ePoster T-CON Board Series
API Guideline V2.0

(USB Interface)

Record of REVISION

Version	Date	Page	Content
1.0	2021.July.31		First Release

Table of Content

1. Introduction

This documentation is aimed at the application developers who needs to manipulate ePaper with eJump T-CON board by their own software. After reviewing this documentation, feedback will be welcomed to be sent to the sale representative, or to the mail: FAE@ejump.com.tw.

This API supports eJump ePoster T-CON Board products as below:

- *EJ8951-1*
- *EJ8951-2*
- *EJ8951-4*
- *EJ8951EL-1*
- *EJ8951EL-2*
- *EJ8951EL-4*
- *EJ1000*

Library features

- Shared library could be upgraded without re-compiling the program
- Initialize eJump T-CON boards through USB
- Query the information of T-CON board
- Load 8-bit monochrome or 24-bit RGB image data to T-CON board buffer
- Display the image
- Control PMIC
- Update firmware/waveform

Error Handling

Typically, functions return 0 on success or a negative error code on failure. These error codes related to LIBTCON_ERROR constants which are listed on APPENDIX I of this documentation.

2. Get Started

Files

- libtcon-dev_usb.so.2.0.x
- inc/tcon_dev.h
- READ.ME

- demo/python/main.py
- demo/python/READ.ME

- demo/cpp/main.cpp
- demo/cpp/makefile
- demo/cpp/inc/tcon_dev.c
- demo/cpp/READ.ME

Prerequisite

- Libusb-1.0.0 or above

Demo Code

C/C++

Step 1.

Make sure you have installed the shared dynamic library 'libtcon-dev_usb.so.2.0.0" so the program could find this library. The simple approach is simply to copy the library into one of the standard directories(e.g. /usr/lib) and run ldconfig(8)

Step.2

Include *tcon_dev.h* first

```
#include "inc/tcon_dev.h"
```

Step 3

Initialize T-CON board

```
short tcon_num;
tcon_num=tcon_init();
```

Step 4

Now you may develop your own program by the following API (please make sure that you know ID of T-CON board, or use ID '-1' as default)

Step 5

Finally, when you compile your program, you'll need to tell the linker about the shared library you're using. Use the -l and -L options for this.

Python

Step.1

Load the shared library 'tcon-dev_usb.so.2.0.0"

```
import ctypes
#Load API Library
tcon_lib=ctypes.cdll.LoadLibrary("./libtcon-dev_usb.so.2.0.0")
```

Step. 2

Initialize T-CON board

```
tcon_num=tcon_lib.tcon_init()
```

Step 3

Now you may develop your own program by the following API (please make sure that you know ID of T-CON board, or use ID '-1' as default)

3. API Library

Initialize T-CON Board

- short **tcon_init**(void)
  - Description
    Initialize T-CON board and return the number of available T-CON boards through USB
  - Parameters
    - *None*
  - Returns
    - *the number of all available T-CON boards through USB*
    - *Error Code*[*1]
      - *LIBTCON_ERROR_IO*
      - *LIBTCON_ERROR_ACCESS*
      - *LIBTCON_ERROR_NOT_FOUND*
      - *LIBTCON_ERROR_BUSY*
      - *LIBTCON_ERROR_TIMEOUT*
      - *LIBTCON_ERROR_PIPE*
  - Demo Code

```
short tcon_num;
// Initialize T-CON board
tcon_num=tcon_init();
```

Query Board Information

short **tcon_get_panel_width**(short ***board_id***)

- Description
  Get the width of panel
- Parameters
  - *board_id: ID of target T-CON board; -1 for the first available T-CON board*
- Returns
  - *the width of panel*
  - *Error Code*[*1]
    - *LIBTCON_ERROR_NO_DEVICE*
- Demo Code

```
short panel_width;
// Get the panel width of the T-CON board with ID ‘0’
panel_width=tcon_get_panel_width(0);
```

short **tcon_get_panel_height**(short ***board_id***)

- Description
  Get the height of panel
- Parameters
  - *board_id: ID of target T-CON board; -1 for the first available T-CON board*
- Returns
  - *the height of panel*
  - *Error Code*[*1]
    - *LIBTCON_ERROR_NO_DEVICE*
- Demo Code

```
int panel_height;
// Get the panel height of the T-CON board with ID ‘0’
panel_height=tcon_get_panel_height(0);
```

short **tcon_get_temp**(short ***board_id***)

- Description
  Get the temperature of T-CON board
- Parameter
  - *board_id: ID of target T-CON board; -1 for the first available T-CON board*
- Returns
  - *the temperature of T-CON board*
  - *Error Code*[*1]
    - *LIBTCON_ERROR_IO*
    - *LIBTCON_ERROR_ACCESS*
    - *LIBTCON_ERROR_NO_DEVICE*
    - *LIBTCON_ERROR_BUSY*
    - *LIBTCON_ERROR_TIMEOUT*
    - *LIBTCON_ERROR_PIPE*
- Demo Code

```
short board_temp;
// Get the temperature of the T-CON board with ID '0'
board_temp=tcon_get_bd_temp(0);
```

short **tcon_get_vcom**(short ***board_id***)

- Description
  Get the ref. VCOM value of T-CON board (T-CON Board EJ8951-2W/EJ8951-4W does not support)
- Parameter
  - *board_id: ID of target T-CON board; -1 for the first available T-CON board*
- Returns
  - *the ref. VCOM value of T-CON board.* ***Real VCOM value should be the return value/1,000*(-1)***
  - *Error Code*[*1]
    - *LIBTCON_ERROR_IO*
    - *LIBTCON_ERROR_ACCESS*
    - *LIBTCON_ERROR_NO_DEVICE*
    - *LIBTCON_ERROR_BUSY*
    - *LIBTCON_ERROR_TIMEOUT*
    - *LIBTCON_ERROR_PIPE*
    - *LIBTCON_ERROR_NOT_SUPPORTED: for EJ8951-2W/EJ8951-4W*
- Demo Code

```
short board_vcom;
// Get the VCOM value of the T-CON board with ID '0'
board_vcom=tcon_get_bd_vcom(0);
board_vcom=board_vcom/1000*(-1);
```

- uint32_t **tcon_get_fw_version**(short ***board_id)***
  - Description
    Get firmware version of T-CON board
  - Parameters
    - *board_id: ID of target T-CON board; -1 for the first available T-CON board*
  - Returns
    - *the firmware version*
    - *Error Code*[*1]
      - *LIBTCON_ERROR_IO*
      - *LIBTCON_ERROR_ACCESS*
      - *LIBTCON_ERROR_NO_DEVICE*
      - *LIBTCON_ERROR_BUSY*
      - *LIBTCON_ERROR_OVERFLOW*
      - *LIBTCON_ERROR_PIPE*
  - Demo Code

```
uint32_t fw_version;
// Get firmware of T-CON board with ID ‘0’;
fw_version=tcon_get_fw_version(0);
```

Load image data to T-CON board buffer

short **tcon_ld_img**(short ***board_id***, uint8_t* ***img_data***, short ***width***, short ***height***, short ***startx***, short ***starty***)

- Description
  Load image data to the buffer of T-CON board (the panels other than monochrome are not supported)
- Parameters
  - *board_id: ID of target T-CON board; -1 for the first available T-CON board*
  - *img_data: 8bpp image data ('0xF0': white, '0x00': black)*
  - *width*[*2]*: width of the image*
  - *height*[*2]*: height of the image*
  - *startx*[*2]*: starting X position on the screen*
  - *starty*[*2]*: starting Y position on the screen*
- Returns
  - *Success: LIBTCON_SUCCESS*
  - *Error Code*[*1]*
    - *LIBTCON_ERROR_IO*
    - *LIBTCON_ERROR_INVALID_PARAM: 'width', 'startx' could not be smaller than 0, larger than panel width, and 'height', 'starty' could not be smaller than 0, larger than panel height*
    - *LIBTCON_ERROR_ACCESS*
    - *LIBTCON_ERROR_NO_DEVICE*
    - *LIBTCON_ERROR_BUSY*
    - *LIBTCON_ERROR_OVERFLOW*
    - *LIBTCON_ERROR_PIPE*
    - *LIBTCON_ERROR_NOT_SUPPORTED: for the panel other from monochrome*
- Demo Code

```
int ret;
uint8_t* img_data;
// Load 500x200 Image to the buffer[20, 10] of T-CON Board with ID '0';
ret=tcon_ld_img(0, img_data, 500, 200, 20, 10);
```

short **tcon_ld_img_rgb**(short ***board_id***, uint8_t* ***img_data_r***, uint8_t* ***img_data_g***, uint8_t* ***img_data_b***, short ***width***, short ***height***, short ***startx***, short ***starty***)

- Description
  Load RGB image data to the buffer of T-CON board (the panels with monochrome are not supported)
- Parameters
  - *board_id: ID of target T-CON board; -1 for the first available T-CON board*
  - *img_data_r: 8bpp RED component of the color data*
  - *img_data_g: 8bpp GREEN component of color data*
  - *img_data_b: 8bpp BLUE component of color data*
  - *width*[*2]*: width of the image*
  - *height*[*2]*: height of the image*
  - *startx*[*2]*: starting X position on the Screen*
  - *starty*[*2]*: starting Y position on the Screen*
- Returns
  - *Success: LIBTCON_SUCCESS*
  - *Error Code*[*1]
    - *LIBTCON_ERROR_IO*
    - *LIBTCON_ERROR_INVALID_PARAM: 'width', 'startx' could not be smaller than 0, larger than panel width, and 'height', 'starty' could not be smaller than 0, larger than panel height*
    - *LIBTCON_ERROR_ACCESS*
    - *LIBTCON_ERROR_NO_DEVICE*
    - *LIBTCON_ERROR_BUSY*
    - *LIBTCON_ERROR_OVERFLOW*
    - *LIBTCON_ERROR_PIPE*
    - *LIBTCON_ERROR_NOT_SUPPORTED: for the panel with monochrome*
- Demo Code

```
int ret;
uint8_t* img_data_r, img_data_g, img_b;
// Load 500x200 Image to the buffer[20, 10] of T-CON Board with ID '0';
ret=tcon_ld_img_rgb(0, img_data_r, img_data_g, img_data_b, 500, 200, 20, 10);
```

short **tcon_fill_img**(short ***board_id***, uint8_t ***gl***, short ***width***, short ***height***, short ***startx***, short ***starty***)

- Description
  Fill one gray level to the buffer of T-CON board (the panels other than monochrome are not supported)
- Parameters
  - *board_id: ID of target T-CON board; -1 for the first available T-CON board*
  - *gl: 8bpp gray level ('0xF0': white, '0x00': black)*
  - *width*[*2]*: width of the image*
  - *height*[*2]*: height of the image*
  - *startx*[*2]*: starting X position on the Screen*
  - *starty*[*2]*: starting Y position on the Screen*
- Returns
  - *Success: LIBTCON_SUCCESS*
  - *Error Code*[*1]*
    - *LIBTCON_ERROR_IO*
    - *LIBTCON_ERROR_INVALID_PARAM: 'width', 'startx' could not be smaller than 0, larger than panel width, and 'height', 'starty' could not be smaller than 0, larger than panel height*
    - *LIBTCON_ERROR_ACCESS*
    - *LIBTCON_ERROR_NO_DEVICE*
    - *LIBTCON_ERROR_BUSY*
    - *LIBTCON_ERROR_OVERFLOW*
    - *LIBTCON_ERROR_PIPE*
    - *LIBTCON_ERROR_NOT_SUPPORTED: for the panel other from monochrome*
- Demo Code

```
int ret;
// Filll the size 500x200 with black to the buffer[20, 10] of T-CON Board with ID '0';
ret=tcon_fill_img(0, 0x00, 500, 200, 20, 10);
```

short **tcon_fill_img_rgb**(short ***board_id***, uint8_t ***gl_r***, uint8_t ***gl_g***, uint8_t ***gl_b***, short ***width***, short ***height***, short ***startx***, short ***starty***)

- Description
  Fill one RGB color to the buffer of T-CON board (the panels with monochrome are not supported)
- Parameters
  - *board_id: ID of target T-CON board; -1 for the first available T-CON board*
  - *gl_r: 8bpp RED component of filled color*
  - *gl_g: 8bpp GREEN component of filled color*
  - *gl_b: 8bpp BLUE component of filled color*
  - *width*[*2]*: width of the image*
  - *height*[*2]*: height of the image*
  - *startx*[*2]*: starting X position on the screen*
  - *starty*[*2]*: starting Y position on the screen*
- Returns
  - *Success: LIBTCON_SUCCESS*
  - *Error Code*[*1]
    - *LIBTCON_ERROR_IO*
    - *LIBTCON_ERROR_INVALID_PARAM: 'width', 'startx' could not be smaller than 0, larger than panel width, and 'height', 'starty' could not be smaller than 0, larger than panel height*
    - *LIBTCON_ERROR_ACCESS*
    - *LIBTCON_ERROR_NO_DEVICE*
    - *LIBTCON_ERROR_BUSY*
    - *LIBTCON_ERROR_OVERFLOW*
    - *LIBTCON_ERROR_PIPE*
    - *LIBTCON_ERROR_NOT_SUPPORTED: for the panel with monochrome*
- Demo Code

```
int ret;
// Fill the size 500x200 with RED to the buffer[20, 10] of T-CON Board with ID '0';
ret=tcon_fill_img_rgb(0, 0xF0, 0x00, 0x00, 500, 200, 20, 10);
```

short **tcon_fill_img_all**(short ***board_id***, uint8_t ***gl***)

- Description
  Fill one gray level to the whole buffer of T-CON board (the panels other than monochrome are not supported)
- Parameters
  - *board_id: ID of target T-CON board; -1 for the first available T-CON board*
  - *gl: 8bpp gray level ('0xF0': white, '0x00': black)*
- Returns
  - *Success: LIBTCON_SUCCESS*
  - *Error Code*[*1]
    - *LIBTCON_ERROR_IO*
    - *LIBTCON_ERROR_INVALID_PARAM: 'width', 'startx' could not be smaller than 0, larger than panel width, and 'height', 'starty' could not be smaller than 0, larger than panel height*
    - *LIBTCON_ERROR_ACCESS*
    - *LIBTCON_ERROR_NO_DEVICE*
    - *LIBTCON_ERROR_BUSY*
    - *LIBTCON_ERROR_OVERFLOW*
    - *LIBTCON_ERROR_PIPE*
    - *LIBTCON_ERROR_NOT_SUPPORTED: for the panel other from monochrome*
- Demo Code

```
int ret;
// Fill with white to the whole buffer of T-CON Board with ID '0';
ret=tcon_fill_img_all(0, 0xF0);
```

short **tcon_fill_img_all_rgb**(short ***board_id***, uint8_t ***gl_r***, uint8_t ***gl_g***, uint8_t ***gl_b***)

- Description
  Fill one RGB color to the whole buffer of T-CON board (the panels with monochrome are not supported)
- Parameters
  - *board_id: ID of target T-CON board; -1 for the first available T-CON board*
  - *gl_r: 8bpp RED component of filled color*
  - *gl_g: 8bpp GREEN component of filled color*
  - *gl_b: 8bpp BLUE component of filled color*
- Returns
  - *Success: LIBTCON_SUCCESS*
  - *Error Code*[*1]
    - *LIBTCON_ERROR_IO*
    - *LIBTCON_ERROR_INVALID_PARAM: 'width', 'startx' could not be smaller than 0, larger than panel width, and 'height', 'starty' could not be smaller than 0, larger than panel height*
    - *LIBTCON_ERROR_ACCESS*
    - *LIBTCON_ERROR_NO_DEVICE*
    - *LIBTCON_ERROR_BUSY*
    - *LIBTCON_ERROR_OVERFLOW*
    - *LIBTCON_ERROR_PIPE*
    - *LIBTCON_ERROR_NOT_SUPPORTED: for the panel with monochrome*
- Demo Code

```
int ret;
// Fill RED to the whole buffer of T-CON Board with ID '0';
ret=tcon_fill_img_all_rgb(0, 0xF0, 0x00, 0x00);
```

Display the image buffer

short **tcon_dpy_img**(short ***board_id***, short ***wf_mode***, short ***width***, short ***height***, short ***startx***, short **s*tarty***)

- Description
  Display the specific area of T-CON image buffer
- Parameters
  - *board_id: ID of target T-CON Board; -1 for the first available T-CON board*
  - *width: width of the image buffer to be displayed*
  - *height: height of the image buffer to be displayed*
  - *startx: starting X position on the screen*
  - *starty: starting Y position on the screen*
  - *wf_mode: ePaper waveform mode*
- Returns
  - *Success: LIBTCON_SUCCESS*
  - *Error Code*[*1]
    - *LIBTCON_ERROR_IO*
    - *LIBTCON_ERROR_INVALID_PARAM: 'width', 'startx' could not be smaller than 0, larger than panel width, and 'height', 'starty' could not be smaller than 0, larger than panel height*
    - *LIBTCON_ERROR_ACCESS*
    - *LIBTCON_ERROR_NO_DEVICE*
    - *LIBTCON_ERROR_BUSY*
    - *LIBTCON_ERROR_OVERFLOW*
    - *LIBTCON_ERROR_PIPE*
- Demo Code

```
// Display the size 600x400 of image buffer on the screen[200, 100] of T-CON board with ID '0'
tcon_dpy_img(0, 2, 600, 400, 200, 100);
```

short **tcon_dpy_img_all**(short ***board_id***, short ***wf_mode***)

- Description
  Display the whole T-CON image buffer
- Parameters
  - *board_id: ID of target T-CON Board; -1 for the first available T-CON board*
  - *wf_mode: ePaper waveform mode*
- Returns
  - *Success: LIBTCON_SUCCESS*
  - *Error Code*[*1]
    - *LIBTCON_ERROR_IO*
    - *LIBTCON_ERROR_INVALID_PARAM: 'width', 'startx' could not be smaller than 0, larger than panel width, and 'height', 'starty' could not be smaller than 0, larger than panel height*
    - *LIBTCON_ERROR_ACCESS*
    - *LIBTCON_ERROR_NO_DEVICE*
    - *LIBTCON_ERROR_BUSY*
    - *LIBTCON_ERROR_OVERFLOW*
    - *LIBTCON_ERROR_PIPE*
- Demo Code

```
// Display the whole buffer image on the full screen of  T-CON board with ID '0'
tcon_dpy_img_all(0, 2);
```

short **tcon_clr_scr**(short ***board_id***)

- Description
  Clear the whole screen with white color
- Parameters
  - *board_id: ID of T-CON board; -1 for the first available T-CON board*
- Returns
  - *Error Code*[*1]
    - *LIBTCON_ERROR_IO*
    - *LIBTCON_ERROR_ACCESS*
    - *LIBTCON_ERROR_NO_DEVICE*
    - *LIBTCON_ERROR_BUSY*
    - *LIBTCON_ERROR_PIPE*
- Demo Code

```
// Clear the screen through T-CON board with ID '0'
tcon_clr_scr(0);
```

Control

short **tcon_set_vcom**(short ***board_id, short vcom_value***)

- Description
  Set the ref. VCOM value of T-CON board (T-CON Board EJ8951-2W/EJ8951-4W does not support)
- Parameter
  - *board_id: ID of target T-CON board; -1 for the first available T-CON board*
  - *vcom_value: new ref VCOM value to be set.* ***Real VCOM value would be the ref VCOM value/1,000*(-1)***
- Returns
  - *Success: LIBTCON_SUCCESS*
  - *Error Code*[*1]
    - *LIBTCON_ERROR_IO*
    - *LIBTCON_ERROR_ACCESS*
    - *LIBTCON_ERROR_NO_DEVICE*
    - *LIBTCON_ERROR_BUSY*
    - *LIBTCON_ERROR_TIMEOUT*
    - *LIBTCON_ERROR_PIPE*
    - *LIBTCON_ERROR_NOT_SUPPORTED: for EJ8951-2W/EJ8951-4W*
- Demo Code

```
short ret;
// Set the VCOM value -1.45 to the T-CON board with ID ‘0’
ret=tcon_set_bd_vcom(0, 1450);
```

short **tcon_set_id**(short ***board_id, short id***)

- Description
  Set the new ID of T-CON board (Only T-CON Board EJ8951-2W/EJ8951-4W support)
- Parameter
  - *board_id: ID of target T-CON board; -1 for the first available T-CON board*
  - *id: new ID to be set.*
- Returns
  - *Success: LIBTCON_SUCCESS*
  - *Error Code*[*1]
    - *LIBTCON_ERROR_IO*
    - *LIBTCON_ERROR_ACCESS*
    - *LIBTCON_ERROR_NO_DEVICE*
    - *LIBTCON_ERROR_BUSY*
    - *LIBTCON_ERROR_TIMEOUT*
    - *LIBTCON_ERROR_PIPE*
    - *LIBTCON_ERROR_NOT_SUPPORTED: for all T-CON boards other than EJ8951-2W/EJ8951-4W*
- Demo Code

```
short ret;
// Set new ID ‘1’ to the T-CON board with ID ‘0’
ret=tcon_set_bd_vcom(0, 1);
```

Update Firmware/Waveform

short **tcon_update_fw**(short ***board_id***, char* ***filename***)

- Description
  Update the firmware of T-CON board
- Parameters
  - *board_id: ID of target T-CON board; -1 for the first available T-CON board*
  - *filename: name of firmware file*
- Returns
  - *Error Code*[*1]
    - *LIBTCON_ERROR_IO*
    - *LIBTCON_ERROR_INVALID_PARAM: 'width', 'startx' could not be smaller than 0, larger than panel width, and 'height', 'starty' could not be smaller than 0, larger than panel height*
    - *LIBTCON_ERROR_ACCESS*
    - *LIBTCON_ERROR_NO_DEVICE*
    - *LIBTCON_ERROR_BUSY*
    - *LIBTCON_ERROR_OVERFLOW*
    - *LIBTCON_ERROR_PIPE*
- Demo Code

```
short ret;
// Update firmware file"EJ8951-1_ED133UT2_V01.bin" to T-CON board with ID"0'
ret=tcon_update_fw(0, "./EJ8951-1_ED133UT2_V01.bin");
```

short **tcon_update_wf**(short ***board_id***, char* ***filename***)

- Description
  Update the waveform of T-CON board
- Parameters
  - *board_id: ID of target T-CON board; -1 for the first available T-CON board*
  - *filename: name of waveform file*
- Returns
  - *Error Code*[*1]
    - *LIBTCON_ERROR_IO*
    - *LIBTCON_ERROR_ACCESS*
    - *LIBTCON_ERROR_NO_DEVICE*
    - *LIBTCON_ERROR_BUSY*
    - *LIBTCON_ERROR_OVERFLOW*
    - *LIBTCON_ERROR_PIPE*
- Demo Code

```
int ret;
// Update waveform file "ED133UT2_V02.wbf" to T-CON board with ID '0'
ret=tcon_update_wf(0, "./ED133UT2_V02.wbf");
```

short **tcon_soft_reset**(short ***board_id***)

- Description
  Enable the soft reset of T-CON board (EJ1000 does not support)
- Parameters
  - *board_id: ID of target T-CON board; -1 for the first available T-CON board*
- Returns
  - *Error Code*[*1]
    - *LIBTCON_ERROR_IO*
    - *LIBTCON_ERROR_ACCESS*
    - *LIBTCON_ERROR_NO_DEVICE*
    - *LIBTCON_ERROR_BUSY*
    - *LIBTCON_ERROR_OVERFLOW*
    - *LIBTCON_ERROR_PIPE*
    - *LIBTCON_ERROR_NOT_SUPPORTED: EJ1000 does not support*
- Demo Code

```
int ret;
// Enable soft reset of T-CON board with ID '0'
ret=tcon_soft_reset(0);
```

Remark

*1: please refer to APPENDIX I for the details of LIBTCON_ERROR code

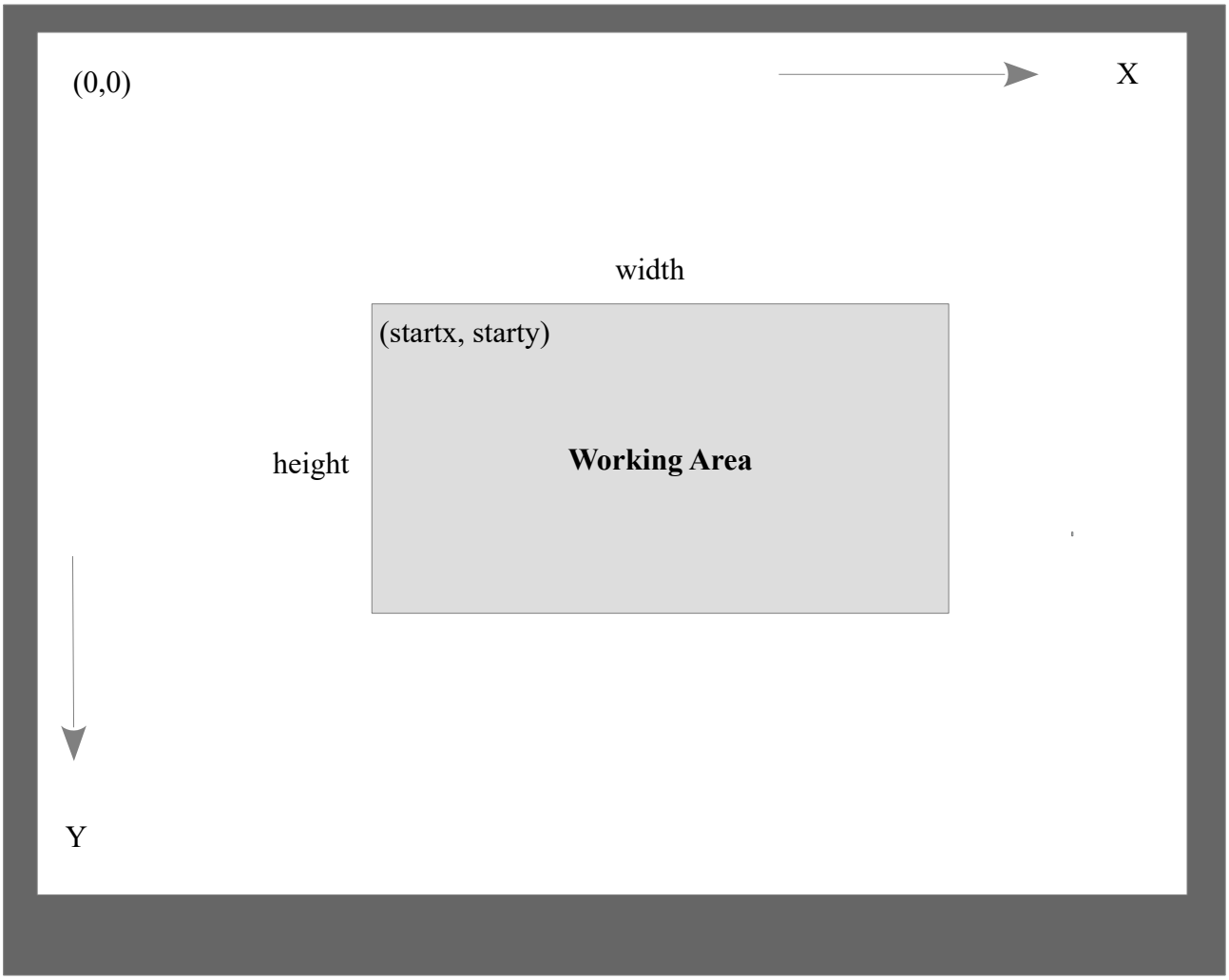
*2: the definition of coordinate please refer to APPENDIX II for the details

APPENDIX I. LIBTCON_ERROR Code List

Enumerator		
LIBTCON_SUCCESS	0	Success
LIBTCON_ERROR_IO	-1	Input/output error
LIBTCON_ERROR_INVALID_PARAM	-2	Invalid parameters
LIBTCON_ERROR_ACCESS	-3	Access denied (insufficient permission)
LIBTCON_ERROR_NO_DEVICE	-4	No such device
LIBTCON_ERROR_NOT_FOUND	-5	Entity not found
LIBTCON_ERROR_BUSY	-6	Resource busy
LIBTCON_ERROR_TIMEOUT	-7	Operation timed out
LIBTCON_ERROR_OVERFLOW	-8	Overflow
LIBTCON_ERROR_PIPE	-9	Pipe error
LIBTCON_ERROR_INTERRUPTED	-10	System call interrupted
LIBTCON_ERROR_NO_MEM	-11	Insufficient memory
LIBTCON_ERROR_NOT_SUPPORTED	-12	Operation not supported or unimplemented on this platform
LIBTCON_ERROR_OTHERS	-99	Other error

APPENDIX II. Definition of Screen Coordinate

MODEL 1. Panel Board on the bottom side of Panel



MODEL 2. Panel Board on the Right Side of Panel