

Instructions for modifying the Teensyduino 4.0 and 4.1 code for a different keyboard matrix.

Modify the Teensyduino code from the Teensy example code.

If you are using Marcel's Python program, its output will automatically provide the information that needs to be added to the Teensyduino code. An example output from his program is given at the end of this document.

Each of the items that need to be modified are listed below.

Const byte rows_max =

- Set this to the number of rows in your matrix

Const byte cols_max =

- Set this to the number of columns in your matrix

Int normal[rows_max][cols_max] = {

- This array should have cols_max items on each line and rows_max lines.
- Transfer every normal key from your matrix table to this array. Yes it's monotonous.
- This array is only for the normal keys, not for Control, Alt, Shift, GUI, Fn, or any Media keys.
- If your matrix table has no normal key in a cell then put a 0 in the array.
- Put a 0 in the cell if your matrix has Control, Alt, Shift, GUI, or Fn keys listed at this location.
- The names given for each key must be as shown in the "All Key Codes" table at: www.pjrc.com/teensy/td_keyboard.html the exception is KEY_MENU, which is not listed on the PJRC table but it still works.
- If your keyboard has a key name that does not exist in the PJRC table, it can't be used.
- The PJRC table uses Tilde for the back tick ` key (also known as grave accent key).

int modifier[rows_max][cols_max] = {

- This array should have cols_max items on each line and rows_max lines.
- Transfer every modifier key from your matrix table to this array.
- If your matrix table has a normal key or no key listed in the cell, put a 0 in this position.
- The names for the modifier keys are as listed in the PJRC table except the "lefts" listed below:
- MODIFIER_LEFT_CTRL, MODIFIER_LEFT_SHIFT, & MODIFIER_LEFT_ALT are missing from the PJRC table but they still work.
- MODIFIER_FN has been defined by me at the top of this code so I can watch for it in case anyone wants to add multimedia or other Fn items. The Fn key by itself is not sent over USB.

```
Int media[rows_max][cols_max] = {
```

- This array should have cols_max items on each line and rows_max lines.
- This table is for the media keys and any other key that are accessed by holding down the Fn key.
- You can only use items that are listed in the PJRC “All Key Codes” table for the Normal, Media Player, and System Control Keys.
- Put a 0 in the matrix if the key has no Fn function or if the function is not supported by PJRC.

You can see the key code definitions that Teensyduino loaded on your PC at:

C:\Program Files (x86)\Arduino\hardware\teensy\avr\cores\teensy3\keylayouts.h

```
boolean old_key[rows_max][cols_max] = {
```

- This array should have cols_max ones on each line and rows_max lines.

```
int Row_IO[rows_max] = {    };
```

- Use the 4.0 or 4.1 translation table on the next page to convert each of the FPC pin numbers to Teensy I/O numbers starting from the first row in your matrix table down to the last row.

```
int Col_IO[cols_max] = {    };
```

- Use the 4.0 or 4.1 translation table on the next page to convert each of the FPC pin numbers to Teensy I/O numbers starting from the first column in your matrix table to the last column.

For the Teensy 4.0, if your keyboard has a 34 pin FPC cable, you need to unsolder the LED on the Teensy so it doesn't interfere. Also comment out any code (if it exists) that was for driving the LED as a CAPS LOCK indicator. Typical CAPS LOCK code to comment out is shown below:

```
#define CAPS_LED 13 // Teensy LED shows Caps-Lock
```

```
if (keyboard_leds & 1<<1) { // mask off all bits but D1 and test if
```

```
set  go_1(CAPS_LED); // turn on the LED
```

```
}
```

```
else {
```

```
    go_0(CAPS_LED); // turn off the LED
```

```
}
```

Teensy 4.0 Translation Table

FPC Pin #	Teensy I/O #
1	23
2	0
3	22
4	1
5	21
6	2
7	20
8	3
9	19
10	4
11	18
12	5
13	17
14	6
15	29
16	7
17	31
18	8
19	33
20	9
21	32
22	10
23	30
24	11
25	28
26	12
27	27
28	26
29	25
30	24
31	16
32	15
33	14
34	13 LED

Teensy 4.1 Translation Table

FPC Pin #	Teensy I/O #
1	23
2	0
3	22
4	1
5	21
6	2
7	20
8	3
9	19
10	4
11	18
12	5
13	17
14	6
15	16
16	7
17	15
18	8
19	14
20	9
21	10
22	11
23	12
24	24
25	25
26	26
27	27
28	28
29	29
30	30
31	31
32	32
33	33
34	41

An Example from Marcel's Python Program is given below:

Results:

FPC PINS:

8 input pins:
[18, 19, 20, 21, 22, 23, 24, 25]

17 output pins:
[1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17]

Keyboard FPC Input and
Output pins

TEENSY PINS (these have to be copied to the arduino file):

cols_max=8
8 input pins:
[8, 16, 9, 15, 10, 14, 11, 26]

rows_max=17
17 output pins:
[23, 0, 22, 1, 24, 2, 21, 3, 25, 4, 20, 5, 19, 6, 18, 7, 17]

FPC pins translated to Teensy
I/O pins

Normal Keys in a row column matrix

KEY copy into int normal[rows_max][cols_max]=

```
{
{0,KEY_INSERT,0,KEY_F12,0,0,0,KEY_RIGHT},
{0,KEY_DELETE,0,KEY_F11,0,0,0,KEY_DOWN},
{KEY_UP,KEY_HOME,KEY_MENU,KEY_END,0,0,0,KEY_LEFT},
{0,KEY_F8,KEY_F7,KEY_9,KEY_O,KEY_L,KEY_PERIOD,0},
{KEY_QUOTE,KEY_MINUS,KEY_LEFT_BRACE,KEY_0,KEY_P,KEY_SEMICOLON,0,KEY_SLASH},
{KEY_F6,KEY_EQUAL,KEY_RIGHT_BRACE,KEY_8,KEY_I,KEY_K,KEY_COMMA,0},
{KEY_H,KEY_6,KEY_Y,KEY_7,KEY_U,KEY_J,KEY_M,KEY_N},
{KEY_F5,KEY_F9,KEY_BACKSPACE,KEY_F10,0,KEY_BACKSLASH,KEY_ENTER,KEY_SPACE},
{KEY_G,KEY_5,KEY_T,KEY_4,KEY_R,KEY_F,KEY_V,KEY_B},
{KEY_F4,KEY_F2,KEY_F3,KEY_3,KEY_E,KEY_D,KEY_C,0},
{0,KEY_F1,KEY_CAPS_LOCK,KEY_2,KEY_W,KEY_S,KEY_X,0},
{KEY_ESC,KEY_TILDE,KEY_TAB,KEY_1,KEY_Q,KEY_A,KEY_Z,0},
{0,0,0,KEY_PRINTSCREEN,0,0,0,0},
{0,0,0,0,0,0,0,0},
{0,0,0,0,0,0,0,0},
{0,0,0,0,KEY_PAGE_UP,KEY_PAGE_DOWN,0,0},
{0,0,0,0,0,0,0,0},
}
```

Modifier Keys in a row column matrix

MODIFIER Copy to int modifier[rows_max][cols_max]=

```
{
{0,0,0,0,0,0,0,0},
{0,0,0,0,0,0,0,0},
{0,0,0,0,0,0,0,0},
{0,0,0,0,0,0,0,0},
{0,0,0,0,0,0,0,0},
{0,0,0,0,0,0,0,0},
{0,0,0,0,0,0,0,0},
{0,0,0,0,0,0,0,0},
{0,0,0,0,0,0,0,0},
{0,0,0,0,0,0,0,0},
{0,0,0,0,0,0,0,0},
{0,0,0,0,0,0,0,0},
{0,0,0,0,0,0,0,0},
{0,0,0,0,0,0,0,0},
{0,0,0,0,0,0,0,0},
{MODIFIERKEY_LEFT_ALT,0,0,0,0,0,0,MODIFIERKEY_RIGHT_ALT},
{0,0,MODIFIERKEY_LEFT_SHIFT,0,0,0,MODIFIERKEY_RIGHT_SHIFT,0},
{0,MODIFIERKEY_LEFT_CTRL,0,0,0,0,MODIFIERKEY_RIGHT_CTRL,0},
{0,0,0,MODIFIERKEY_GUI,0,0,0,0},
{0,0,0,0,0,MODIFIERKEY_FN,0,0},
}
```

Media Fn keys in a row column matrix

FN Copy to int media[rows_max][cols_max]=

```
{
{0,0,0,KEY_MEDIA_NEXT_TRACK,0,0,0,0},
{0,0,0,KEY_MEDIA_PLAY_PAUSE,0,0,0,0},
{0,0,0,0,0,0,0,0},
{0,KEY_MEDIA_VOLUME_DEC,KEY_MEDIA_MUTE,0,0,0,0,0},
{0,0,0,0,0,0,0,0},
{0,0,0,0,0,0,0,0},
{0,0,0,0,0,0,0,0},
{0,KEY_MEDIA_VOLUME_INC,0,KEY_MEDIA_PREV_TRACK,0,0,0,0},
{0,0,0,0,0,0,0,0},
{0,0,0,0,0,0,0,0},
{0,0,0,0,0,0,0,0},
{0,0,0,0,0,0,0,0},
{0,0,0,0,0,0,0,0},
{0,0,0,0,KEY_MEDIA_EJECT,0,0,0},
{0,0,0,0,0,0,0,0},
{0,0,0,0,0,0,0,0},
{0,0,0,0,0,0,0,0},
{0,0,0,0,0,0,0,0},
}
```

ONE

[illegible]