# TruDAC

# HARDWARE Manual





THE INNOVATOR IN SOUND & VIBRATION TECHNOLOGY

#### Notes, Notices, and Cautions

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The NOTE icon indicates important information for better use of the controller.

A The CAUTION icon indicates a potential for property damage, personal injury, or death.

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# **Hardware Overview**

### Front & Back Panels

FRONT PANEL



The front panel mini-XLR connector receives the digital drive signal from equipped controllers, including the VR10500 and VR9700.

#### BACK PANEL



The rear panel has two BNC output connectors that support analog drive devices up to  $\pm 10$  V. For single-axis control, the DRIVE port typically drives an amplifier or servo-hydraulic controller. The DRIVE and AUX outputs can be used simultaneously to support differential mode output. The rear panel DB9 connector supports REMOTE integration.

# **Capabilities & Specifications**

### Item Check List

The following items are included with the TruDAC:

- AC power adapter and power cord
- Digital drive cable (mini-XLR)
- Analog drive cable (BNC)
- Hardware manual

# **General Specifications**

- 2 analog output channels
- Total harmonic distortion < -100dB THD+N
- 32-bit resolution
- Isolation between digital input and analog outputs

### ANALOG OUTPUTS

- 216 kHz simultaneous sample rate
- 50 kHz frequency range

#### Analog Reconstruction Filter

A fixed 2-pole analog filter with a corner frequency at 50 kHz. The fixed analog filter removes high frequencies that could otherwise leak through the digital filter.

#### **Digital Reconstruction Filter**

The digital filter has a cutoff frequency proportional to the sample rate.

#### Characteristics for Sample Rates (F<sub>s</sub>)

Passband	Stopband	Stopband Attenuation
0 to 0.45×F <sub>s</sub>	0.55×F <sub>s</sub>	> -100dB

# **Environmental Specifications**

Operating temperature: 35° to 122° F (2° to 50° C) Storage temperature: -40° to 185° F (-40° to 85° C) Humidity: Up to 95% relative humidity, non-condensing Altitude: Up to 3,000 m MSL (9,842 ft)

# Installation

### Installation Precautions

A CAUTION: Read and follow the safety instructions before performing any of the following procedures.

A CAUTION: The protection provided by the equipment may be impaired if the equipment is used in a manner not specified by the manufacturer.

A CAUTION: Observe the following points before performing the procedures in this section:

- Observe and follow the service markings. Do not service any device that is not defined in the system documentation.
- Opening or removing covers may cause electrical shock. These components are to be serviced by trained service technicians only.
- Make sure the power cable, extension cable, and plug are not damaged.
- If using a cable other than the provided AC power cable, the detachable power cord must be of adequate rating.
- The external power supply should only be supplied by Vibration Research and must be double insulated.
- Do not expose the TruDAC to water.
- Do not expose the TruDAC to radiators or heat sources.
- Do not push foreign objects into the TruDAC as it may cause a fire or electric shock.
- Use the TruDAC with approved equipment only.
- Allow the TruDAC to cool before removing covers or touching internal equipment.
- Do not install the TruDAC in an environment where the operating ambient temperature might exceed 122° F (50° C).
- The airflow around the front, sides, and back of the TruDAC must not be restricted.
- For indoor use.

# Installation CONTINUED

A CAUTION: The terminals on the unit should only be connected to passive load transducers or source transducers that apply no more than 10 V to the circuit that originates from the TruDAC.

A CAUTION: If any connections add voltage to the existing voltage originating from the TruDAC, the total shall not exceed the 70 VDC or 33 VAC (RMS).

A CAUTION: Other than the IEC inlet for input power to the included power adapter, the terminals on the TruDAC should only be connected to SELV/double-insulated circuits of other equipment.

A CAUTION: All external connections must be double-insulated circuits or reinforced insulated circuits from mains.

# Site Requirements

Before installing the TruDAC, verify that the site selected for the device meets the following site requirements:

- Power: The TruDAC is installed within 5 ft (1.5 m) of an easily accessible outlet 220/110 VAC, 50/60 Hz. Generally, a power outlet is provided inside the amplifier for this purpose.
- General: The power source is correctly installed.
- Clearance: There is adequate clearance for operator access. Allow clearance for cabling, power connections, and ventilation.
- Cabling: The cabling is routed to avoid sources of electrical noise such as radio transmitters, broadcast amplifiers, power lines, and fluorescent lighting fixtures.
- Ambient requirements: The ambient TruDAC operating temperature range is 36° to 122° F (2° to 50° C) at a relative humidity of up to 95% RH, non-condensing. Verify that water or moisture cannot enter the TruDAC case. The ambient AC adapter operating temperature range is 32° to 104° F (0° to 40° C).

Do not operate this device near volatile or flammable materials.

# **Physical Dimensions**

Height: 1.1 in (28 mm) Width: 5.7 in (144 mm) Depth: 5.2 in (132 mm) (including connectors) Weight: 0.8 lbs (0.36 kg)

### Storage

The TruDAC can be stored in a non-operating state in an ambient temperature of -40° to  $185^{\circ}$  F (-40° to  $85^{\circ}$  C).

# Connection

### Connecting the Device to a Power Supply

**CAUTION**: This device must be installed in accordance with the prevailing electrical wiring regulations and safety standards.

- Connect the provided AC power adapter to an AC power source using the provided AC power cord. No operator settings are required for voltage configuration.
- Connect the DC power cable from the AC power adapter to the TruDAC and confirm the device is operating correctly by examining the lights on the front of the unit.
- The AC power cable is the primary disconnecting device. Position the equipment so it is easy to disconnect the AC power cord.

### Connecting the Device to a Controller

- Connect the digital drive cable between the controller output and the TruDAC's front panel input.
- After connection, the TruDAC front panel status light will blink green to indicate a valid connection with the controller and VibrationVIEW.

# Connecting the Device to an Amplifier

**CAUTION**: Always connect the power cable to an AC outlet prior to connecting or disconnecting the drive cable.

Connect the 50  $\Omega$  BNC cable (or equivalent) between the TruDAC's DRIVE output and the power amplifier's drive input.

# **Remote I/O**

## **Digital Input**

The digital input interface on the front panel of the TruDAC receives two drive output channels. Both channels are encoded onto a single 110  $\Omega$  twisted pair interface that is based around the AES/EBU specification. Cable lengths of 100 m (328 ft) are possible with the appropriate 110  $\Omega$  AES/EBU cabling. This interface is transformer coupled to help isolate ground loops.

The digital input interface uses a standard 3 position mini-XLR connector with a Switchcraft TA3MX mating connector (or equivalent). The pinout on the front of the TruDAC is shown below.



Pin	Signal
1	Shield
2	DOUT_N
3	DOUT_P
Shell	Chassis

# **BNC Outputs**

The back panel BNC analog outputs are typically used to drive a power amplifier. Nominal ranging allows driving maximum ±10 V peak devices.

BNC connectors are manufactured with 50  $\Omega$  and 75  $\Omega$  impedance capability. 50  $\Omega$  cables are typical for vibration testing applications.

### **Power Connector**

The DC power inlet on the back panel supplies power to the TruDAC. The mating connector is a 2.1 mm ID x 5.5 mm OD barrel plug, wired center positive.

#### Input Power Requirements

12 VDC ± 5%, 0.5 A typical, 1.0 A maximum

#### Typical AC Adapter Power

6 W/16 VA

# Remote I/O CONTINUED

### **Remote Interface**

The remote interface provides alternate connection points for integrating the TruDAC. All connections except the digital drive input are available through the remote interface. This interface uses a standard DB9 connector and a TE Connectivity 5-747904-5 (or equivalent) mating connector.





#### Analog Outputs

The DRIVE and AUX outputs can alternately be connected to the remote interface instead of using the BNC connectors.

#### **DRIVE ON Indicator**

The drive on indicator provides a dry switched contact that indicates when the DRIVE/AUX outputs are active and mirrors the DRIVE ON light on the front panel.

- Switch OPEN: not active
- Switch CLOSED: active
- Switches up to 24 V and 0.1 A
- Switch resistance: 25 Ω maximum

#### +12 V Input Power

The +12 V input power can alternately be connected to the remote interface instead of using the DC barrel connector.

# **Pinout Information**

Pin No	Pin Name	Function	Description
1	OUT_AUX	AUX Output	±10 V output
2	OUT_DRIVE	DRIVE Output	±10 V output
3	DRIVE_ON_B	Dry Contact	Used with DRIVE_ON_A
4	ESTOP_IN	Emergency STOP	Used with ESTOP_OUT
5	+12V_IN	Pow er Input	+12 V ± 5%, 0.5 A typical, 1.0 A maximum
6	OUT_GND	Signal Ground	Reference for DRIVE/AUX outputs
7	DRIVE_ON_A	Dry Contact	Used with DRIVE_ON_B
8	ESTOP_OUT	Emergency STOP	Used with ESTOP_IN
9	+12V_GND	Pow er Ground	Ground for +12 V input pow er

# **Emergency Stop**

The TruDAC supports several emergency stop implementations. Please contact Vibration Research if you are interested in this functionality.

# **Isolation & Grounding**

The TruDAC is designed to provide flexibility in challenging grounding situations.

# **Input Power & Chassis Ground**

The TruDAC power adapter is rated for Class II operation (double insulated) and does not require a protective earth connection for safe operation.

The chassis ground connection point (M3x0.5 thread) on the back panel of the TruDAC is for functional grounding.

# **Output Isolation**



The DRIVE and AUX outputs can be isolated or connected to chassis ground using the switch behind the TruDAC front panel.

- Switch UP: DRIVE and AUX isolated from chassis ground
- Switch DOWN: DRIVE and AUX tied to chassis ground

# **Digital Drive Input**



The included digital drive cable uses shielded-twisted-pair wiring. The cable shield is tied to the shield pin in the connector (Pin 1) at both ends and is isolated from the connector shell.

- The TruDAC digital drive input connector shell is tied to chassis ground
- The TruDAC digital drive input connector shield pin (Pin 1) is AC coupled to chassis ground by default. It can be reconfigured to DC coupled or floating via jumper but requires more extensive disassembly of the TruDAC
- The TruDAC digital drive input data path is transformer coupled for isolation

# Maintenance

An annual output offset verification is recommended for the TruDAC.

### Cleaning

A CAUTION: Remove power from the TruDAC prior to cleaning.

Clean enclosures with a soft, dry cloth, a soft cloth moistened with water, or a soft cloth moistened with a solution of water and a gentle, non-scratch household cleaner that does not contain ammonia.

# **Offset Voltage Check**

Periodic calibration verification is not required for the TruDAC.

It is recommended to check the DRIVE and AUX offset voltage annually. High offset voltage can cause popping on the shaker when switching tests.

# **Offset Voltage Check Procedure**

**MOTE**: Keysight is formerly known as Agilent Technologies.

#### REQUIRED EQUIPMENT

- TruDAC
- Digital drive signal source (e.g., VR10500 or VR9700)
- VibrationVIEW software installed on a Windows PC
- Digital drive cable
- BNC (coaxial) cable
- Dual banana to BNC adapter
- Keysight/Agilent/HP 34401A, 34410A, 34411A, 34461A, 34465A, 34470A, or 3458A digital multimeter (DMM)

#### FIELD PROCEDURE

- 1. Connect the TruDAC to a power source using the power adapter.
- Connect the TruDAC digital drive input to the controller connected to workstation computer running VibrationVIEW. See the VibrationVIEW Help file for more information.
- 3. Run VibrationVIEW.
- 4. Select Test > Test Type > System Check.
- 5. Select Test > Edit Test and set the sample rate to 48,000 Hz.
- 6. Verify the TruDAC status light is blinking and the DRIVE ON light is illuminated.
- 7. Run the TruDAC in System Check for 1 hour to allow the temperature to stabilize.
- Connect the TruDAC DRIVE output to the DMM using the BNC cable and BNC to banana adapter. Use the DMM terminals for measuring DC voltage.

9. Select DCV measurement on the DMM.

DC Volta	ge • Auto Trigger	DCV	ACV (RZW)	Ω4W V	Ω-#÷++
4	1 123 456	S S Freq	Cont)]) Temp	։ "🔘 լ (	<b>"</b> "
_		VDC Reset	Probe Hold Math Single Null	bo Vpl	1000 VI 750 VI
Manual	Peak	1.124 0 VDC	Help Assults		
L IV	P-P:+0.000 9 VDC Min:+1	.123 1 VDC	CAL Local		500 V
Range 1V	Aperture Auto Zero Input Z DCV NPLC Time Off On 10M Auto Off	Ratio Clear On Peaks	$\ge$ $\sim$		34
			aloct > Range		

- 10. After the 1 hour warm-up, verify the voltage reading on the DMM is within the range of -1 mV to + 1mV (-0.001 V to +0.001 V).
- 11. Switch the BNC cable to the TruDAC AUX output and verify the voltage reading on the DMM is within the range of -1 mV to +1 mV (-0.001 V to +0.001 V).

If either measurement is outside the range of -1 mV to +1 mV (-0.001 V to +0.001 V), contact Vibration Research for options to perform an offset voltage adjustment.

# Troubleshooting & Diagnostics

### **Front Panel Lights**



#### POWER

A power LED is on the front panel of the TruDAC. The following table describes the power supply status LED indications:

LED Color	Description
Green solid	Power applied to TruDAC
Off	TruDAC not powered

If the power light does not illuminate, verify the power adapter is plugged into a live outlet. If the power light flashes or flickers, the unit may require service. Contact Vibration Research for assistance.

#### STATUS

A status LED is located on the front panel of the TruDAC. The following table describes the status LED indications:

LED Color	Description
Off	No digital drive input signal detected
Green flashing	TruDAC receiving a valid digital drive signal LED will flash faster with higher sample rates

If the status light does not blink, verify the digital drive input is connected to a controller running VibrationVIEW.

#### DRIVE ON

A DRIVE on LED is on the front panel of the TruDAC. The following table describes the DRIVE on LED indications:

LED Color	Description
Off	DRIVE and AUX outputs inactive
Green solid	DRIVE and AUX outputs active

#### FAULT

A fault LED is on the front panel of the TruDAC. The following table describes the fault LED indications:

LED Color	Description
Off	No faults
Red solid	DRIVE and AUX outputs are deactivated due to a fault condition
	Example fault conditions:
	<ul> <li>Digital drive input signal interrupted while a test was running</li> <li>Emergency Stop switch activated</li> </ul>
	After the fault condition is removed, restart test in VibrationVIEW to clear
Red flashing	Invalid sample rate; maximum TruDAC sample rate 216 kHz

### **RECOVERY/RECYCLING FOR EU CUSTOMERS**

To comply with European directive 2002/96/EC on Waste Electrical and Electronic Equipment (WEEE) this equipment must be recycled or disposed of properly. If you wish to discard this product, please ensure the following:

- Do not dispose of this product as unsorted municipal waste
- · Collect this product separately
- Use collection and return systems available to you

Correct disposal and recycling will help prevent potential negative consequences to the environment and human health. For more detailed information about the disposal of your old equipment, please contact your local authorities, waste disposal service, or the dealer where you purchased the product.



This symbol is only valid in the European Union.





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