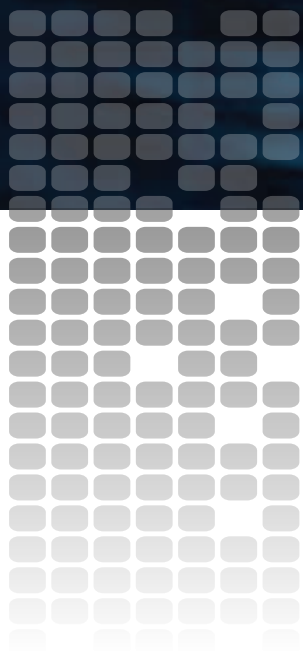


5000 and 5100 Series



Digital Analog Clocks Installation and Operation Manual

5000/5100Series

Digital Analog Clocks

Installation and Operation Manual

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Warranty Information

The Limited Warranty Policy provides a complete description of your warranty coverage, limitations, and exclusions, as well as procedures for obtaining warranty service. To view the complete warranty, visit www.broadcast.harris.com/leitch.

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Preface

Manual Information

Purpose

This manual details the features, installation, operation, maintenance, and specifications for 5000/5100 Series Digital Analog Clocks.

Audience

This manual is written for engineers, technicians, and operators responsible for installation, setup, maintenance, and/or operation of 5000/5100 Series Digital Analog Clocks.

Revision History


Table P-1. Revision History of Manual

Edition	Date	Comments
C	December 1998	Full release
D	August 2006	Manual reformatted and updated

Writing Conventions

To enhance your understanding, the authors of this manual have adhered to the following text conventions:

Table P-2. Writing Conventions

Term or Convention	Description
Bold	Indicates dialog boxes, property sheets, fields, buttons, check boxes, list boxes, combo boxes, menus, submenus, windows, lists, and selection names
<i>Italics</i>	Indicates E-mail addresses, the names of books or publications, and the first instances of new terms and specialized words that need emphasis
CAPS	Indicates a specific key on the keyboard, such as ENTER, TAB, CTRL, ALT, or DELETE
Code	Indicates variables or command-line entries, such as a DOS entry or something you type into a field
>	Indicates the direction of navigation through a hierarchy of menus and windows
hyperlink	Indicates a jump to another location within the electronic document or elsewhere
Internet address	Indicates a jump to a Web site or URL
 Note	Indicates important information that helps to avoid and troubleshoot problems

Obtaining Documents

Product support documents can be viewed or downloaded from our Web site at www.broadcast.harris.com/leitch (go to **Support> Documentation**). Alternatively, contact your customer service representative to request a document.

Unpacking/Shipping Information

Unpacking a Product

This product was carefully inspected, tested, and calibrated before shipment to ensure years of stable and trouble-free service.

1. Check equipment for any visible damage that may have occurred during transit.
2. Confirm that you have received all items listed on the packing list.
3. Contact your dealer if any item on the packing list is missing.
4. Contact the carrier if any item is damaged.
5. Remove all packaging material from the product and its associated components before you install the unit.

Keep at least one set of original packaging, in the event that you need to return a product for servicing.

Product Servicing

5000/5100 Series Digital Analog Clocks are not designed for field servicing. All upgrades, modifications, or repairs require you to return the product to the Customer Service center.

Returning a Product

In the unlikely event that your product fails to operate properly, please contact Customer Service to obtain a Return Authorization (RA) number, then send the unit back for servicing.

Keep at least one set of original packaging in the event that a product needs to be returned for service. If the original package is not available, you can supply your own packaging as long as it meets the following criteria:

- The packaging must be able to withstand the product's weight.
- The product must be held rigid within the packaging.
- There must be at least 2 in. (5 cm) of space between the product and the container.
- The corners of the product must be protected.

Ship products back to us for servicing prepaid and, if possible, in the original packaging material. If the product is still within the warranty period, we will return the product prepaid after servicing.

Restriction on Hazardous Substances (RoHS) Compliance

Directive 2002/95/EC—commonly known as the European Union (EU) Restriction on Hazardous Substances (RoHS)—sets limits on the use of certain substances found in electrical and electronic equipment. The intent of this legislation is to reduce the amount of hazardous chemicals that may leach out of landfill sites or otherwise contaminate the environment during end-of-life recycling. The Directive takes effect on July 1, 2006, and it refers to the following hazardous substances:

- Lead (Pb)
- Mercury (Hg)
- Cadmium (Cd)
- Hexavalent Chromium (Cr-VI)
- Polybrominated Biphenyls (PBB)
- Polybrominated Diphenyl Ethers (PBDE)

According to this EU Directive, all products sold in the European Union will be fully RoHS-compliant and “lead-free.” (See our Web site, www.broadcast.harris.com/leitch, for more information on dates and deadlines for compliance.) Spare parts supplied for the repair and upgrade of equipment sold before July 1, 2006 are exempt from the legislation. Equipment that complies with the EU directive will be marked with a RoHS-compliant emblem, as shown in Figure P-1.



Figure P-1. RoHS Compliance Emblem

Waste from Electrical and Electronic Equipment (WEEE) Compliance

The European Union (EU) Directive 2002/96/EC on Waste from Electrical and Electronic Equipment (WEEE) deals with the collection, treatment, recovery, and recycling of electrical and electronic waste products. The objective of the WEEE Directive is to assign the responsibility for the disposal of associated hazardous waste to either the producers or users of these products. Effective August 13, 2005, producers or users will be required to recycle electrical and electronic equipment at end of its useful life, and may not dispose of the equipment in landfills or by using other unapproved methods. (Some EU member states may have different deadlines.)

In accordance with this EU Directive, companies selling electric or electronic devices in the EU will affix labels indicating that such products must be properly recycled. (See our Web site, www.broadcast.harris.com/leitch, for more information on dates and deadlines for compliance.) Contact your local sales representative for information on returning these products for recycling. Equipment that complies with the EU directive will be marked with a WEEE-compliant emblem, as shown in Figure P-2.

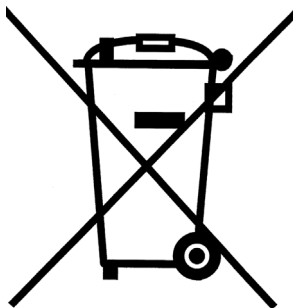


Figure P-2. WEEE Compliance Emblem

Safety

Carefully review all safety precautions to avoid injury and prevent damage to this product or any products connected to it. If this product is rack-mountable, it should be mounted in an appropriate rack using the rack-mounting positions and rear support guides provided. It is recommended that each frame be connected to a separate electrical circuit for protection against circuit overloading. If this product relies on forced air cooling, it is recommended that all obstructions to the air flow be removed prior to mounting the frame in the rack.

If this product has a provision for external earth grounding, it is recommended that the frame be grounded to earth via the protective earth ground on the rear panel.

IMPORTANT! Only qualified personnel should perform service procedures.

Safety Terms and Symbols in this Manual



WARNING

Statements identifying conditions or practices that may result in personal injury or loss of life. High voltage is present.



CAUTION

Statements identifying conditions or practices that can result in damage to the equipment or other property.

DAC-5000 Series Digital Analog Clocks

Overview

This chapter provides installation and operation information about the DAC-5000 Series digital analog clocks. It includes the following topics:

- [“Introduction” on page 2](#)
- [“Installation” on page 3](#)
- [“Control Modes” on page 8](#)
- [“General Operation” on page 9](#)
- [“Specifications” on page 12](#)

Introduction

The DAC-5000 Series Digital Analog Clocks feature a quiet, digitally controlled drive mechanism. Each hand is driven independently by a separate motor and drive train. The exact position of each hand is microprocessor controlled and virtually error free.

The standard clock face provides two sets of numerals: 1 to 12 are black, and 13 to 24 are red. A clock face with only black numerals from 1 to 12 is optional.

The DAC-5000 Series clocks operate with standard drive signals and consequently can be easily integrated into new or existing systems. Selection of the drive signals is made by switches located on the back panel. The usable drive signals are:

- Serial Timecode (SMPTE or EBU)
- 12 VDC Impulse Clock
- Internal Time Base
- Line Frequency Reference

All clock models accept Serial Timecode are in either the SMPTE or EBU format.

If reception of the timecode is lost, the error LED located on the clock's face will light up and the clock will automatically switch to either the Internal Time Base or the Line Frequency Reference, as selected on the back panel switches, without interruption of its operation.

The Internal Time Base is provided by a 4.9 MHz crystal oscillator. The Line Frequency Reference uses a 50/60 Hz power line. Selection of either 50 or 60 Hz is made by soldering a jumper on the 5000DL Drive Logic module.

The following models are available:

- **DAC-5016** 16 inch illuminated, wall mounting. Rack mounting kit optional.
- **DAC-5012** 12 inch illuminated, wall mounting. Rack mounting kit optional.
- **DAC-5008** 8 inch illuminated, wall mounting. Rack mounting kit optional.
- **DAC-5006** 5 inch non-illuminated, rack mounting.
- **DAC-5005** 5 inch non-illuminated, desk top.

Installation

Wall Mounting

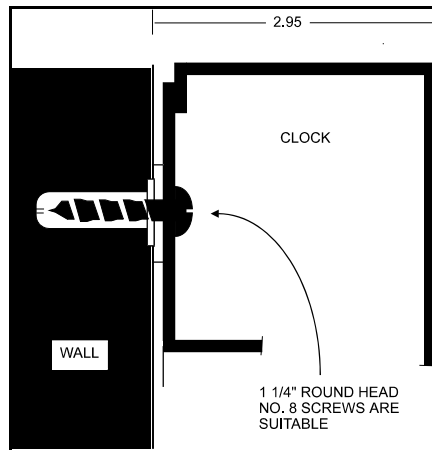


Figure 1-1. Typical Wall Mount

The DAC-5008, DAC-5012 and DAC-5016 Digital Analog Clocks are designed for wall mounting. Rack mounting kits are optional.

The rear panels of both the DAC-5012 and DAC-5016 clocks are provided with four rubber feet and four keyholes while the DAC-5008 has only three keyholes. These are dimensioned for #8 screws. The rear panel also has a large depression to contain the connecting wires and allow the clock to be placed close to the wall.

Table 1-1 provides information about clock wall mounting specifications

Table 1-1. Clock Wall Mounting Specifications

Clock	Overall Dimensions	Mounting Keyhole Centers
DAC-5016	17.45×17.45 in.	16.0×15.5 in. (4 keyholes)
DAC-5012	13.95×13.95 in.	12.0×10.5 in. (4 keyholes)
DAC-5008	10.45×10.45 in.	8.0×8.0 in. (3 keyholes). The bottom single keyhole is located



Note

A convenient template drawing showing the correct mounting centers is included with the clock.

Clearances

Table 1-2 lists the minimum clearances, measured in inches, from the mounting keyhole centers to the outside edge of each clock:

Table 1-2. Clock Clearances

Clock	Clearances (Inches)
DAC-5016	<ul style="list-style-type: none">• Top edge 0.8• Sides 0.725• Bottom edge 1.275
DAC-5012	<ul style="list-style-type: none">• Top edge 1.12• Sides 0.975• Bottom edge 2.35
DAC-5008	<ul style="list-style-type: none">• Top edge 0.825• Sides 1.275• Bottom edge 1.85

Rack Mounting

The DAC-5008, DAC-5012 and DAC-5016 clocks can be rack mounted with the optional rack mounting kit. The kit is installed by removing the back panel side screws, placing the rack mount in position, and reinstalling the screws. The rack mount kits are designated as 5008RM, 5012RM, and 5016RM, respectively.

The DAC-5006 clock is pre-designed to be rack mounted, and does not require the optional rack mounting kit. It has an overall dimension of 7×19 inches.

[Table 1-3](#) lists the required rack space for each clock.

Table 1-3. Required Space For Rack Mounting

Clocks	Rack Units	Inches
DAC-5016	10	17.45
DAC-5012	8	13.95
DAC-5008	6	10.45
DAC-5006	4	7

Rear Panel

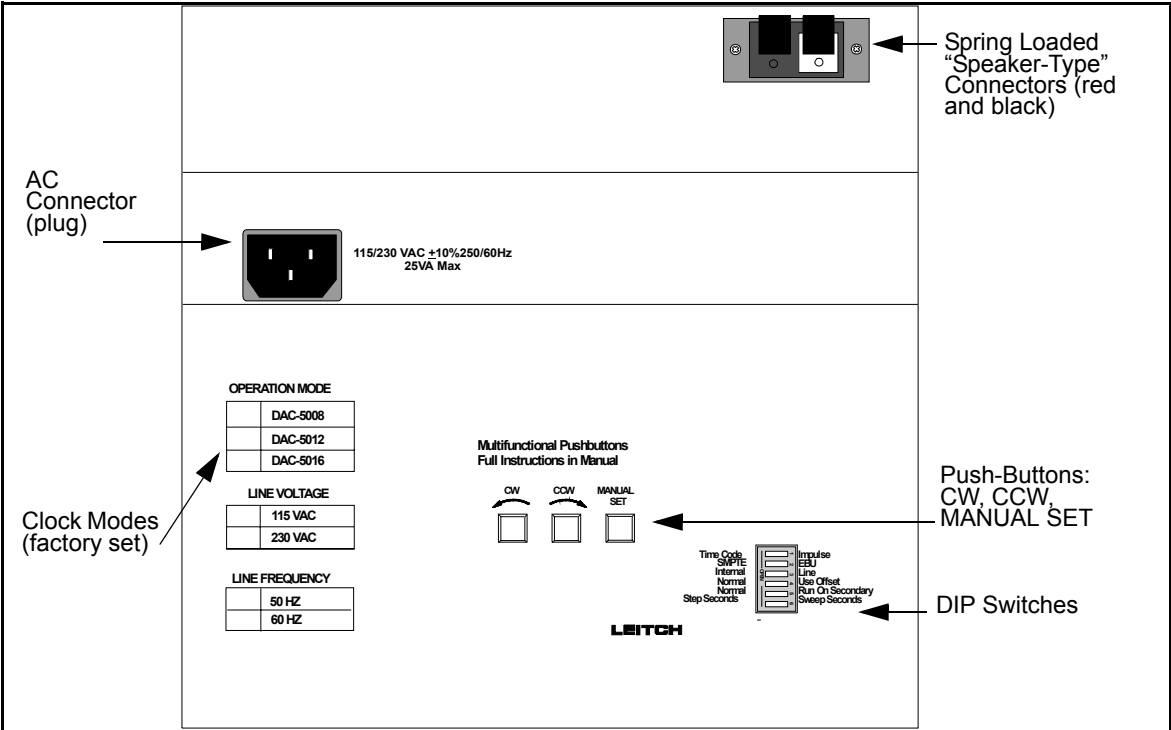


Figure 1-2. DAC-5008/5012/5016 Rear Panel

The rear panels of the DAC-5008/5012/5016 have two spring-loaded speaker-type connectors (one red, one black) to accept the Primary Reference input (i.e. SMPTE Serial Timecode or Impulse Drive signals).

A standard AC connector for the power feed of the unit can be found in the recessed area running across the middle of the rear panel.

Below this recessed area are the multifunction clock setting buttons and the six DIP switches (SW1 to SW6), all of which must be set prior to installation.

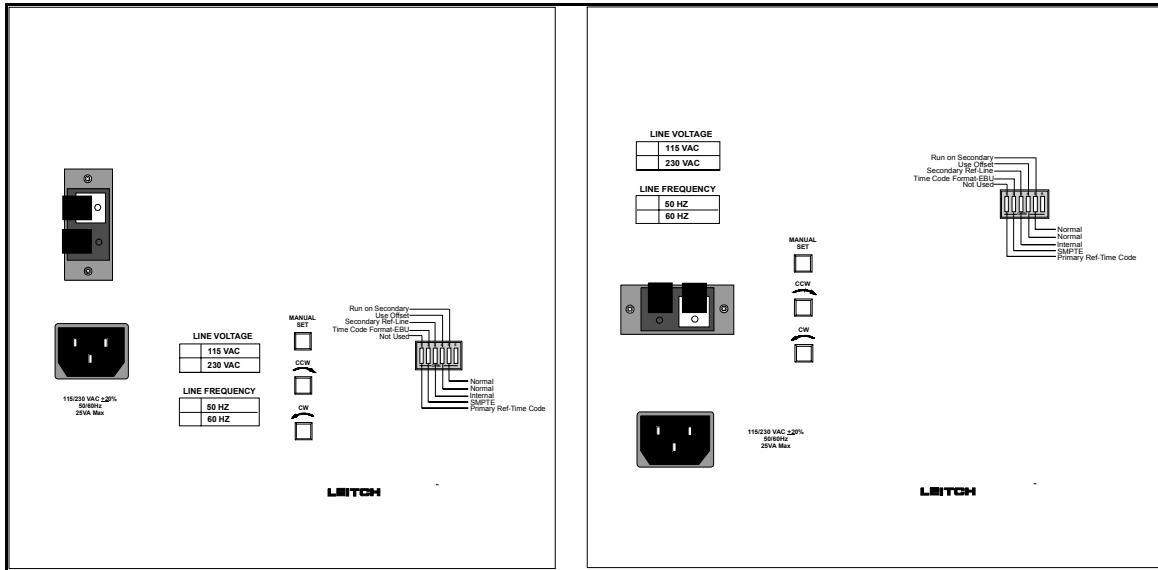


Figure 1-3. DAC-5005 (left) and DAC-5006 (right) Rear Panels

Control Modes

Table 1-4 lists the Clock Control mode DIP switch options.

Table 1-4. Clock Control Mode DIP switch options

Dip Switch	Switch Options	
	Open	Closed
SW1	Timecode	Impulse
SW2	SMPTE	EBU
SW3	Internal	Line
SW4	Normal	Use offset
SW5	Normal	Run on secondary
SW6 (Secondary)	NA	NA

Calibration of the Internal Time Base

This procedure is used to adjust the frequency of the 4.9152 crystal oscillator. The accuracy of this adjustment directly affects the accuracy of the Internal Time Base. The only equipment required is a high resolution frequency counter.

Connect the frequency counter to the clock test point provided at pin 9 of the CMOS NSC800N Microprocessor IC11. Adjust the 6-25 pF trimmer capacitor connected to pin 11 of IC11 until the counter indicates 2.457.600 Hz. It is recommended to use the longest sampling time possible.

General Operation

Clock Control Modes

Primary Reference Mode

The Primary Reference Mode provides two options, the Timecode and the Impulse Clock modes. Selection of either mode is done by switch SW1.

Timecode Mode

No setting of time is required when the timecode mode is selected. However, selection of either SMPTE or EBU format should be made by means of switch SW2.

Upon selecting Timecode mode, the microprocessor will start reading the code and will light the error LED of the clock face (found under the 6) to indicate that the unit is not yet synchronized with the timecode.

Once the timecode is decoded, the clock hands will move in a clockwise direction towards the 12:00 position where the three hand detectors are located. The clock hands will then move to their new position via the shortest route and the error LED will go off to indicate that the unit is synchronized with the timecode.

If there is a change in the timecode, the error LED will activate again while the microprocessor verifies the code to ensure that there is a valid time change and not a transient condition. This verification requires 30 consecutive full code frames or 1 second for SMPTE format operation, and 1.2 seconds for EBU format, depending on the selection of switch SW2. Once the verification is completed and if there is a valid change, the clock hands will move to the new time position as previously described and the error LED will go off.

If the timecode is lost due to a mechanical failure such as a disconnected cable or to a malfunction of the master clock, the error LED will light up again. The clock, however, will continue to operate and show accurate time since it will automatically switch to the secondary time base selected by switch SW3 (either the line frequency, or the internal crystal oscillator). Once the malfunction is eliminated the clock will automatically switch back to timecode and re-synchronize to the incoming timecode, and the error LED will go off.

Impulse Clock Mode

The DAC-5000 Series clocks will emulate a standard impulse clock. Like any impulse clock, it must be manually set to the correct time and will stop if the impulses from the master clock also stop. The unit will check the polarity of the pulses so that the positive pulses from the red input connector on the rear panel will move the second hand to an even number of the clock face (i.e. 2, 4, 6 etc.), while the black input connector will handle the odd numbers.

This check will only occur after the position of the second hand is known by the microprocessor. This takes place when the hand passes the detector located near the 12:00 position.

Correct hand position will be established automatically by the microprocessor when the clock hands pass their detection positions. However, to establish the minute hand, the position of the second hand must be already established. To establish the hour hand, the position of both the minute and second hands must also be established.

The error LED will not be on when operating as an impulse clock.

Secondary Reference Mode

The DAC-5000 Series clock will run as a standard wall clock with no exterior Timecode or Impulse drive when selected by the run on secondary switch SW5. Selection of either Internal reference or Line frequency is done by switch SW3. Correct hand position is established in the same manner as for the Impulse Clock. The time must also be set manually.

The error LED will not be operational when this mode is selected.

Clock Setting Controls

Manual Setting

The clock is manually set by means of three push-buttons located on the rear panel.

- **MANUAL SET** Press this button once to select the hour hand, twice to select the minute hand, three times to select the second hand, and four times to set the clock. When selected, the hands will start shaking briskly to visually indicate their status.

- **CCW** This button moves the selected hand counter-clockwise one unit. When the time is set, press the **MANUAL SET** button (a fourth time) and release it at the exact time that the clock is to be set. The clock will now return to normal time keeping with the second hand advancing one second after the **MANUAL SET** button is released.
- **CW** Press this button to move the selected hand clockwise one unit. When the time is set, press the **MANUAL SET** button (a fourth time) and release it at the exact time that the clock is to be set. The clock will now return to normal time keeping with the second hand advancing one second after the **MANUAL SET** button is released.

Use Offset

The **USE OFFSET** function allows the addition of a user programmed constant offset to the user bits of a standard timecode. Therefore, the availability of a timecode generator capable of programming the user bits of the timecode is essential.

This function is generally used when it is desired to simultaneously provide GMT and local time with two clocks being fed the same timecode.

The **USE OFFSET** function is selected by closing the control mode switch SW4 of the rear panel. Six bits of data are used to specify the offset. The six bits are divided into two three bit sections. The first three bits follow the unit minutes at bits 36, 37 and 38 of the timecode. The second three bits follow the unit hours data at bits 52, 53 and 54. The minimum offset allowed is 30 minutes. This can be incremented in 30 minute periods until reaching 23 hours and 30 minutes which is the maximum offset allowed.

Specifications

Specifications and designs are subject to change without notice.

Electrical

Table 1-5. Electrical

Item	Specification
Electrical voltage	115/230 VAC \pm 20%
Frequency	50 or 60 Hz, selectable
Power	25 VA max.

Primary Drive Inputs

Table 1-6. Primary Drive Inputs

Input	Item	Specification
Serial timecode SMPTE/EBU	Impedance	Hi-Z, balanced
	Maximum voltage	100 Vp-p
	Common mode rejection	55 dB
	Level	4 Vp-p \pm 12 dB
Impulse drive 12 VDC \pm 6 dB, bipolar	Impedance	Hi-Z, balanced
	Maximum voltage	100 Vp-p
	Common mode rejection	55 dB
	Level	4 Vp-p \pm 12 dB

Secondary Time Bases

Table 1-7. Secondary Time Bases

Item	Specification
Internal	Derived from processor clock 2.4576 MHz, crystal oscillator
Power line	50 or 60 Hz, jumper selectable

Mechanical

Table 1-8. Mechanical Specifications

Clock	Item	Specification
DAC-5016	Style	Wall-mount
	Face diameter	16 in. (406 mm)
	Overall dimensions	17.45×17.45×2.8 in. (443×443×71 mm)
	Weight	9.1 lbs (4.1 kg)
DAC-5012	Style	Wall-mount
	Face diameter	11.75 in. (298 mm)
	Overall dimensions	13.95×13.95×2.8 in. (354×354×71 mm)
	Weight	7.3 lbs (3.3 kg)
DAC-5008	Style	Wall-mount
	Face diameter	8 in. (203 mm)
	Overall dimensions	10.45×10.45×2.8 in. (265×265×71 mm)
	Weight	5 lbs (2.3 kg)
DAC-5006	Style	Rack-mount
	Face diameter	5 in. (127 mm)
	Overall dimensions	7×19×2.8 in. (177×482×71 mm)
	Weight	4.5 lbs (2 Kg)
DAC-5005	Style	Desk-mount
	Face diameter	5 in. (127 mm)
	Overall dimensions	8.25×6×7.25 in. (209×152×184 mm)
	Weight	3.8 lbs (1.75 Kg)

ADC-5100 Series Analog Digital Clocks

Overview

This chapter provides installation and operation information about the ADC-5100 Series digital analog clocks. It includes the following topics:

- [“Introduction” on page 16](#)
- [“Installation” on page 18](#)
- [“Control Modes” on page 23](#)
- [“General Operation” on page 24](#)
- [“Troubleshooting” on page 32](#)
- [“Specifications” on page 34](#)

Introduction

The ADC-5100 Series Analog Digital Clocks are a group of quiet, digitally controlled, self-setting analog face clocks. These may operate either stand-alone via power line frequency or internal crystal, or with a SMPTE or EBU serial timecode input.

When provided with a SMPTE or EBU timecode source, the ADC Series Clocks are self-setting. If the timecode is valid, the ADC Series Clocks will advance or reverse their hand positions to the correct time.

In the event of a power failure, the ADC Series Clocks maintain the correct time internally via a battery-backed timekeeping memory. If power should be restored without timecode, the ADC Series Clocks will self-set to the correct time as maintained by the battery backup, and then continue to operate on internal crystal or power line timebase.

The ADC clocks may operate with either a sweep or step second hand, and will automatically decode either SMPTE or EBU timecode inputs. Additionally, the ADC may function as a timecode generator when operated from its internal crystal. Either SMPTE or EBU timecode may be generated and used to drive other clocks (in Master Mode).



Note

Internal connector 'P1' must be reversed for Master Operation.

The ADC Series clocks are compatible with a user-defined auxiliary offset when driven from the following clock system drivers;

- MTG-3901 Master Timing Generator
- CSD-3901/3902 Master Clock System Driver
- CSD-5300 Master Clock System Driver.

A local offset can also be provided by electronically re-positioning the clock hands.

In the event of a timecode input failure, an error LED (located on the clock face under the 6) will flash at the rate of twice per second. The ADC clock will then automatically switch to the user-selected secondary timebase, either power line frequency or internal crystal. The power line frequency is automatically determined during power-up. The error LED will illuminate during power-up to indicate 50 Hz power line frequency detection.

If timecode operation is not required, the ADC clock may be set to use the secondary timebase permanently, and the error LED will be extinguished.

The following models are available:

- **ADC-5116** 16 inch, wall mounting. Rack mounting and light kit optional.
- **ADC-5112** 12 inch, wall mounting. Rack mounting and light kit optional.
- **ADC-5108** 8 inch, wall mounting. Rack mounting and light kit optional.
- **ADC-5106** 5 inch, rack mounting. Light optional.
- **ADC-5105** 5 inch, desk top mounting. Light optional.

Installation

Wall Mounting

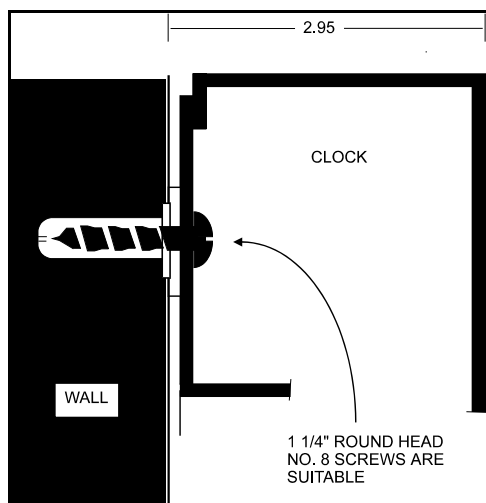


Figure 2-4. Typical Wall Mounting

The ADC-5108, ADC-5112, and ADC-5116 Analog Digital Clocks are designed for wall mounting. Rack mounting kits are optional.

The rear panels of both the ADC-5112 and ADC-5116 clocks are provided with four rubber feet and four keyholes, while the ADC-5108 has only three keyholes. These are dimensioned for #8 screws. The rear panel of all three clocks is recessed for connectors, and to allow the clock to be placed close to the wall.

Table 2-9 provides information about clock wall mounting specifications

Table 2-9. Clock Wall Mounting Specifications

Clock	Overall Dimensions	Mounting Keyhole Centers
ADC-5116	17.5×17.5 in.	16.0×15.5 in. (4 keyholes)
ADC-5112	14.0×14.0 in.	12.0×10.5 in. (4 keyholes)
ADC-5108	10.5×10.5 in.	8.0×7.75 in. (3 keyholes). The bottom single keyhole is located 0.35 in. to the right of the center line.



Note

A convenient template drawing showing the correct mounting centers is included with the clock.

Clearances

Table 2-10 lists the minimum clearances, measured in inches, from the mounting keyhole centers to the outside edge of each clock:

Table 2-10. Clock Clearances

Clock	Clearances (Inches)
ADC-5116	<ul style="list-style-type: none"> • Top edge 0.813 • Sides 0.75 • Bottom edge 1.187
ADC-5112	<ul style="list-style-type: none"> • Top edge 1.125 • Sides 1.0 • Bottom edge 2.375
ADC-5108	<ul style="list-style-type: none"> • Top edge 0.875 • Sides 1.250 • Bottom edge 1.875

Rack Mounting

The ADC-5116, ADC-5112 and ADC-5108 clocks can be rack mounted with the optional rack mounting kit. The kit is installed by removing the back panel side screws, placing the rack mount in position, and reinstalling the screws. The rack mount kits are designated as RM-5116, RM-5112, and RM-5108, respectively.

The ADC-5106 clock is pre-designed to be rack mounted, and does not require the optional rack mounting kit. It has an overall dimension of 7×19 inches.

Table 2-11 lists the required rack space for each clock.

Table 2-11. Required Space For Rack Mounting

Clocks	Rack Units	Inches
ADC-5116	10	17.5
ADC-5112	8	14.0
ADC-5108	6	10.5
ADC-5106	4	7

Desk Mounting

The ADC-5105 clock can simply be set or mounted on any desk surface. Its overall dimensions are 8.25 x 5.85 in.

Rear Panel

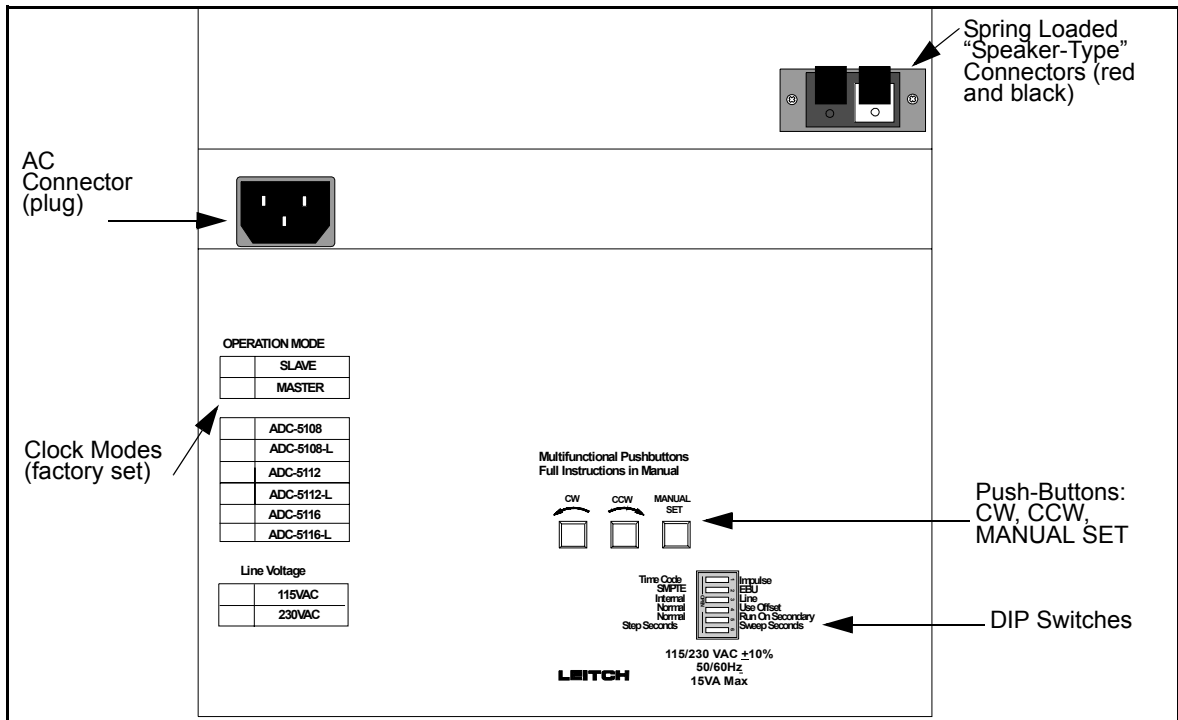


Figure 2-5. ADC-5108/5112/5116 Rear Panel

The rear panels of the ADC-5108/5112/5116 have two spring-loaded speaker-type connectors (one red, one black) to accept the Primary Reference input (i.e. SMPTE Serial Timecode or Impulse Drive signals). Note that the correct polarity (i.e. red-to-red) is **not** required.

There is an indicator along the left side of the clock rear panel noting whether the clock is in "MASTER" or "SLAVE" configuration. All clocks are shipped configured for timecode input (slave) operation, unless otherwise specified when ordering. The clock type and operating voltage are also indicated on the rear panel.

A standard AC connector for the power feed of the unit can be found in the recessed area running across the middle of the rear panel.

Control Modes

Selection of the clock control modes is achieved with the rear panel DIP switches. [Table 2-12](#) lists the Clock Control mode DIP switch options.

Table 2-12. Clock Control Mode DIP switch options

Dip Switch	Switch Options	
	Open	Closed
SW1	Timecode	Impulse
SW2	SMPTE	EBU
SW3	Internal	Line
SW4	Normal	Use offset
SW5	Normal	Run on secondary
SW6 (Secondary)	Step seconds	Sweep seconds



Note

Changes to the DIP Switch settings (other than SW3) made during clock self-setting will NOT be recognized until the clock has finished setting.

General Operation

Clock Control Modes

Primary Reference (timecode) Mode

No setting of time is required when input timecode is provided to the ADC Series clock. Once valid timecode is detected, either SMPTE or EBU, the clock will begin to self-set. The self-setting procedure moves the hands at a rapid rate in either the clockwise or counter-clockwise direction until the correct position is obtained. If the hands and the correct time are the maximum distance apart (6 hours), the self-setting process may require up to 15 minutes to complete.

Once the clock hands match the correct time, as indicated by the input timecode, the error LED on the clock face will extinguish to indicate that the clock is synchronized with the timecode.

The clock may require up to 2 additional minutes of normal operation (following self-set) for the second hand to completely re-synchronize. This is due to accumulated gear slippage during counter-clockwise movements.

If there is a failure of the input timecode, the clock will switch to the Secondary Reference as selected by DIP switch SW4 on the rear panel. Either the clock's own internal crystal or the power line frequency may be selected as the secondary reference. Both will provide the clock with a timebase during the absence of input timecode. (Note that either a 50 Hz or 60 Hz power line frequency is suitable for the timebase, since the clock automatically selects the correct frequency available.)

To signal the failure of the input timecode, the error LED on the clock face will flash at a rate of twice per second. When correct timecode is re-established, the clock will again self-set to the new time, and the error LED will extinguish.

Similarly, if there is an error in the input timecode, the clock will automatically switch to the secondary reference, and the error LED will flash.



Note

Impulse input is not currently recognized by the ADC-5100 Series clocks.

Secondary Reference Mode

The ADC-5100 Series clocks will run as standard wall clocks when no input timecode is provided. Rear panel DIP switch SW4 selects the timebase to be used, either the clock's internal crystal, or the power line frequency (50/60Hz).

Rear panel DIP switch SW2 should be switched to the **RUN ON SECONDARY** position when the clock is used in this mode. When in this position, the error LED on the clock face will extinguish. Note that the clock will still function without selecting **RUN ON SECONDARY**. However, the error LED will flash at the rate of twice per second to indicate the absence of input timecode.

When operating in this mode, the time must be set manually using the rear panel set switches, **MANUAL SET**, **CW**, and **CCW**. Once set, however, the correct time is maintained even in the event of a power failure. Upon the return of external power, the clock will automatically self-set to the correct time. The internal battery-backed timekeeping function will maintain time for up to two years in the absence of external power.

Auxiliary Offset

DIP switch SW3 allows access to a user-programmed auxiliary offset from the input timecode's user bits. The timecode source, however, must have the ability to generate the correct information in the user bits.

The MTG-3901, CSD-3901/3902, and CSD-5300 Clock System Drivers are real time timecode sources which can program such an offset into the timecode's user bits. The offset is programmed in 30 minute intervals up to 23 hours and 30 minutes, using 6 bits of the timecode's user bit space.

The offset is encoded using timecode bits 36, 37, 38, 52, 53, and 54. Bit 36 is the least significant bit (LSB), while bit 54 is the most significant bit (MSB).

When DIP switch SW3 on the ADC-5100 Series clock is in the **USE OFFSET** position, the auxiliary offset found in the input timecode's user bits is added to the input timecode. The clock hands then display the total. If no input timecode is available, then DIP switch SW3 has no effect. If the user bits are incorrectly programmed, then the offset is disregarded.

Local offsets (hand position offsets) are still in effect while using the auxiliary offset. The hand positioning local offsets are totally transparent to the input timecode's user bit offset.

If input timecode is removed while **USE OFFSET** is selected, the clock will retain the time with the offset added, not the original time.

Timecode Generator Mode (Master Clock)

The ADC Series Clocks can also function as real time timecode generators, essentially operating as master clocks. In this mode, the clock will be accurate to within ± 4 seconds per month. (The MTG-3901, CSD-3901/3902, and CSD-5300 master clocks are accurate to within ± 1 second per year.)

To configure the ADC as a timecode generator, an internal connector must be transposed so that the rear panel speaker-type connectors become the timecode output terminals.

To do this, remove the 10 screws along the outside edge of the clock. Carefully lift the rear panel from the chassis taking care not to disturb the cables connected to the motor assembly. (If the cables become disconnected, the time shown on the hands may become offset from the real time, in which case, see [“Clock Setting” on page 26.](#))

Follow the two wires from the speaker-type terminals to their connector on the PC board. The connector, attached at point P1, must be removed and reversed. Normally, the wires on the connector are located near the corner of the board at pin 1. Reversing this will relocate the wires on the connector to pin 10. When completed, return the rear panel chassis and re-fasten the 10 screws.

After completing this process, the rear speaker-type connectors will output real time timecode when DIP switch SW4 is set to the **INTERNAL** position.

To set the time, see [“Clock Setting”](#).

Clock Setting

When shipped from the factory, the hands are set to 12:00. The clock's internal microprocessor has been re-set to memorize this hand position, and the internal battery has been electronically disabled to preserve battery life during storage and shipping.

When first powered up, the clock will start from 12:00:00. Or, if the external timecode is present, the clock will automatically reset to the correct time. This may take up to 15 minutes.

The battery is enabled when power is first applied. Henceforth, the clock will continue to retain time information for the lifetime of the battery, even if the power is disconnected.

Manual Setting

The ADC Series clocks may be manually set using the three push-button switches located on the rear panel. These push-buttons, labelled **MANUAL SET**, **CW**, and **CCW** may be used to reposition the hands of the clock for any of the following reasons:

- The clock will be used as a Stand Alone Clock, locked to its own internal crystal or AC line frequency. In this case the hands must be initially set to the correct time.
- The clock will be used as a master timecode generating clock.
- The clock hands must be offset for a different time zone.
- The offset must be removed. (For example, an offset of hours, minutes, or seconds may have been inadvertently applied if the rear buttons were actuated without following the correct procedure. In this case, the hands and the internal microprocessor must both be set to the same time. The clock will then display the correct time when timecode is applied).
- **MANUAL SET** This rear panel button stops hands and enters/exits Manual Set Mode. (LED is on continuously when entering Manual Set Mode, LED flashes when exiting Manual Set Mode.)
- **CW** This rear panel button moves hands one second clockwise while in Manual Set Mode.

Advances time one hour if held for 10 seconds during normal operation (non-Manual Set Mode), without timecode input.

- **CCW** This rear panel button moves hands 50 seconds counter-clockwise while in Manual Set Mode.

Changes time by minus one hour if held for 10 seconds during normal operation (non-Manual Set Mode), without timecode input.

- **CW + MANUAL SET** Pressed together, these buttons advance second hand position for precise tracking during normal operation (non-Manual Set Mode).

- **CCW + MANUAL SET** Pressed together, these buttons move second hand position in counter-clockwise direction for precise tracking during normal operation (non-Manual Set Mode).

Repositioning the Hands

To reposition the clock hands, follow these steps:

1. Enter the Manual Set Mode by pressing and holding the **MANUAL SET** button until the hands come to a complete stop and the error LED at the bottom of the clock face is illuminated.
2. The **CW** button advances the hands clockwise by one second each time it is pressed. If the **CW** button is held down, the hands accelerate until full speed is reached (after about 30 seconds). To stop the hands, re-press the **CW** button.
3. The **CCW** button causes the hands to move counter-clockwise. When pressed once, the hands move backwards 50 seconds. If the **CCW** button is held down, the hands accelerate until full speed is reached. To stop the hands, re-press the **CCW** button.

Setting the Time in Master Clock or Stand Alone Modes

To set the time in Master Clock or Stand Alone modes, follow these steps:

1. Follow the steps described in [“Repositioning the Hands”](#).
2. Stop the hands a little after the real time and wait for the precise moment to start the clock.
3. Press and hold the **MANUAL SET** button. Release **MANUAL SET** one second before the correct time to ensure proper synchronization with the time of day. The clock will start normally.

Local Time Offsets

The clock hands may be electronically repositioned to provide a local offset from the input timecode. This is particularly useful for displaying multiple time zones from the same timecode source. There are a number of methods to achieve this and the simplest is described below.

This method assumes that the local time reference is 12:00:00. The hands are manually set to the required offset time (according to Table 2-13 on page 29) and the microprocessor is then reset. This tells the microprocessor that the hands are at the 12:00 position, whereas in fact they are set to the offset time. When timecode is applied, the clock will set itself to the correct offset time. To set an offset, follow these steps:

1. Disconnect the timecode input.
2. Enter the Manual Set Mode by pressing and holding the **MANUAL SET** button until the hands come to a complete stop and the error LED at the bottom of the clock face is illuminated.
3. Set the hands to the offset time using the **CW** and **CCW** buttons as described in [“Repositioning the Hands” on page 28](#). (For example, to apply a + 4 hour offset, set the hands to 4:00. If the hands are a long way off, the process may take up to 15 minutes. A short cut method is described in [“Hands are Offset” on page 32](#).)
4. Once the hands are positioned at the appropriate time, press and hold the **MANUAL SET** button until the error LED flashes. While still holding the **MANUAL SET** button, press and hold the **CCW** button to reset the microprocessor. Once the LED extinguishes, release the **CCW** button and then the **MANUAL SET** button.
5. Re-connect the timecode. The hands should move to the correct offset time.

[Table 2-13](#) lists local offset programming settings:

Table 2-13. Table 3.1 Local Offset Programming

Offset Desired (hrs)	Move Hands To	Offset Desired (hrs)	Move Hands To
None	12:00:00	+1/2	12:30:00
+1	1:00:00	+1 1/2	1:30:00
+2	2:00:00	+2 1/2	2:30:00
+3	3:00:00	+3 1/2	3:30:00
+4	4:00:00	+4 1/2	4:30:00
+5	5:00:00	+5 1/2	5:30:00
±6	6:00:00	+6 1/2 or -5 1/2	6:30:00
-5	7:00:00	-4 1/2	7:30:00

Table 2-13. Table 3.1 Local Offset Programming (*Continued*)

Offset Desired (hrs)	Move Hands To	Offset Desired (hrs)	Move Hands To
-4	8:00:00	-3 1/2	8:30:00
-3	9:00:00	-2 1/2	9:30:00
-2	10:00:00	-1 1/2	10:30:00
-1	11:00:00	-1/2	11:30:00

**Note**

The offset range is only ± 6 hours due to the 12-hour representation of 24-hour time. For example, offsets of -8 or +16 hours can both be represented by a move of +4 hours.

Daylight Saving Time Adjustment (Free Running Clocks)

To advance the time by one hour, press and hold the **CW** button for 10 seconds. Release the **CW** button when the clock hands begin to move rapidly. The clock will automatically set to the new time.

To revert the time by one hour, press and hold the **CCW** button for 10 seconds. Release the **CCW** button when the clock hands begin to move rapidly. The clock will automatically set to the new time.

**Note**

When operating from external timecode, daylight saving time is applied to the master clock, not the ADC.

Second Hand Tracking

If the second hand is not falling on the second marks, the following calibration procedure should be used while the clock is operating normally. (Be careful not to enter the Manual Set Mode).

**Note**

Before moving the seconds hands, place the hands in Step Mode using DIP switch SW1 (closed position).

- To advance the second hand clockwise slightly, press and hold the **CW** and **MANUAL SET** buttons together in the following manner: press and hold the **CW** button first, followed by the **MANUAL SET** button. For every second that the buttons are held, the hands will move three extra motor points forward. There are 150 motor points per second; therefore a one second error requires that the **CW** and

MANUAL SET buttons be held for 50 seconds. When adjustments are complete and the second hand is on the marker, be sure to release the **CW** button after the **MANUAL SET** button in order to avoid accidentally entering the Manual Set Mode.

- To move the second hand counter-clockwise, press and hold the **CCW** and **MANUAL SET** buttons together in the following manner: press and hold the **CCW** button first, followed by the **MANUAL SET** button. For every second that the buttons are held, the hands will move three extra motor points backward. There are 150 motor points per second; therefore a one second error requires that the **CCW** and **MANUAL SET** buttons be held for 50 seconds. When adjustments are complete and the second hand is on the marker, be sure to release the **CCW** button after the **MANUAL SET** button in order to avoid accidentally entering the Manual Set Mode.

Troubleshooting

Hands are Offset

Sometimes the hands are offset by any number of hours, minutes, or seconds. This generally occurs when the microprocessor loses track of where the clock hands are positioned. This problem may occur if the rear push buttons have been pressed in the wrong sequence.

The hands can be re-aligned (see t“[Repositioning the Hands](#)” on [page 28](#)). This involves setting the hands to 12:00:00, which may take up to 15 minutes. A short cut method is provided below.



Note

You cannot use the short cut method for the 24-hour model ADC-5124.

In the shortcut method, the hands are re-positioned to the top of the closest hour and then the microprocessor is advised of the new hand position. To re-calibrate the hands using this method follow these steps:

1. Disconnect the timecode. The front LED will flash twice per second.
2. Press and hold the **MANUAL SET** button until the LED stays illuminated.
3. Using the **CW** and/or **CCW** buttons (as described in the section “[Repositioning the Hands](#)” on [page 28](#)), position the hands to the top of the nearest hour.
4. Press and hold **MANUAL SET**. The error LED will start to flash.
5. While holding **MANUAL SET**, press and hold the **CCW** button until the error LED extinguishes.
6. While continuing to hold the **MANUAL SET** and **CCW** buttons, momentarily press the **CW** button once for every hour indicated on the hour hand. For example, if the hands are set to 7:00, press the **CW** button seven times. The LED will flash once every time the **CW** button is pressed. Doing this will tell the microprocessor what time the hands are showing. To apply offset times, add or subtract the number of hours offset to the number of times the **CW** button is pressed. For example, for -3 hours offset, press the **CW** button 4 times (7 - 3). In case of difficulties, please see t“[Local Time Offsets](#)” on [page 28](#).

7. Release the **CCW** button, and then release the **MANUAL SET** button.
8. Re-connect timecode.

Specifications

Specifications and designs are subject to change without notice.

Electrical

Table 2-14. Electrical

Item	Specification
Electrical voltage	115/230 VAC \pm 20%, selectable
Frequency	50 or 60 Hz, automatic selection

Inputs and Outputs

Table 2-15. Inputs

Item	Specification
Serial timecode	SMPTE/EBU
Impedance	Hi-Z, balanced
Level	4 Vp-p \pm 8 dB

Table 2-16. Outputs

Item	Specification
Serial timecode	SMPTE/EBU non-drop frame
Impedance	Lo-Z, balanced
Level	+10 dB nominal unloaded -3dB into 180 Ohms

Time Base

Table 2-17. Time Base

Item	Specification
Timecode	SMPTE/EBU, automatic selection
Internal	Crystal, \pm 4 sec/month, 0°—50°C
Power line	50 or 60 Hz, automatic selection
Battery backup	Crystal, \pm 10 sec/month, 0°—50°C

Controls

Table 2-18. Controls

Item	Specification
Output timecode format	SMPTE/EBU
Secondary reference	Internal or power line
Second hand movement	Step or continuous sweep
Aux. offset	Requires one of the following system clock drivers: <ul style="list-style-type: none"> • MTG-3901 • CSD-3901/3902 • CSD-5300

Mechanical

Table 2-19. Mechanical Specifications

Clock	Item	Specification
ADC-5116	Style	Wall-mount
	Face diameter	16 in. (406 mm)
	Overall dimensions	17.5×17.5×3.375 in. (445×445×86 mm)
ADC-5112	Style	Wall-mount
	Face diameter	11.5 in. (292 mm)
	Overall dimensions	14.0×14.0×3.375 in. (356×356×86 mm)
ADC-5108	Style	Wall-mount
	Face diameter	8 in. (203 mm)
	Overall dimensions	10.5×10.5×3.375 in. (267×267×71 mm)
ADC-5106	Style	Rack-mount
	Face diameter	5.4 in. (137 mm)
	Overall dimensions	8.25×19×6.6 in. (178×483×168 mm)
ADC-5105	Style	Desk-mount
	Face diameter	5 in. (127 mm)
	Overall dimensions	8.25×5.85×7.25 in. (209×145×184 mm)

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