

M5Stack smart CAT/CIV display

The M5Stack smart CAT/CIV display that is Bluetooth connected to, and displays in real-time the current information from your Icom and Yaesu radios. It currently supports the Icom IC-7100, IC-7300, IC-9700 and IC-705 radios. It also supports the Yaesu FT-710, FT-991 and FT-DX10 radios.

It displays information such as the tuned frequency, mode, filters, S/SWR/ALC/COMP/ID/VD/PO meters as well as several other concurrent settings.

The display and software are designed to allow for easy future firmware upgrades.



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M5Stack Smart CAT-CIV Display specifications:

- M5Stack Basic Core module
- 2.0 inch LCD screen
- 110mAh battery
- Supports with the Icom IC-7100, IC-7300, IC-9700 and IC-705 radios
- Supports the Yaesu FT-710, FT-991 and FT-DX10 radios
- Displays real time information including:
 - tuned frequency
 - mode
 - filters
 - S/SWR/ALC/COMP/ID/VD/PO meters
- Icom IC-705 is supported via Bluetooth built into the radio
- Other Icom and Yaesu radios are supported via separate purchase Bluetooth adapters

Kit includes:

- M5Stack Smart CAT-CIV display and stand
- 5V-3A USB-C power supply
- USB-C firmware programming cable
- 1 Year Warranty

Software libraries used:

The M5Stack Smart CAT-CIV Display uses portions of two open-source projects. License information can be found at the links below.

- FreeType Project
 - Portions of this software are copyright © 2022 The FreeType Project (www.freetype.org). All rights reserved. (<u>https://gitlab.freedesktop.org/freetype/freetype/-/blob/master/docs/FTL.TXT</u>)
- LZ4 Library
 - Copyright (c) 2011-2020, Yann Collet All rights reserved. (<u>https://github.com/lz4/lz4/blob/dev/lib/LICENSE</u>)

Radio setup:

Icom IC-7100 setup:

Press the "SET" button to enter the configuration menus.



Use the **UP** and **DOWN** arrows to scroll through the options and then press the "**Connectors**" button.



Use the **UP** and **DOWN** arrows to scroll through the options and then press the "**CI-V**" button.

HE	VHEALINE TRANS	
ECTORS	6	3/4
WOD	A	cc 🔺
l Keypad		
		T
DATA1 F	unction	
	ECTORS MOD I Keypad	ECTORS MOD A I Keypad DATA1 Function

Ensure the **"Baud Rate"** is set to **9600**, the **"Address"** is set to **88h** and the **"Transceive"** is set to **"OFF"**. Press the back button a number of times to return to the radio main screen.

	IC-7100
	_1/1 ≣
CI-V Baud Rate	
00.00	
CI-V Address	
OT Y Address	_
88h	
CI-V Transceive	T
OFF	
CI-V Output (for ANT)	
	5
OPE	
	NGC



Ensure power is turned off to the radio. Next, connect the BT-7100/7300 Bluetooth adapter to the back of the IC-7100 radio as shown in this image.



You can watch a YouTube video showing the same steps here: https://youtu.be/T5bGWe-m2nY

Icom IC-7300 setup:



Press the "**MENU**" button on the front of the radio.

Next, press the "SET" button.



Use the **UP** and **DOWN** arrows to scroll through the options and then press the "**Connectors**" button.



Use the **UP** and **DOWN** arrows to scroll through the options and then press the "**CI-V**" button.

	CONNECTORS	3/4
	USB SEND/Keying	
	External Keypad	
(CI-V	
	USB (B)/DATA Function	IJ

Ensure the **"Baud Rate**" is set to **9600**, the **"Address**" is set to **94h** and **"CI-V Transceive**" is set to **"OFF**". Press the back button a number of times to return to the radio main screen.

	CI-V		1/2
CI-V Baud Rate			
		9600	A
CI-V Address			
		94h	
CI-V Transceive			▼
		OFF	
CI-V USB→REMOTE T	ransceive Ad	dress	
		00h	5



Ensure power is turned off to the radio. Next, connect the BT-7100/7300 Bluetooth adapter to the back of the IC-7300 radio as shown in this image.



You can watch a YouTube video showing the same steps here: https://youtu.be/mk3XrnPRTdl

Icom IC-9700 setup:



Press the "**MENU**" button on the front of the radio.

Next, press the "SET" button.



Use the **UP** and **DOWN** arrows to scroll through the options and then press the "Connectors" button.



Use the **UP** and **DOWN** arrows to scroll through the options and then press the "**CI-V**" button.

	CONNECTORS	3/4
	USB SEND/Keying	
	External Keypad	
(CI-V	
	USB (B)/DATA Function	D

Ensure the **"Baud Rate"** is set to **9600**, the **"Address"** is set to **A2h** and **"CI-V Transceive"** is set to **"OFF"**. Press the back button a number of times to return to the radio main screen.





First, make sure power is turned off to the radio. Next, connect the BT-9700 Bluetooth adapter to the back of the IC-9700 radio as shown in this image.



You can watch a YouTube video showing the same steps here: https://youtu.be/lLcgeCNjJWo

Icom IC-705 setup:

Press the "**MENU**" button on the radio.



Next press the "SET" button.



Use the **UP** and **DOWN** arrows to scroll through the options and then press the "Connectors" button.



Use the **UP** and **DOWN** arrows to scroll through the options and then press the "**CI-V**" button.

CONNECTORS		3/3
CI-V		
USB (B) Function		
MIC Jack 8V Output	OFF I	
		IJ

Ensure the "CI-V Address" is set to A4h, the "CI-V Transceive" is set to "OFF" and the "CI-V USB Echo Back" is set to "OFF". Press the back button a number of times to return to the radio main screen.



Icom IC-705 first time pairing to M5Stack:

Press the "**MENU**" button on the radio.



Next, press the "SET" button.



Use the **UP** and **DOWN** arrows to scroll through the options and then press the "**Bluetooth Set**" button.



Use the **UP** and **DOWN** arrows to scroll through the options and ensure "**Bluetooth**" is "**ON**".



Use the **UP** and **DOWN** arrows to scroll through the options and press the "**Pairing/Connect**" button.

BLUETOOTH SET	1/2
Bluetooth	
ON	
Auto Connect	
ON	
Pairing/Connect	
< <pairing reception="">></pairing>	U

Next, press the "Device Search" button.

PAIRING/CONNECT	1/1
Device Search	
	•
	t I

Next, press the "Search Data Device" button.



The IC-705 will take a few seconds to find all the available Bluetooth devices nearby.



It should find the device called "ZUM-BT-M"

ZUM-BT-M 78:21:84:A6:98:8A	1/1
SEARCHING CANCEL	
	IJ

Wait for the search to complete and press the "**ZUM-BT-M**" device from the list of Bluetooth devices.

SEARCH DATA DEVICE	1/1
ZUM-BT-M 78:21:84:A6:98:8A	
	•
	D

Press the "YES" button when asked if you want to connect the radio to the Bluetooth device.

		SEAR	CH DATA	DEVICE		1/1
	ZUM-BT	-M				
Ŵ	Connec	t?				
						incontants.
			YES		NO	100000008
						D

It should show "Connecting..." for a few seconds.



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Next, confirm the passkey. This number is random. Press "CONFIRM" to continue.

SEARCH DATA DEVICE	1/1
ZUM-BT-M	
Confirm the following passkey is	
shown on	BEBEBBBBB
ZUM-BT-M.	
Passkey:155655	•
CONFIRM	
	t

After a few more seconds the IC-705 should now show that it is "Connected." to the display.



It should show "Connect". Press the back button a number of times to return to the radio main screen.



Icom IC-705 - Subsequent pairing to the display

Press the "**MENU**" button on the radio.



Next press the "SET" button.



Use the **UP** and **DOWN** arrows to scroll through the options and press the "**Bluetooth Set**" button.



Ensure "Bluetooth" is "ON".



Use the **UP** and **DOWN** arrows to scroll through the options and press the "Pairing/Connect" button.

BLUETOOTH SET		1/2
Bluetooth		
	ON	
Auto Connect		
	ON 🖉	
Pairing/Connect		
< <pairing reception="">></pairing>		U

Next press the "ZUM-BT-M" button to start the pairing.



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Press the "YES" button when asked if you want to connect the radio to the Bluetooth device.



It should show "**Connecting...**" for a few seconds.

P/	AIRING/CONNECT	1/1
Devi ZOIVI-B I-IVI Connecting.		
		•
		IJ

It should show "Connect". Press the back button a number of times to return to the radio main screen.



Icom IC-705 - Automatic Bluetooth pairing

After the radio has been successfully paired to the display, it should automatically connect each time the radio is powered on. Assuming the display is on and ready to pair, it should give the **"ZUM-BT-M Connected.**" message.



Yaesu FT-710 setup:

Press the "FUNC" button on the radio.



Next press the "**OPERATION SETTING**" button.

S ₁₃₅	7 9 +20 +4 0 15 20]. 0E	3. E	20
COMP -		NB	LS	s 7.01	JU.U6U	LEVEL
LEVEL +2.5dB	PEAK LV1	MARKER ON	COLOR 5	CONTRAST	DIMMER 15	M-GROUP
MIC GAIN			AMC LEVEL	VOX GAIN	VOX DELAY	
RF POWER 5W	MONILEVEL	OFF	OFF	CW SPEED 20wpm	700Hz	200ms
MESSAGE	RECORD	PLAY	TXW		AESS <mark>50%</mark>	AESS-CF 700Hz
RADIO SETTING	CW SETTIN	OPERATION SETTING	ISPLAY	EXTENSION Setting	ВА	ск

Next press the "GENERAL" button and ensure the TUL/LIN PORT is set to "CAT-3".

OPERATION SETTING				
GENERAL	BEEP LEVEL			
	4			
RX DSP	RF/SOL VR			
TX AUDIO	RF			
	TUN/LIN OKT SELLET			
TX GENERAL	CAT-3			
TUNING	TUNER TYPE SELECT			
	INT			
	CAT-1 RATE			
	38400bps			
	BACK			



Use the **UP** and **DOWN** arrows to scroll through the options and ensure "**CAT-3 RATE**" is set to "**9600bps**" and "**CAT-3 TIMEOUT TIMER**" is set to "**10msec**". Lastly press "**BACK**" a number of times to return to the main screen.



Ensure power is turned off to the radio. Next, connect the BT-710 Bluetooth adapter to the back of the FT-710 radio as shown in this image.



You can watch a YouTube video showing the same steps here: https://youtu.be/hCFvZN2RZHw

Yaesu FT-991 setup:

Press the "**MENU**" button on the radio.



Use the "MULTI"-wheel to scroll to menu items "031", "032", and "033". Ensure that "CAT RATE" is "9600bps", "CAT TOT" is "10msec" and "CAT RTS" is "DISABLE". Next, press the "MENU" button to return to the main screen.

VE	O-A		17:422
		2050	F
	сн-р	0.930	00 M-LIS
		CLAR C)Hz
ſ	S. 1. 3. 5.	7 9 +20 +40 +6	Odd SETUP
Carl Saint	VDD	10 13.84	
	031 CAT BATE	9600hne	BAND
	032 CAT TOT	10msec	
	033 CAT RTS	DISABLE	MODE
	And the Party of the Party of States of States	SELECT	



Ensure power is turned off to the radio. Next, connect the BT-991/DX10 Bluetooth adapter to the back of the FT-991 radio as shown in this image.



Yaesu FT-DX10 setup:

HF/50MHz TRANSCEIVER FTDX 10 V/M A/B CLAR RX CLAR TX м SHIFT- S-WIDTH QMB SPLIT non тхи мотсн ZIN NOTCH-O-CON LOCK FUNC knob

Press the "FUNC" button on the radio

Next, press the "OPERATION SETTING" button.

S ₁ 35 1010 P0	7 9 +20 +4 50 100 1	0 dB +60 US 50 W		3.04	. 	
LEVEL -5.0dB	PEAK LV1	MARKER ON	COLOR 5	CONTRAST	DIMMER 15	M-GROUP
MIC GAIN	MIC EQ OFF	PROC LEVEL OFF	AMC LEVEL	VOX GAIN <mark>50</mark>	VOX DELAY 500ms	ANTI VOX 50
RF POWER 5W	MONI LEVEL OFF	KEYER OFF	BK-IN OFF	CW SPEED 20wpm	CW PITCH 700Hz	BK-DELAY 200ms
DNF OFF	MESSAGE	RECORD	PLAY	DECODE		
RADIO SETTING	CW SETTIN 3	OPERATION SETTING	SETTING	EXTENSION Setting	ВА	ск

Next press the "GENERAL" button, and use the UP and DOWN arrows to scroll through the options and ensure "CAT RATE" is set to "9600bps", "CAT TIMEOUT TIMER" is set to "10msec" and "CAT RTS" is set to "OFF". Next press the "BACK" button a number of times to return to the main screen.



Ensure power is turned off to the radio. Next, connect the BT-991/DX10 Bluetooth adapter to the back of the FT-DX10 radio as shown in this image.



You can watch a YouTube video showing the same steps here: <u>https://youtu.be/pYII9uVuTOA</u>



Display Settings:

The display has three buttons called "Button A", "Button B" and "Button C". The function for each button can change for each screen.



On the side of the display, there is a red reset button which is right above the USB-C connector which supplies the power.



First startup:

Each time the display is powered on, it will show the splash screen which includes the firmware version number.



The first time the display is powered up, it will automatically go to the **Configuration** screen after the splash screen. Here you can select the make/model/ID of your radio. You can also set the clock, power off the display or reset the display back to factory settings.



Radio Setup for Icom radios:

From the Configuration screen, use "**Prev**" and "**Next**" buttons to move the cursor over "**Radio setup**" and then press the "**Select**" button.



The "**Prev**" and "**Next**" buttons are used to switch between "**Icom**" and "**Yaesu**" radios. Press the "**Select**" button to confirm configuration will be done for an Icom radio.

Radio setup				
Manufacturer	lcom			
Prev Sele	ect Next			

The "**Prev**" and "**Next**" buttons are used to switch among the supported Icom "**Radio model**". Press the "**Select**" button to confirm the selected radio model.



The "**Prev**" and "**Next**" buttons are used to change the "**Radio addresses**". Make sure the address displayed matches the address configured in your Icom radio. Press the "**Select**" button to confirm the selected radio model. This will return to the main menu.

Radio setup				
Manufacturer	lcom			
Radio model	IC-7610			
Radio address	0x98			
Prev Sele	ect Next			

From within the Configuration menu, press the "Select" button to return the display to run mode.



Configuring Yaesu radios:

From the Configuration screen, use "**Prev**" and "**Next**" buttons to move the cursor over "**Radio setup**" and then press the "**Select**" button.



The "**Prev**" and "**Next**" buttons are used to switch between "**Icom**" and "**Yaesu**" radios. Press the "**Select**" button to confirm configuration will be done for an Yaesu radio.

Radio setup				
Manufacturer	Yaesu			
Prev Sele	ect Next			



The "**Prev**" and "**Next**" buttons are used to switch among the supported Yaesu "**Radio models**". Press the "**Select**" button to confirm the selected radio model. This will return to the main menu.

Radio setup				
Manufacturer	Yaesu			
Radio model	FT-710			
Prev Sele	ect Next			

From within the Configuration menu, press the "Select" button to return the display to run mode.



Set clock:

The Display hardware does not have a built-in Real Time Clock. It will not be able to retain the set time after power is removed.

From the Configuration screen, use "**Prev**" and "**Next**" buttons to move the cursor over "**Set clock**" and then press the "**Select**" button .

Configuration						
	Radio set	up				
	Set cloc	k				
	About					
Power off						
	Factory reset					
Exit						
Pre	ev Select	Next				

The display will change to the "**Set clock**" screen. Use the "**Prev**" and "**Next**" buttons to toggle between having the clock "**Enabled**" and "**Disabled**". Press the "**Select**" button to continue.

Set clock	Set clock		
Clock Disabled	Clock Enabled		
Prev Select Next	Prev Select Next		

The "**Prev**" and "**Next**" buttons are used to change the "**Hour**" value for the clock. Press the "**Select**" button to confirm the hour.



The "**Prev**" and "**Next**" buttons are used to change the "**Minute**" value for the clock. Press the "**Select**" button to confirm the minute.





The "**Prev**" and "**Next**" buttons are used to change the "**Second**" value for the clock. Press the "**Select**" button to confirm the second. This will return to the main menu.



From within the Configuration menu, use"**Prev**" and "**Next**" buttons to move the cursor over "**Exit**". Press the "**Select**" button to return the display to run mode.



About:

From the Configuration screen, use"**Prev**" and "**Next**" buttons to move the cursor over "**About**" and then press "**Select**". The display will change to the About screen with software version information as well as copyright information.



Press the "**Ok**" button to return to the Configuration screen.



Power off:

From the Configuration screen, use the "**Prev**" and "**Next**" buttons to move the cursor over "**Power off**" and then press the "**Select**" button. The display will turn off immediately. You can wake the display by either pressing the **Reset** button or **ButtonA**.



Factory reset:

From the Configuration screen, use the "**Prev**" and "**Next**" buttons to move the cursor over "**Factory Reset**" and then press the "**Select**" button. It should reboot to the spash screen in a few seconds and then return to the Configuration screen. The configured manufacturer/model/ID values will be reset to the unconfigured state.





Pairing progress:

Once the Display is configured for a specfic radio (other than the IC-705), it will attempt to pair to the Bluetooth adatper connected to the radio. Once connected, it will then show the CAT/CIV screen.



The Display will show that it is waiting for the IC-705 to pair to it



When the Display detects that it has become disconnected from radio, an error message and progress message will be shown on the screen.



When the Display detects that the IC-705 has become disconnected, an error message and progress message will be shown on the screen.

Radio disconnected from display

Waiting for display to pair to radio



Operating Display:

Switching between two VFOs:

Each time **ButtonC** is pressed, the display switches between showing the two VFOs in the radio if there are two. If not, it remains showing the single VFO frequency.

Returning to Configuration screen:

ButtonB is used for returning to the main menu. Also, during booting, you can force the Display to enter the Configuration screen by holding down **ButtonB**.

Selecting Icom meter:

Each time **ButtonA** is pressed, the display changes the meter shown. It first cycles through all the needle meters (SWR, Po, Vd, Id, ALC and COMP) and then to the bar graph meter. It then goes back to the needle meters.



Selecting Yaesu meter:

Each time **ButtonA** is pressed, the display changes the meter shown. It first cycles through all the needle meters (SWR, ID, PO, VDD, ALC and COMP) and then to the bar graph meters (SWR, ID, PO, VDD, ALC and COMP). It then goes back to the needle meters.



Troubleshooting:

Display no longer responds to FT-710 radio:

This is a known issue with the FT-710. After a long period of inactivity, the radio appears to turn off the CAT port where the Bluetooth adapter is plugged. The only know solution is to turn off the FT-710 radio and then turn it on again.

Display no longer responds to IC-7100 radio:

This is a known issue with the IC-7100. After a long period of inactivity, the radio appears to turn off the CAT port where the Bluetooth adapter is plugged. The only know solution is to turn off the IC-7100 radio and then turn it on again.

IC-705 displays "Connection Failed" message:

A few things to check on the radio

- Make sure the "ZUM-BT-M" adapter is visible in the list of found Bluetooth adapters
- Press the reset button on the side of the display, right above the power connector
- Delete the "ZUM-BT-M" adapter from the list of known devices on the radio. Then complete the initial pairing steps again.

Display reboots to menu screen:

After pressing the reset button the display should show the splash screen for a few seconds and then begin the Bluetooth pairing process. If the display end up on the menu screen then try to move the cursor to exit and press the select button.

IC-705 is unable to find ZUM-BT-M device when scanning for Bluetooth devices

A few things to check:

- Rescan for devices on IC-705
- Look for the "Waiting for radio to pair to display" message on display, showing that it is waiting for IC-705 radio to connect to it.

IC-705 connection failure:

If the radio is unable to connect to the display, it will show the "Connection failed." error message. Try:

- Press the reset button on the Display and restart the pairing on the IC-705
- Rescan for devices on IC-705



Updating firmware:

Plug the M5Stack into your computer using the short USB programming cable that was included with your purchase.

Using **Device Manger**, find the **COM** port number for your M5Stack.



Download the M5Stack Display firmware from the ZUM Radio website:

https://zumradio.com/downloads.html#precompiled It will have a file name similar to this: EasyLoader-M5Stack-0.87.exe



Run the program from your Windows computer. You may see an **"Unknown Publisher**" warning from Windows. Press the **"Run**" button to continue.

Open File	- Security War	ning	×		
The publisher could not be verified. Are you sure you want to run this software?					
	Name:		\EasyLoader-M5Stack-0.86.exe		
	Publisher:	Unknown Publis	sher		
	Туре:	Application			
	From:	G:\My Drive\	EasyLoader-M5		
			<u>R</u> un Cancel		
✓] Aiways ask before opening this file					
This file does not have a valid digital signature that verifies its publisher. You should only run software from publishers you trust. How can I decide what software to run?					

Select the COM port number you found using **Device Manager.**

🥙 Easy Loader	_		×	
M5Stack CAT/CIV				
СОМ:			\sim	
Baud:	M1 M46		-	
	Burn			
Erase				
Ready				

Set the "Baud" rate to "921600"

🥙 Easy Load	ler	_		×
M5Stack CAT/CIV				
COM:	COM46			~
Baud:	150000 921600 750000 234000 115200	0		~
	Era	se		
Ready				

Finally press the "**Burn**" button. This will start the flashing process. You may see another "**Unknown Publisher**" warning from Windows. If son, press the "**Run**" button to continue.

🥙 Easy Loa	der	_		×
M5Stack CAT/CIV				
COM:	COM46	i		~
Baud:	921600)		~
	Bu	rm		
	Era	ise		
Ready				

A new window will open and display the flashing progress. It should take about a minute to complete.



Support:

The primary location for support for ZUM Radio products is via the ZUM Radio Facebook support group: <u>https://www.facebook.com/groups/249802742395450/</u>