User Guide
For

MD23-225

Configurable Digital
Airspeed Indicator

powered by

FLEX™

Rev	Date	Detail	Approved
1	12/09/2021	Initial release.	BAW
2	11/07/2023	Added TS6 support	KC
3	05/16/2025	Corrected Pin 25 and Pin 26 of table 2.	TH

This manual provides information intended for use by persons who, in accordance with current regulatory requirements, are qualified to install this equipment. It is a supplement to the MD23 Installation Manual and Operating Instructions, p/n 9019161.

If further information is required, please contact Mid-Continent Instruments and Avionics.

Mid-Continent Instruments and Avionics

User Guide UG225
Revision 3

Mid-Continent Instrument Co., Inc.
dba Mid-Continent Instruments and Avionics
9400 E. 34th Street N.
Wichita, KS 67226 USA
ph (800) 821-1212
www mcico.com

1.1 INTRODUCTION

The model MD23-225 Digital Airspeed Indicator is a standard 2-inch (2-¼") panel-mounted instrument that can be configured to display several ranges and range markings for indicated airspeed. Based on Mid-Continent Instruments and Avionics patented FLEX™ Custom Function Display, this FAA and EASA TSO-approved instrument bring a highly capable and modern addition to the cockpit to display required information and provide useful related functions.

This User Guide is a supplement to the Installation Manual and Operating Instructions (IM), MCIA part number 9019161. The IM contains all information associated with the standard product, including installation procedures, product specifications, operating instructions, certification data, and maintenance requirements. This User Guide provides additional information associated with the specific features of the configurable digital airspeed indicator. It addresses product identification, electrical pinout, initial configuration setup, and in-flight user operation.

1.2 PRODUCT IDENTIFICATION

Each MD23 is comprised of certified hardware and certified software. Within the context of the certified software is a set of data items that can configure and customize the behavior of the unit. This set of data is referred to as a Custom Instrument Definition, or a CID file. The CID file for this instrument is pre-loaded and may be available for future updates via a standard USB flash drive through the programming port on the rear of the unit.

A unique CID number has been assigned specifically to this application. The CID is identified by its two-digit number and an alphabetic character representing the CID version, starting with "A".

The identification of the hardware, software, and CID configurations are listed below. Both the software version and the CID can be viewed on the Introduction Screen during the first few seconds of applying power to the unit. This information can also be accessed on the Info page of the Options Menu during Flight Mode.

Unit Versions		
Hardware Part Number	**Software Version**	**CID**
6420023-2	1.0.2, or later	25B, or later

1.3 PRODUCT FUNCTION

The Configurable Digital Airspeed Indicator primarily provides indicated airspeed up to 500 knots. Airspeed is numerically presented as a scrolling value in a central window (known as a 'counter drum') with 1 unit resolution. A single pointer also provides visual analog representation with selectable maximum ranges of 160, 200, 300, 400, or 500. Colored range marking arcs can be configured to represent various speed thresholds for a given installation. Airspeed units are available in knots or miles per hour.

Other features include a dynamic MMO, or barber pole, function, a Mach number display, and optional display of external data such as true air speed (TAS) and ground speed (GS). The instrument can also provide airspeed and Mach number as a digital output to other equipment.

2.1 CONNECTOR PINOUT

For standard pre-installation and installation instructions, including location, cable harness assembly, pneumatic inputs (if applicable), mounting, and others, please refer to the IM.

Pinout identification specific to this CID is listed in the table below. A brief description is provided. Further definition of the inputs and outputs should be documented in the technical requirements and/or statement of work and are not provided within this User Guide.

Connector Pinout – Without TS6		
Pin	**Description**	**Function**
1	Ground	Power return; connect to a/c ground
2	ARINC Out (A)	Labels 205, 206
3	ARINC Out (B)	(paired with pin 2)
4	Dimmer Input	5, 14, or 28VDC input (if used)
5	ARINC In (A)	Labels 210, 312
6-13	Reserved	
14	ARINC In (B)	(paired with pin 5)
15-18	Reserved	
19	Power Input	+10-32VDC
20-26	Reserved	

Table 1 Unit Connector Pin Identification – Without TS6 Battery

Connector Pinout – With TS6		
Pin	**Description**	**Function**
1	Ground	Power return; connect to a/c ground
2	ARINC Out (A)	Labels 205, 206
3	ARINC Out (B)	(paired with pin 2)
4	Dimmer Input	5, 14, or 28VDC input (if used)
5	ARINC In (A)	Labels 210, 312
6-13	Reserved	
14	ARINC In (B)	(paired with pin 5)
15,16	Reserved	
17	Aircraft Power	+10-32VDC Aircraft Power bus - to monitor loss of power
18	Reserved	
19	Power Input	Connect to TS6 J1 pin 7
20-24	Reserved	
25	SoC	Backup battery state of charge, connect to TS6 pin 4
26	Batt Disable	Battery disable, connect to TS6 J1 pin 6

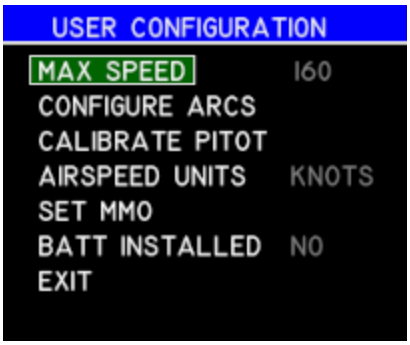
Table 2 Unit Connector Pin Identification – With TS6 Battery

Pneumatic Ports		
Port	**Description**	**Function**
S	Static / Absolute	External Static Pressure
P	Pitot / Differential	External Pitot Pressure

The Configurable Digital Airspeed Indicator also provides ARINC outputs of the following data:

Label	Parameter	Units	LSB	MSB	Resolution	Min	Max	Xmit period
0205	Mach	Mach	14	29	0.0000625	0	4.095	0.065 sec
0206	Computed Airspeed	Knots	16	29	0.0625	0	1024	0.065 sec

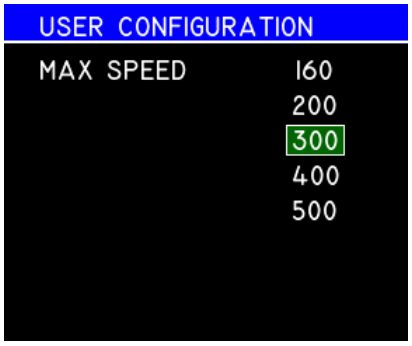
3.1 CONFIGURATION AND SETUP



Enter Configuration Mode by pressing and holding the Control Knob while applying power to the unit. For configuration and setup of standard unit functions, including dimming control options and dimming curve definition, please refer to the IM.

Configuration settings specific to this unit are found within the User Configuration menu option. The User Configuration items include the following functions:

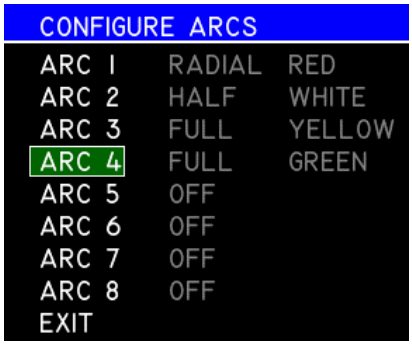
3.1.1. MAX SPEED



The Max Speed configuration item sets the range of the airspeed indicator. Options available are 160, 200, 300, 400, or 500.

Turn the Control Knob to highlight the preferred range and press to select it. The cursor will return to the User Configuration options in the menu list and the selected option will be shown in gray to the right.

3.1.2. CONFIGURE ARCS



The Configure Arcs function is used to set up unique range markings for each particular installation. Refer to the aircraft's Pilot Operating Handbook (POH) for appropriate airspeed markings. For each element/arc, press the Control Knob to select the item, turn the Control Knob to select a half arc, full arc, or radial, then press the Control Knob again and select a color. Once selected, the screen will show the dial and allow the user to turn the knob to the beginning position (LO) of the arc or radial, indicated with a blinking magenta marker. The numeric counter drum will also show the exact value. Once determined, press the Control Knob and repeat the process to define the end position of the arc (HI) (if applicable). Pressing the Control Knob again will return back to the Configure Arcs table. Repeat the process for all arcs and radials.

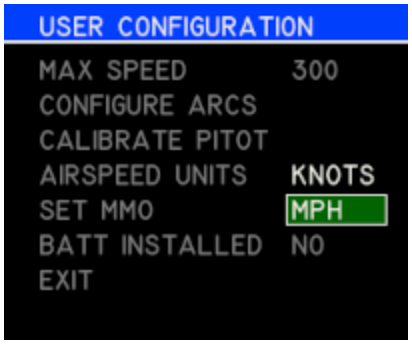
NOTE: The arcs that are at the top of the list have priority and are displayed 'on top'. If there is any overlap of arcs, those defined further down in the list will be placed under those above it.

3.1.3. CALIBRATE PITOT

Use the Calibrate Pitot process if the displayed airspeed does not match a known airspeed reference. When selected, the Calibrate Pitot option opens a new page. Allow the unit five to ten (5-10) seconds to settle and display the currently reported airspeed. The airspeed will be shown in the units that are currently configured.

Turn the Control Knob until the airspeed value matches the known external reference (note: zero airspeed is an acceptable reference value). Pressing the Control Knob will confirm the calibration and exit the page back to the User Configuration Menu.

3.1.4. AIRSPEED UNITS



Within the User Configuration Menu, the Airspeed Units can be set without leaving the page. By selecting the Airspeed Units option, the units to the right become active and additional options are displayed. The MD23 can be set to display airspeed in either Knots or MPH (miles per hour).

Turn the Control Knob to highlight the preferred units and press to select it. The cursor will return to the Airspeed Units option in the menu list and the selected option will be shown in gray to the right.

3.1.5. SET MMO

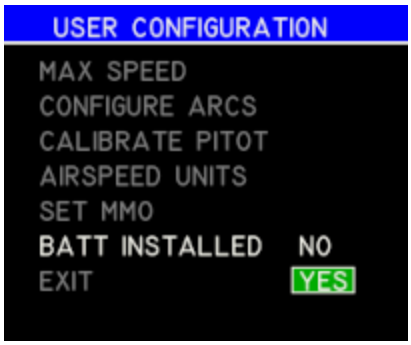
To set the maximum Mach operating speed, use the SET MMO feature in the User Configuration menu. By selecting the appropriate MMO Mach number on this page, it will control the behavior of the barber pole on the dial, indicating the effective speed limit at the given altitude and airspeed conditions. Turn the value down to zero to turn the MMO feature OFF (which will be displayed as OFF in white).

Press the Control Knob to complete the entry and return to the User Configuration Menu.

3.1.6. BATT INSTALLED

If the installation includes a TS6 Emergency Battery Power Supply, you should activate the battery interface features of the Airspeed Indicatory by changing the BATT INSTALLED menu item from NO to YES.

Press the Control Knob to complete the entry and return to the User Configuration Menu.



3.1.7. EXIT

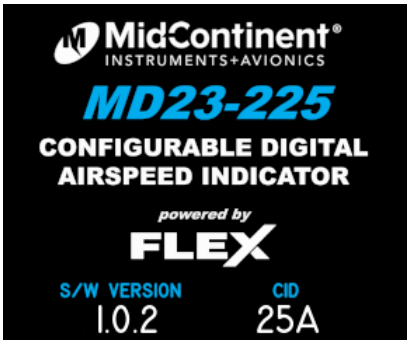
Highlighting and selecting the Exit menu item will close the User Configuration Menu and return to the Configuration Menu. Exiting the Configuration Menu will reboot the unit into Flight Mode.

4.1 OPERATION

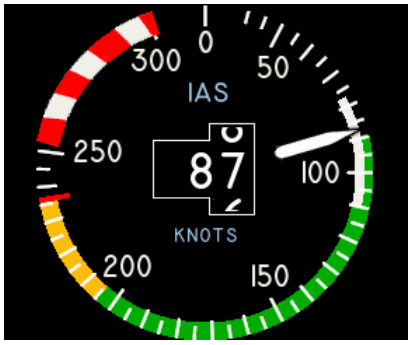
For operation of standard unit functions, including the Options Menu, manual brightness control, Info page, and others, please refer to the IM.

4.1.1. PRIMARY DISPLAY PRESENTATION

In Flight Mode, the display is presented as shown in the example figures below.



Power on screen
(example)



Normal Operation
(example)

Primary Function elements are defined as follows:

- Dial: Numbers from 0 to max indicated airspeed, with numeric major grads and sub-divided graduations between. No airspeed is indicated between zero and the minimum airspeed value shown on the dial grads.
- Pointer: Rotates clockwise with increasing airspeed, counterclockwise with decreasing airspeed. The unit cannot display negative airspeed.

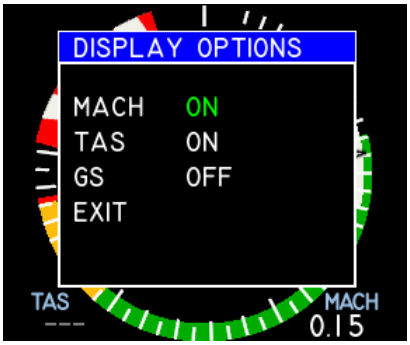
- Counter Drum window: Displays the airspeed as a numeric value. The value is displayed in an expanded window with rolling numbers representing every 1 unit. The tens or hundreds digits will change with a similar rolling action at each increment. Invalid airspeed will be represented with red dashes (- - -). The airspeed units, as selected in the Configuration Mode, is displayed below the window.

4.1.2. SECONDARY DISPLAY PRESENTATION

Secondary Function elements are defined as follows. Further details about each secondary function can be found in 4.1.3.

- Mach Number: displayed in the lower right corner.
- Ground Speed (GS): displayed in the upper left corner.
- True Air Speed (TAS): displayed in the lower left corner.

4.1.3. USER OPTIONS



Pressing and holding the Control Knob for three (3) seconds will activate the Options Menu. The manual brightness adjustment and info page are described in the IM. The Options Menu or User Options items will close and return to the active display after ten (10) seconds if no knob activity is recorded.

When highlighted and selected, the User Options item will open a new page and display the available options available to the user during Flight Mode. The User Options menu is where the Secondary Functions can be turned on or off. The list of features is provided in 4.1.2 and shown in the image.

Mach number can be turned on or off and is available based on standard pitot and static inputs. Mach number will also be output via ARINC 429 on label 205.

For True Airspeed (TAS) and Ground Speed (GS), an external ARINC 429 Input must be provided for labels 210 and 312, respectively, to view this information. If these features are turned on without an external input, the values will be shown as “- - -“.

If the aircraft is installed with the TS6 Emergency Battery Power Supply and the BATT INSTALLED configuration option (see 3.1.6) is set to YES, there will be an additional User Options menu item which allows access to a battery status/control menu page.

Highlight and select Exit to return to the Options Menu or simply wait ten (10) seconds and the unit will return to the active Flight Mode display.

Highlight and select Exit to return to the Options Menu or simply wait ten (10) seconds and the unit will return to the active Flight Mode display.

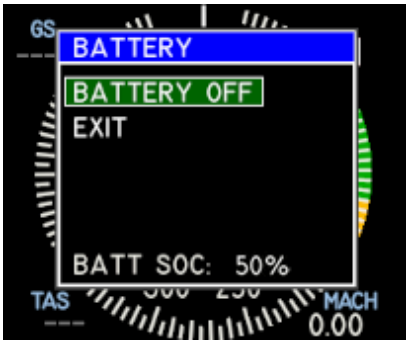
4.1.4 TS6 EMERGENCY BATTERY POWER SUPPLY INTERFACE FEATURES

If the aircraft is installed with the TS6 Emergency Battery Power Supply and the BATT INSTALLED configuration option (see 3.1.6) is set to YES, the MD23 will monitor aircraft power and display a pop-up notification and option menu when power loss is detected as shown in the image to the right.

When this pop-up is displayed and you wish to power down the unit, either wait for the 60 second countdown to reach zero or turn the Control Knob to highlight the OFF option and press. This will send the Disable signal to the battery, thus removing power from the instrument.

To maintain operation on battery power, press the Control Knob while the ON option is highlighted. This will stop the countdown and remove the pop-up. If aircraft power is restored, the unit will continue operation and the battery icon will be removed.

To turn the unit off while operating on battery power, press and hold the Control Knob to access the User Options menu. Select the BATTERY menu option, and then select the BATTERY OFF option.



Selecting EXIT will return to the User Options menu and continue operation on battery power.

BATTERY STATE OF CHARGE

The TS6 battery state of charge can be viewed at any time by selecting the BATTERY menu option from the User Options menu. The battery state of charge (BATT SOC) will be displayed in percent at the bottom of the menu window.

If the unit is not currently operating on battery power, the BATTERY OFF option will be unavailable, but the BATT SOC will still provide the battery state of charge.

A high-level representation of the battery state of charge is also indicated on the main display. The battery icon will be displayed when operating on battery power, or if the state of charge of the battery is less than 50%.

If above 50%, the icon will be green when operating on battery power and off (not visible) when operating on normal aircraft power. Whether operating on normal aircraft power or battery power, if the battery state of charge is below 50% and above 20%, the icon will be shown and will be amber. Under the same conditions, the icon will be shown and will be red if the battery state of charge is less than 20%.

5.1 CONFORMANCE

For standard conformance items such as qualification levels and software updates, please refer to the IM.

5.1.1 INSTRUCTIONS FOR CONTINUED AIRWORTHINESS

For this application, the MD23 is configured to accept and display data associated with a static and pitot pressure source. Some aviation regulations may apply to inspect and test for accuracy on a regular basis. (for example, 14 CFR §91.411 for altimeters) Please identify and/or refer to the appropriate maintenance procedures for your aircraft in the pilot operating handbook or flight manual supplement.

5.1.2 COMPONENT MAINTENANCE AND REPAIR

No periodic scheduled maintenance or calibration is necessary for continued airworthiness of the MD23 Custom Function Display, unless specified in the aircraft maintenance procedures, as referenced above in 5.1.1.

The unit display can be cleaned using a lint-free cloth moistened with water. No chemicals should be used to clean the display.

If the unit fails to perform to specifications, the unit must be removed and serviced by Mid-Continent Instruments and Avionics or their authorized designee. Other than software version updates or in-field calibration, there are no repairable parts or processes available to be performed in the field.

For component maintenance and repair of the TS6 Emergency Battery Power Supply (if applicable), refer to the TS6 Installation Manual and Operating Instructions, p/n 9019857.