HIMAX Touch Driver Android Porting Guide

Platform: MTK318

Version: v1.0.2

2018-01

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Contents

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1. Files in the Himax driver porting folder

|=====================================

File Name	Description
himax_common.c	The same flow or function will generate in this file for various IC.
himax_common.h	Common header file, almost functions will turn on/off in this file.
himax_ic.c	Himax touch IC function.
himax_ic.h	IC header file.
himax_debug.c	Driver node for debug functions.
himax_debug.h	Debug header file.
himax_platform.c	Functions for platform based.
himax_platform.h	Platform based function header file.
D816_2014_11_24.i	Sample FW image file for reference.(using for auto update FW)
Kconfig	Sample Kconfig file for reference.
Makefile	Sample Makefile file for platform reference.

|====/kernel/drivers/input/touchscreen/mediatek/hxchipset ====

We put all the drivers and head files(the bold files) in the same folder.

=======================================

|=== Kconfig /sample Kconfig file

|=== Makefile /sample Makefile file

|====/kernel/driver/input/touchscreen/============

|===

|===device_tree_sample.dtsi //sample device tree file for reference

|====/kernel3.18/arch/arm64/boot/dts/xxx.dts==============

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2. Function porting on kernel side

2-1 Function porting on MTK 3.18 platform

I. Copy "**himax_platform.c**", "**himax_ic.c**", "**himax_common.c**", "**himax_debug.c**", "**himax_platform.h**", "**himax_ic.h**" , "**himax_common.h**" , "**himax_debug.h**" , "**Kconfig**", "**Makefile**" into workspace/kernel3.18/drivers/input/touchscreen/ mediatek /hxchipset.

II. Modify workspace/kernel3.18/drivers/input/touchscreen /mediatek /Makefile as below.

```
obj-$(CONFIG_TOUCHSCREEN_MTK_GT1151)     +=  GT1151/
obj-$(CONFIG_TOUCHSCREEN_MTK_GT1151TB)   +=  GT1151TB/
obj-$(CONFIG_TOUCHSCREEN_MTK_GT910) +=  GT910/
obj-$(CONFIG_TOUCHSCREEN_MTK_GT9XXTB_HOTKNOT)    +=  GT9XXTB_hotknot/
obj-$(CONFIG_TOUCHSCREEN_MTK_GT9XX_HOTKNOT) +=  GT9XX_hotknot/
obj-$(CONFIG_TOUCHSCREEN_MTK_SYNAPTICS_I2C_RMI4)    +=  synaptics_i2c_rmi4
obj-$(CONFIG_TOUCHSCREEN_MTK_GT928) +=  GT928/
obj-$(CONFIG_TOUCHSCREEN_MTK_GT9XX_HOTKNOT_SCP) +=  GT9XX_hotknot_scp/
obj-$(CONFIG_TOUCHSCREEN_MTK_GT911) +=  GT911/
obj-$(CONFIG_TOUCHSCREEN_MTK_FT5X0X)     +=  ft5x0x/
obj-$(CONFIG_TOUCHSCREEN_MTK_SYNAPTICS_3320_50) +=  synaptics_3320_50/
obj-$(CONFIG_TOUCHSCREEN_MTK_GT9271TB_HOTKNOT) +=  GT9271TB_hotknot/
obj-$(CONFIG_TOUCHSCREEN_HIMAX_CHIPSET) +=  hxchipset/
```

III. Modify workspace/kernel3.18/drivers/input/touchscreen /mediatek /Kconfig as below.

```
if INPUT_TOUCHSCREEN

config TOUCHSCREEN_MTK
    bool "MediaTek Touch Panel Driver"
    help
      Say Y here if you have MediaTek touch panel.

      If unsure, say N.

      To compile this dirver as a module, choose M here: the
      module will be called.

config TOUCHSCREEN_HIMAX_CHIPSET
    bool "Himax touchpanel HIMAX_CHIPSET CHIPSET for Mediatek package"
    depends on I2C
    help
      Say Y here if you have a Himax CHIPSET touchscreen.
      HIMAX controllers are multi touch controllers which can
      report 10 touches at a time.

        If unsure, say N.
source "drivers/input/touchscreen/mediatek/hxchipset/Kconfig"
```


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IV. Add CONFIG definition on workspace/kernel/arch/arm64/project_defconfig file as below.

```
CONFIG_INPUT_TOUCHSCREEN=y
CONFIG_TOUCHSCREEN_MTK=y

CONFIG_TOUCHSCREEN_HIMAX_CHIPSET=y
CONFIG_TOUCHSCREEN_HIMAX_I2C=y
CONFIG_TOUCHSCREEN_HIMAX_DEBUG=y
```

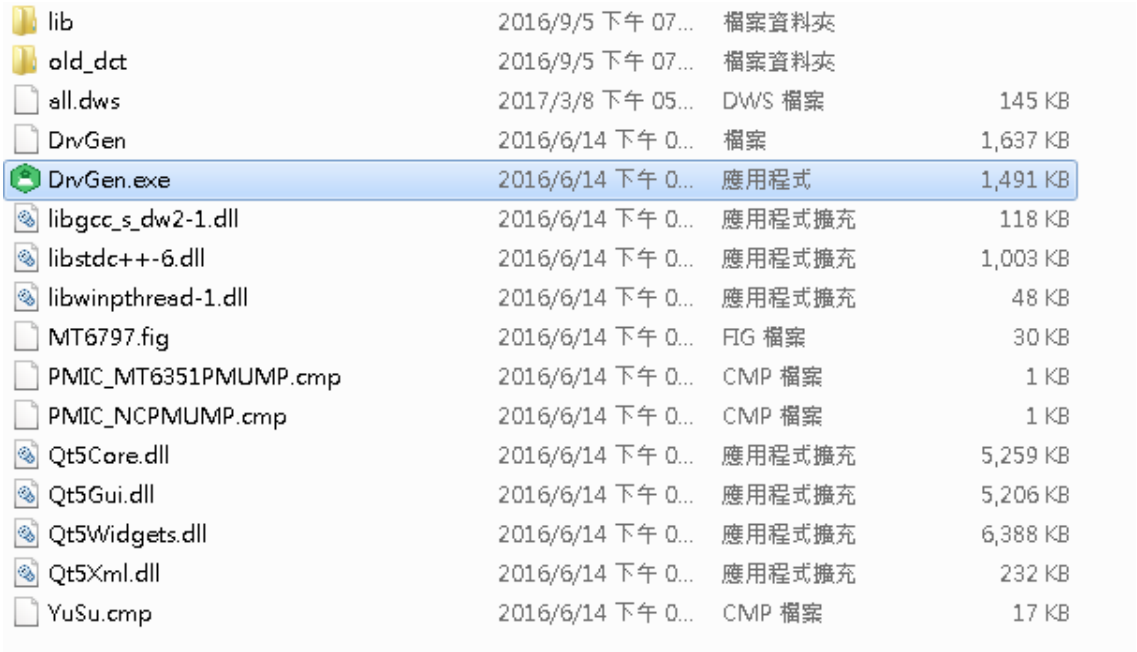
V. Touch function related detailed setting

✧ In himax_platform.h :

```
48  #include <linux/dma-mapping.h>
49  #include "tpd.h"
50  #define TPD_I2C_NUMBER          2
51  #endif
```

VI. DCT customization

Modify GPIO and EINT variable setting by MTK dct tool which in path “workspace/kernel-3.18/tools/dct”



lib	2016/9/5 下午 07...	檔案資料夾	
old_dct	2016/9/5 下午 07...	檔案資料夾	
all.dws	2017/3/8 下午 05...	DWS 檔案	145 KB
DrvGen	2016/6/14 下午 0...	檔案	1,637 KB
DrvGen.exe	2016/6/14 下午 0...	應用程式	1,491 KB
libgcc_s_dw2-1.dll	2016/6/14 下午 0...	應用程式擴充	118 KB
libstdc++-6.dll	2016/6/14 下午 0...	應用程式擴充	1,003 KB
libwinpthread-1.dll	2016/6/14 下午 0...	應用程式擴充	48 KB
MT6797.fig	2016/6/14 下午 0...	FIG 檔案	30 KB
PMIC_MT6351PMUMP.cmp	2016/6/14 下午 0...	CMP 檔案	1 KB
PMIC_NCPMUMP.cmp	2016/6/14 下午 0...	CMP 檔案	1 KB
Qt5Core.dll	2016/6/14 下午 0...	應用程式擴充	5,259 KB
Qt5Gui.dll	2016/6/14 下午 0...	應用程式擴充	5,206 KB
Qt5Widgets.dll	2016/6/14 下午 0...	應用程式擴充	6,388 KB
Qt5Xml.dll	2016/6/14 下午 0...	應用程式擴充	232 KB
YuSu.cmp	2016/6/14 下午 0...	CMP 檔案	17 KB

Edit one of the following .dws files, and replace the others.

```
./kernel-3.10/drivers/misc/mediatek/mach/mt6795/YOUR_PRJ/dct/dct/codegen.dws
./bootable/bootloader/lk/target/YOUR_PRJ/dct/dct/codegen.dws
./bootable/bootloader/preloader/custom/YOUR_PRJ/dct/dct/codegen.dws
./vendor/mediatek/proprietary/custom/YOUR_PRJ/kernel/dct/dct/codegen.dws
```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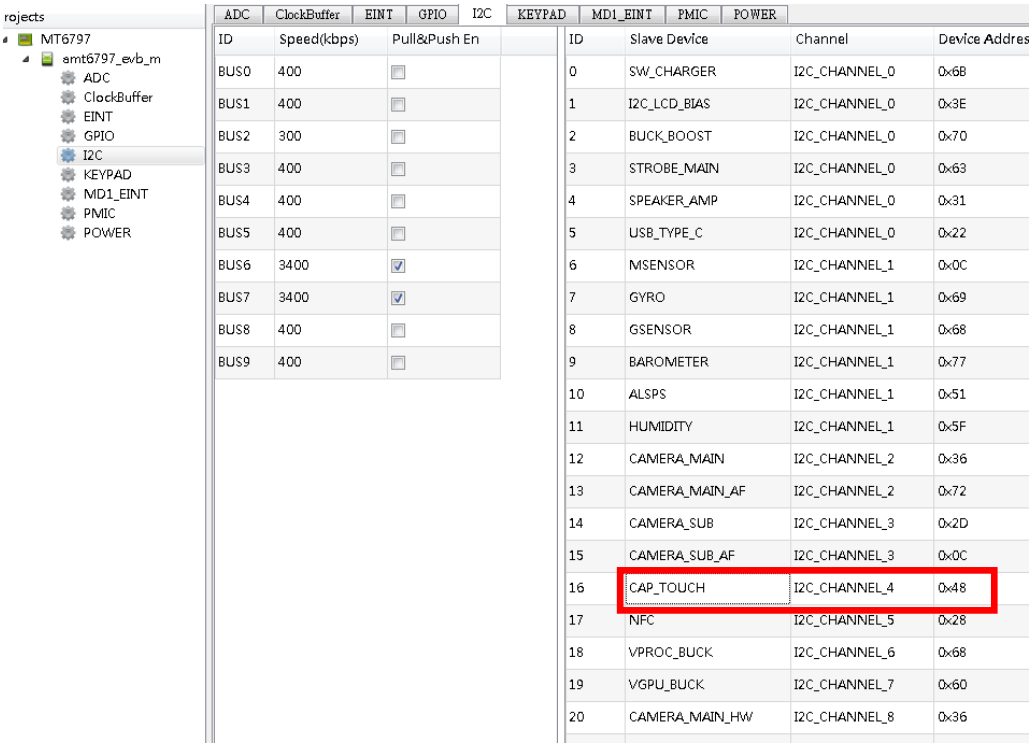
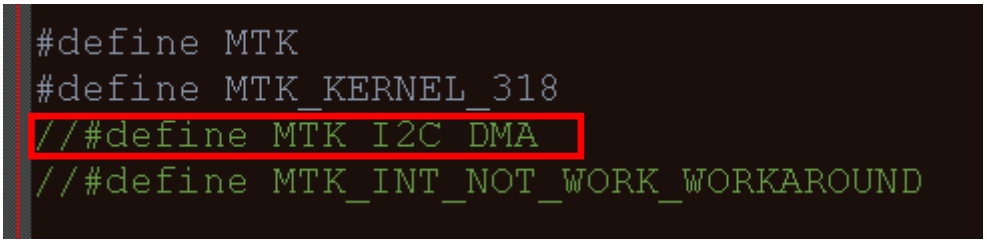
✧ Set related I2C channel number and address.

The I2C slave device will be set as Auto-Detect type if Device Address is empty.



VII. DMA Operation

There are some MTK platform support DMA Operation and some does not. So we create a define let user can select it turn on or not in himax_platform.h



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3. Push himax touch Idc and kl file to device

A. Use command to push himax-touchscreen.idc to device
   Ex:
   a. plug-in USB cable
   b. adb remount
   c. adb push himax-touchscreen.idc /system/usr/idc

B. Use command to push himax-touchscreen.kl to device
   Ex:
   a. plug-in USB cable
   b. adb remount
   c. adb push himax-touchscreen.kl /system/usr/keylayout

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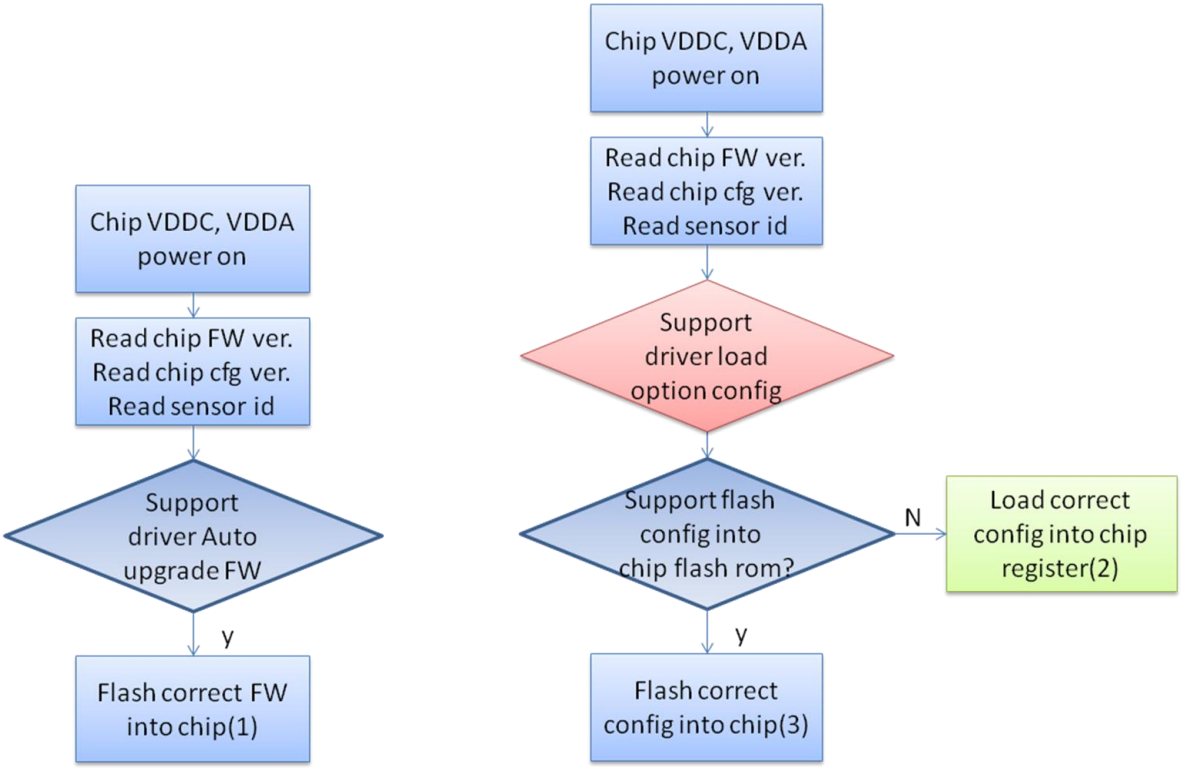
4. Himax function enable/disable in driver



Based on different driver build define, we could support three kind of chip's FW and config upgrade feature.

<TYPE 1>: Could flash touch FW into chip only. Config setting include in touch FW.

⇨ **#define HX_AUTO_UPDATE_FW**

<TYPE 2>: Could flash touch config into chip. Config setting would be NOT clear after system reboot. (FW image include in driver, driver code size would increase 32KB on local build test)

⇨ **#define HX_AUTO_UPDATE_CONFIG**

#define HX_SMART_WAKEUP

⇨ When system was suspend, double tape device's panel and wake up the system.

⇨ If FW could support this feature, enable the definition on driver side.

⇨ If turning on this feature, you also need to define the gesture what you need by using *GESTURE* node which is rely on this feature.

#Note: We can use echo 1 > SMWP to turn on this feature.

And using echo 1111111111111111 > GESTURE to define the gestures which match to FW define. And it can suupport 16 kinds of gestures at most.

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#define HX_RESEND_CMD

- ⇨ It need to turn on **HX_SMART_WAKEUP** first.
- ⇨ There are some IC need to using this function to reset the SMWP status.

#define HX_GESTURE_TRACK

- ⇨ It used to report the special track to system and wake up or something other work to call other APs.
- ⇨ If FW could support this feature, it also need to turn on **HX_SMART_WAKEUP**

#define HX_ESD_RECOVERY

- ⇨ If touch panel has no response after ESD test, could try to enable this definition.
- ⇨ If FW could support this feature, enable the definition on driver side.

#define HX_CHIP_STATUS_MONITOR

- ⇨ If you have already enable definition **HX_ESD_RECOVERY**, touch panel still has no response after ESD test, you could try to enable this definition.
- ⇨ This feature would affect system performance. If definition **HX_ESD_RECOVERY** could cover ESD test fail case, please **DO NOT** enable this definition.
- ⇨ If FW could support this feature, enable the definition on driver side.

#define HX_USB_DETECT_GLOBAL

- ⇨ If you have touch noise problem, you could try to enable this definition.
- ⇨ If FW could support this feature, enable the definition on driver side
- ⇨ Using a flag which is defined in system to determine we need to turn on this feature or not .

#define HX_USB_DETECT_CALLBACK

- ⇨ If you have touch noise problem, you could try to enable this definition.
- ⇨ If FW could support this feature, enable the definition on driver side
- ⇨ It will be register our function into the callback function which is in system, and if the system receive these request, system will call our function.

#define HX_PALM_REPORT

- ⇨ When system was resuming, palm device’s panel. System would enter suspend mode.
- ⇨ If FW could support this feature, enable the definition on driver side.

#define HX_HIGH_SENSE

- ⇨ When system detect cover close, touch controller would enter high sensitivity mode.
- ⇨ If FW could support this feature, enable the definition on driver side.

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#define HX_EN_SEL_BUTTON

#define HX_EN_MUT_BUTTON

- ⇨ When project have virtual key on touch panel, we need to enable one of these definition.
- ⇨ If FW could support this feature, enable the definition on driver side.

#define HX_PLATFOME_DEFINE_KEY

- ⇨ Because there is some specific request just like using special coordinates to report keys I in MTK kernel 3.18.
- ⇨ It should turn on **HX_EN_SEL_BUTTON** or **HX_EN_MUT_BUTTON**.
- ⇨ You need to set the keys(buttons) data in MTK device tree as below graphic.
  in …/workdir/kernel-3.18/arch/arm64/boot/dts/project_name.dts

```
&touch {
    tpd-resolution = <1080 1920>;  resolution
    use-tpd-button = <1>;1: have key,0: no key
    tpd-key-num = <3>;Key number
    tpd-key-local= <139 172 158 0>;Key Code
    tpd-key-dim-local = <180 2400 100 40 360 2400 100 40 540 2400 100 40 0 0 0 0>;Key Location
    tpd-max-touch-num = <5>;                x    Y
    tpd-filter-enable = <1>;
    tpd-filter-pixel-density = <192>;
    tpd-filter-custom-prameters = <0 0 0 0 0 0 0 0 0 0 0 0>;
    tpd-filter-custom-speed = <0 0 0>;
    pinctrl-names = "default", "state_eint_as_int", "state_eint_output0", "state_eint_output1",
        "state_rst_output0", "state_rst_output1";
    pinctrl-0 = <&ctp_pins_default>;
    pinctrl-1 = <&ctp_pins_eint_as_int>;
    pinctrl-2 = <&ctp_pins_eint_output0>;
    pinctrl-3 = <&ctp_pins_eint_output1>;
    pinctrl-4 = <&ctp_pins_rst_output0>;
    pinctrl-5 = <&ctp_pins_rst_output1>;
    status = "okay";
```

- ⇨ And it also need to adjust the setting in our driver code as below graphic.
  in himax_platform.c (MTK318)

```
#if defined(HX_PLATFOME_DEFINE_KEY)
/*In MT6797 need to set 1 into use-tpd-button in dts kernel-3.18\arch\arm64\boot\dts\amt6797_evb_m.dts*/
/*key_range : [keyindex][key_data] {..{x,y}..}*/
static int key_range[3][2]={{180,2400},{360,2400},{540,2400}};
#endif
```


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5. Himax support debug functions under /proc/android_touch

Use below command to to enter driver debug function

(1). plug-in USB cable

(2). adb shell

(3). cd proc/android_touch

(1) debug : debug tool / FW update interface

Update Firmware: download the firmware (*.bin) from local storage and it support to update FW in many kinds of size.

EX: **Driver version < 0.1.96.0**

※(push the *.bin into local storage.)

adb push fw.bin /sdcard/

※(do FW upgrade)

echo t / sdcard/fw.bin > /proc/android_touch/debug

※(read FW upgrade status pass/fail)

cat /proc/android_touch/debug

Driver version > 0.1.96.0

※(push the *.bin into local storage.)

adb push fw.bin **/system/etc/firmware**

※(do FW upgrade)

echo t fw.bin > /proc/android_touch/debug

※(read FW upgrade status pass/fail)

cat /proc/android_touch/debug

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Command ‘ v ’ : Read FW Version from flash. Get result by cat command.

EX : echo v > /proc/android_touch/debug

cat /proc/android_touch/debug

```
FW_VER = 0xE411
CONFIG_VER = 0x15
```

Command ‘ d ’ : Read debug information about : RX/TX/BT channel number , Point number , Resolution , INT setup

EX : echo d > /proc/android_touch/debug

cat /proc/android_touch/debug

```
Himax Touch IC Information :
IC Type : HX852xES
IC Checksum : CRC
Interrupt : EDGE TIRGGER
RX Num : 24
TX Num : 12
BT Num : 0
X Resolution : 720
Y Resolution : 1280
Max Point : 5
XY reverse : 0
```

IC type: Himax touch chip type

IC Checksum: type of checksum on touch chip

Interrupt: type of level/edge trigger

RX/TX Num: RX/TX channel number on this device

BT Num: Button number on this device.

X/Y Resolution: Touch panel resolution on this device

Max point: Maximum support touch point on this device

(2) attn: interrupt pin status

EX : cat /proc/android_touch/attn

attn =1 => interrupt pin was high

attn =0 => interrupt pin was low

(3) int_en: enable / disable the IRQ (1 : enable , 0 : disable)

EX : echo 1 > /proc/android_touch/int_en ➔ enable IRQ

echo 0 > /proc/android_touch/int_en ➔ disable IRQ

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(4) reset: Reset the touch chip, now we have implemented 4 kinds of methods to reset IC as below table.

- ⇨ O: It means it will do this action.
- ⇨ X: It will NOT do this action.
- ⇨ reload config :If O, it will reload touch information and touch data and so on..
- ⇨ turn on/off irq : If O, it will turn off the irq before trigger reset pin. And turning on irq after reset.
- ⇨ trigger reset pin : Trigger reset pin to reset IC.

command	reload config	turn on/off irq	trigger reset pin
1	X	X	O
2	X	O	O
3	O	X	O
4	O	O	O

EX : echo 1 > /proc/android_touch/reset ➔ without reload and turn on/off.
echo 4 > /proc/android_touch/reset ➔ It will reload config and turn on/off irq.

(5) register: read/write register on chip

Command ‘ r ’ : Setup the read register.

EX : Get register 0xC5 register value :
echo r:xC5 > /proc/android_touch/register
cat /proc/android_touch/register

EX : Get register 0xFE(08) register value :
echo r:FE08 > /proc/android_touch/register
cat /proc/android_touch/register

Command ‘ w ’ : Write the register value by parameters.

EX : Write 0x00,0x01,0x02 into register 0xC5
echo w:xC5:x00:x01:x02 > /proc/android_touch/register

(6) diag: Support for Raw data report

Command ‘ 0 ’ : Stop the Touch monitor.

EX : echo 0 > /proc/android_touch/diag

Command ‘ 1 ’ : Start the Touch monitor to catch IIR data

EX : echo 1 > /proc/android_touch/diag
cat /proc/android_touch/diag

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```
ChannelStart:   24,   12

  [00] [01] [02] [03] [04] [05] [06] [07] [08] [09] [10] [11] [12] [13] [14] [15] [16] [17] [18] [19] [20] [21] [22] [23] [24]
  [01]    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
  [02]    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    2
  [03]    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
  [04]    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
  [05]    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
  [06]    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    1
  [07]    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    1
  [08]    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    2
  [09]    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
  [10]    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    1
  [11]    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    1
  [12]    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    1
          0    1    0    0    0    0    2    2    1    1    0    1    1    2    2    2    1    2    1    3    1    1    2    0
ChannelEnd
Mutual Max:  0, Min:  0
Self Max:  3, Min:  0
```

Command ‘ 2 ’ : Start the Touch monitor to catch DC data.

EX : echo 2 > /proc/android_touch/diag

cat /proc/android_touch/diag

```
ChannelStart:   24,   12

  [00] [01] [02] [03] [04] [05] [06] [07] [08] [09] [10] [11] [12] [13] [14] [15] [16] [17] [18] [19] [20] [21] [22] [23] [24]
  [01]  119  132  130  118  129  114  117  115  130  127  116  115  115  131  117  123  123  130  134  128  122  135  118  139  119
  [02]  143  132  141  135  142  130  137  133  139  137  139  133  143  134  152  135  130  131  142  138  148  128  136  145  113
  [03]  154  130  149  140  144  132  140  139  147  145  143  141  140  139  146  134  152  143  150  140  136  152  152  145  122
  [04]  154  149  147  143  139  135  133  141  140  129  134  141  146  158  149  146  140  148  158  140  144  137  144  151   86
  [05]  153  144  157  141  151  143  160  149  148  149  149  155  141  145  157  149  153  149  141  147  149  151  145  155   59
  [06]  148  164  151  142  144  146  148  150  158  154  160  157  152  150  147  153  144  149  153  155  147  159  151  151   60
  [07]  152  154  155  155  163  155  147  140  158  144  159  148  151  154  161  161  161  153  148  150  155  154  150  149   99
  [08]  143  151  145  153  151  153  153  154  147  160  148  142  157  150  148  152  148  144  152  147  146  155  139  160   85
  [09]  162  153  157  153  158  163  160  158  159  162  159  155  157  165  157  157  156  156  155  165  160  165  160  153   70
  [10]  156  159  144  165  153  159  153  152  147  157  143  150  159  157  157  165  162  149  162  161  153  149  158  155   68
  [11]  155  147  155  158  152  151  166  164  161  151  151  158  169  157  155  152  164  150  148  158  151  152  158  154   95
  [12]  165  164  165  165  165  165  165  165  165  165  165  168  165  165  165  165  165  165  165  165  165  169  165  165  117
         63  117  108  115   85   56  101   88  124  111  122  112   54  134  130  124   57   98  117   77   94   60  119  118
ChannelEnd
Mutual Max:169, Min:114
Self Max:134, Min: 54
```

Command ‘ 3 ’ : Start the Touch monitor to catch BANK data

EX : echo 3 > /proc/android_touch/diag

cat /proc/android_touch/diag

```
ChannelStart:   24,   12

  [00] [01] [02] [03] [04] [05] [06] [07] [08] [09] [10] [11] [12] [13] [14] [15] [16] [17] [18] [19] [20] [21] [22] [23] [24]
  [01]   64   54   65   53   66   54   67   55   66   56   67   56   67   55   67   55   66   55   67   56   67   55   65   53  166
  [02]   76   74   76   73   77   73   78   73   76   73   78   74   79   74   80   76   78   77   79   79   80   77   78   77  180
  [03]   85   85   85   84   86   84   87   84   85   84   87   85   88   85   89   87   88   89   89   91   89   90   88   89  162
  [04]   97  101   97   99   98   99   99   99   97   98   99  100  101  101  102  103  100  105  102  107  102  105  100  105  164
  [05]   52   45   52   45   52   45   53   46   51   46   52   47   52   46   53   46   52   47   53   48   54   47   53   47  162
  [06]   57   51   57   50   57   50   58   51   57   51   58   52   58   51   58   51   57   52   60   54   60   53   59   52  160
  [07]   62   56   62   56   63   56   63   56   62   56   63   57   63   57   64   57   63   58   64   59   65   58   63   57  160
  [08]   68   63   68   63   69   63   70   64   68   64   69   64   70   64   70   64   69   65   72   67   71   66   70   66  159
  [09]   53   46   53   45   53   46   53   46   52   47   53   47   52   46   53   46   52   47   54   48   56   48   53   47  158
  [10]   56   50   56   49   56   49   56   49   55   50   56   50   56   49   57   50   56   50   59   52   60   51   57   51  159
  [11]   56   50   57   50   57   50   58   51   57   51   58   52   58   51   58   51   57   52   58   53   58   52   57   52  156
  [12]  129   97  129  129  129  129  129  129  129  129  129   60  129  129  129  129  129  129  129  129  129  109  129  129  164
        153  151  149  148  147  148  149  148  150  163  151  151  171  113   97   93   92   88   86   84   84   84   86   26
ChannelEnd
Mutual Max:129, Min: 45
Self Max:180, Min: 26
```

(7) diag_arr : Select the arrangement of raw data, default is 0

Command format : bit[2][1][0] = [T][X][Y] = 0-7, T=transpose, X = X reverse,Y = Y reverse

EX: echo 0 > diag_arr

- ❖ not Transpose & X not reverse & Y not reverse

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```
root@msm8974:/proc/android_touch # echo 1 > diag
echo 1 > diag
root@msm8974:/proc/android_touch # cat diag
cat diag
ChannelStart:   32,   20

   1   2   3   4   5   6   7   8   9  10  11  12  13  14  15  16  17  18  19  20  21  22  23  24  25  26  27  28  29  30  31  32   0
  33  34  35  36  37  38  39  40  41  42  43  44  45  46  47  48  49  50  51  52  53  54  55  56  57  58  59  60  61  62  63  64   0
  65  66  67  68  69  70  71  72  73  74  75  76  77  78  79  80  81  82  83  84  85  86  87  88  89  90  91  92  93  94  95  96   0
  97  98  99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128   0
 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160   0
 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191 192   0
 193 194 195 196 197 198 199 200 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224   0
 225 226 227 228 229 230 231 232 233 234 235 236 237 238 239 240 241 242 243 244 245 246 247 248 249 250 251 252 253 254 255 256   0
 257 258 259 260 261 262 263 264 265 266 267 268 269 270 271 272 273 274 275 276 277 278 279 280 281 282 283 284 285 286 287 288   0
 289 290 291 292 293 294 295 296 297 298 299 300 301 302 303 304 305 306 307 308 309 310 311 312 313 314 315 316 317 318 319 320   0
 321 322 323 324 325 326 327 328 329 330 331 332 333 334 335 336 337 338 339 340 341 342 343 344 345 346 347 348 349 350 351 352   0
 353 354 355 356 357 358 359 360 361 362 363 364 365 366 367 368 369 370 371 372 373 374 375 376 377 378 379 380 381 382 383 384   0
 385 386 387 388 389 390 391 392 393 394 395 396 397 398 399 400 401 402 403 404 405 406 407 408 409 410 411 412 413 414 415 416   0
 417 418 419 420 421 422 423 424 425 426 427 428 429 430 431 432 433 434 435 436 437 438 439 440 441 442 443 444 445 446 447 448   0
 449 450 451 452 453 454 455 456 457 458 459 460 461 462 463 464 465 466 467 468 469 470 471 472 473 474 475 476 477 478 479 480   0
 481 482 483 484 485 486 487 488 489 490 491 492 493 494 495 496 497 498 499 500 501 502 503 504 505 506 507 508 509 510 511 512   0
 513 514 515 516 517 518 519 520 521 522 523 524 525 526 527 528 529 530 531 532 533 534 535 536 537 538 539 540 541 542 543 544   0
 545 546 547 548 549 550 551 552 553 554 555 556 557 558 559 560 561 562 563 564 565 566 567 568 569 570 571 572 573 574 575 576   0
 577 578 579 580 581 582 583 584 585 586 587 588 589 590 591 592 593 594 595 596 597 598 599 600 601 602 603 604 605 606 607 608   0
 609 610 611 612 613 614 615 616 617 618 619 620 621 622 623 624 625 626 627 628 629 630 631 632 633 634 635 636 637 638 639 640   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
```

EX: echo 2 > diag_arr

- ❖ not Transpose & X reverse & Y not reverse

```
root@msm8974:/proc/android_touch # echo 2 > diag_arr
echo 2 > diag_arr
root@msm8974:/proc/android_touch # echo 1 > diag
echo 1 > diag
root@msm8974:/proc/android_touch # cat diag
cat diag
ChannelStart:   32,   20

  32  31  30  29  28  27  26  25  24  23  22  21  20  19  18  17  16  15  14  13  12  11  10   9   8   7   6   5   4   3   2   1   0
  64  63  62  61  60  59  58  57  56  55  54  53  52  51  50  49  48  47  46  45  44  43  42  41  40  39  38  37  36  35  34  33   0
  96  95  94  93  92  91  90  89  88  87  86  85  84  83  82  81  80  79  78  77  76  75  74  73  72  71  70  69  68  67  66  65   0
 128 127 126 125 124 123 122 121 120 119 118 117 116 115 114 113 112 111 110 109 108 107 106 105 104 103 102 101 100  99  98  97   0
 160 159 158 157 156 155 154 153 152 151 150 149 148 147 146 145 144 143 142 141 140 139 138 137 136 135 134 133 132 131 130 129   0
 192 191 190 189 188 187 186 185 184 183 182 181 180 179 178 177 176 175 174 173 172 171 170 169 168 167 166 165 164 163 162 161   0
 224 223 222 221 220 219 218 217 216 215 214 213 212 211 210 209 208 207 206 205 204 203 202 201 200 199 198 197 196 195 194 193   0
 256 255 254 253 252 251 250 249 248 247 246 245 244 243 242 241 240 239 238 237 236 235 234 233 232 231 230 229 228 227 226 225   0
 288 287 286 285 284 283 282 281 280 279 278 277 276 275 274 273 272 271 270 269 268 267 266 265 264 263 262 261 260 259 258 257   0
 320 319 318 317 316 315 314 313 312 311 310 309 308 307 306 305 304 303 302 301 300 299 298 297 296 295 294 293 292 291 290 289   0
 352 351 350 349 348 347 346 345 344 343 342 341 340 339 338 337 336 335 334 333 332 331 330 329 328 327 326 325 324 323 322 321   0
 384 383 382 381 380 379 378 377 376 375 374 373 372 371 370 369 368 367 366 365 364 363 362 361 360 359 358 357 356 355 354 353   0
 416 415 414 413 412 411 410 409 408 407 406 405 404 403 402 401 400 399 398 397 396 395 394 393 392 391 390 389 388 387 386 385   0
 448 447 446 445 444 443 442 441 440 439 438 437 436 435 434 433 432 431 430 429 428 427 426 425 424 423 422 421 420 419 418 417   0
 480 479 478 477 476 475 474 473 472 471 470 469 468 467 466 465 464 463 462 461 460 459 458 457 456 455 454 453 452 451 450 449   0
 512 511 510 509 508 507 506 505 504 503 502 501 500 499 498 497 496 495 494 493 492 491 490 489 488 487 486 485 484 483 482 481   0
 544 543 542 541 540 539 538 537 536 535 534 533 532 531 530 529 528 527 526 525 524 523 522 521 520 519 518 517 516 515 514 513   0
 576 575 574 573 572 571 570 569 568 567 566 565 564 563 562 561 560 559 558 557 556 555 554 553 552 551 550 549 548 547 546 545   0
 608 607 606 605 604 603 602 601 600 599 598 597 596 595 594 593 592 591 590 589 588 587 586 585 584 583 582 581 580 579 578 577   0
 640 639 638 637 636 635 634 633 632 631 630 629 628 627 626 625 624 623 622 621 620 619 618 617 616 615 614 613 612 611 610 609   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

ChannelEnd
```

EX: echo 7 > diag_arr

- ❖ Transpose & X reverse & Y reverse

```
root@msm8974:/proc/android_touch # echo 7 > diag_arr
echo 7 > diag_arr
root@msm8974:/proc/android_touch # echo 1 > diag
echo 1 > diag
root@msm8974:/proc/android_touch # cat diag
cat diag
ChannelStart:   32,   20

 640 608 576 544 512 480 448 416 384 352 320 288 256 224 192 160 128  96  64  32   0
 639 607 575 543 511 479 447 415 383 351 319 287 255 223 191 159 127  95  63  31   0
 638 606 574 542 510 478 446 414 382 350 318 286 254 222 190 158 126  94  62  30   0
 637 605 573 541 509 477 445 413 381 349 317 285 253 221 189 157 125  93  61  29   0
 636 604 572 540 508 476 444 412 380 348 316 284 252 220 188 156 124  92  60  28   0
 635 603 571 539 507 475 443 411 379 347 315 283 251 219 187 155 123  91  59  27   0
 634 602 570 538 506 474 442 410 378 346 314 282 250 218 186 154 122  90  58  26   0
 633 601 569 537 505 473 441 409 377 345 313 281 249 217 185 153 121  89  57  25   0
 632 600 568 536 504 472 440 408 376 344 312 280 248 216 184 152 120  88  56  24   0
 631 599 567 535 503 471 439 407 375 343 311 279 247 215 183 151 119  87  55  23   0
 630 598 566 534 502 470 438 406 374 342 310 278 246 214 182 150 118  86  54  22   0
 629 597 565 533 501 469 437 405 373 341 309 277 245 213 181 149 117  85  53  21   0
 628 596 564 532 500 468 436 404 372 340 308 276 244 212 180 148 116  84  52  20   0
 627 595 563 531 499 467 435 403 371 339 307 275 243 211 179 147 115  83  51  19   0
 626 594 562 530 498 466 434 402 370 338 306 274 242 210 178 146 114  82  50  18   0
 625 593 561 529 497 465 433 401 369 337 305 273 241 209 177 145 113  81  49  17   0
 624 592 560 528 496 464 432 400 368 336 304 272 240 208 176 144 112  80  48  16   0
 623 591 559 527 495 463 431 399 367 335 303 271 239 207 175 143 111  79  47  15   0
 622 590 558 526 494 462 430 398 366 334 302 270 238 206 174 142 110  78  46  14   0
 621 589 557 525 493 461 429 397 365 333 301 269 237 205 173 141 109  77  45  13   0
 620 588 556 524 492 460 428 396 364 332 300 268 236 204 172 140 108  76  44  12   0
 619 587 555 523 491 459 427 395 363 331 299 267 235 203 171 139 107  75  43  11   0
 618 586 554 522 490 458 426 394 362 330 298 266 234 202 170 138 106  74  42  10   0
 617 585 553 521 489 457 425 393 361 329 297 265 233 201 169 137 105  73  41   9   0
 616 584 552 520 488 456 424 392 360 328 296 264 232 200 168 136 104  72  40   8   0
 615 583 551 519 487 455 423 391 359 327 295 263 231 199 167 135 103  71  39   7   0
 614 582 550 518 486 454 422 390 358 326 294 262 230 198 166 134 102  70  38   6   0
 613 581 549 517 485 453 421 389 357 325 293 261 229 197 165 133 101  69  37   5   0
 612 580 548 516 484 452 420 388 356 324 292 260 228 196 164 132 100  68  36   4   0
 611 579 547 515 483 451 419 387 355 323 291 259 227 195 163 131  99  67  35   3   0
 610 578 546 514 482 450 418 386 354 322 290 258 226 194 162 130  98  66  34   2   0
 609 577 545 513 481 449 417 385 353 321 289 257 225 193 161 129  97  65  33   1   0
   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0

ChannelEnd
```


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(8) SMWP : Switch of SMWP.

Command ' 1 ' : Turn on SMWP

EX : echo 1 > /proc/android_touch/SMWP

Command ' 0 ' : Turn off SMWP

EX : echo 0 > /proc/android_touch/SMWP

cat /proc/android_touch/SMWP → To show now status of SMWP.

(9) GESTURE : If you want to use this feature to define your gestures, you should turn on SMWP first. There are 16 kinds of gestures which are switches it will control driver to recognize this gesture or not.

EX:

echo 1 > /proc/android_touch/GESTURE → Turn on 1st gesture

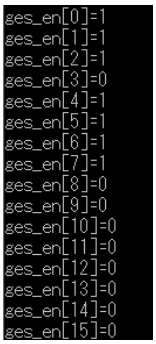
echo 1111 > /proc/android_touch/GESTURE → Turn on first 4 gestures

echo 1101111 > /proc/android_touch/GESTURE → Turn on first 7 gestures without 3rd gesture

echo 1111111111111111 > /proc/android_touch/GESTURE → Turn on all gestures

echo 0000000000000000 > /proc/android_touch/GESTURE → Turn off all gestures

cat /proc/android_touch/GESTURE → Show the status of GESTURE



flash_dump : dump flash by using driver.

2_32 for 32KB, 2_64 for 64KB, 2_24 for 124KB, 2_28 for 128KB,

EX:

echo 1 > /proc/android_touch/flash_dump

→ Start to dump flash and you can cat this node to get result at last.

echo 2_32 > /proc/android_touch/ flash_dump

→ Start to dump flash and you can cat this node to get result and store it as /sdcard/HX_Flash_Dump.bin at last.

cat /proc/android_touch/flash_dump → It will show the result and process

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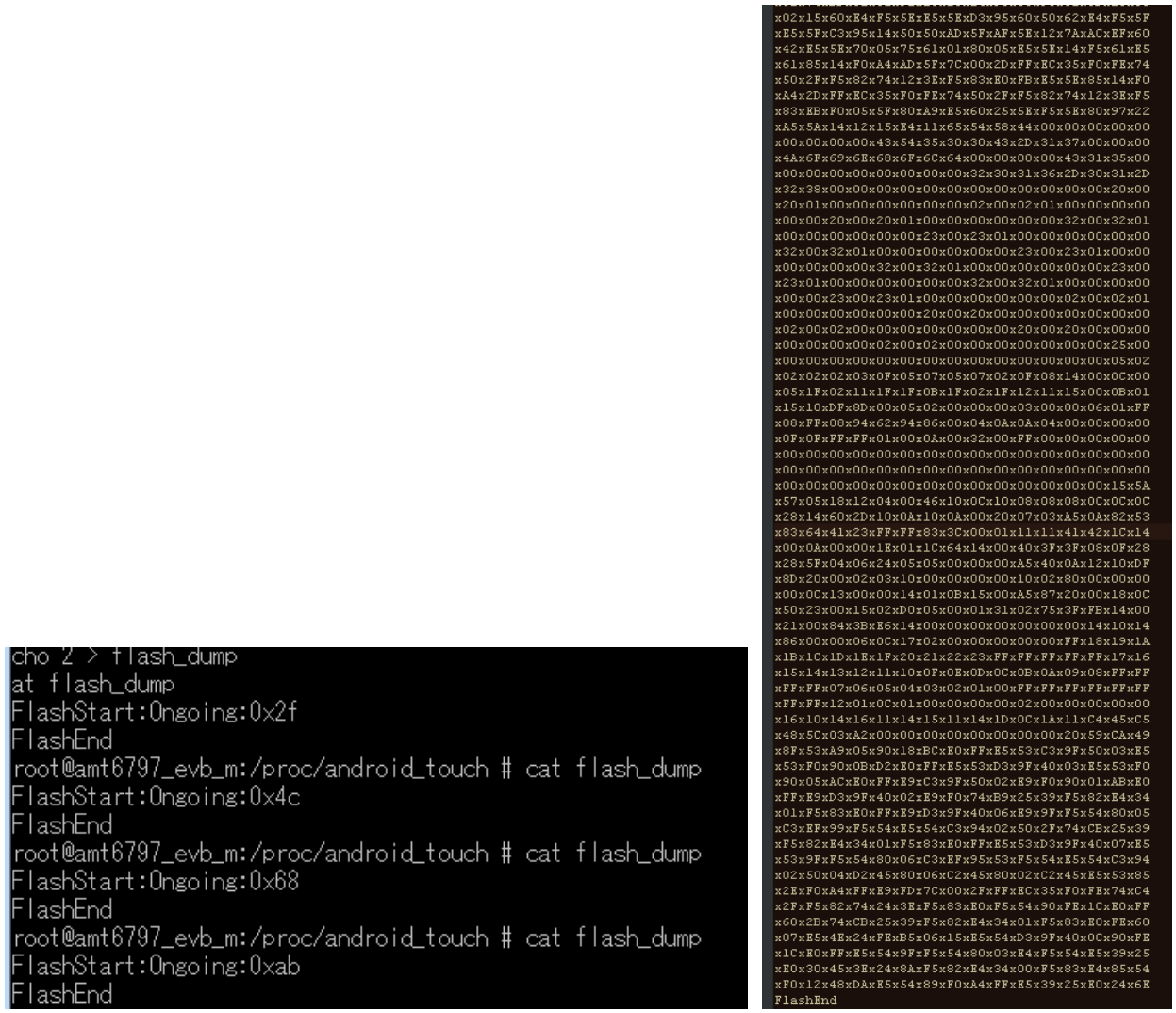

(10) vendor : get version of FW,CFG and Sensor ID

EX: cat /proc/android_touch/vendor

#Note: This information is in the one variable, if you need the newest information you can use echo v > debug.

(11) SenseOnOff : do sense on/off

EX: echo 0 > /proc/android_touch/SenseOnOff

→ Set command to let IC Sense off

echo 1 > /proc/android_touch/SenseOnOff

→ Set command to let IC Sense on, run flash

echo 1s > /proc/android_touch/SenseOnOff

→ Set command to let IC Sense on, run SRAM

(12) debug_level : get more debug message of report points

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EX: echo 8 > /proc/android_touch/debug_level

→Get data of report point when touch or leave (kmsg/dmesg)

```
[HXTP] status: Screen:F:04 Down, X:885, Y:1357, W:75, N:0
[HXTP] status: Screen:F:04 Up, X:839, Y:659, N:0
[HXTP] status:0, Screen:F:01 Up, X:546, Y:702, N:0
[HXTP] status:0, Screen:F:02 Up, X:659, Y:452, N:0
[HXTP] status: Screen:F:01 Down, X:522, Y:1048, W:38, N:0
[HXTP] status:0, Screen:F:01 Up, X:522, Y:1048, N:0
[HXTP] status: Screen:F:01 Down, X:526, Y:1046, W:38, N:0
[HXTP] status: Screen:F:02 Down, X:588, Y:669, W:47, N:0
[HXTP] status: Screen:F:02 Up, X:607, Y:656, N:0
[HXTP] status:0, Screen:F:01 Up, X:770, Y:362, N:0
```

echo 4 > /proc/android_touch/debug_level

→ Get latency of every report point (kmsg/dmesg)

```
[HXTP] Touch latency = 1851 us
[HXTP] Touch latency = 1891 us
[HXTP] Touch latency = 1831 us
[HXTP] Touch latency = 2077 us
```

echo 2 > /proc/android_touch/debug_level

→Get data of every report point (kmsg/dmesg)

```
[HXTP] Finger 2=> X:686, Y:544 W:76, Z:76, F:2, N:0
[HXTP] Finger 2=> X:685, Y:543 W:76, Z:76, F:2, N:0
[HXTP] Finger 2=> X:684, Y:543 W:76, Z:76, F:2, N:0
[HXTP] Finger 2=> X:683, Y:543 W:75, Z:75, F:2, N:0
[HXTP] Finger 2=> X:683, Y:543 W:74, Z:74, F:2, N:0
[HXTP] Finger 2=> X:682, Y:544 W:71, Z:71, F:2, N:0
[HXTP] All Finger leave
```

echo 1 > /proc/android_touch/debug_level

→Get event raw data of every report point (kmsg/dmesg)

```
[HXTP] P  0 = 0x02 P  1 = 0x62 [HXTP] P  2 = 0x03 P  3 = 0xC0 [HXTP] P  4 = 0xFF P  5 = 0xFF [HXTP] P  6 = 0xFF P  7 = 0xFF [HXTP]
[HXTP] P  8 = 0xFF P  9 = 0xFF [HXTP] P 10 = 0xFF P 11 = 0xFF [HXTP] P 12 = 0xFF P 13 = 0xFF [HXTP] P 14 = 0xFF P 15 = 0xFF [HXTP]
[HXTP] P 16 = 0xFF P 17 = 0xFF [HXTP] P 18 = 0xFF P 19 = 0xFF [HXTP] P 20 = 0xFF P 21 = 0xFF [HXTP] P 22 = 0xFF P 23 = 0xFF [HXTP]
[HXTP] P 24 = 0xFF P 25 = 0xFF [HXTP] P 26 = 0xFF P 27 = 0xFF [HXTP] P 28 = 0xFF P 29 = 0xFF [HXTP] P 30 = 0xFF P 31 = 0xFF [HXTP]
[HXTP] P 32 = 0xFF P 33 = 0xFF [HXTP] P 34 = 0xFF P 35 = 0xFF [HXTP] P 36 = 0xFF P 37 = 0xFF [HXTP] P 38 = 0xFF P 39 = 0xFF [HXTP]
[HXTP] P 40 = 0x54 P 41 = 0x00 [HXTP] P 42 = 0x00 P 43 = 0x00 [HXTP] P 44 = 0x00 P 45 = 0x00 [HXTP] P 46 = 0x00 P 47 = 0x00 [HXTP]
[HXTP] P 48 = 0x00 P 49 = 0x00 [HXTP] P 50 = 0x00 P 51 = 0x00 [HXTP] P 52 = 0xF1 P 53 = 0x01 [HXTP] P 54 = 0x00 P 55 = 0xB7 [HXTP]
```

echo 0 > /proc/android_touch/debug_level

→Turn off debug_level

(13) guest_info : Getting the first 128 byte customize info which is rest of 64K in flash every 1K total 10 times.

echo r > /proc/android_touch/guest_info

cat /proc/android_touch/guest_info

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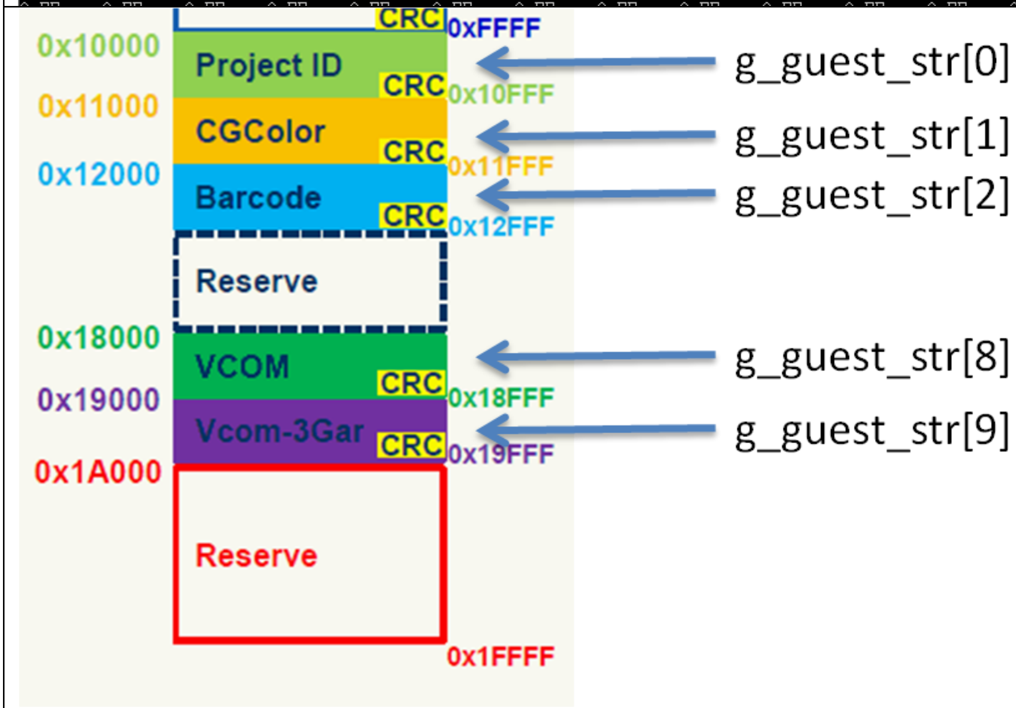
```
g_guest_str0:
0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF
0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF
0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF
0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF
0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF
0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF
0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF
0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF
g_guest_str1:
0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF
0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF
0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF
0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF
0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF
0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF
0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF
0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF
g_guest_str2:
0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF
0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF
0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF
0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF
0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF
0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF
0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF
0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF
g_guest_str3:
0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF
0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF
0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF
```



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6. Q&A

a. How to implement FW image i file into driver

<1>. Enable “HX_AUTO_UPDATE_FW” define at “himax_common.h” in workspace/kernel/include/linux.

```
00074: #define W(x...)
00075: #define E(x...)
00076: #define DIF(x...)
00077: #endif
00078: //===========Himax Option function=============
00079: #define HX_RST_PIN_FUNC
00080: //#define HX_LOADIN_CONFIG
00081: #define HX_AUTO_UPDATE_FW        //if enable HX_AUTO_UPDATE_FW, need to disable HX_LOADIN_CONFIG
00082: //#define HX_AUTO_UPDATE_CONFIG      //if enable HX_AUTO_UPDATE_CONFIG, need to disable HX_LOADIN_CONFIG
00083: //#define HX_SMART_WAKEUP
00084: //#define HX_DOT_VIEW
00085: //#define HX_PALM_REPORT
00086: //#define HX_ESD_WORKAROUND
00087:
```

<2>. add “D816_2014_11_24.i” into workspace/kernel/drivers/input/touchscreen.

<3>. Check “D816_2014_11_24.i” has been defined in workspace/kernel/drivers/input/touchscreen/himax_common.c

```
00027: static u8 g_proximity_en = 0;
00028: #endif
00029:
00030: #if defined(HX_AUTO_UPDATE_FW)||defined(HX_AUTO_UPDATE_CONFIG)
00031:     static unsigned char i_CTPM_FW[]=
00032:     {
00033:         #include "D816_2014_11_24.i"
00034:     };
00035: #endif
00036:
00037: //static int        tpd_keys_local[HX_KEY_MAX_COUNT] = HX_KEY_ARRAY; // for Virt
```

<4>. Finally, rebuild the kernel image and flash into device to check it.

b. debug log pattern in system kernel log

<1>. If there is NO [HXTP] log pattern in kernel log, Please check device tree file first.

<2>. Normal power on log pattern was as below. There are Not [HXTP][ERROR] or [HXTP] [WARNING] log pattern in log.

<Power on sample log>

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```
[     4.427583] c1     40 [HXTP]   DT-himax_parse_dt:panel-coords = 0, 1080, 0, 1920
[     4.434848] c1     40 [HXTP]   DT-himax_parse_dt:display-coords = (720, 1280)
[     5.431385] c1     40 [HXTP]   DT:gpio_3v3_en value is not valid
[     5.431393] c1     40 [HXTP]   DT:gpio_irq=17, gpio_rst=16, gpio_3v3_en=-22
[     5.431399] c1     40 [HXTP]   DT:protocol_type=1
[     5.431405] c1     40 [HXTP]   DT-No vk info in DT
[     5.459201] c1     40 [HXTP] himaxcommon_probe, pdata, EE250C80
[     5.506149] c1     40 [HXTP] Himax IC package 852x ES
[     5.589190] c0     40 [HXTP] sensor_id=11.
[     5.592242] c0     40 [HXTP] fw_ver=f1,1.
[     5.596233] c0     40 [HXTP] config_ver=0.
[     5.600341] c0     40 [HXTP] himax_power_on_initCMD:
[     5.819189] c0     40 [HXTP] himax_touch_information:IC_TYPE =6
[     5.939190] c0     40 [HXTP] himax_touch_information:HX_RX_NUM =15,HX_TX_NUM =25,HX_MAX_PT=10
[     6.039194] c0     40 [HXTP] himax_loadSensorConfig: initialization complete
[     6.039205] c0     40 [HXTP] calcDataSize: coord_data_size: 40, area_data_size:12, raw_data_frame_size:67, raw_data_nframes:1
[     6.039213] c0     40 [HXTP] himaxcommon_probe: calcDataSize complete
[     6.039219] c0     40 [HXTP] himaxcommon_probe: Use Protocol Type B
[     6.039234] c0     40 [HXTP] input_set_abs_params: mix_x 0, max_x 1080, min_y 0, max_y 1920
[     6.087631] c0     40 [HXTP] himax_ts_register_interrupt level trigger low
[     6.096959] c0     40 [HXTP] himax_ts_register_interrupt: irq enabled at qpio: 340
[    21.139230] c0     32 [HXTP]   himax_fb_register in
[    39.083809] c1    159 [HXTP] S1@594, 1561
[    39.370575] c1    159 [HXTP] E1@591, 790
```

c. How to enable 2T2R debug function in driver

<1>. Enable “HX_TP_PROC_2T2R” define at “himax_common.h”
in workspace/kernel/include/linux.

<2>. Re-build kernel image and upgrade kernel image

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```
#if defined(CONFIG_TOUCHSCREEN_HIMAX_DEBUG)
#define HX_TP_PROC_DIAG
#define HX_TP_PROC_REGISTER
#define HX_TP_PROC_DEBUG
#define HX_TP_PROC_FLASH_DUMP
#define HX_TP_PROC_SELF_TEST
#define HX_TP_PROC_RESET
#define HX_TP_PROC_SENSE_ON_OFF
#define HX_TP_PROC_2T2R
```


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