

# Technics ST-S7

Quartz Synthesizer  
FM/AM Digital Tuner

stereo

FM

103.9

MHz

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Archiv Michael Otto







## A Quartz Synthesizer Tuner That Is a Worthy Source of High Fidelity

The ST-S7 tuner provides listening quality which will convince you that FM broadcasts can, in fact, be sources of superb sound. To achieve this high level performance, we have departed from conventional tuner design in several areas. Two of the most significant design elements are the incorporation of digital signal processing technology and the introduction of DC amplification and detection (which is impossible to achieve through conventional analog designs). Benefits of this design include improved stereo separation, especially in the low-bass range, for a faithful reproduction of musical ambience. This is achieved along with a very high selectivity of 85 dB indicating no trade off of selectivity vs. separation as is the case with conventional designs.

We've also taken full advantage of the quartz synthesizer's potential by providing an optional FM antenna tuning control with our remarkably effective SH-F101 compact room antenna. All this is contained in a sleek, slim tuner with a 43.6 mm (1-23/32") high front panel. In appearance as well as performance, the ST-S7 is an excellent match for the recently introduced Technics' "New Class A" amplifiers.

## DC Amplification, DC Detection, and DC Stereo Decoding for Excellent Sound Quality

DC capability has recently been introduced to amplifiers. Even though tuners are intended to handle the same audio signals as amplifiers, little progress has been made, until now, in DC tuner technology.

The instability of the local oscillator frequency produces this situation. In a superheterodyne dial-type tuner, a drift in local oscillator frequency creates inaccuracy in the IF center frequency. This results in increased distortion, which is caused by DC voltage in the detector. In a conventional analog tuner, this "output without input" can be corrected, but not prevented. Analog tuners employ AFC (Automatic Frequency Control) to correct this problem, but AFC handles all the DC voltages in the detector stage as erroneous signals. This makes it impossible to provide amplification and detection down to DC.

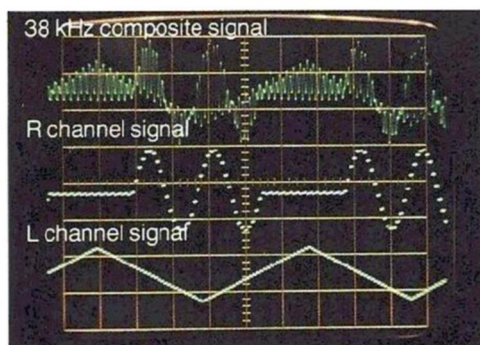
Unlike the conventional analog tuners, a quartz synthesizer digital tuner's local oscillator frequency is stabilized by the extremely precise quartz oscillator frequency. Since there is no need for AFC, this makes DC amplification (including the RF stage, DC detection, and DC stereo demodulation) possible.

By taking advantage of the inherent potential of the quartz synthesizer approach, we have produced the world's first DC tuner.

In addition to such a significant innovation, we've also added other useful features which improve performance, like a balanced detector output for connection to the MPX stage.

## DC Peak Sample and Hold MPX Circuitry for Superb Stereo Separation

The ST-S7 exhibits very high FM selectivity of 85 dB, a figure that is rarely matched with conventional designs. Normally, tuners with such high selectivity have sacrificed in the areas of distortion and stereo separation. But in the ST-S7 the employment of DC peak-sampling holding circuitry has removed this design conflict. Wide stereo separation (55 dB) is achieved despite the high selectivity of 85 dB and distortion is only 0.15% stereo. The keys to this success are DC capability in the detector and MPX stages and the digital sample/hold processing of the 38 kHz stereo subcarrier, which replaces the conventional switching decoder method. Because of the high sampling rate, additional information is obtained from the stereo channels. Moreover, frequency separation is unaffected by the potential instability of the 19 kHz pilot signal until the point of complete detuning.



## 19 kHz Pilot Signal Cancel Circuit with Automatic Level Adjustment

First developed in 1972, our original pilot cancel circuit contributes significantly to a high frequency response extension. These specs for the ST-S7 are superb: 5 Hz to 18 kHz, +0.2 dB, -0.5 dB. Since the 19 kHz pilot signal can occasionally vary, the ST-S7 incorporates, for the first time, variable cancel circuitry which can cancel out the actual pilot signal rather than just the 19 kHz standard. Distortion derived from pilot signal variation is thereby eliminated.

## Jitter Distortion Elimination Circuit for Clear High-Range Response

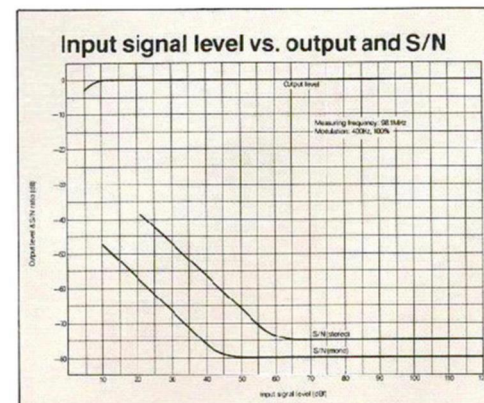
In tuners, jitter distortion is caused by interference between the 19 kHz pilot signal, or the 38 kHz subcarrier, and the audio signal components. The ST-S7 eliminates the 19 kHz signal as described above, plus the 38 kHz signal, with a very sharp band-pass filter, so both sources of jitter in the audio output are eliminated.

## 25 kHz Quartz Reference Frequency

The reference frequency of the ST-S7's quartz synthesizer tuner is 25 kHz; most other quartz tuners use a reference frequency of 5 kHz. This is but one measure of the ST-S7's superior performance. Although it may seem contradictory to find a reference frequency within an audio band, this arose because of the ready availability of an IC that was originally developed for car stereo tuners. When the 5 kHz reference frequency of this IC leaks into the audio signal path, a low-level whistling sound is produced. Distortion may not be audible in the relatively noisy environment of an automobile; but it is undesirable, to say the least, in a high quality tuner like the ST-S7. Therefore, we developed our own IC specifically for quartz synthesizer tuners. This new IC produces a highly stable reference frequency of 25 kHz, safely above the audio frequency spectrum.

## Back-to-Back High-Q Varactors and MOS FET Front End to Prevent IM Interference and Provide High Sensitivity

On a crowded FM band, it is particularly important to eliminate IM interference (which is caused by interference of three nearby broadcast frequencies) in the tuner's RF stage.





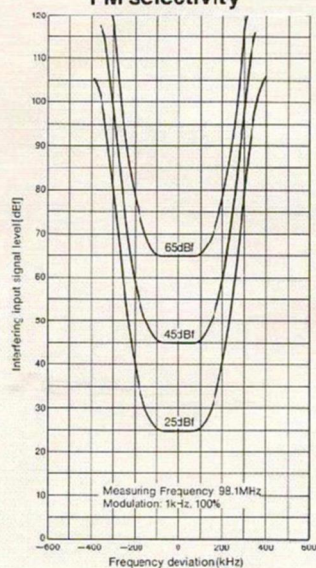


In the ST-S7, our back-to-back varactors (equivalent to a four-ganged variable capacitor) control capacitance through an applied DC potential rather than the manually controlled variation in capacitance found in dial-type analog tuners. These varactors exhibit a very high Q so that only the desired broadcast frequency is selected, and intermodulation products from nearby stations are effectively avoided. The 4-pole MOS FET RF amp provides a superb sensitivity of 37.2 dBf/50 dB quieting.

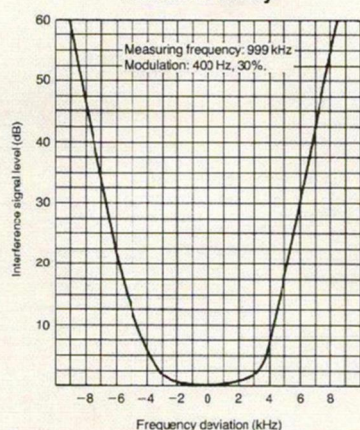
### IF Stage Ceramic Filters Have Outstanding Group Delay Characteristics to Provide High Selectivity and Low Distortion

Selectivity is extremely important on a crowded FM dial. With conventional tuners, you have two choices: a wide IF band with low distortion or a narrow IF band with higher selectivity and higher distortion. Because of this, some tuners are provided with switchable wide/narrow IF bands.

FM selectivity



AM selectivity

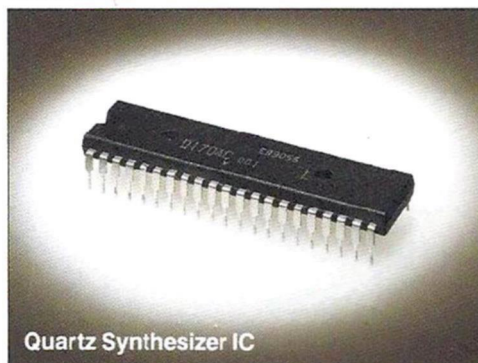


In this tuner, we have succeeded in achieving both low distortion and wide selectivity by using three very carefully manufactured and selected 4-element ceramic filters which have very flat group-delay characteristics. Without resorting to IF band switching, we've attained a very high selectivity of 85dB, while distortion is a very low 0.1% (mono), 0.15% (stereo).

### Extremely Easy and Accurate Tuning with Quartz Synthesizer Preset Buttons for a Total of 16 Stations, 8 AM and 8 FM, Plus Quartz Lock Indicator

Perhaps the greatest advantage of quartz synthesizer tuning is that virtually perfect tuning can be achieved easily and quickly. Moreover, this completely electronic tuning system readily lends itself to preset capability, thereby eliminating the need for signal strength or center tuning meters.

To "manually" tune the ST-S7, you just press the UP or DOWN button. This lets you electronically scan the dial as long as you keep either the UP or DOWN button pressed. When you reach the desired broadcast frequency, the locked indicator lights up, indicating that the station that you have selected is precisely tuned in.



Quartz Synthesizer IC

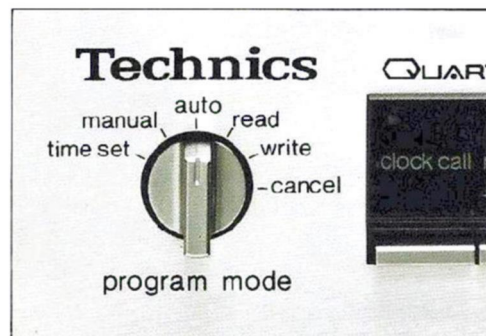
Of course, in most listening situations you'll probably rather rely on the preset buttons. The ST-S7 front end contains eight preset buttons and an FM-AM selector switch. Each preset button can be set for an AM and an FM station, and these stations can be chosen from any available broadcast frequency. The selector switch lets you choose either the AM or FM presetting for each button. So a total of 16 stations (8 AM and 8 FM) can be rapidly and easily tuned in. Any station which is tuned in has its broadcast frequency lit up on the FL (fluorescent) digital display on the front panel. And, at the same time, an LED channel indicator lights up to indicate a preset station. There's even a built-in memory that retains the last preset station you listen to before turning off the tuner. So when you turn the ST-S7 back on again, that same station is still tuned in. Even if there is a power failure, a backup power supply consisting of three batteries protects the preset memory from erasure. (batteries not provided).

### Built-in Programmable Timer for On/Off Tuning of Three Programs

The Technics-developed micro processor, utilized for our quartz-synthesizer tuning, is so powerful that it can also provide a programmable timer function.

This allows you to program the tuner to tune in the stations you want at the times you choose. The programmable timer can be set to turn two programs off and on every day, and an additional program for one particular time. So the tuning of three programs can be left entirely to the tuner.

The timer also controls the power to the tuner's switched AC outlet so that your amp or tape deck will turn on at the same time as the programs are tuned in.



This tuner is equipped with a 24-hour quartz clock which provides great accuracy (+10, -0 seconds per month). In fact, it can serve as a digital clock when the TUNER OFF button is pressed.

To program the timer, simply set the program selector to WRITE and press the preset buttons for the times you want. Of course, you can cancel in the middle of a program (CANCEL) or check your setting (READ). While listening to a program, you can check on the preset time by pressing the CLOCK CALL button. The time will be displayed for about five seconds; then the tuned-in station's frequency will reappear on the digital display.

### The Size and Shape of a Tuner

Although tuners don't have the large transformers or heat sinks found in amplifiers, they are often just as large and bulky. Since the ST-9038, we have adopted a policy of building tuners with a more manageable size. The slim, sleek lines and 43.6 mm (1-23/32") height of the ST-S7 make it clear that this is a tuner designed to be a high fidelity music source which will also occupy less space than many other tuners.

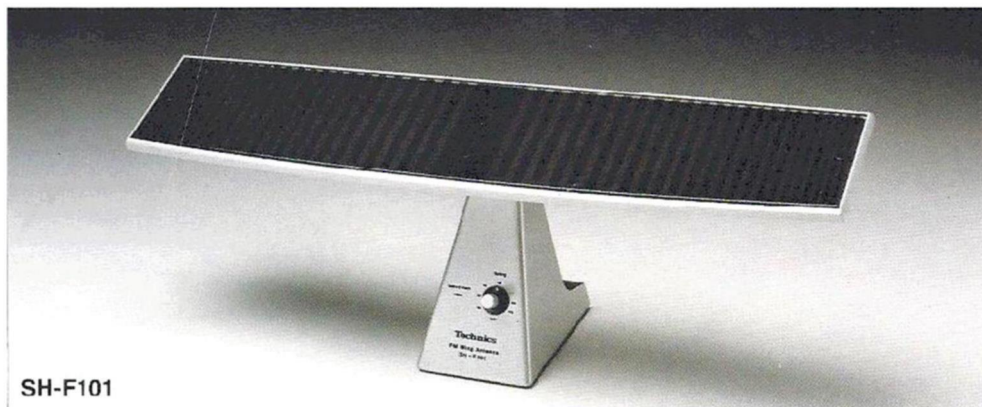
### 440 Hz, 50% Modulation, Recording Level Check Switch

Just turn on this switch before recording off the air in order to check recording levels and make precise adjustments with a standard signal strength.



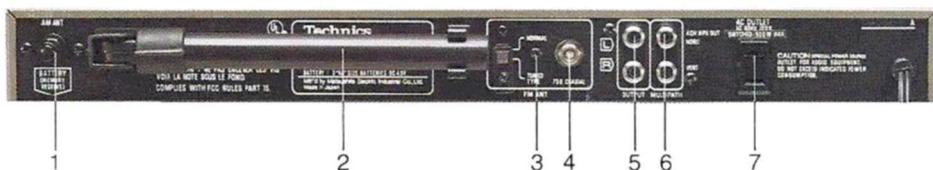
## "Wing Antenna" Terminals for Optimum Tuning at All Times

Special terminals are provided on the back panel for connection with the optional SH-F101 Indoor Active Tuned FM Wing Antenna. This antenna has built-in varactor diodes and coils designed to perform internal antenna tuning. A DC control voltage, required for this type of tuning, is automatically provided by the local oscillator in the ST-S7's quartz synthesizer. The SH-F101 is designed for inside use and fits neatly on top of the ST-S7.



SH-F101

## Rear Panel Facilities



1. AM antenna terminal
2. AM ferrite bar antenna
3. FM antenna selector (NORMAL, TUNED TYPE)
4. FM antenna terminal (75Ω COAXIAL)
5. Output terminals
6. 4-channel MPX output & FM multipath outputs
7. AC outlet (SWITCHED)

## ST-S7 — A Perfect Match for Technics SU-V8 and SU-V6 Amplifiers

The ST-S7 Quartz Synthesizer FM/AM Digital Tuner has been designed and built to performance standards that will be fully realized with Technics SU-V8 or SU-V6 Integrated DC Amplifiers. Be sure to hear them working together.



ST-S7 and SU-V8



ST-S7 and SU-V6

## Technical Specifications

### FM TUNER SECTION

|                                             |                                 |
|---------------------------------------------|---------------------------------|
| Frequency range                             | 87.9~107.9 MHz (0.2 MHz step)   |
|                                             | 87.5~108.0 MHz (0.05 MHz step)  |
| Sensitivity                                 | 10.8 dBf (0.95 $\mu$ V IHF '58) |
| 50 dB quieting sensitivity                  |                                 |
| MONO                                        | 16.3 dBf (1.8 $\mu$ V IHF '58)  |
| STEREO                                      | 37.2 dBf (20 $\mu$ V IHF '58)   |
| Total harmonic distortion                   |                                 |
| 1 kHz                                       | 0.1% (mono), 0.15% (stereo)     |
| S/N                                         |                                 |
| MONO                                        | 77 dB                           |
| STEREO                                      | 72 dB                           |
| Frequency response                          | 5 Hz~18 kHz, +0.2 dB, -0.5 dB   |
| Alternate channel selectivity $\pm$ 400 kHz | 85 dB                           |
| Capture ratio                               | 1.0 dB                          |
| Image rejection at 98.1 MHz                 | 80 dB                           |
| IF rejection at 98.1 MHz                    | 110 dB                          |
| Spurious response rejection at 98.1 MHz     | 95 dB                           |
| AM suppression                              | 55 dB                           |

|                   |                              |        |
|-------------------|------------------------------|--------|
| Stereo separation | 1 kHz                        | 55 dB  |
| Carrier leak      | 19 kHz                       | -70 dB |
|                   | 38 kHz                       | -50 dB |
| Antenna terminals | 75 $\Omega$ (F-type coaxial) |        |

### AM TUNER SECTION

|                             |                            |
|-----------------------------|----------------------------|
| Frequency range             | 530~1620 kHz (10 kHz step) |
|                             | 522~1611 kHz (9 kHz step)  |
| Sensitivity                 | 30 $\mu$ V, 250 $\mu$ V/m  |
| Selectivity                 | 55 dB                      |
| Image rejection at 1000 kHz | 45 dB                      |
| IF rejection at 1000 kHz    | 50 dB                      |

### TIMER SECTION

|           |                                     |
|-----------|-------------------------------------|
| Clock     | Quartz-lock type 24-hour indication |
| Precision | Within 0~+10 sec. monthly (at 25°C) |
| Function  | 24-hour programmable                |
|           | everyday: 2 times                   |
|           | once only: 1 time                   |

### Programmable content

|                               |                                                       |
|-------------------------------|-------------------------------------------------------|
| Program source (FM, AM)       |                                                       |
| Power ON/OFF timing           |                                                       |
| Designation of preset station |                                                       |
| Setting intervals             | 1 minute~23 hours, 59 minutes (at 1 minute intervals) |
| Priority order                | once, everyday 2, everyday 1                          |
| Memory "back-up"              | About 3 months (without AC power)                     |

### GENERAL

|                                  |                                                               |
|----------------------------------|---------------------------------------------------------------|
| Output voltage                   | 0.6 V (fixed)                                                 |
| Power consumption                | 9 W                                                           |
| Power supply                     | AC 120 V, 60 Hz                                               |
| Batteries (for memory "back-up") | DC 4.5 V (3 "AA" size batteries Panasonic UM-3 or equivalent) |
| Dimensions (W×H×D)               | 430×53×310 mm (16-15/16"×2-3/32"×12-7/32")                    |
| Weight                           | 4.0 kg (8.8 lbs.)                                             |

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