VICS

Voice information computer system

Specification and Installation Instructions

Rev1.0

October 2021

Models

- VICS-01

Note: VICS-01 is non-TSO certified as a flight instrument.

Credits

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Revision History

Below is the document's revision hi story.

Revision #	Revision Date	Comments
Rev 1.0	October 05, 2021	Initial Release of this document

Contents

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1. Introduction

Voice information computer system (VICS) is an advanced electronic device designed for use in experimental/home-built airplanes in conjunction with the following EFIS systems: MiniUni, Mini or xPlane series. It is a small and easy to install module that can be positioned behind most instrument panels in the airplanes.

The audio processing computer relies on EFIS's digital solid sensors and high-speed AHRS processing unit, and generates speech messages and feeds them to airplane's intercom or directly into pilot's headset in order to provide pilot with additional layer of guidance when required.

VICS is intended to assist the pilot in flying the airplane efficiently and safely. The unit is designed using state of art technology and works in conjunction with compatible MiniUni, Mini or xPlane EFIS series, that provide user interface and controls for the device. The on-board audio processing system generates high quality sound and priority based muting to improve clarity.

The goal of VICS is to provide sounds and speech cues to ease pilot overload by providing timely updates and warnings related to airplane attitude, speed, engine and other parameters. VICS connects externally to compatible EFIS systems and ENGOOD engine monitor via CAN bus (two wires). VICS can also be connected to up to 3 other external sensors (ex: canopy, gear, etc).

VICS module can be configured and controlled via menu in compatible EFIS modules. There are a few different operation modes available in VICS module.

Please note: in this document "VICS", "device", "unit" and "module" are used interchangeably when reference is made to VICS system.

2. General Description

VICS module is an electronic device which is comprised of a microcontroller, audio processing unit, micro-SD card and a flash memory. All configuration is done via compatible EFIS module.

VICS module has a built in SD card slot for MicroSD card. This card is used for all firmware updates as well as for logs and speech processing functions.

MicroSD card must always remain installed in the VICS unit for correct operation of the module.

3. Technical Specifications

Description	VICS Module
Input voltage	+10 to +28 Volts
Power consumption	3.6W
Current	0.3A at 12V
Unit size	115mm x 70mm x 27mm (with mounting ears)
Weight (MiniUni2)	65 g
Operation humidity	25% to 90%
Unit processor	ARM
Audio processor	Cirrus Logic
System startup time	5 sec
SD Card slot	Standard MicroSD (FAT32 or FAT formatted)
External communication	CAN bus (proprietary protocol and UART 115200
Pitch/Roll range*	360 degrees
Altitude range*	-1000ft to 32000ft
Vertical speed range*	10000ft/min up/down
Receiver*	GPS receiver high sensitive Ublox
Antenna*	Mag mount GPS with male SMA connector
Pitot/Static lines*	¼" Quick connect
Manufacturer*	360Avionics

*Standalone VICS model only.

4. General functionality description

VICS module is controlled by external EFIS such as MiniUni, Mini EFIS, ENGOOD engine monitor and other compatible modules via CAN bus. Various voice commands produced by VICS module are based on requests from external devices. Audio signal is fed to audio panel or directly to pilot's headphones.

Module has three dedicated inputs to connect external triggers such as gear up/transit/down switch, canopy/door switch, etc. These inputs can be configured for various audible commands to warn pilot, when triggered.

Reminder for pilots: VICS module is designed to provide an advisory information to pilot when triggered, however it is solely pilot's responsibility to verify and assess the real situation and react in a safe manner. Any electronic system by its design may introduce mistake due to malfunction. Pilot should assess' various available information before making a decision.

Examples of the cases when voice warning is given to a pilot by VICS system:
- Steep banking turns over 45 degrees
- Too high pitch on takeoff (over 20 degrees)
- Nose too low during flight (below -20 degrees)
- High rate of descent (exceeding 2500 ft/min)
- Gear up while on final (via external trigger input)
- Canopy is not locked on takeoff (via external trigger input)
- Engine temperatures/pressures over limit (when connected with ENGOOD engine monitor module)
- Etc.

5. Configuration Menu

All VICS module settings can be configured via externally connected compatible EFIS such as MiniUni, Mini or xPlane models. Please refer to EFIS manual to access the Settings Menu for VICS: "Settings" menu > "External devices".

VICS Warn
- 'All warnings' will enable all available warnings.
- 'Altitude warnings' will only keep altitude information related warnings while
- 'Attitude warnings' will only keep attitude warnings to pilot.

All warnings and Altitude warnings
When 'All warnings' or 'Altitude warnings' mode is enabled, VICS module will read altitude on takeoff from the airfield (AGL) and every 100' until circuit altitude is reached (normally 1000' AGL). It will also read altitude on every thousand feet when climbing up or descending. When descending below 1000' VICS module will say altitude every 100'.

All warnings and Attitude warnings
When 'All warnings' or 'Attitude warnings' mode is enabled and airplane is banked at an angle of more than 45 degrees, VICS module will warn about bank angle. In case if airplane is pitched up or down more than 20 degrees VICS module will advise pilot.

Whenever the descent rate of airplane exceeds 2500' per minute VICS module warns pilot about this condition.

Two additional functionality modes in VICS module are Altimeter and Speed Directors.

Altimeter Director mode

Altimeter director mode allows pilot to set a predefined altitude during cruise flight. Whenever altitude changes, VICS module will warn the pilot. There are three settings options for the warning message:
- 'Say warning'
- 'Say altitude'
- 'Disabled'

Say warning

- more than 5% change in altitude – will say "Altitude High or Low" voice message
- more than 10% change in altitude - will say "Altitude too high or too low" voice message
- more than 15% change in altitude – will produce audible sound, followed by "Altitude too high or too low" voice message.

Say altitude

- more than 5% change in altitude – will read the altitude
- more than 10% change in altitude – will read the altitude
- more than 15% change in altitude – will produce audible sound, then will read the altitude

To set the altitude which you would like to maintain:

1. Switch EFIS to Altitude display mode (the image below is an example of MiniUni module). To the right of the current altitude, there is an Altitude Director information.

2. Climb or descent airplane to the desired altitude and hold the knob down on EFIS for at least 3 seconds until orange 'INACTIVE' message changes to green 'ACTIVE' message and desired altitude appears under 'Altitude Director'. VICS module will read the pre-set altitude.

3. Whenever altitude changes by more than 5% from pre-set, pilot will hear a voice message from VICS module.

4. In order to turn off Altitude director mode, switch EFIS to Altitude display mode and hold the knob down for at least 3 seconds until green 'ACTIVE' message changes back to orange 'INACTIVE' message.

Whenever Altitude director mode is active, the following label will be shown on top left corner quadrant of each screen: **'->ALT'**

Speed Director mode

Speed Director mode – allows pilot to set predefined speed during cruise flight. Whenever speed changes VICS module warns pilot. There are three settings options for the warning message:

- - 'Say warning'
- - 'Say speed
- - 'Disabled'

Say warning
- • more than 5% change in speed – will say "Speed High or Low" voice message
- • more than 10% change in speed - will say "Speed too high or too low" voice message
- • more than 15% change in speed – will produce audible sound, followed by "Speed too high or too low" voice message.

Say speed
- • more than 5% change in speed – will read the speed
- • more than 10% change in speed – will read the speed
- • more than 15% change in speed – will produce audible sound, then will read the speed

To set the speed which you would like to maintain:

1. Switch EFIS to Speed display mode (the image below is an example of MiniUni module). To the left of the current speed, there is Speed Director information.

2. Set airplane to desired power/speed and hold down the knob on EFIS for at least 3 seconds until orange 'INACTIVE' message changes to green 'ACTIVE' message and desired speed appears in speed director. VICS module will read the pre-set speed.

3. Whenever speed changes by more than 5% from the pre-set, pilot will hear a voice message from VICS module.

4. In order to turn off the Speed director mode, switch EFIS to Speed display mode and hold down the knob on EFIS for at least 3 seconds until green 'ACTIVE' message changes back to orange 'INACTIVE' message.

Whenever Speed director mode is active, the following label will be shown on top left corner quadrant of each screen: '->SPD'

Muting the voice messages

Whenever Speed or Altitude director messages are pronounced the 'MUTE' label will be shown in the center bottom of the EFIS display.

This 'MUTE' label will be shown during voice messages on all of EFIS functional modes except 'Settings Menu' mode. Mute label will only appear on display for the duration of 2 seconds while message is pronounced.

- During that short period of time, press the knob once to mute the voice for 20 seconds.
- If after 20 seconds, the warning condition still exists, VICS module will provide another warning voice message and 'MUTE' label will again show up on display. Pressing the knob for the second time, will mute the voice for 40 seconds.
- If after 40 seconds, the warning condition still exists, pressing the knob for the third time (and all consecutive times), will mute the voice for 60 seconds.

If MUTE is selected, all of the voice messages will be muted. While mute mode is active the 'MUTE' label will be shown in the top left corner of the display.

Best Glide Speed Director mode

VICS module has a Best Glide Speed director mode. In case of emergency, when gliding is the only option for a pilot to safely land the airplane onto the field (engine-out situation), pilot may press the left button on EFIS to activate Best Glide Speed director mode.

While in this mode, VICS will automatically calculate best glide speed based on Vx and Vy (must be pre-set in compatible EFIS), and direct pilot by saying if his speed is below or above best glide speed in a regular Speed Director manner. This mode reduces the workload on pilot during emergency landing situation by allowing him to keep best glide speed (have maximum glide range) while looking for suitable field for landing and processing other emergency tasks/checklists.

This mode is supported by MiniUni3, xPlane Mini and xPlane EFIS units only.

MiniUni3 – Press and hold left button for 3 seconds to activate Best Glide Director mode
xPlane Mini and xPlane EFIS – Press and hold most left button for 3 seconds to activate Best Glide Director mode

Please note that this mode is not available with MiniUni2 EFIS.

⚠ *Important warning: Pilot must periodically practice his emergency landing procedures and simulated emergency landing to keep his proficiency and knowledge sharp.*

6. Product installation

6.1 Space requirements

VICS module is easy to install. Module can be installed behind the instrument panel, or on top of the panel or in any other suitable location. VICS module has four mounting holes – two on each ear. It is sufficient to use only two (2) mounting points to firmly hold the module in place, however use of all four is recommended when possible.
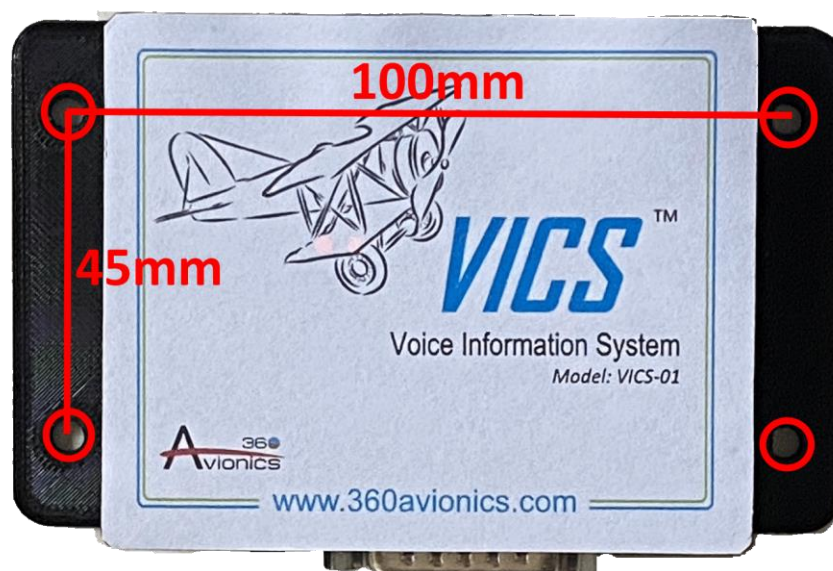
The installation depth of the VICS module will require approximately 125mm (including depth of the plugged D-SUB connector).

⚠ *Important installation warning: Please study carefully pinout description of the unit to ensure proper connections for power and CAN bus lines.*

6.2 Connections

On one side of the VICS module, there is a main 15 pin D-SUB connector. This connector provides all electrical power, CAN bus, UART Tx/RX and audio connections. Female D-SUB 15 connector is included with the kit for all wiring.

Next to the main D-SUB connector, there is a 3.5mm standard audio connector that can be used to connect to audio panel or pilot's headphones. Inside of D-SUB main connector, there are two audio lines which are parallel with 3.5mm audio connector and can be used for hardwiring of the VICS module.

3.5mm Audio connector

15pin D-SUB connector

On the side of the VICS module, there is an SD card slot with card inserted in it. Please ensure that the original SD card always remains inserted for proper module operation. In case if your SD card is lost or damaged contact manufacturer for replacement SD card.

6.3 15-pin Main connector pinout:

1 – Power +V (positive)
2 - UART Rx
3 – UART Tx
5 – Line Out R
6 – Line Out L
8 – Audio and UART GND
10 – CAN Low
11 – CAN High
12 – External trigger input 1
13 – External trigger input 2
14 – External trigger input 3
15 – Power GND

It is recommended to use 22AWG for all power connections (pins 1 and 15). For all other connections it is acceptable to use 24AWG. Use milspec wires for all connections to ensure high quality and robustness of the wiring. Kit includes female D-SUB 15pin connector header with optional soldering or crimp-in pins. Plastic enclosure for the connector header is also provided. In case of wires soldering, ensure that they are properly attached without cold soldering.

3.5mm Audio connector is internally connected with pins 5,6 and 7. It is up to installer to decide whether to use a 3.5mm connector or pins in D-SUB connector for connection with the audio panel or headphones dedicated input.

6.4 CAN Bus termination:

VICS should be installed in the airplane together with compatible 360 Avionics EFIS unit such as MiniUni, Mini or xPlane series and/or engine monitor, and connected to a single CAN line. Whenever VICS module is the last module installed in CAN bus chain (furthest from the EFIS) it is required to install 120 Ohm termination resistor (included with the kit) between pin 10 and pin 11. The resistor must be installed in the connector and left inside of the enclosure. This is done to ensure that CAN bus will operate in correct mode.

⚠ *Important installation warning: Make sure that whenever VICS is installed and connected via CAN bus line to compatible EFIS module, the termination 120 Ohm resistor in EFIS's connector is removed while termination resistor at VICS connector is added. There must be only one termination resistor on the CAN bus at the very end of the CAN line.*
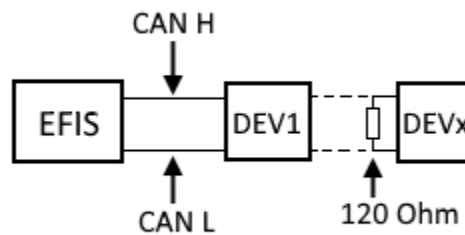
6.5 Power bus:

Use AWG22 or less gauge of wires to connect power to the unit (pins 1 and 15). It is required to have 1A circuit breaker on power line for the VICS module. It is acceptable to connect and use the same circuit breaker with EFIS MiniUni models 3 or 2 for powering VICS module as long as the circuit breaker is 5A. Ground wire can be connected to chassis ground or directly to the battery negative terminal.

Power line with circuit breaker is usually connected via Avionics master switch or via Main master switch depending on the airplane configuration.

RS-232 Port:

Pins used for the port

3 - UART Tx
8 – GND (UART and Audio)
2 - UART Rx

Port settings are: 115200 8N1

This port is used in UART low voltage mode (3V3). To connect with RS232 port TTL level converter is required. At present time this port is not in use.

7. Maintenance and Repair

VICS module testing procedure should be performed annually (every 12 months) to ensure proper operation of the device.

There are no field repairable parts inside of the VICS module. In case of any malfunction, the unit should be returned to manufacturer for test and repair.

8. Firmware Update Procedure

VICS Main Control Unit ("MCU") operates using firmware inside. Each unit comes preloaded with the latest available firmware at time of production, however future firmware updates are possible via SD card.

Note: It is strongly recommended to have airplane battery connected to external trickle charger for the duration of the firmware update. This is needed to avoid unexpected power outage and unsuccessful firmware update.

Should firmware update be available and required for your unit it can be performed in a few easy steps:

1.   Download firmware from www.360avionics.com or receive by email from a 360 Avionics technical support agent.

2.   Copy firmware update file to a microSD card. VICS usually comes with the SD card of 4Gb or bigger size. This card is already formatted and includes specific folder tree structure which should always remain unchanged. Firmware should be copied inside of the 'Update' folder of the microSD card.

3.   Make sure that nothing else is saved inside of the SD card's 'Update' folder except the update file. Firmware update file name start with '**FW_**' and have an extension '**.enc**'. Update may consist of one single file or several files. In case if update includes more than a single file, additional instruction for the update steps will be provided in a separate document along with firmware update file.

For example:

FW_VICS_main.enc

4.   Make sure that power to the unit is OFF (Master switch is off). Insert SD card with copied firmware update into the VICS module. Turn on Master power switch and wait until both VICS module and EFIS module are booted up. Open EFIS 'Settings Menu' followed by 'External Devices' sub menu. Choose 'VICS Update' menu and wait for on-screen directions.
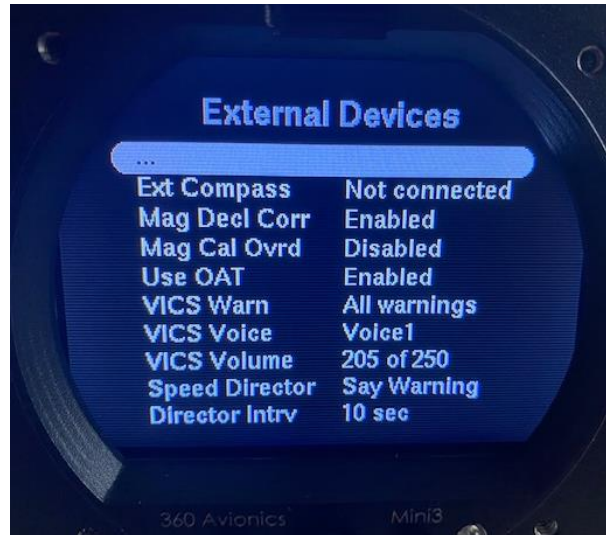
9. VICS configuration

All configuration of the VICS module is done via compatible EFIS menu. Follow EFIS dedicated instructions to access its 'Settings Menu' followed by 'External Devices' sub menu.

10.   Settings Menu

In EFIS, select "Settings" menu, then "External Devices" submenu.

Submenu: **External Devices**

VICS Warn – Enables/Disables VICS external module warnings and allows to choose specific warnings only.

Altitude only – this will only allow altitude voice warnings during climb and descent
Attitude only – this will only allow pitch/roll voice warnings during flight
All warnings – will allow both Altitude and Attitude warnings
Disabled – turns off all altitude and attitude warnings. Please note that this will not turn off Speed and Altitude director warnings

VICS Voice – Allows to choose between Male and Female voices for external VICS module.
Voice1 – Male voice
Voice2 – Female voice

VICS Volume – Sets the output volume for external VICS module.
Can be adjusted between 0 and 255. Recommended setting is between 210-255 depending on the audio panel input level

Speed Director – Enables/Disables Speed Director mode and allows to choose warning type
Say warning – will pronounce warnings 'High speed, Too high speed'
Say speed – will pronounce speed value

Director Intrv – Sets the interval in seconds for Altitude and Speed Directors voice warnings
Sets interval between 3 and 15 seconds to repeat Speed/Altitude director warnings if condition is available.

Altitude Director – Enables/Disables Altitude Director mode and allows to choose warning type
Say warning – will pronounce warnings 'High altitude, Too high altitude'
Say altitude – will pronounce altitude value

11.   Operation Limitations

- Information from airplane's POH is always supersedes information provided in this manual

- This unit is non-TSO certified and cannot be installed on the certified airplane unless special permission is obtained from regulatory agency/airplane manufacturer.

12.   Warranty coverage and limitations

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12. TSO approval and Liability limitations

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