

# Accuphase

MDS COMPACT DISC PLAYER

## DP-400

- High-precision CD drive, high-quality CD tray, and ultra quiet and smooth loading mechanism
- MDS++ D/A converters and low-pass "Direct Balanced Filter" with totally separate balanced and unbalanced signal paths
- Two sets of transport outputs and digital inputs allow insertion of DG-48 into signal path for sound field correction
- Balanced and unbalanced analog outputs





**Dedicated CD Player with high-precision drive — High-quality disc tray made from extruded aluminum, combined with ultra quiet and smooth loading mechanism. Processor section features further refined MDS++ type D/A converters. Fully separate transport and processor section, with coaxial and optical transport outputs and digital inputs, allowing easy insertion of DG-48 into signal path for sound field correction in the digital domain.**

The Compact Disc format with its 20-year history offers an unsurpassed wealth of musical treasures. It still is the most important source medium for many music lovers. Many audiophiles have extensive CD collections and they want to get the best and most up-to-date reproduction quality possible. In response to such demands, Accuphase developed a CD drive in-house and first incorporated it in the high-end dedicated CD player DP-500, which has won enthusiastic praise the world over. The DP-400 inherits the technical know-how of the DP-500 while employing the latest digital technology. It offers CD reproduction bound to satisfy even the most discerning audiophile for whom sound quality is paramount. By bringing out the full potential of the format down to the finest nuances, it lets the listener rediscover the sheer exhilaration of the music experience.

The high-precision drive mechanism in the transport section of the DP-400 uses a chassis construction that not only keeps internal vibrations of rotating parts to a minimum, it also is highly impervious to external vibrations. This is the secret behind extracting the information on the CD one-hundred percent. The sophisticated know-how gained while developing the DP-500 is fully in evidence here.

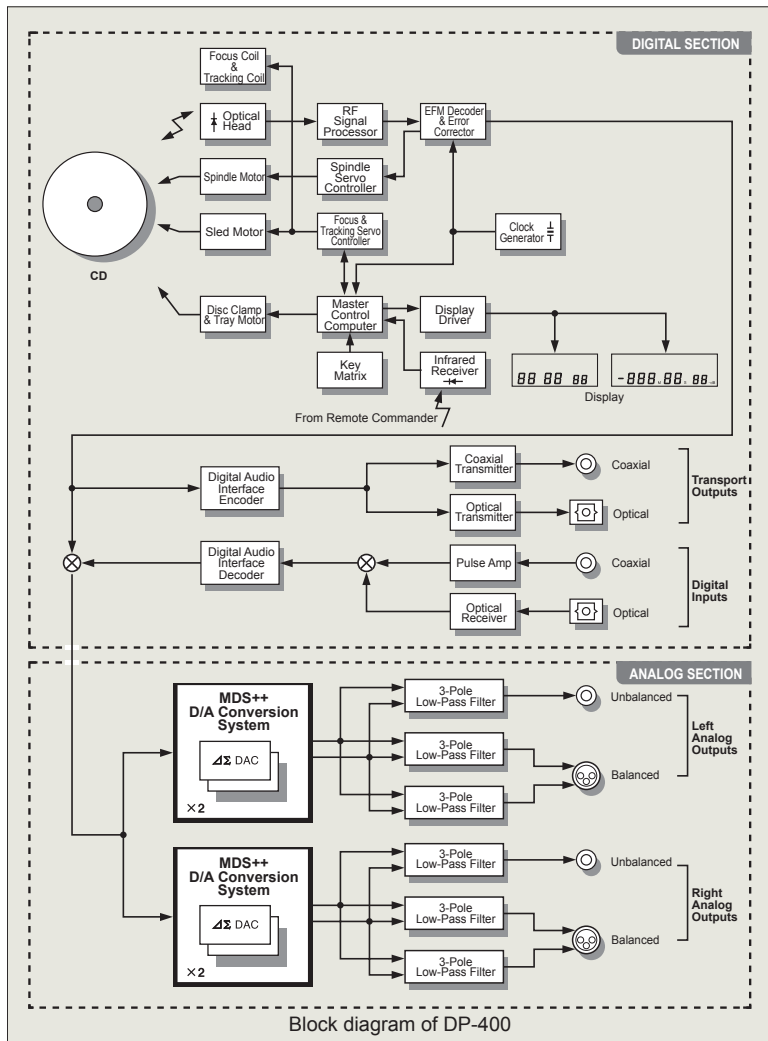
The processor section incorporates digital technology of the highest order, with a further refined MDS++ type D/A converter, another proprietary Accuphase development. In the DP-400, two strictly selected high-performance delta-sigma devices are operating in parallel. This significantly improves performance parameters including conversion accuracy, THD, S/N ratio, and linearity at low signal levels. The analog filter is a "Direct Balanced Filter" with totally separate analog low-pass filtering (3-pole Butterworth) for the balanced and unbalanced signal paths. The transport and processor sections are configured independently of each other, allowing separate use in conjunction with other components.



Coaxial input indication



Optical input indication



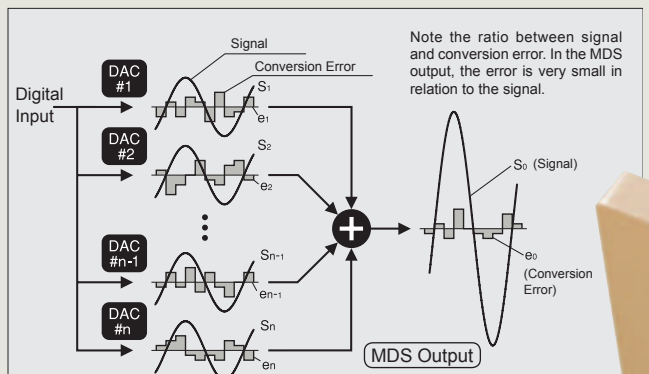
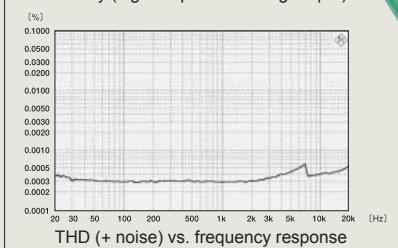
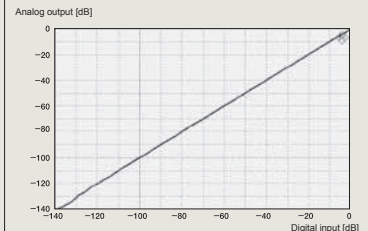
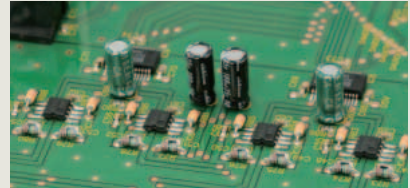
### MDS++ D/A converter

MDS (Multiple Delta Sigma) is a revolutionary design which employs several delta sigma type converters in a parallel configuration. In the combined output, conversion errors cancel each other out, resulting in a drastic improvement in all relevant aspects of converter performance such as conversion accuracy, S/N ratio, dynamic range, linearity, and THD.

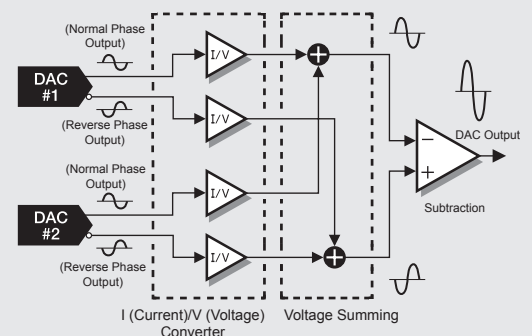
In the DP-400, two delta-sigma type PCM1796 converters (made by Texas Instruments) are driven in parallel. Compared to a single converter, this results in an overall performance improvement by a factor of 1.41 ( $=\sqrt{2}$ ).

As shown in the diagram, the MDS++ features an enhanced current-to-voltage (I/V) converter for processing the D/A converter output current.

A combination of current summing and voltage summing is used, providing even better stability and top-notch performance. The music emerges from a totally silent background, with breathtaking detail resolution and accurate spatial information.



### MDS type D/A converter principle



Block diagram of MDS++ converter in DP-400

## Transport section features high-rigidity, high-precision CD drive



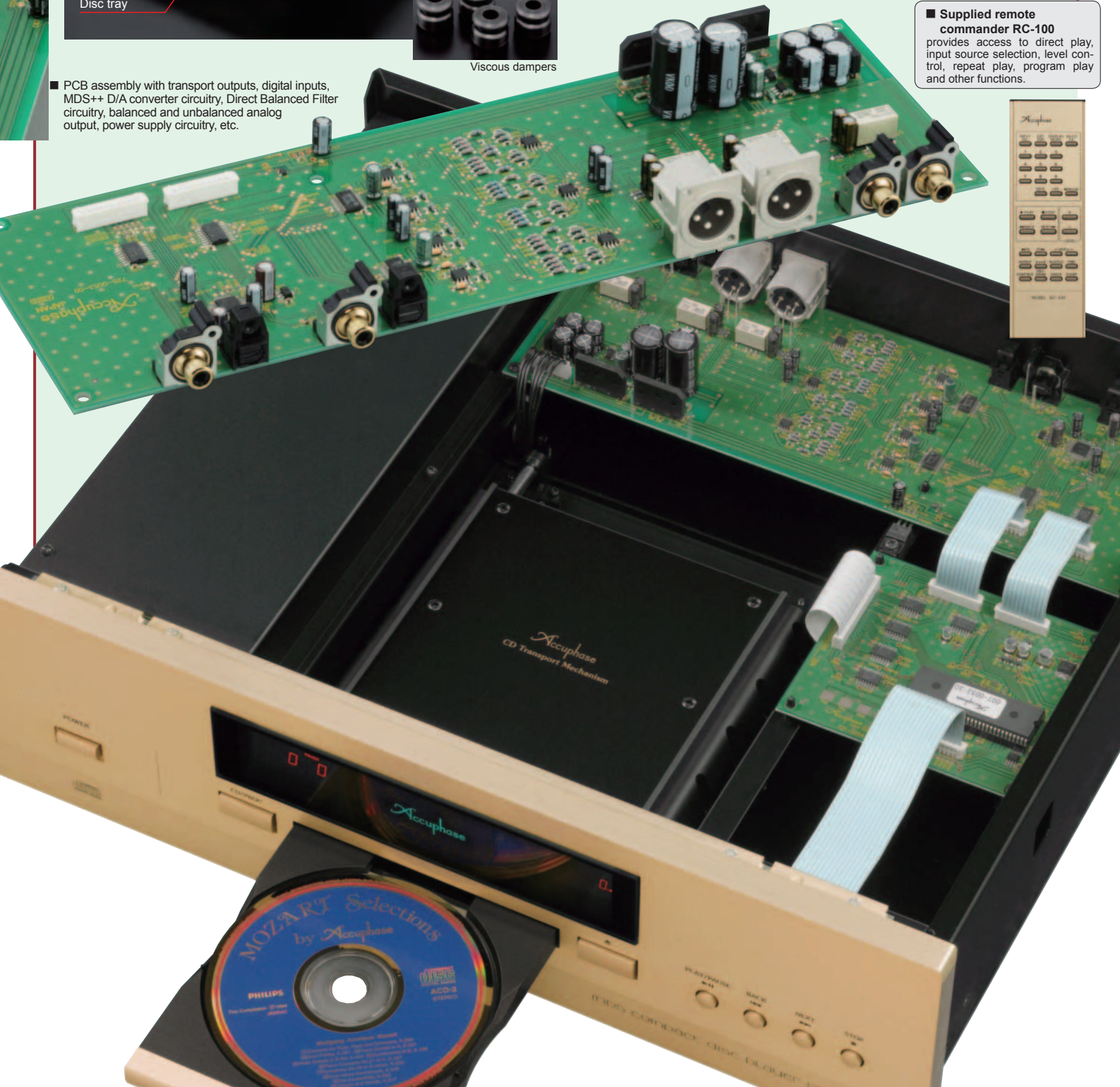
- Sturdy chassis absorbs external vibrations
- Highly rigid and precise construction
- Traverse mechanism with floating design and viscous damping
- Integrated design with large bridge joined to mechanism base
- Low center of gravity and efficient vibration control
- High-quality disc tray made from extruded aluminum, plus ultra quiet and smooth loading mechanism

### CD transport section features and functions

- Fully digital control of CD mechanism
- Laser pickup with integrated RF amplifier for drastically reduced noise interference
- Power-on play feature allows automatic playback
- Balanced drive circuitry for actuator control eliminates interaction with other circuits

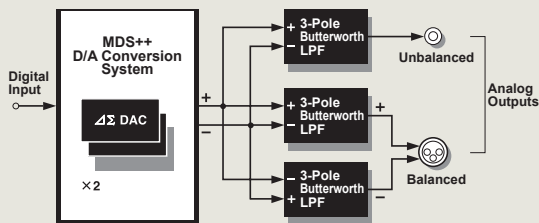
■ Supplied remote commander RC-100 provides access to direct play, input source selection, level control, repeat play, program play and other functions.

■ PCB assembly with transport outputs, digital inputs, MDS++ D/A converter circuitry, Direct Balanced Filter circuitry, balanced and unbalanced analog output, power supply circuitry, etc.



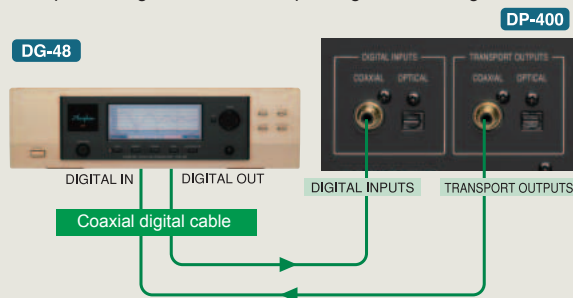
## Direct Balanced Filter with separate balanced/unbalanced circuitry

The output of any D/A converter contains so-called aliasing noise in the very high frequency range. In the DP-400, the analog filter designed to remove that noise is a 3-pole Butterworth type with extremely flat frequency response in the passband. In order to prevent unwanted interaction, completely separate filters are provided for the balanced and unbalanced signal paths. A direct connection from the balancing circuit at the output of the D/A converter to the filter circuitry and symmetrical +/- configuration ensures that the +/- output impedance is also identical. This provides ideal transmission conditions for the high-quality MDS++ output.



## Connection example for DG-48

The transport output of the DP-400 can be connected to the digital input of the DG-48 (by coaxial or optical fiber cable) for sound field processing of the CD transport signal in the digital domain.

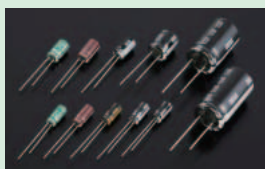


### Other features

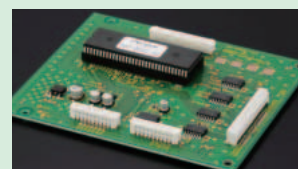
- Completely separate transport and processor sections
- Two sets (coaxial and optical) of transport outputs and processor inputs allow connection of DG-48 for sound field correction
- Balanced and unbalanced analog outputs
- "High Carbon" cast iron insulator feet with superior damping characteristics further enhance sound quality



Delta-sigma D/A converter

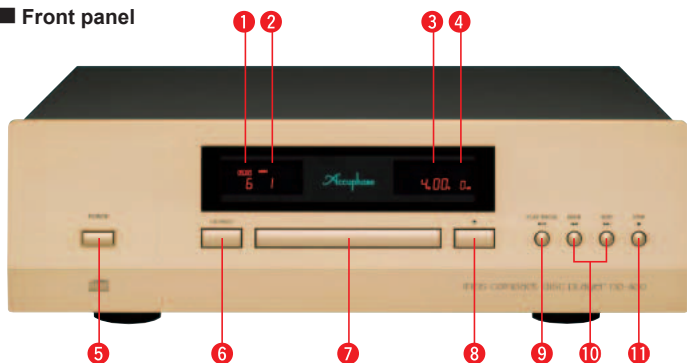


High-quality, high-reliability parts



Digital signal processing assembly

### Front panel



### Rear panel



- 1 Play track indicator
- 2 Total track/index indicator
- 3 Time indicator
- 4 Output level indicator
- 5 Power switch
- 6 CD transport/processor selector button
- 7 Disc tray
- 8 ▲ Disc tray open/close button
- 9 ▶▶ Play/pause button
- 10 ◀◀▶▶ Track search buttons
- 11 ■ Stop button

- 12 Digital input connectors (coaxial, optical)
- 13 Transport output connectors (coaxial, optical)
- 14 Balanced output connectors (analog)  
① Ground ② Inverted (-) ③ Non-inverted (+)
- 15 Unbalanced output connectors (analog)
- 16 AC power connector\*

#### Supplied accessories:

- AC power cord
- Audio cable with plugs (1 meter)
- Remote Commander RC-100

### Remarks

- \* This product is available in versions for 120/230 V AC. Make sure that the voltage shown on the rear panel matches the AC line voltage in your area.
- \* The shape of the AC inlet and plug of the supplied power cord depends on the voltage rating and destination country.

## DP-400 Guaranteed Specifications

- \* Guaranteed specifications are measured according to the JEITA standard CP-2402A.
- \* Measurement disc: JEITA CP-2403A compliant

### CD Transport

- **Standard CD format**
  - Quantization: 16 bits
  - Sampling frequency: 44.1 kHz
  - Error correction principle: CIRC
  - Number of channels: 2
  - Revolution speed: 500–200 rpm (CLV)
  - Scan velocity: 1.2–1.4 m/s, constant
- **Data read principle** Non-contact optical pickup
- **Laser** GaAlAs (double hetero-junction visible-spectrum semiconductor laser diode)
- **Transport output level**
  - COAXIAL (IEC 60958): 0.5 Vp-p, 75 ohms
  - OPTICAL (JEITA CP-1212): Light output -21 to -15 dBm
  - Wavelength 660 nm

### Digital Processor

- **Input format (IEC 60958/AES-3 compliant)**
  - Quantization: 16–24 bits, linear
  - Sampling frequency: 32 kHz, 44.1 kHz, 48 kHz, 88.2 kHz, 96 kHz
- **Digital input level**
  - COAXIAL (IEC 60958): 0.5 Vp-p, 75 ohms
  - OPTICAL (JEITA CP-1212): Light output -27 to -15 dBm
- **Frequency response** 4 to 20,000 Hz ±0.3 dB
- **D/A converter** 24 bits, MDS++ type
- **Total harmonic distortion** Max. 0.001% (20–20,000 Hz, 24-bit input)
- **Signal-to-noise ratio** 114 dB or better
- **Dynamic range** 110 dB or better
- **Channel separation** 110 dB or better
- **Output voltage and impedance**
  - BALANCED: 2.5 V into 50 ohms, balanced XLR type
  - UNBALANCED: 2.5 V into 50 ohms, RCA-type phono jacks
- **Output level control** 0 to -60 dB in 1-dB steps (digital type)

### General

- **Power requirements** AC120 V/230 V, 50/60 Hz (Voltage as indicated on rear panel)
- **Power consumption** 13 W
- **Max. dimensions**
  - Width 465 mm (18-5/16")
  - Height 150 mm (5-7/8")
  - Depth 393 mm (15-1/2")
- **Mass**
  - 13.6 kg (30.0 lbs) net
  - 20.0 kg (44.1 lbs) in shipping cartion
- **Supplied Remote Commander RC-100**
  - Remote control principle: Infrared pulse
  - Power supply: Two IEC R03 (size AAA) batteries
  - Max. dimensions: 56 mm × 175 mm × 26 mm
  - Weight: 155 g (including batteries)

Accuphase

ACCUPHASE LABORATORY, INC.