Sonic Frontiers SFT-1 CD transport

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CD transport with remote control. Outputs: RCA coaxial, BNC coaxial, AES/EBU, ST-Type optical. Output impedance: 110 ohms ±5% (AES/EBU), 75 ohms ±5% (coaxial). Specified jitter: <2ps RMS (40kHz bandwidth) on output clock, typically 10ps RMS at outputs. Dimensions: 17" W by 3.5" H by 11" D. Weight: 17 lbs net.

Warranty: 5 years parts and labor, 1 year on transport mechanism. Price: $2295. Approximate number of dealers: 75. Serial number of unit tested: 95330096. Manufacturer: Sonic Frontiers Inc., 2790 Brighton Road, Oakville, Ontario L6H 5T4, Canada. Tel: (905) 829-3838. Fax: (905) 829-3033.

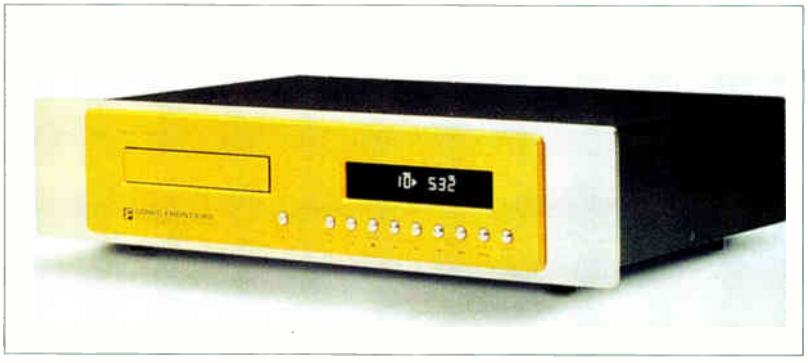
An often-overlooked aspect of choosing a CD transport is how well the transport matches to your digital processor. I'm not talking just about matching components sonically, but about the unique *electrical* interaction that occurs at the interface between a CD transport and digital processor. The transport, digital interconnect, and digital processor form a complex, interactive transmission system that works—and sounds—its best only when all three components are well-matched electrically.

In theory, a given transport should work equally well with every digital processor. In practice, a transport's fundamental sound quality can change depending upon what processor it drives. Similarly, digital processors can sound very different when driven by different transports. The changes have nothing to do with the transport's intrinsic sound.

Although a set of technical standards exists for engineering S/PDIF (Sony/Philips Digital Interface Format) transmitters and receivers, it is apparent that many manufacturers don't follow them. Some don't appear to think input and output impedances, voltage levels, and connector characteristic impedances are important. Others just design by ear without regard for technical performance. Consequently, how the transport's transmitter interacts with the cable and the digital processor's receiver becomes a significant variable in the music playback chain.

Sonic Frontiers has attempted to avoid this situation by designing their new SFT-1 transport in strict accordance with the S/PDIF specification. Moreover, the SFT-1's output stage uses a sophisticated reclocking circuit that reportedly has less than two picoseconds of jitter on its internal clock, and less than 10ps of jitter in the S/PDIF output. Indeed, the company claims the SFT-1 is the lowest-jitter transport on the market.

As always, however, the proof of any claimed performance is in the listening.



Sonic Frontiers SFT-1 CD transport

Technology

Sonic Frontiers' first transport is designed to visually and electrically complement the company's SFD-1 and SFD-2 digital processors. Its machined-aluminum faceplate is partially covered by a black- or gold-finished panel. Although the SFT-1 uses a Philips transport mechanism, the custom-made remote control is nicer than that found on the standard Philips-issue unit. It has curved edges and a larger, more easily accessed control surface.

The unit's layout is remarkably similar to that of the PS Audio Lambda and Theta Data Basic transports. A row of small round buttons beneath the display controls the transport, with the drawer Open/Close button offset next to the front-loading disc drawer. The rear panel holds the SFT-1's four digital outputs—AES/EBU, RCA coaxial, BNC coaxial, and ST-Type optical.

The SFT-1's power supply is unusually large and elaborate for a CD transport. Incoming AC at the rear-panel IEC jack is filtered before reaching the two custom, potted toroidal transformers. The larger transformer has dual secondary windings, one of which supplies the spindle motor, laser sled, and the regulated 5V stage that powers the front-panel logic and display circuits. This transformer's other secondary winding supplies two +5V regulation stages that feed the output crystal oscillator and reclocking circuit, respectively. The smaller transformer provides power to the fluorescent display. The SFT-1 uses a total of six separately regulated supplies.

The transport is a Philips CDM 12.4, a new and fairly inexpensive mechanism that's starting to appear in place of the discontinued CDM 9 Pro (the CDM 9 Pro is used in the Theta Data Basic and PS Audio Lambda). The CDM 12.4 reportedly benefits from the increased performance and reliability available in recently designed mechanisms as a result of the explosion in demand for CD-ROM drives.

The transport control, decoding, and error-correction electronics are incorporated in the latest-generation Philips chip set. Rather than buying the servo control and decoding board from Philips, Sonic Frontiers buys only the chips. This allows them to implement the chips their own way for better performance. For example, the SAA7345 demodulator/EFM decoder/serial interface chip on the transport servo board is driven by a clock powered from its own regulated supply. This technique prevents noise on the chip's power and ground lines from contaminating the system's master clock and power supply.

One theory of CD transport design holds that the mechanism's sonic influence can be virtually eliminated if the output stage is designed correctly. An ideal output-clocking circuit, the argument goes, produces a virtually jitter-free output regardless of the jitter produced by the transport mechanism. Sonic Frontiers seemed to follow this approach; the SFT-1 uses a moderately priced mechanism coupled to a very sophisticated output clocking circuit with extensive power-supply isolation.

The output stage consists of a buffer, flip-flop, and crystal oscillator. The oscillator provides the clock signal to the flip-flop and buffer, which reclock the output signal. The clock and output buffer/flip-flop are supplied from separate voltage-regulation stages for greater isolation and lower jitter. A pair of custom-designed Scientific Conversions pulse transformers follow the buffer output.

It is common practice for a designer to put a 75 ohm resistor in series with the transport's output to create an output impedance of "75 ohms." According to the SFT-1's designers, this technique doesn't achieve a precisely controlled 75 ohm output impedance over a wide-enough bandwidth. In the SFT-1, a network of 10 passive components is used *after* the pulse transformer to condition the signal. This passive RLC network not only provides the correct output impedance, but is claimed to ensure a wide bandwidth, fast risetime, and minimum overshoot and ringing in the output signal.

This output stage was designed in an unusual way: the work-in-progress SFT-1 prototype was connected by a digital interconnect to a digital processor whose internal word-clock jitter *at its DAC* was measured and monitored. Design changes in the transport were evaluated by measuring the recovered clock jitter in the digital processor driven by the SFT-1. A sophisticated new jitter analyzer, recently developed by Rémy Fourré at UltraAnalog,[1] was used to perform the jitter measurements. This new analyzer reportedly has a noise-floor of less than 1ps, making it extremely sensitive to small jitter variations. The design team discovered some interesting aspects of transport design using this approach, including the fact that the logic family in the transport's output stage[2] has a measurable effect on jitter in the digital processor's recovered clock.[3]

Every aspect of the output stage's design, layout, and power supply were evaluated with this measurement technique, in conjunction with listening tests. The designers found a strong correlation between the waveshape at the SFT-1's output and the word-clock jitter measured in the digital processor — the point at which jitter degrades digital-audio sound quality.

System

I've been using the SFT-1 transport on and off for the past few months, alternating it in my system with the $8495 Mark Levinson No.31 Reference CD Transport. The No.31 continues to live up to its name as the reference against which other transports are judged. When the SFT-1 first arrived, I made some listening comparisons with the $1750 Theta Data Basic, which was sent back for updating to Data Basic Two status, and with the No.31. The SFT-1 drove, at one time or another, the Spectral SDR-2000 Pro, Mark Levinson No.30.5, Classé DAC-1, Sonic Frontiers SFD-2 Mk.II, and PS Audio UltraLink Two processors.

Digital interconnects included an AudioQuest Diamond X3 AES/EBU, Illuminati's true 75 ohm coaxial cable, an MIT Digital Reference (coaxial), and a generic ST-type optical cable. The transports and processors under audition sat on a Billy Bags 5500-series equipment rack or a Merrill Stable Table.

These digital front-ends fed a Spectral DMC-20 Series 2 preamplifier and Spectral DMA-180 power amplifier via MIT MI-350 Reference interconnect. The Spectral amp drove Avalon Radian HC loudspeakers, connected with MIT MH-850 tri-wired loudspeaker cable. AC to the system was conditioned by MIT's Z-Center, Z-Iso-Duo, Z-Stabilizer, and Z-Cord II AC cords. I auditioned the SFT-1 with its stock AC cord and also with the MIT Z-Cord II. (The MIT/Avalon/Spectral "2C3D" system was reviewed in the January '95 *Stereophile*, Vol.19 No.1, p.163.)

I also had experience with the SFT-1 in my usual reference system of the Sonic Frontiers SFL-2 preamp, Audio Research VT150 power amplifiers, and Genesis II.5 loudspeakers. Interconnects in this system were AudioQuest Diamond X3 and Lapis, and loudspeaker cables were AudioQuest Dragon II.

Listening

My first impression of the SFT-1 in a comparison with the Theta Data Basic and Mark Levinson No.31 was that the Sonic Frontiers transport was a significant step up from the Theta, and nearly equaled the No.31 in some respects. Further listening confirmed these impressions, placing the SFT-1 between these two highly regarded transports.

The SFT-1's overall sound was big, dynamic, and slightly more forward than that of the No.31. Where the No.31 was smooth and laid-back, with a tremendous sense of ease, the SFT-1 was a little more aggressive, both in perspective and tonal balance. Instruments were pushed slightly in front of the loudspeakers with the SFT-1, giving the sound a more immediate and incisive perspective.

Similarly, the SFT-1 had a somewhat brighter and less liquid treble than the No.31. I heard a slight edge on instrumental textures through the SFT-1, in contrast with the No.31's velvety-smooth portrayal. Cymbals took on a trace of hardness not heard through the No.31. The woodwinds on the new Oregon disc *Beyond Words* (Chesky JD130) sounded less smooth and liquid with the SFT-1, particular in the higher registers and during loud passages. The result of the more forward perspective and brighter sound was less impression of refinement and ease from the SFT-1 compared to the No.31. In relation to the Theta Data Basic, the SFT-1 was just a tad brighter than the smooth-sounding Data Basic.

On the plus side, the SFT-1 had excellent dynamics and a big, full bottom end. Victor Wooten's bass playing on the Béla Fleck records had a wonderful solidity, power, and control. The full presentation was coupled with good articulation and wide dynamics. Consequently, the SFT-1 had a robust, weighty, and upbeat quality that made the No.31 sound polite by comparison. The SFT-1's punchy bottom end gave the music a powerful rhythmic quality I greatly enjoyed.

The SFT-1 was also highly resolving of recorded detail. The presentation was infused with a wealth of detail that was captivating. I heard fine nuances in the music that better conveyed what went

1 Rémy Fourré was the author of the superb *Stereophile* article on interface jitter published in Vol.16 No.10.

2 Digital logic circuits come in a variety of "families" for different applications: AND, OR, NOR, EXOR, etc. The oldest and most common is "Transistor-Transistor Logic," or TTL. Other families include CMOS (which consumes very little power). The different families perform the same logic functions, but are made using different processes.

3 Steve McCormack of McCormack Audio told me nearly five years ago that he heard differences in sound quality between logic families. It's interesting that in late 1995 we have the first measurable confirmation of a phenomenon first discovered purely by critical listening. See my interview with Steve McCormack in Vol.15 No.4, particularly p.91.

on during the recording session. Zappa's orchestral *The Yellow Shark* (Barking Pumpkin R271600) is extremely challenging music for any playback system; there's so much going on musically that many components simply don't convey. The SFT-1 did a great job at unraveling the layers of dense orchestration and presenting sounds as separate instruments. In fact, the SFT-1's resolution was just a notch below the No.31's resolving power, which is one of the Levinson transport's greatest qualities. The No.31 had a greater ability to keep individual instrumental lines separate from each other, both tonally and spatially. Moreover, the No.31 had a more refined and subtle presentation of detail, a quality that added to the Levinson's greater sense of ease.

The SFT-1 was stunning in its ability to portray space and air. The soundstage was open, transparent, and spacious, and threw a wonderful halo of air around the soundstage edges on naturally miked recordings. Moreover, the SFT-1 revealed a tangible bloom around individual instrumental images. The fabulous new Dorian recording *Baroque Inventions* (Dorian DOR-90209), featuring music of Bach, Handel, and Scarlatti performed by two classical guitarists, highlighted the SFT-1's remarkable ability to resolve the finest spatial detail. The SFT-1 beautifully conveyed the gorgeous acoustic enveloping the guitarists, as well as the bloom around each instrument. The HDCD®-encoded *Requiem* (Reference Recordings RR-57CD) by John Rutter and *From the Age of Swing* (Reference Recordings RR-59CD) were stunning in their spaciousness and air. The SFT-1 in no way constricted the vast spatial expanse that the Spectral/Avalon/MIT system is capable of revealing. In this regard, the SFT-1 was the No.31's equal.

Conclusion

The Sonic Frontiers SFT-1's combination of superb dynamics, a weighty and powerful bass presentation, a huge soundstage, a wonderful ability to reveal fine spatial detail, and reasonable price make it an excellent value in affordable CD transports. Only in comparison with the $8495 Mark Levinson No.31 did the SFT-1's main shortcoming—a slightly bright and less-than-pristine treble—become apparent. In relation to the less-expensive Theta Data Basic, the SFT-1 was the better-sounding transport overall, with greater resolution, wider dynamics, and a bigger and more open soundstage.

Moreover, my listening confirmed that with its carefully engineered output stage, the SFT-1 offers more consistent results with a wide range of digital processors than is usually the case.

Overall, I was surprised by how good the SFT-1 sounded for its price. The SFT-1 is both a good alternative to the higher-priced transports and a must-audition component. **S**