Remote Controller Test Box User Manual

Version	Date	Author	Description
v0.1	3/11/2026	Tide Yin	Initial version
v0.2	4/12/2026	Tide Yin	Fine tune document
v0.3	4/28/2026	Tide Yin	Fine tune and add some new AT commands

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Hardware:	v2
Relative Doc	N/A

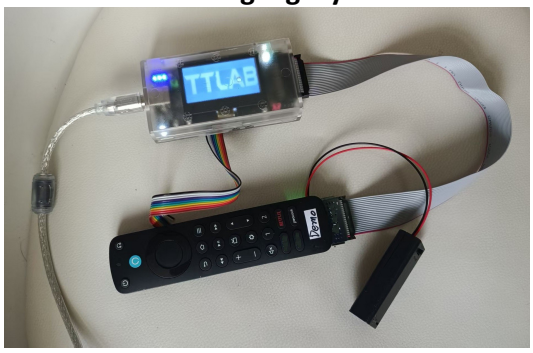
Content

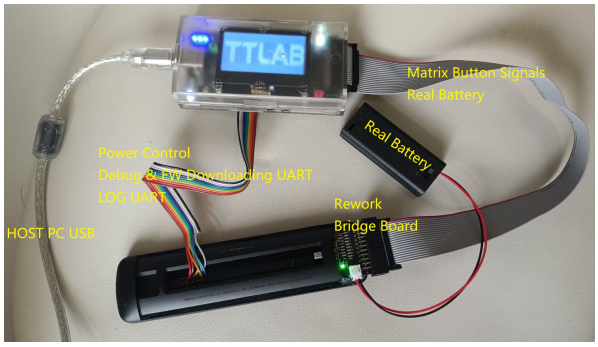
Chapter 1: Remote Controller Test Box information

1.1 Introduction

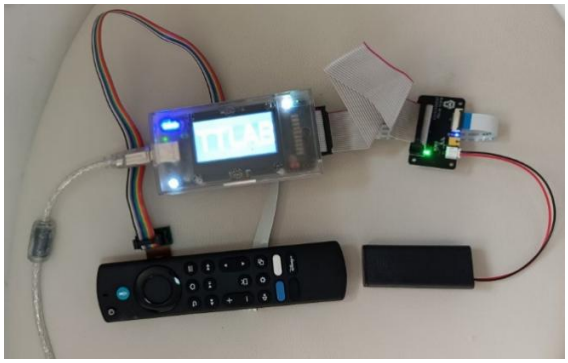
Remote Controller Test Box is a universal smart test kit for remote controller testing.

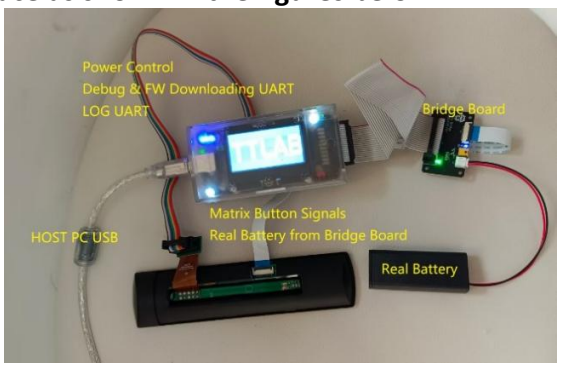
Rework for existing legacy remote connections as shown in the figures below.





Remote connections with standard test interface as shown in the figures below.





1.2 Features

1.2.1 Emulate Key press

The kit supports emulating single and combo key presses by using a matrix switcher IC, and it does not require pressing physical keys on the remote panel.

1.2.2 Provides remote controller's Debug UART channel

Host PC operates remote controller and downloads firmware for the remote under test through the Debug UART channel.

1.2.3 Provides remote controller's log UART channel

Host PC captures remote controller's LOG through the log UART channel.

1.2.4 Provides AT command UART channel

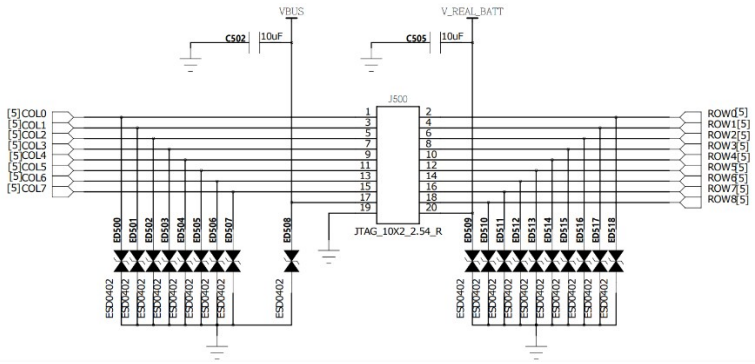
Host PC sends AT commands through the AT command UART channel to emulate remote controller real physical operations.

Chapter 2: Remote Controller Test Box's Ports

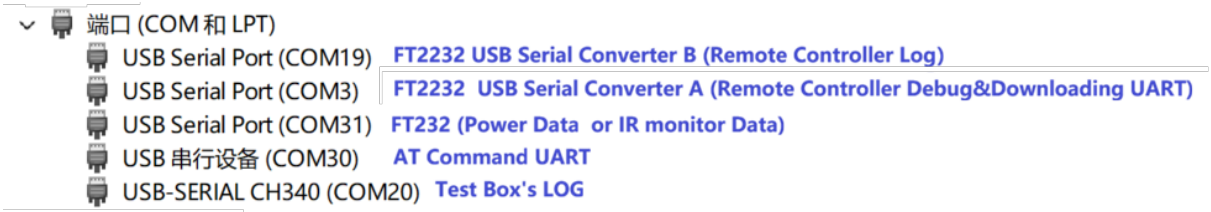
2.1 Matrix Key port

This connector connects to reworked Remote.

1. It links to each col and row signal from Remote for matrix key emulation;
2. It gets real battery power from Remote controller;
3. The **top right** is **COL0**, the **bottom right** is **ROW0**



2.2 USB port with Host PC

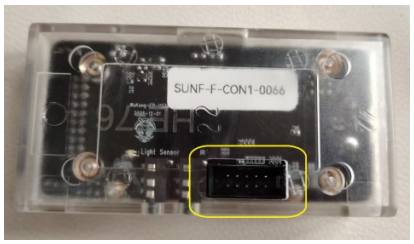


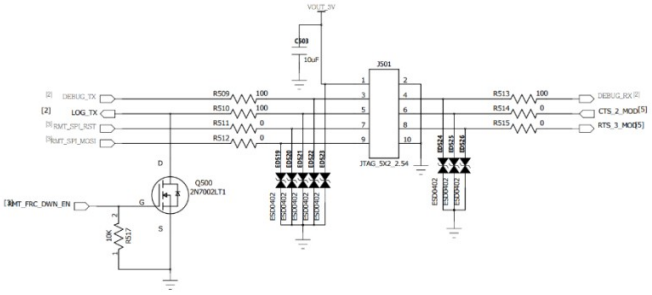
The four USB serial ports share the same USB cable to the host PC.

1. USB Serial Port with Microsoft Driver is for Remote Controller Test Box AT command;
2. USB Serial Port with FT232 Driver is for high speed ADC data of power monitor;
3. USB to UART Bridge, FT2232 USB Serial Converter B is Remote Controller's LOG UART;

4. USB to UART Bridge, FT2232 USB Serial Converter A is UART for Debug and Firmware download;

2.3 Function Port





The 10-pin connector contains:

1. Battery power to Remote controller;
2. LOG UART Rx from Remote controller Tx (FT2232 Serial Converter B);
3. Control UART to Remote controller Rx/Tx (FT2232 Serial Converter A);
4. Function pins (Force download pin etc.);

Chapter 3: Matrix Key Test

3.1 AT Commands for Matrix Keys Pressing Test

Matrix Key Test AT Command			
Command	**Return**	**Behavior**	**Comments**
AT+KEYDLY=<Value>	OK	Delay Value ms	100 < Value < 99999
AT+FLXMTX=CR	OK	Press and then release a Key Exp: AT+FLXMTX=42	C->Col , R->Row Delay time is defined by: AT+KEYDLY=<Value>
AT+SETMTX=CRV	OK	Press or release a Key Exp: AT+SETMTX=311	C->Col , R->Row , V->Value (0=release , 1=press)
AT+HD_KEY=PWR Other Values: UP,DWN,VUP,VDN,CUP,CDN,SEL,LFT,RIT,MUT,MNU,HOM,BAK VOC,PPL,FF,REW,GUD,SET,	OK REJECT	Short press a specific key	
AT+HD_COMBO=FACRST Other Values:FRSTTV , REBOOTTV,	OK REJECT	Hold Combo Keys	Delay time is defined by:

PAIRTV,SHTCUT,DBGMNU,SYXRAY			AT+KEYDLY=<Value>

3.2 Key mapping

Key mapping is for AT+SETMTX=CR and AT+SETMTX=CRV command. The commands are convenient for user to realize key press/hold and combo keys operations.

3.2.1 Realtek Reference Key mapping①

RealTek Reference Key Mapping								
Row/Col	0	1	2	3	4	5	6	7
0	GUIDE	LEFT	PLAY/PAUSE	FAST FORWARD	PARTNER4	POWER	AUDIO SELECTION/Headset	TERRESTRIAL
1	SELECT	MENU	RIGHT	UP	MUTE	NUM7/Next	INPUT SWITCH/Preset1	PARTNER7
2	REWIND	HOME	VOICE	PARTNER1	VOL+	NUM8/Previous	NUM11/Preset2	PARTNER8
3	BACK	DOWN	PARTNER2	PARTNER3	VOL-	NUM9/Timer/Setting	NUM12	RECORDING LIST
4	CHANNEL+	CHANNEL-	RED	NUM1	NUM4	DATA BROADCAST	BS	
5	GREEN	YELLOW	BLUE	NUM2	NUM5	NUM10/0	CS	
6	PAUSE	SOUND FOCUS	MYAPP	NUM3	NUM6	STOP/TXT	4K	
7	QUICK SETTINGS	MY VIERA	SKIP REWIND	SKIP FORWARD	SKIP 30SEC	PARTNER5	PARTNER6	

3.2.2 Cypress Platform Key mapping②

Cypress Reference Key Mapping								
Row/Col	0	1	2	3	4	5	6	7
0	FAST FORWARD	PLAY/PAUSE	VOL+	VOL-	PRIME VIDEO/TV GUIDE	NETFLIX/PB1	MUSIC/MUTE	NUM6
1	UP	RIGHT	DOWN	SELECT	LEFT	BACK	MENU	NUM7
2	POWER	VOICE	HOME	REWIND	LIVE/PB4	MUTE/PB3	AMAZON PHOTOS/PB2	NUM8
3	CHANNEL+	CHANNEL-	FREEVIEW	COLOUR	K123	RED	GREEN	NUM9
4	YELLOW	BULE	NUM1	NUM2	NUM3	NUM4	NUM5	
5								
6								
7								

3.2.3 Telink Platform Key mapping③

TeLink Reference Key Mapping								
Row/Col	0	1	2	3	4	5	6	7
0	GUIDE	LEFT	PLAY/PAUSE		PARTNER4	POWER		
1	SELECT	MENU	RIGHT	UP	MUTE			
2		HOME	VOICE	PARTNER1	VOL+			
3	BACK	DOWN	PARTNER2	PARTNER3	VOL-			
4	CHANNEL+	CHANNEL-						
5								
6		SETTING	MY APP					

①②③ It's just for a reference design , Remote Controller Test Box is using the mapping tables to get AT command AT+HD_KEY to send right IR code with Demo Customer code and Demo Function code. For real products, please use AT+SETMTX=CR and AT+SETMTX=CRV to do matrix button operation. Host PC should maintain Matrix Table for different remote controller products.

3.3 Key Matrix Detection

When the user presses a physical button manually or a simulation is triggered by AT command, Remote Controller Test Box detects the operation and transfers an indicator to Host PC through AT command UART and it shows the same information on LCD.

Chapter 4: Battery Test

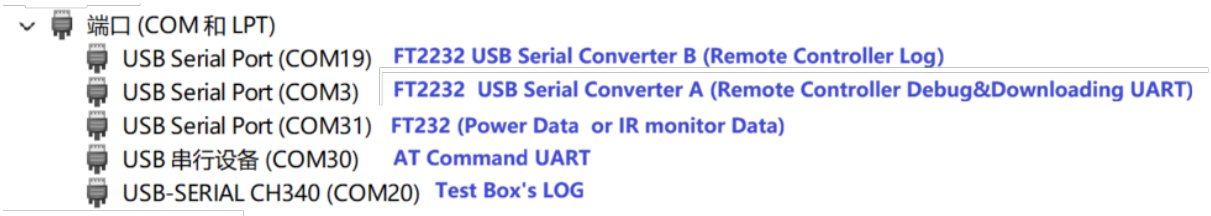
4.1 Battery Test AT Commands

Use the Battery Test AT commands below to turn on/off real or fake battery, set fake battery voltage and measure voltage/current of battery.

Battery Test AT Command			
Command	**Return**	**Behavior**	**Comments**
AT+SETBAT=<value>	OK	Turn on/off real/Fake battery	REAL , FAKE , OFF
AT+BATVOT?	BATVOT:3.212V	return Battery Voltage	
AT+BATSTA?	REAL/FAKE/OFF	return REAL/FAKE/OFF	It will return SETBAT Value
AT+BATCUR?	BATCUR:0.125mA	return Battery Current	
AT+BATPWR?	BATVOT:3.212V BATCUR:0.125mA	return Battery Voltage and Current	
AT+BATADC=START	OK	Start continue data through FT232 UART	
AT+BATADC=STOP	OK	Stop continue data through FT232 UART	
AT+FAKVOT=<value>	OK	Change Fake battery voltage	valid data 550~3190 (mV) exp: AT+FAKVOT=3100
AT+FAKVOT?	FAKVOT:xxxxmV	Return setting of Fake battery	

Chapter 5: Factory mode/Firmware downloading and LOG

5.1 COM function ports

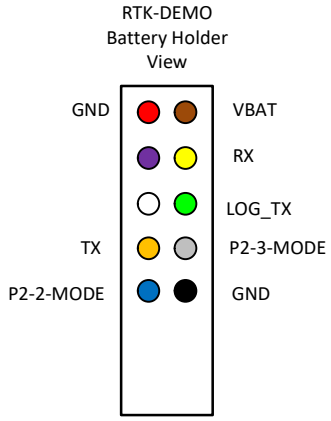


Remote LOG → COM19 ① (FT2232 Converter B)
Remote Debug UART → COM3 ② (FT2232 Converter A)
AT UART → COM30 ③ (USB CDC UART)
Power Data or IR monitor Data → COM31 ④ (for power test and IR monitor) (Cannot work together)

Test Box LOG → COM20 ⑤ (Remote Controller Test Box's LOG)
①②③④⑤ Refer to the COM port numbers in Device Manager.

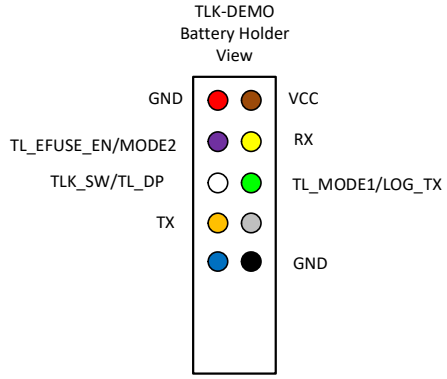
5.2 Realtek Physical signals on 10 pin cable

To align with Realtek remote SoC reference design. The signals are shown in the figure below.



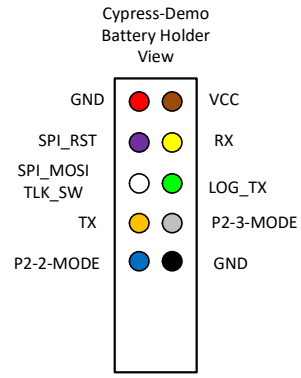
5.3 Telink Physical signals on 10 pin cable

To align with Telink remote SoC reference design. The signals are shown in the figure below.



5.4 Cypress Physical signals on 10 pin cable

To align with Cypress remote SoC reference design. The signals are shown in the figure below.



5.5 Factory Mode:

AT+REBOOT=NRM (Reboot to normal mode)
Send the command below within 5 seconds to enter factory mode.
>> ./enter_factory_mode.py COM3 (FT2232 Converter A)
Then send any factory command as you want. Example:
>> ./read_hw_rev.py COM3

5.6 Download Mode

AT+REBOOT=DWN (Reboot to download mode) (Delay[log_tx low] value is controlled by AT+KEYDLY=<value>)
>> ./dnld_img.py COM3 (download command within image information in .py file) (FT2232 Converter A)
AT+REBOOT=NRM (Enter normal mode)

5.7 LOG UART

The UART can export Remote Controller's LOG (FT2232 Converter B)

Chapter 6: IR Send and Receive

6.1 Accessory for IR Send and Receive

The Remote Controller Test Box has two 3.5 mm 4-pole audio jacks for accessory connections. The one near USB is for IR Send and Receive. Connect an IR Send and Receive Accessory (picture as below) to the IR jack on the Remote Controller Test Box by using a direct 4-pole 3.5 mm audio cable.

6.2 IR Send and Receive AT Command

Use the IR Send and Receive AT commands to do IR-related operations by using the Remote Controller Test Box.

IR Send and Receive AT Command			
Command/Indicator	**Return**	**Behavior**	**Comments**
AT+IRMON=START	OK	Enable IR monitor	Enable IR raw data through ADC_HS_UART
AT+IRMON=STOP	OK	Disable IR monitor	Disable IR raw data through ADC_HS_UART
AT+IRMON?	IRMON:ON (OFF)	Return IR monitor On or OFF	ON/OFF current mode (Will be ready)
AT+IR_NEC=0xXX	OK	Send IR code (customer code+function code)	
AT+HD_NEC=NECPWR (Other IR code, NECHOM , NECSEL , NECLFT, NECRIT , NECUP , NECDWN , NECPUP , NECPDN , NECVUP , NECVDN , NECMNU , NECMUT,NECBAK, NECFWD,NECRWD, NECVOC, NECPLY)	OK/REJECT	Default send Demo IR code	Default use Demo customer code Return OK in SEND mode and ON
AT+IRCSM=<Value>	OK	Set IR customer(company) code	Exp: AT+IRCSM=0x3789
AT+IRCSM?	IRCSM:0x3789	Get IR customer(company) code	
N/A	#$IR_NEC%#:0x392723DC	Indicator for valid IR code	

Chapter 7: Light Sensor for E2E Test

7.1 Light Sensor accessory for end to end test

The Remote Controller Test Box has two 3.5 mm 4-pole audio jacks for accessory connections. The one near 20-pin Matrix signals connector is for the light sensor accessory. Connect a light

sensor (picture as below) to the light sensor jack on the Remote Controller Test Box by using a direct 4-pole 3.5 mm audio cable.

7.2 Light Sensor AT Command

Use the Light Sensor AT commands to trigger an end to end latency test. Start time is the command time, end time is when the light sensor detects a screen light change.

Light Sensor AT Command			
Command/Indicator	**Return**	**Behavior**	**Comments**
AT+LITMTX=CR	OK	Press or release a Key Exp: AT+LITMTX=3 1	C->Col , R->Row , Press, wait for light on , Release , then wait for light off ①
AT+LATENCY?	LATENCY:ON->XXXX,OFF->XXXX	Return screen on/off's latency after a button pressing	XXXX's unit is ms②

①②The command is customized for a specific test process. Will provide a common process AT command.

Chapter 8: System AT Command

8.1 Common System AT Command

The Common System AT Commands to do system settings and to get the Remote Controller Test Box's status.

Common System AT Command			
Command	**Return**	**Behavior**	**Comments**
AT?	OK	Basic AT command	
AT+PING?	PING:WKFB	Basic Ping command	
AT+VER?	VER:FB.00.12	Return Version	

AT+SETVFLG=XXX	OK	Set lock flags for system values	Config Tool Only Valid Values: DSN PRD NVM USR ALL
AT+DELVFLG=XXX	OK	Unlock flags for system values	Config Tool Only Valid Values: DSN PRD NVM USR ALL
AT+NVMVER=1	OK	Set NVM version	Config Tool Only Protected by NVM VFLG
AT+NVMVER?	NVMVER:0x1	Return NVM version	
AT+DSN=	OK	Set DSN (Device Serial Number)	Config Tool Only Protected by DSN VFLG
AT+DSN?	DSN:JNWE-0-0000-0000	Return Device Serial Number	
AT+OWNER=	OK	Set Owner Name	Config Tool Only Protected by USR VFLG
AT+OWNER?	OWNER:TideYin	Return Owner Name	
AT+LOGIN=	OK	Set Login	Config Tool Only Protected by USR VFLG
AT+LOGIN?	LOGIN:tideyin@	Return Login	
AT+LOCAT=	OK	Set Location	Config Tool Only Protected by USR VFLG
AT+LOCAT?	LOCAT:PEK12	Return Location	

8.2 Specific System Command

The Specific System AT Commands to do system settings and to get the DUT's① status.

Specific System AT Command			
Command	**Return**	**Behavior**	**Comments**

AT+PRODUCT=	OK	Set Remote product name	Config Tool Only Protected by PRD VFLG
AT+PRODUCT?	PRODUCT:Pico	Return Remote product name	
AT+RMTSOC=X	OK	Set Remote Product SoC name	Config Tool Only, Protected by PRD VFLG Valid value: 1→ Realtek, 2->Cypress , 3→Telink
AT+RMTSOC?	RMTSOC:2	Return Remote Product SoC name	
AT+REBOOT=<Value>	OK		DWN -> Download mode NRM -> Normal mode

①DUT: Device under test

8.3 Common System HW Command

Common System AT Command			
Command	**Return**	**Behavior**	**Comments**
AT+SYSRST=REBOOT	OK	System Reboot	
AT+SYSRST=DFU	OK	System reboot to DFU download mode	
AT+RGB=011	OK	Set RGB LED	
AT+SYSCMD=LCDOFF	OK	Turn off LCD	
AT+SYSCMD=LCDLOGO	OK	LCD show LOGO	