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TECHNICS SH-8055 GRAPHIC EQ/RTA

Manufacturer's Specifications
Frequency Response: 5 Hz to 100 kHz.
Rated Sensitivity/Output Voltage: 1 V.
Harmonic Distortion: 0.003% from 20 Hz to 20 kHz.
Maximum Output: 8 V.
Filter Center Frequencies: Two sets at 25, 40, 63, 100, 160, 250 and 500 Hz, 1, 2, 4, 8 and 16 kHz.
Control Range: ±12 dB.
Pink-Noise Output: 50 mV.
Dimensions: 16-15/16 in. (430 mm) W × 4¼ in. (108 mm) H × 10⅝ in. (270 mm) D.
Weight: 9 lbs. (4.1 kg).
Price: $340.00; optional RP-3800E microphone, $60.00.

Company Address: Panasonic, One Panasonic Way, Secaucus, N.J. 07094.
For literature, circle No. 91

Technics calls the SH-8055 a stereo graphic equalizer, but that title fails to do justice to this unit, which includes a most-useful RTA (real-time analyzer) and a built-in pink-noise generator. The SH-8055 is configured with 12 bands of equalization and analysis, two more for each channel than the typical octave-band unit. The RTA display, at the left of the front panel, shows the 12 band levels with bright, bluish-white fluorescent bar-graphs, which are very easily seen under any ambient lighting. At the right of the display, there is a somewhat wider bar-graph that shows the overall average level. Below the display are a horizontal slider for "Display Level" and two on/off pushbuttons for left and right inputs to the RTA, fed from the corresponding channel outputs after the equalizer section. To the left of the display are the power on/off switch and a phone jack for an optional microphone. When plugged in, it is fed directly to the RTA, disconnecting the other inputs.

In operation, particularly in a somewhat dim room, the SH-8055 catches the eye because its narrow slider knobs have small red LEDs mounted in their ends. The graphic charac-

ter of the equalization is thus shown in a rather intriguing and attractive way. The Technics unit has most of its filters centered on the normal octave-band frequencies, but replaces the usual 31.5- and 125-Hz filters with four filters at 25, 40, 100 and 160 Hz. This additional resolution in the region of poor speaker response and room standing waves is potentially very useful, and so it proved under test.

Below the sliders are three large pushbuttons for input selection: "Source" or input, "Tape 1" and "Tape 2." These are interlocking, although the buttons do not stay in: The black designation changes to orange with actuation. There is also an EQ in/out button of the same design. A small, orange "Rec Mode" pushbutton selects "EQ" (in) or "Straight" (out). This switch inserts the selected equalization into the signal path to the recorders. Equalizing the playback is done with the "Tape" switches mentioned earlier (which also make automatic connections for dubbing, if that is desired). Having connections for two recorders will be useful to many these days, and the automatic connection for dubbing is a further plus. There are also two small on/off pushbuttons, for the pink-noise generator and a 20-dB microphone attenuator.

On the back panel are in/out stereo pairs for line and two tape recorders as well as an unswitched a.c. outlet. Examination of the interior showed that the majority of the circuitry was on one large p.c. board, almost chassis size. There was also a medium-sized card with the RTA driver circuitry. With limited disassembly, it was impossible to examine most of the soldering, but what could be seen was excellent. All parts were identified, and functional areas were also labelled. The main card was supported at a number of points, but it was still somewhat springy. No fuses were noted, but a couple of resistors could have been fusible types.

Measurements

The first series of tests were conducted on the equalizer section of the Technics unit. The frequency responses were within less than 0.2 dB (−0.17 dB maximum deviation) from 20 Hz to 20 kHz, with or without EQ in. The responses were 3 dB down at about 1.1 Hz for both conditions, with the high-end limit at 110 kHz with EQ and about 1.9 MHz without. As the EQ out position is a bypass, also used when the 8055 is switched off, the 1.9-MHz limit, high as it is, is probably from stray capacitance to ground.

The filter center frequencies were fairly accurate, with an average offset of 3.2%. Figure 1 shows the responses of each filter section and the maximums obtained with all sliders at the extremes. Figure 2 is of the swept responses, with the 63-Hz, 2-kHz and 4-kHz filters set for 2-dB steps from −12 to +12 dB. With the exception of the first steps away from zero, the boosts and cuts are quite accurate and the steps are very even. Note also that, regardless of the amount of boost or cut, the region between 150 and 400 Hz stayed at zero level. This relates to the fact that the SH-8055 filters have fairly high Q (narrow bandwidth) starting at ±4 dB. This is also reflected in the relatively small increase in maximum levels in Fig. 1 when all filters are at maximum, compared to single-filter peaks. Figure 3 displays another facet of how filter responses add together. The topmost trace is that with a 1-kHz tone and the 1-kHz filter at its maximum boost. The middle waveform is with just the 500-Hz filter slider at maximum, and the bottom trace is the result with just the 2-kHz filter at maximum. For all three, the oscilloscope was locked to the source. With the lagging phase in the 500-Hz filter and the leading phase with the 2-kHz one, the amplitudes are not directly additive, hence the relatively small additional boost from adjacent filters.

The maximum boost and maximum cut values were very consistent from filter to filter, with a total spread of less than 0.7 dB at either extreme. Tests on just the 500-Hz filter

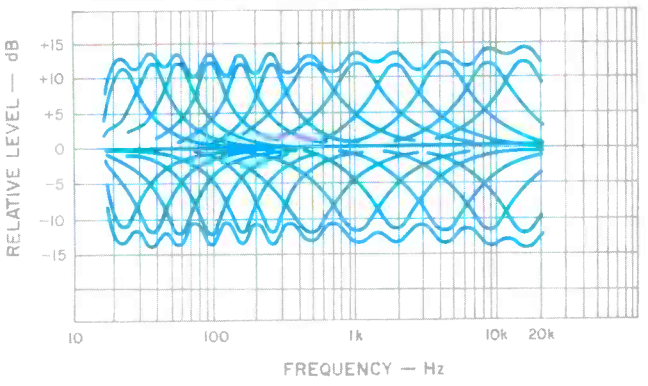


Fig. 1—Swept frequency responses with each filter at maximum boost and cut and with all filters at maximum boost and cut.

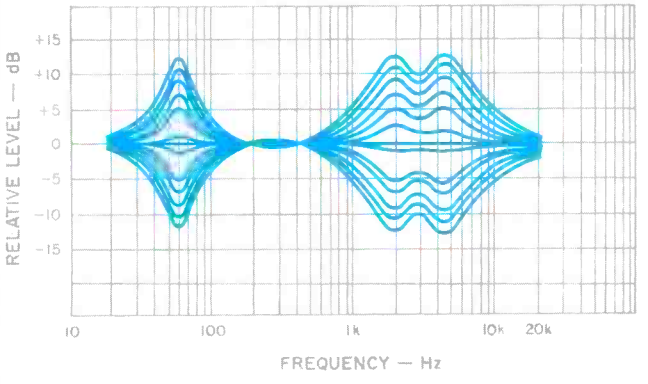
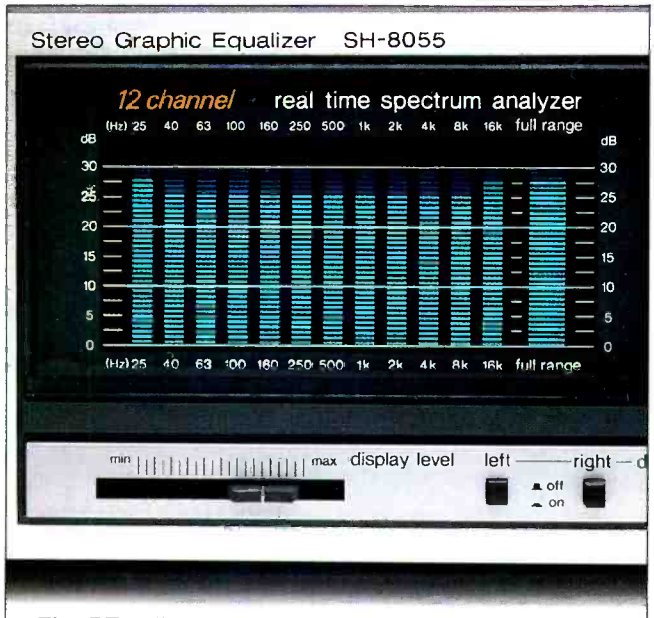


Fig. 2—Swept-frequency responses with 63-Hz, 2-kHz and 4-kHz filters set successively for 2-dB steps from −12 to +12 dB.

In equalizing a simulated system response, I found the extra bass filter channels instrumental in pulling down low-frequency peaks while retaining bass.



The RTA display shows extra bands below 250 Hz.

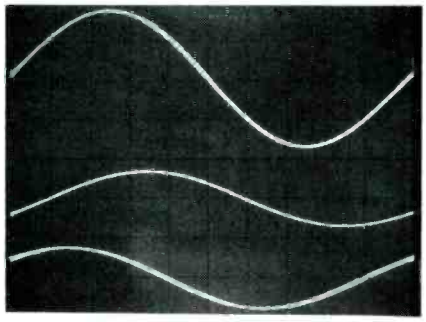


Fig. 3—One cycle of a 1-kHz sine wave, showing differing phase and amplitude of maximum boost from each of three filters: 1 kHz (top), 500 Hz (middle) and 2 kHz (bottom). Horizontal scale: 0.1 mS/div. with sweep locked to source.

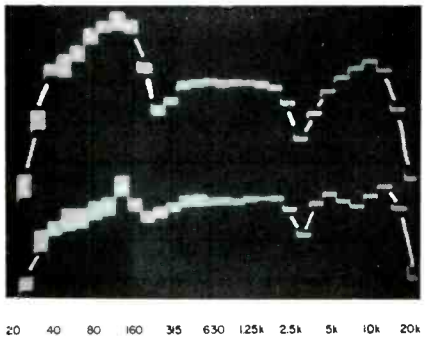


Fig. 4—One-third octave RTA display of simulated loudspeaker response (top) and response after adjusting EQ (bottom).

revealed that a bandwidth of 1 octave was reached with a boost of 10.9 dB. A bandwidth of 1.4 octaves (for a non-ringing Q = 1) was reached with about 5 dB of boost, with rather gentle narrowing above that point.

With all sliders in the gentle center detent, the gain change between EQ in and EQ out was only 0.04 dB. The maximum input/output voltage was 8.9 V open circuit and 7.1 V with a 10-kilohm load from 20 Hz to 20 kHz—for the right channel only. The left channel was the same at low frequencies, but some sort of current starvation (not clipping) became progressively worse above 1 kHz, limiting the maximum to 4.0 V. (I suspect that a simple device replacement would bring that channel up to spec.) The input impedance was about 45 kilohms across the band, and the output impedance was 230 ohms, rising somewhat at 20 kHz.

With a 2-V test signal, THD was 0.0031% or less from 20 Hz to 20 kHz; including noise, the figures were 0.0064% for right channel and 0.018% for left channel—not as good, but still very low. I expected to find that the left channel would show more slew-rate limiting, but both channels were very close, just starting to show limiting at 75 kHz with a 2-V drive signal. The signal-to-noise ratio was greater than 100 dBA relative to 1 V, right at my test equipment's 10-μV minimum voltage limit. With various settings of the sliders, there was an indication that the ratio would be about 94 dBA relative to 0.5 V for typical operating conditions.

A series of tests were also performed on the RTA section of the Technics unit. The center frequencies of its filters were within nominal values to better than 2.5%, on the average. The display filter sections' responses to discrete tones at their center frequencies were rather uneven: The 25- and 40-Hz filters were more sensitive, and the 250-Hz, 500-Hz, 8-kHz and 16-kHz filters were less sensitive than the reference 1-kHz band. A check of and with its own built-in pink noise, however, showed that, in the main, these display deviations were compensating for deviations in the pink-noise spectrum. The level of a 1-kHz tone in adjacent bands was 18 dB down, and in the second adjacent bands, it was about 30 dB down. The crossover points were 11.5 dB down. These characteristics all serve to reject out-of-band energy, and that is good, but the response within the band is sharply pointed, rejecting energy near the crossovers. Overall, I would have preferred less pointing, with greater response at the crossover points, even at the cost of lower adjacent-channel rejection.

The vertical display had steps of 2.5 dB, with each step consisting of three, fine horizontal bars. The accuracy of the steps was sufficient to keep all steps within each ladder within 1 dB of nominal, with the exception that the last steps, between "25" and "30," were compressed. My conclusion was that "20" was a good reference level for equalization tasks. At the lower frequencies, the time to get to a "20" indication was about 800 mS, and the decay time to zero was 1.7 S. At higher frequencies, the charge time was about 400 mS, and the decay time was 850 mS. The output level of the built-in pink-noise source was 67 mV rms.

The optional (but supplied) microphone is 0.353 inch in diameter, not a standard for easy calibration, but it fit my ⅜-inch calibrator close enough to determine that good RTA

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displays were possible from 55 dB SPL up to 100 dB or so. The display level slider had a range of 33 dB, with a "20" indication with pink noise settable anywhere from 18 to 800 mV. With indications at "25," the upper limit would be 1.4 V, probably needed for some systems. The microphone response was acceptably flat, especially when angled 45° or more away from a loudspeaker.

Use and Listening Tests

The owner's manual is better than most, with a number of detailed connection diagrams and a collection of suggestions on equalizing for specific purposes, such as making tapes for use in cars. I would have liked more emphasis on listening to the effects of adjustments. The manual should also include statements on microphone usage, including the desirability of scanning the listening area to check for possible response variations.

All of the controls were easy and straightforward to use. I had a small problem with the EQ in/out button, but only because its latching was soft in sound and feel, and the "EQ" illuminated before the mechanical latch was made. The black designations on the brushed aluminum panel were easy to read, and the RTA display and the illuminated equalizer sliders were a pleasure visually and an aid when using the SH-8055. The dB offsets of the sliders were difficult to read in dim light, but as the sliders were adjusted to get the desired RTA display, there was no problem in practice.

The averaging response of the RTA worked very well for EQ tasks, but it was too slow for watching the dynamics of music. The 2.5-dB steps were judged slightly coarse, but the thresholds were good and consistent; with the bargraph display, adjustments could be made quickly without confusion.

Figure 4 shows a simulated system response (top) and the results (bottom) after equalizing with the SH-8055. All adjustments were made using the Technics RTA, without reference to the ⅓-octave displays shown. Take note of the fact that improvements made include reductions of the boosts at 125 Hz and 10 kHz and the notches at 250 Hz and 3 kHz. Deviations were reduced from about +8, −7 dB to +2, −4 dB from 40 Hz to over 16 kHz. The extra channels of the unit were instrumental in pulling down the low-frequency boost while retaining response to 40 Hz.

The Technics SH-8055 is a very good value for audiophiles and semi-pros, with the constraint that it should not be used in portable systems. The higher Q of its filter sections and the accuracy of its slider settings make it one of the very few equalizers with accurate graphic indications. There is no match-level scheme, but the overall-level band of the RTA will help. And, get the optional microphone; it's well worth it.

Howard A. Roberson