



# *Alpine F<sup>#1</sup> Status™*

**//////ALPINE®**

# Meeting a new challenge to realize the best sound in the passenger compartment

## Alpine F#1 Status

For a quarter of a century, Alpine has been pursuing the best sound in the passenger compartment which is subject to harsh physical and electronic conditions. Alpine has developed its own unique on-board acoustic technology, which is totally different from that of home audio, in order to overcome these tough listening conditions. The Mobile Multimedia Era is flourishing, and recording media and reproduction technology have evolved in a remarkable fashion. For an exciting and wide range of emotional experience, sound is more important than ever, and is becoming the central factor.

While establishing its standing as a Mobile MultiMedia specialist, Alpine has concentrated its incomparable craftsmanship, which resembles that of master artisans of musical instruments, based on its unique technology and expertise accumulated through long experience. Alpine constantly strives to deliver the best possible sound in this new era with an approach called “micro-dynamics.” This approach consists of micro- and macroscopic- technological analysis and design, in order to deliver increased precision in reproduction speed and time measurement, to maximize the musical sensory experience.

The best sound in the passenger compartment promises the most advanced multimedia experience to serious listeners in the passenger compartment.

Alpine F#1 Status.

The passionate challenge begins from here.

# CD Head Unit

***Carefully selected and fine-tuned high-precision parts to attain “best accuracy” for distortion-less reproduction of minute signals.***

■ **A new high precision “DP-ST”, ensures precise retrieval of digital information and high vibration resistance.**

The DP-ST achieves six times greater precision than conventional CD products by incorporating accurate skew optimization along the X, Y, and Z axes.

The DP-ST keeps the laser much more perpendicular to the CD compared to Alpine’s already high quality transports. This reduces data reading errors. Since the following circuits correct fewer errors, they “strain” less, improving the “easiness” of the music DP/ST has the best-in-industry data readout accuracy, which can be provided to only the flagship model.

■ **Hand picked K-Grade “Sign-Magnitude” 24-bit DACs from Burr-Brown offer the highest precision available.**

Many types of Digital-to-Analog Converters (DACs) exist: the original multi-bit, 1-bit, bitstream, MASH, delta-sigma, etc. But the Sign-Magnitude DAC still remains unequaled. The Sign-Magnitude Multi-bit DAC, uses precision laser-trimmed ladder resistors to precisely decode each bit, while a unique architecture sidesteps zero-cross distortion problems. Since even such precision manufactured products have slight variance, each “K” grade DAC is hand picked and carefully selected for use. K-grade products achieve a three-times lower distortion rating and higher S/N ratio compared to the already awesome basic Sign-Magnitude. It is the highest grade DAC that can be produced at the present time, with incredible capability to eliminate low-level noise, thus reproducing a sensitive expression of the music performance.

■ **Promising the highest precision: Burr-Brown matching 24-bit digital filter.**

The PXA-H900 utilizes a very high grade 24-bit, 8 times oversampling digital filter. This companion unit to the Burr-Brown “Sign-Magnitude” 24-bit DAC promises the highest accuracy and precision available today. In fact, by cutting noise outside the audible range, high-precision reproduction with ultra-wide dynamic range is possible. This creates a rich abundance of musical information and harmonics.

■ **By eliminating high-frequency noise, quietude and depth are reproduced: “GIC-type low-pass filter”**

In all CD systems, a lowpass filter keeps digital noise out of the music. Instead of a typical series filter, Alpine has employed a GIC (Generalized Impedance Converter) filter. This type of filter essentially short-circuits spurious noise signals while letting the music pass directly to the next stage. Removing the series filter keeps the music purer. And, by using the special GIC filter, high-frequency noise that cannot usually be removed by 8 times oversampling is eliminated. This high precision low-pass filter extracts only the true musical information.

■ **Sound quality not possible with typical “Balance” and “Fader” circuits has been achieved: “Independent Precision Attenuators”**

Analog volume control has been said to be preferable for sound. The common analog implementation requires three circuits in series to achieve volume, balance and fader functions. The sound passes through each of the three stages, and each stage inevitably adds some slight distortion and noise. With the new circuit design, each channel employs its’ own high precision ladder resistor electronic volume. Based on the users’ settings, a microchip calculates what each channel’s output setting should be, and orchestrates all channels together. Loss of music information due to passing through multiple stages does not occur.

## ***Noise from various points of the circuit is restricted to the ultimate level to reproduce unprecedented “quietude”***

### ■ **Black-finish DP/ST mechanism & copper-plated black-finish chassis for less noise effects, electric distortion, and data reading deterioration.**

Reflections of the laser from the CD surface can bounce into the laser reading head, causing transition errors when the digital bits change between 0 and 1 (“jitter”). These transition errors decode as low level noise and distortion. To eliminate such possibilities, the DP/ST mechanisms are all painted black, including the inner faces and circuit boards. This reduces the optical noise and achieves an improved S/N ratio that can be easily recognized in the reproduced sounds.

### ■ **Reducing noise by lowering impedance of power supply system: four-layer PCB with STAR Circuit**

A copper through-hole four-layered PCB allows ideal patterning and part layout for minimal pickup of radiated electromagnetic noise. Furthermore, by doubling the thickness of the copper foil to 70mm, a reduction of noise is achieved, along with lower impedance of the power supply system. One layer out of four is the ground and Alpine’s unique STAR (Signal Transit for Accurate Response) Circuit is mounted in order to reduce interference. By inserting the ground layer, a reduction in interference and ideal part layout were targeted.

### ■ **Shield FPC shuts out noise**

Flexible Printed Circuit+j

The FPC, sandwiched between two shield layers, rejects noise effects from the power line and master clock line.

### ■ **Plenty of carefully selected “high-quality parts” supporting the high performance of DAC**

Includes non-metal carbon film resistors (for high-quality audio) with no magnetostriction, high-quality sound custom slave-less electrolytic capacitors preventing electricity charge on the capacitor coating that may affect capacitor characteristics adversely, hand-picked high-performance op amps, etc. The unrestricted use of these noise/signal distortion-resistant devices achieves a three-times-higher S/N ratio.

## ***Unprecedented “wide dynamic range” Persistent pursuit of energetic and enjoyable “high-speed sound”***

### ■ **Resonant DC-DC converter for stable power supply**

Whereas the general DC-DC converters send rectangular waves to the step-up transformer, the resonant DC-DC converter, with a simple design integrating capacitors in its Taylor circuit, sends sine waves to the step-up transformer. Consequently, the high frequency components inherent to the normal switching power supply units are significantly reduced and high frequency noise and spike noises are extremely small. The right solution for a clean power supply.

### ■ **A large capacity power supply circuit allows instantaneous supply of a large amount of electrical current, four times as large as the maximum current consumption. It's as powerful as those used in desktop audio units.**

An audio-use large capacity power supply is employed. The dual line independent power cables and independent shield structures for the respective circuit blocks allow the separation of the power for the audio signal circuits from those of the operation display systems, remarkably reducing mutual interference (noise or voltage fluctuation effects). These designs achieve both a listener feel of wide dynamic range and lower noise level, while ensuring sufficient power supply capacity. More than enough dynamic range is constantly available.

### ■ **High-Voltage I/V converter eliminates the necessity of a final stage booster circuit which amplifies noise.**

Inside the DAC, the digital bits are translated into electric currents. An I/V (current, I to voltage, V) converter transforms those currents into output voltage. To achieve high output voltage, a commonly available booster IC typically amplifies the I/V converter output. Unfortunately this amplifies noise as well. Instead of following this standard path, Alpine specially engineered a Direct High Voltage I/V converter. The output from the I/V converter is already high voltage, so no additional noise amplification occurs.

### ■ **Large-diameter power cable improves the power supply capacity**

The power cables, from the battery to the black box, are all OFC (Oxygen Free Copper) 14AWG equivalents (2 mm<sup>2</sup>). The carefully selected cable size and material (OFC) contribute to impedance reduction, ensuring not only satisfactory anti-noise performance but also top-level capacity for instantaneous power supply.

### ■ **Custom large-capacity electrolytic capacitors provide extremely clear and crisp sound**

These capacitors, with their improved capacity for instantaneous current supply, are remarkably effective in sound reproduction stability including powerful bass expression and quick sound generation. CDA-7990 uses eight times the total capacity of compared to normal systems.

***High-precision signal transmission to maintain high quality sound information. All design factors, including contact resistance, noise effects, durability and matching, are optimized for the in-vehicle environment.***

- **4V PREOUT improves the S/N ratio by cutting off noise effects and restricting amplifier gain**

The high voltage output level allows reduction of amplifier gain. Therefore, any noise induced in the RCA lines to the amplifier will not be amplified as much.

- **”High-performance RCA connector/power terminals” with outstanding durability and anti-vibration performance, as well as less propensity to contact resistance and noise**

The RCA connectors, and power terminals are all critical factors for sound reproduction quality. This awareness is carefully reflected in the designs of these devices. For example, the contact faces are machined with high accuracy and high attachment pressure is provided to the connectors. The power terminals, with their thick gold plating, are high attachment pressure types optimized for high voltage design.

They exhibit improved durability against vibration and external shocks, thus reducing the possibilities of sound quality deterioration caused by contact resistance.

- **Custom developed RCA cables use a titanium-containing heat resistant insulator for powerful bass frequencies and gentle, clear mid-to-high frequencies**

Alpine teamed with Monster Cable to develop an original RCA cable with excellent bandwidth balance that can transmit high-quality sound signals completely with no loss. To attain a good balance across the different bandwidths of sound signals, hybrid stranded wire is adopted for the cable. The wire itself uses both PCOCC (Pure Copper by Ohno Continuous Casting process) and Hi-OFC (Hi-Oxygen Free Copper) wires. Inner and outer strand layers adopt different winding techniques, one to optimize the bass and the other to optimize high frequencies. Moreover, this stranded wire is covered with a high durability insulation material made from a titanium compound, providing the RCA cable with heavy-duty specifications to meet the severe on-vehicle environment (including severe temperature changes). The appearance of this thick cable also gives a feel of power and grace as well as improves the scale of the reproduced sounds.

- **Digital optical output accommodating high-quality sound data transfer to external units with minimal deterioration**

Digital fiber optic output offers a precise, interference-free transmission of digital data to outboard sound processors. The CDA-7990s output offers an even more precise data output than the normal system. The improvements in the CD transport mechanism provide a cleaner data signal to start with, with a large reduction in transition timing errors (jitter) found with conventional transports. Additionally, a hand-picked DIT (digital interface transmitter) ensures that the data is transmitted optimally.

## ***Advanced ergonomic design concept for “user-friendly interface” even while driving***

### ■ **BioLite display with wide viewing angle and high resolution/contrast**

The high quality display uses biochemical luminescence technology that ensures outstanding visibility even in daylight. It also emphasizes advanced technology with an interactive display environment and feedback to every operation by the user.

### ■ **”High-rigidity rotary encoder” inspires the user to touch and feel**

The 20mm aluminum shaped knob provides the feel of real quality that only top-grade audio systems provide. When touched, it exhibits a richness in torque response, tactile feel, and grip, inspiring the user with the prospect of high-quality sound. Its comfortable and smooth analog feel will fascinate all kinds of owners.

### ■ **”Key layout,” combination of legacy and innovation exhibiting clear design identity**

The simple layout of the six LED-lit preset buttons and control knobs create the Alpine identity with universal appeal to high-end users.