about this approach of direct addition of levels, but I put off final conclusions until the listening tests.

To the right of "EQ Plus" is the "EQ" on/off button with its red indicator, and below are the interlocked "Display Mode" switches: "EQ Level" and "Spectrum Analyzer."

On the back panel are the stereo pairs for line in and line out and for record/playback for two recorders. There is also an a.c. convenience outlet to replace whatever one the SH-8066 uses.

Removal of the top and side cover of the SH-8066 revealed a large, almost chassis-size p.c. board containing the great majority of the circuitry. There were some discrete components, but ICs were most evident. Board and parts quality was satisfactory, but the large board was springy and the front panel needed the cover for good rigidity. Soldering was generally excellent, with most inter-board connections made with multi-conductor cabling. The plastic transformer enclosure was just warm to the touch after some hours of operation. Parts and functions were labelled.

Equalizer Measurements

Frequency response was down only 0.1 dB at 20 Hz and only 0.04 dB at 20 kHz, both with and without EQ punched in. At the low end, the −3 dB points were 3.1 Hz both with and without EQ; at the high-frequency end, those points were 152 kHz with EQ and 248 kHz without. Swept-frequency response plots were made (Fig. 1) for each of the filters at maximum cut and boost, and for all of the filters, combined, at the maximums. The plots show quite clearly the closer spacing of the bottom six filters in comparison to the top six. This is an advantage to the user, in general, for greater resolution in the bass region can help tame standing-wave effects.

Most of the filters had center frequencies within 5% of the specification, which is good, but two were 8% high, which is just satisfactory. The maximum boosts ranged from +12.0 to +13.6 dB and the maximum cuts ran from −11.8 to −13.4 dB, which is an acceptable spread at these maximum points. The boost for a 1-octave bandwidth (Q = 1.4) was +8 dB, lower than most units, and the boost for Q = 1 (1.4 octaves) was only +4 dB, much lower than most units.

The swept-frequency responses of the 63-Hz and 2- and 4-kHz filters (Fig. 2) illustrate the sharpness of the filters even with relatively little boost or cut. In comparison with many other equalizers, the constant-Q SH-8066 is more correct graphically, and there is not much interaction among its filter responses. However, boosts, in particular, should be used with caution to minimize the possibility of ringing. The accuracy of the 2-dB steps was checked at 1 kHz, and most of the steps were very close to 2.0 dB. However, the first steps in either direction from center zero were on the high side, measuring ±2.46 dB.

With various test frequencies and EQ settings, the maximum input/output voltages were usually 8.0 to 8.9 V. For some settings, however, 7.1 V proved to be a more realistic limit to prevent even a hint of clipping. The input impedance was 19.4 kilohms and the output impedance was 1.1 kilohms, both very satisfactory. Harmonic distortion was 0.004% or less from 20 Hz to 20 kHz. No slew-rate limiting was observed with 2 V input at 100 kHz. The A-weighted noise voltage was below 10 μV, giving a signal-to-noise ratio of greater than 100 dBA (re: 1 V) through the SH-8066 when no equalization was applied. After trying a number of different equalization settings, I determined that in normal use, with EQ, 97 dBA (re: 1 V) would be more typical.

Spectrum Analyzer Measurements

The filters of the real-time spectrum analyzer were well aligned to those of the equalizer for most bands, but not for the 100-Hz band, where the RTA's filter was centered on 87 Hz. The analyzer filters were found to have quite peaked

Overall sound was better with automatic EQ than without it—certainly smoother, in general, but lacking in detail.

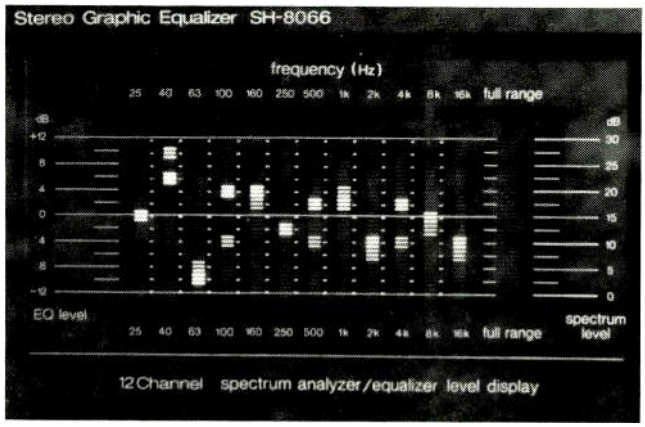

Fig. 3—RTA display showing equalization settings obtained for left and right channels after automatic equalization.

responses with adjacent-filter crossovers from 5 to 10 dB down. The analyzer's level steps were about the expected 2.5 dB.

The analyzer display's response was flat, within its limits of resolution, when fed pink noise from an Ivie IE-20A. The response time of the 1-kHz filter was about 250 mS, and it took about 1.5 S for a 20-dB decay.

The built-in pink-noise source had an output level of 200 mV rms. Measured with an Ivie IE-30A ⅓-octave analyzer, the frequency content of the pink noise was within ±1 dB or better at most points, but was 1 to 2 dB low from 25 to 63 Hz and about 1 dB high from 200 to 400 Hz.

It was possible to use the analyzer to display the frequency content of music fed into the SH-8066 from a music system. However, measurement of the required input range showed that 20 mV would be about minimum for a good display, and 200 mV would be the maximum allowable to prevent what appeared to be a form of compression above "25" on the SH-8066's display. I felt frustrated that I couldn't just turn a knob to shift the display range.

Using the microphone supplied, the RTA's indicated level was somewhat erratic when sound levels below about 70 dB SPL were involved; above 90 dB, the RTA indications showed some compression. However, the display was reliable with sound signals ranging between these two levels.

A comparison was made between the SH-8066 with its microphone and the Ivie IE-30A, with both subjected to the same noise field. Over most of the band, the Technics microphone matched the Ivie's within ±2 dB, but it did show some low-end droop. It was also observed to be slightly directional, albeit—to its credit—less so than most microphones supplied with EQ/RTA combinations.

Use and Listening Tests

The owner's manual for the SH-8066 is quite well written, with good figures to emphasize the points being made and many suggested applications. I don't agree with all the suggestions, but I'm glad Technics encourages listeners to use their equalizers again and again, thereby learning more about music and the listening environment.

All controls and functions were completely reliable throughout the testing. I really liked the pushbutton switches, which had good tactile and audible snap action. The status lights were also helpful. I did feel that the indicator light for the "Lock" button was on the faint side, though in low light it was easier to see. Most of the panel labels could be read in such light, but I did lose track of where I was on the EQ matrix at times. A look at the display, of course, pinpointed what I had or had not done. In making some manual EQ changes, I did feel that I wanted smaller steps.

To test the Auto EQ function, I plugged in the microphone, turned on the pink noise, and increased the system volume to get an analyzer display. I put the mike at a good listening spot and pushed "Auto EQ." The display gave indications of the flattening process, but levels in several bands were erratic. Rechecks showed that 80 dB SPL was about the minimum sound level for a good analyzer display and speedy correction. Figure 3 shows the automatically determined EQ for both channels on a system without any other equalization. The overall sound was better with this EQ than without, certainly smoother in general, but lacking in detail. I next tried the SH-8066 on a system that was quite smooth already; some changes were for the better, but the sound still needed something, and the RTA display showed what it was. With both sound systems, the SH-8066 had cut response in the 2-kHz band, right about where I felt something was missing. Once I restored response in this band to zero, the whole sound improved greatly. This serves to reinforce an important point: Setting equalizers, manually or automatically, according to the dictates of an RTA may yield significant aural improvements, but the user must still listen and make manual adjustments to get the best result.

In making some manual corrections, I definitely felt the need for steps smaller than 2 dB to satisfy my ears. I tried the rock, jazz, and vocal fixed-memory EQs, singly and in combination with the Auto EQ. I always felt I wanted to change something to satisfy my tastes. I had hoped that "EQ Plus" would average response curves, instead of summing them, to get the best overall EQ for a given listening space. Alas, it does not.

The bar-graph display of the analyzer provided good, general monitoring of the music spectrum. Its sensitivity was well matched to most of the signal levels in my system, but the display became strongly compressed at high signal levels when the SH-8066 was connected to recorders with outputs of more than 0.5 V. (On decks with adjustable output levels, of course, this is no problem.) The display has a lot of vertical parallax, so I had to continually bend down to be certain what the actual boost and cut values were.

With the constraints of the 2-dB resolution of the filter steps and the somewhat sharp constant-Q filters, this Technics unit is not actually as flexible as some less sophisticated devices. The individual user should make his own personal assessment of the limitations discussed. Outside of those, the SH-8066 performed quickly and reliably, offering an excellent display of what it was doing at all times.

Howard A. Roberson