# Equil SDK
# for Windows

PNF

2015. 05

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I. Concept
- Hardware Structure
- Software Structure
- Background knowledge

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- Project setting
- components of Library
- reference
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III. Design Guide

# I. Concept

- Hardware Structure
- Software Structure
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II. Development

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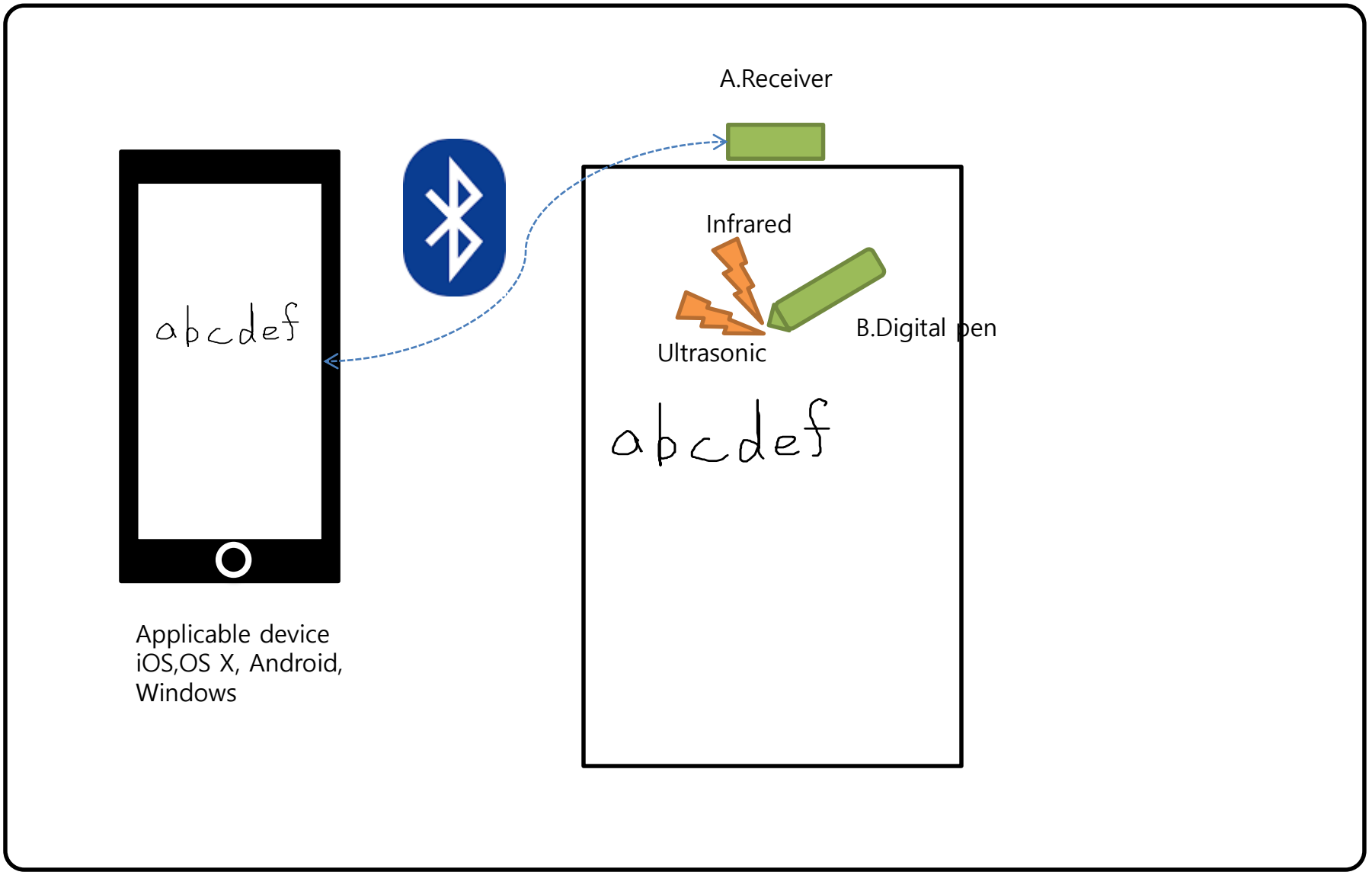
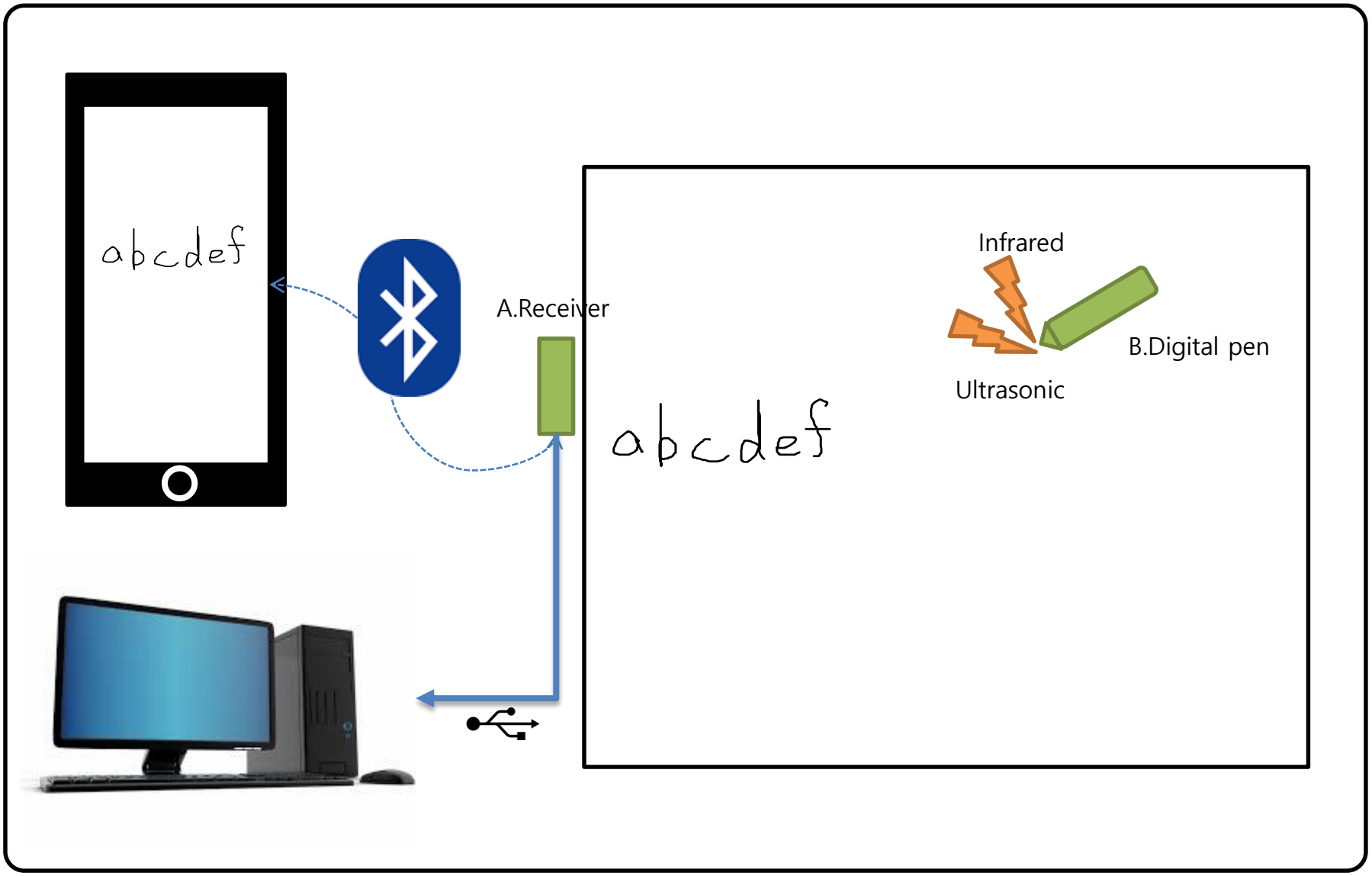
- Topics

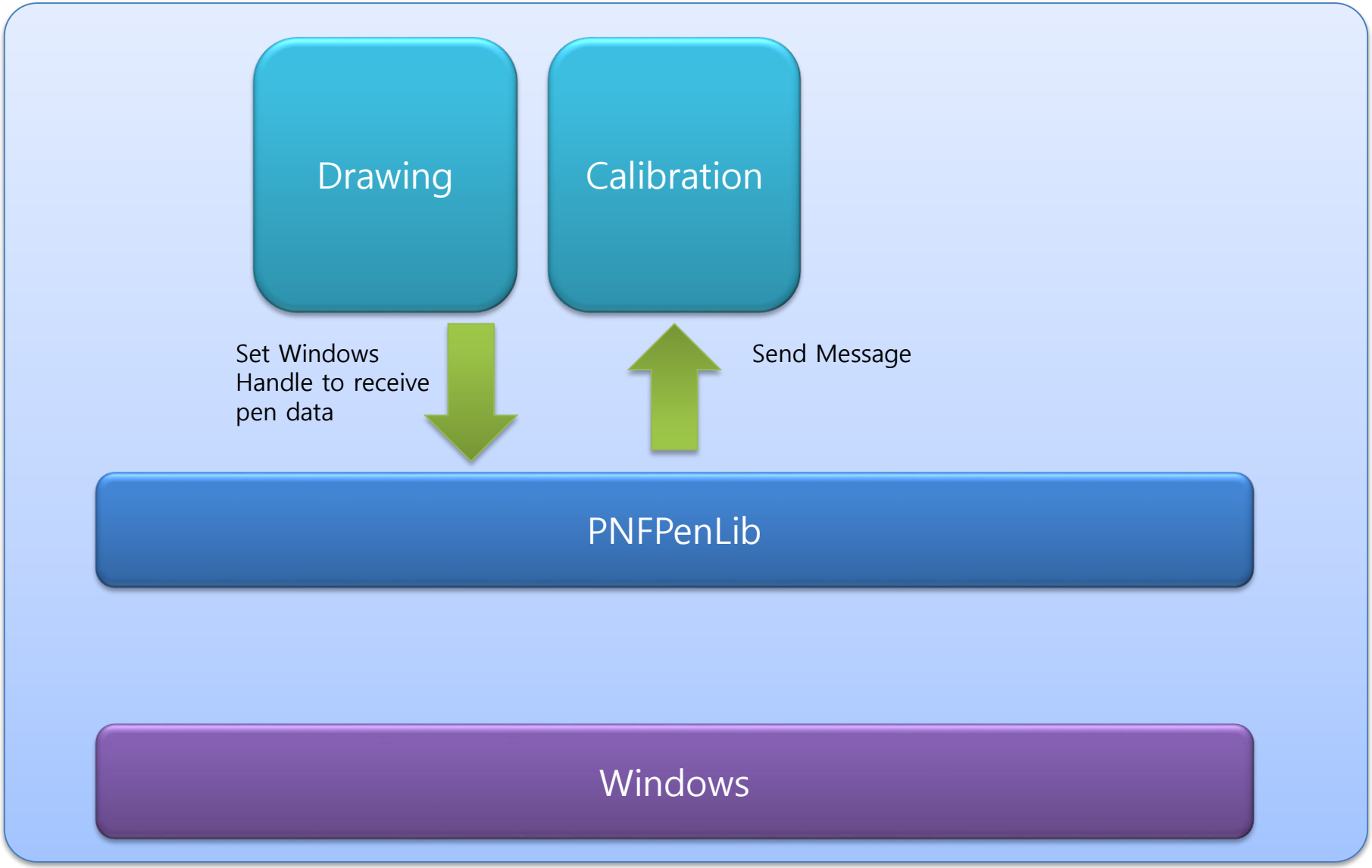
III. Design Guide

| Model | Applicable Device | Connection | Writing | |
|---|---|---|---|---|
| Equil Smart Pen | iPhone,iPod,iPad<br>Android<br>Windows<br>OS X | Bluetooth | On Any Paper | |
| Equil Smart Marker | iPhone,iPod,iPad<br>Android<br>Windows<br>OS X | Bluetooth<br>USB cable | On Any Whiteboard, Wall | |

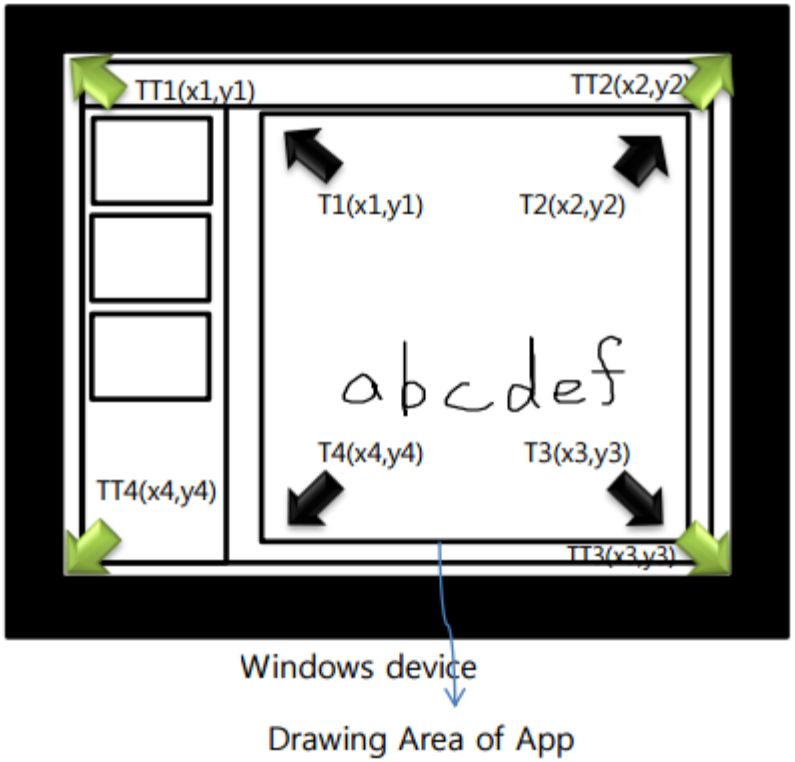
# Concept > Hardware Structure (Equil Smart Pen)

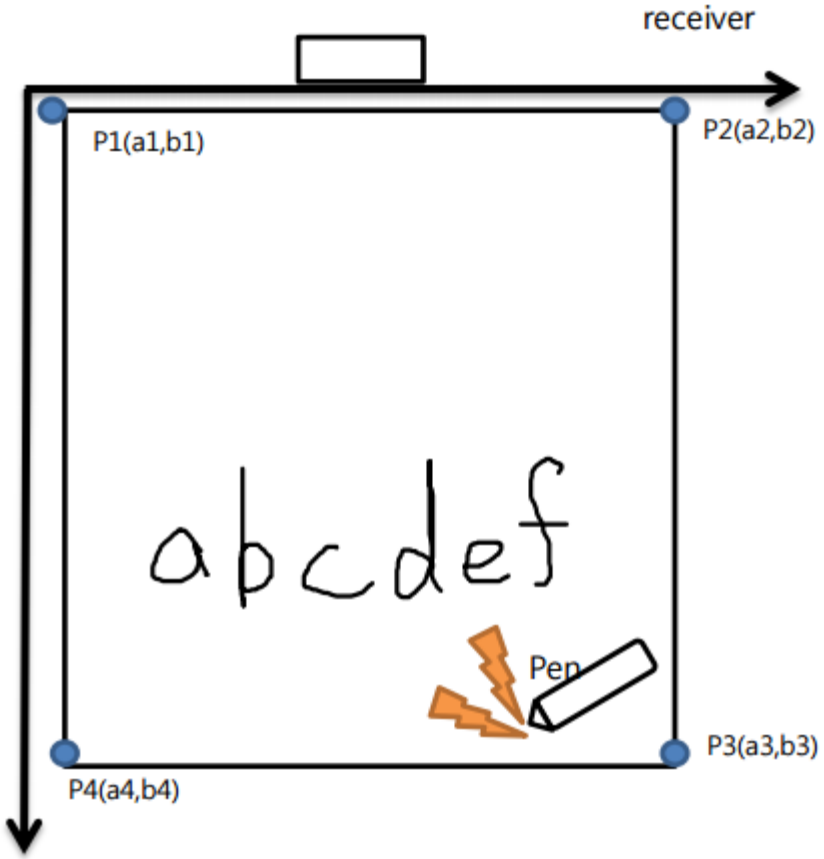



abcdef
A.Receiver
abcdef
Infrared
B.Digital pen
Ultrasonic


Drawing
Calibration
Set Windows Handle to receive pen data
Send Message
PNFPenLib
Windows

Calibration is Mapping the points of paper P1~P4 to coordinates T1~T4 (Pen Mode) TT1~TT4(Mouse Mode) of screen in order to have the image on the screen look the same as the image on the paper. In case of Equil, assuming that receiver is parallel with paper, just clicking two points(P1,P3) is enough.



- Refer to Serial Port Protocol communication

http://support.microsoft.com/kb/823179

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1. copy PNFPenLib.dll into your folder where exe file exists.
2. Add PNFModule.vb in the sources into your project

# Development > components of Test Sample (PenEx_VBDotNetVer)

| Folder | File | Class | descript |
|---|---|---|---|
| $PenEx_VBDotNetVer | PenEx_VBDotNetVer.vbproj | | |
| | PenEx_VBDotNetVer.vbproj.user | | |
| | Module1.vb | Module1 | Definitions |
| | frmPenEx.vb | frmPenEx | Main form |
| | frmPenEx.Designer.vb | frmPenEx | |
| | frmPenEx.resx | frmPenEx | |
| | frmCalibration.vb | frmCalibration | Calibration Form |
| | frmCalibration.Designer.vb | frmCalibration | |
| | frmCalibration.resx | frmCalibration | |
| $PenEx_VBDotNetVer/bin/Release | BTlib.dll | | Library DLL |
| | cali_bg.png | | Image for Calibration |
| | cali_num1.png | | Image for Calibration |
| | cali_num2.png | | Image for Calibration |

※ $(TestHome) : [unZipped folder]/ PenEx_VBDotNetVer

# ● Constants and APIs for Equil

| Declared in | Module1.vb |
|---|---|

## ➢ Overview

Definitions of functions and constants for Pen Library

## ➢ Members

| PenStatus | | | |
|---|---|---|---|
| Type | Enum Integer | Property | readonly |
| Description | PEN_DOWN : Pentip down<br>PEN_MOVE : Move with Pentip down<br>PEN_UP :Pentip up<br>PEN_HOVER : Move with Pentip up | | |
| Range | 1 ~ 4 | | |
| Device | Equil Smart Pen / Marker | | |
| Usage | | | |

| GestureMessage | | | |
|---|---|---|---|
| Type | Integer | Property | readonly |
| Description | GESTURE_CIRCLE_CLOCKWISE = 100<br>GESTURE_CIRCLE_COUNTERCLOCKWISE<br>GESTURE_CLICK | | |
| Range | 100 ~ 102 | | |
| Device | Equil Smart Pen | | |
| Usage | | | |

| WM_PENCONDITION | | | |
|---|---|---|---|
| Type | Integer | Property | readonly |
| Description | Message for environment variables of device. | | |
| Range | &H400 + 3 | | |
| Device | Equil Smart Pen | | |
| Usage | | | |

| WM_RETURNMESSAGE | | | |
|---|---|---|---|
| Type | Integer | Property | readonly |
| Description | Message for Pen Data | | |
| Range | &H400 + 1 | | |
| Device | Equil Smart Pen / Marker | | |
| Usage | | | |

| WM_GESTUREMESSAGE | | | |
|---|---|---|---|
| Type | Integer | Property | readonly |
| Description | Message for Pen Gesture | | |
| Range | &H400 + 2 | | |
| Device | Equil Smart Pen | | |
| Usage | | | |

## ➢ APIs

| FindPort() | | |
|---|---|---|
| Description | It searches and connects all serial port devices in the registry sequentially. If it is valid port, start to communicate. | |
| Out | Void | |
| Input | N/A | |
| Device | Equil Smart Pen / Marker | |
| Usage | Public Sub ConnectPen()<br>SetReciveHandle(m_ReciveHanle)<br>SetDrawHandle(m_DrawHanle)<br>.....<br>End Sub | |

| SetDrawHandle(ByVal hWnd As System.IntPtr) | | |
|---|---|---|
| Description | Define the object to receive pen data | |
| Out | Void | |
| Input | System.IntPtr | Window handle to receive pen data |
| Device | Equil Smart Pen / Marker | |
| Usage | Public Sub ConnectPen()<br>SetReciveHandle(m_ReciveHanle)<br>SetDrawHandle(m_DrawHanle)<br>....<br>End Sub | |

| CheckConnect() | | |
|---|---|---|
| Description | Where pen is connected or not | |
| Out | Boolean | True/False |
| Input | N/A | |
| Device | Equil | |
| Usage | Public Sub ConnectPen()<br>SetReciveHandle(m_ReciveHanle)<br>SetDrawHandle(m_DrawHanle)<br>FindPort()<br>…<br>bPenConnectExit = False<br>bPenConnect = CheckConnect()<br>Dim del As ConnectDelegate = New ConnectDelegate(AddressOf DelegateUISet)<br>Me.BeginInvoke(del)<br>bPenConnecting = False<br>MouseFlagDisable()<br>End Sub | |

| SetCalibMode(ByVal bCalibMode As Boolean) | | |
|---|---|---|
| Description | Set pen mode or mouse mode.<br>Pen mode is to receive Pen data only to target view.<br>Mouse mode is to receive Pen data as mouse event. | |
| Out | Void | |
| input | Boolean | True : Pen Mode, False: Mouse Mode |
| Device | Equil Smart Pen | |
| Usage | If bPenConnect Then<br>SetCalibMode(True)<br>bPenRunning = True<br>Else<br>MessageBox.Show("Either device is off or not in good connection. Check device and try again. Or pair it again.")<br>End If | |

| OnDisconnect() | | |
|---|---|---|
| Description | Disconnect device. Close serial port. | |
| Out | Void | |
| Input | N/A | |
| Device | Equil Smart Pen / Marker | |
| Usage | OnDisconnect()<br><br>bPenConnect = False<br><br>MouseFlagDisalbe() | |

| SetCalibration_Top(ByVal pt As PointF) | | |
|---|---|---|
| Description | Set P1(left top) coordinate of calibration | |
| Out | Void | |
| Input | PointF | P1 coordinate of calibration |
| Device | Equil Smart Pen / Marker | |
| Usage | If m_pRec.PenStatus = PenSatus.PEN_UP Then<br>Select Case iPenCalibrationStatus<br>Case PenCalibrationSatus.CAL_TOP<br>iPenCalibrationStatus += 1<br><br>SetCalibration_Top(New PointF(m_pRec.X, m_pRec.Y))<br><br>pic1.Visible = False<br>pic2.Visible = True<br>Case PenCalibrationSatus.CAL_BOTTOM<br>SetCalibration_Bottom(New PointF(m_pRec.X, m_pRec.Y))<br>SetCalibration_End()<br>End Select<br>End If | |

| SetCalibration_Bottom(ByVal pt As PointF) | | |
|---|---|---|
| Description | Set P3(right bottom) coordinate of calibration | |
| Out | Void | |
| Input | PointF | P3 coordinate of calibration |
| Device | Equil | |
| Usage | If m_pRec.PenStatus = PenSatus.PEN_UP Then<br>Select Case iPenCalibrationStatus<br>Case PenCalibrationSatus.CAL_TOP<br>iPenCalibrationStatus += 1<br><br>SetCalibration_Top(New PointF(m_pRec.X, m_pRec.Y))<br><br>pic1.Visible = False<br>pic2.Visible = True<br>Case PenCalibrationSatus.CAL_BOTTOM<br>SetCalibration_Bottom(New PointF(m_pRec.X, m_pRec.Y))<br>SetCalibration_End()<br>End Select<br>End If | |

| SetCalibration_End() | | |
|---|---|---|
| Description | Finish calibration | |
| Out | Void | |
| Input | N/A | |
| Device | Equil Smart Pen / Marker | |
| Usage | If m_pRec.PenStatus = PenSatus.PEN_UP Then<br>Select Case iPenCalibrationStatus<br>Case PenCalibrationSatus.CAL_TOP<br>iPenCalibrationStatus += 1<br><br>SetCalibration_Top(New PointF(m_pRec.X, m_pRec.Y))<br><br>pic1.Visible = False<br>pic2.Visible = True<br>Case PenCalibrationSatus.CAL_BOTTOM<br>SetCalibration_Bottom(New PointF(m_pRec.X, m_pRec.Y))<br>SetCalibration_End()<br>End Select<br>End If | |

| SetPenDownThreshold(ByVal iDown As Integer) | | |
|---|---|---|
| Description | Set threshold of pen pressure for recognizing if pen tip is down<br>* Default Value = 25; | |
| Out | Void | |
| Input | Integer | 25 ~ 700 |
| Device | Equil Smart Pen | |
| Usage | SetPenDownThreshold(TrackBar1.Value) | |

| SetAudio | | |
|---|---|---|
| Description | Change Audio mode and volume of Smart Marker | |
| Out | Void | |
| Input | BOOL | Yes:/No |
| Device | Equil Smart marker | |
| Usage | SetAudio(CByte(CInt(txtAudioMode.Text)), CByte(CInt(txtAudioVolume.Text))) | |

## ●_pen_rec Structure

| Declared in | Module1.vb |
|---|---|

### ➢ Overview

_pen_rec is packet of pen data.
It is received every pen strokes and hovering through WM_RETURNMESSAGE message.

### ➢ Members

| X, Y | | | |
|---|---|---|---|
| Type | Integer | Property | readonly |
| Description | Not calibrated coordinates | | |
| Range | 0 ~ 6500 | | |
| Device | Equil Smart Pen / Smart Marker | | |
| Usage | | | |

| TX, TY | | | |
|---|---|---|---|
| Type | Integer | Property | readonly |
| Description | Calirated coordinates | | |
| Range | According to the target view size | | |
| Device | Equil Smart Pen / Smart Marker | | |
| Usage | | | |

| PenStatus | | | |
|---|---|---|---|
| Type | Integer | Property | readonly |
| Description | Where pentip is pressed or not | | |
| Range | PEN_DOWN : Pentip down<br>PEN_MOVE : Move with Pentip down<br>PEN_UP :Pentip up<br>PEN_HOVER : Move with Pentip up<br>(defined in PNFModule.vb) | | |
| Device | Equil Smart Pen / Smart Marker | | |
| Usage | | | |

| T | | | |
|---|---|---|---|
| Type | Integer | Property | readonly |
| Description | Temperature | | |
| Range | 0~60 ((Celcious) ) | | |
| Device | Equil Smart Pen | | |
| Usage | | | |

| P | | | |
|---|---|---|---|
| Type | Integer | Property | readonly |
| Description | Pressure | | |
| Range | 0 ~ 700 | | |
| Device | Equil Smart Pen | | |
| Usage | | | |

| FUNC | | | |
|---|---|---|---|
| Type | Integer | Property | readonly |
| Description | Status of Pen button | | |
| Range | 0 ~ 1 | | |
| Device | Equil Smart Pen | | |
| Usage | | | |

| IRGAP | | | |
|---|---|---|---|
| Type | Integer | Property | readonly |
| Description | IR Gap (only for firmware, SW dot not need to know) | | |
| Range | 0 ~ 3000 | | |
| Device | Equil Smart Pen | | |
| Usage | | | |

| Sensor_dis | | | |
|---|---|---|---|
| Type | Integer | Property | readonly |
| Description | Distance between Ultrasonic sensors | | |
| Range | Fixed by model | | |
| Device | Equil Smart Pen | | |
| Usage | | | |

| ModelCode | | | |
|---|---|---|---|
| Type | Integer | Property | readonly |
| Description | Model code. | | |
| Range | Equil Smart Pen : 2<br>Equil Smart Pen 2 : 3<br>Equil Smart Marker : 4 | | |
| Device | Equil Smart Pen / Marker | | |
| Usage | | | |

| HWVer | | | |
|---|---|---|---|
| Type | Integer | Property | readonly |
| Description | Version of Hardware of receiver and pen | | |
| Range | >=0 | | |
| Device | Equil Smart Pen / Marker | | |
| Usage | | | |

| MCU1 | | | |
|---|---|---|---|
| Type | Integer | Property | readonly |
| Description | Version of MCU 1 of receiver and pen | | |
| Range | >=0 | | |
| Device | Equil Smart Pen / Marker | | |
| Usage | | | |

| MCU2 | | | |
|---|---|---|---|
| Type | Integer | Property | readonly |
| Description | Version of MCU 2 of receiver and pen<br>Smart Marker Firmware can be updated on windows. | | |
| Range | >=0 | | |
| Device | Equil Smart Pen / Smart Marker | | |
| Usage | | | |

| PenTiming | | | |
|---|---|---|---|
| Type | Integer | Property | readonly |
| Description | Pen Type of Smart Marker. | | |
| Range | RED = 81<br>GREEN = 82<br>YELLOW = 83<br>BLUE = 84<br>PEN_UP = 15<br>PURPLE = 86<br>BLACK = 88<br>ERASER_CAP = 89<br>LOW_BATTERY = 90<br>BIG_ERASER = 92 | | |
| Device | Equil Smart Marker | | |
| Usage | | | |

| bRight | | | |
|---|---|---|---|
| Type | Integer | Property | readonly |
| Description | Which side of receiver to be drawn | | |
| Range | 0 : Left side of receiver<br>1 : Right side of receiver | | |
| Device | Equil Smart Pen / Smart Marker | | |
| Usage | | | |

| Station_Position | | | |
|---|---|---|---|
| Type | Integer | Property | readonly |
| Description | Position of sensor | | |
| Range | TOP = 1<br>LEFT =2<br>RIGHT=3<br>BOTTOM=4 | | |
| Device | Equil Smart Pen / Smart Marker | | |
| Usage | | | |

## ● _PENConditionData Structure

| Declared in | Module1.vb |
|---|---|

### ➢ Overview

_PENConditionData is packet of environment data
It is received every 2 seconds through WM_PENCONDITION message.

### ➢ Members

| modelCode | | | |
|---|---|---|---|
| Type | Integer | Property | readonly |
| Description | modelcode | | |
| Range | Equil Smart Pen : 2<br>Equil Smart Pen 2 : 3<br>Equil Smart Marker : 4 | | |
| Device | Equil Smart Pen / Smart Marker | | |
| Usage | | | |

| pen_alive | | | |
|---|---|---|---|
| Type | Integer | Property | readonly |
| Description | How much seconds has passed after pen is awaken.<br>Pen will fall a sleep, if pen is not used for 600 seconds. | | |
| Range | 0~600 | | |
| Device | Equil Smart Pen / Smart Marker | | |
| Usage | | | |

| battery_station | | | |
|---|---|---|---|
| Type | Integer | Property | readonly |
| Description | Battery status of sensor | | |
| Range | 0~100 | | |
| Device | Equil Smart Pen / Smart Marker | | |
| Usage | | | |

| battery_pen | | | |
|---|---|---|---|
| Type | Integer | Property | readonly |
| Description | Battery status of Pen | | |
| Range | 0~100 : Smart Pen<br>0,100 : Smart Marker (Smart Marker has only two level as HIGH,LOW) | | |
| Device | Equil Smart Pen / Smart Marker | | |
| Usage | | | |

| StationPosition | | | |
|---|---|---|---|
| Type | Integer | Property | readonly |
| Description | Position of sensor | | |
| Range | TOP = 1<br>LEFT =2<br>RIGHT=3<br>BOTTOM=4 | | |
| Device | Equil Smart Pen / Smart Marker | | |
| Usage | | | |

| usbConnect | | | |
|---|---|---|---|
| Type | Integer | Property | readonly |
| Description | If connection is by USB or Bluetooth. | | |
| Range | 0: Bluetooth<br>1: USB | | |
| Device | Equil Smart Smart Marker | | |
| Usage | | | |

## ➢ Overview

Create and initialize Connection

## ➢ Example

```
1.Set handle of object to receive message for pen data
        SetReciveHandle(Handle)
2. Set handle of form to draw
        SetDrawHandle(picMain.Handle)
3. Start to connect

        If FindDevice() Then     'find usb connetion (only for over F/W version 6)
        Else
            PortSearch()         'find BT Connection

        End If
4. Check if connection is successful.
        bPenConnect =CheckConnect()

        If bPenConnect Then
                    bPenRunning = True
         Else
                    MessageBox.Show("Either device is off or not in good connection. Check device and try again. Or pair it again.")
         End If
```

Example : Module1.vb, frmPenEx.vb

## ➢ Overview

Internally PNFPenLib is supposed to send message about Pen Moving to the object set by "SetReciveHandle" whenever the pen moves

## ➢ Example

```
1. Set handle to process pen data
   SetReciveHandle(Handle)
2. Process message of Pen
  Protected Overrides Sub WndProc(ByRef m As System.Windows.Forms.Message)
   Select Case m.Msg
   Case WM_RETURNMESSAGE
   Select Case m_pRec.PenStatus
   Case PenStatus.PEN_DOWN
 ....
   Case PenStatus.PEN_MOVE
 ....
   Case PenStatus.PEN_UP
 ....
   Case PenStatus.PEN_HOVER
 ....
 End Select
   Case WM_PENCONDITION
   If m.WParam = 1 Then 'receiver power off
   ElseIf m.LParam = 2 Then 'pen power off
   End If
 Case Else
   MyBase.WndProc(m)
 End Select
End Sub
```

Example source: frmPenEx.vb

## ➢ Overview

Pen coordinates is converted to screen coordinates by projective matrix which is set in the calibration view.

## ➢ Example

```
1. . create calibration controller
     Dim frmCali As New frmCalibration
2. set calibration controller as target view
     SetReciveHandle(frmCali.Handle)
     frmCali.ShowDialog()
3. after calibration, reset target handle.
     SetReciveHandle(Handle)
4. example
   If bPenConnect Then
       If m_bDraw Then
           m_bDraw = False
           Dim frmCali As New frmCalibration
           SetReciveHandle(frmCali.Handle)
           frmCali.ShowDialog()
           SetReciveHandle(Handle)
           m_bDraw = True
       Else
           Dim frmCali As New frmCalibration
           SetReciveHandle(frmCali.Handle)
           frmCali.ShowDialog()
           SetReciveHandle(Handle)
      End If
 End If
```

Example source: frmCalibration.vb, frmPenEx.vb

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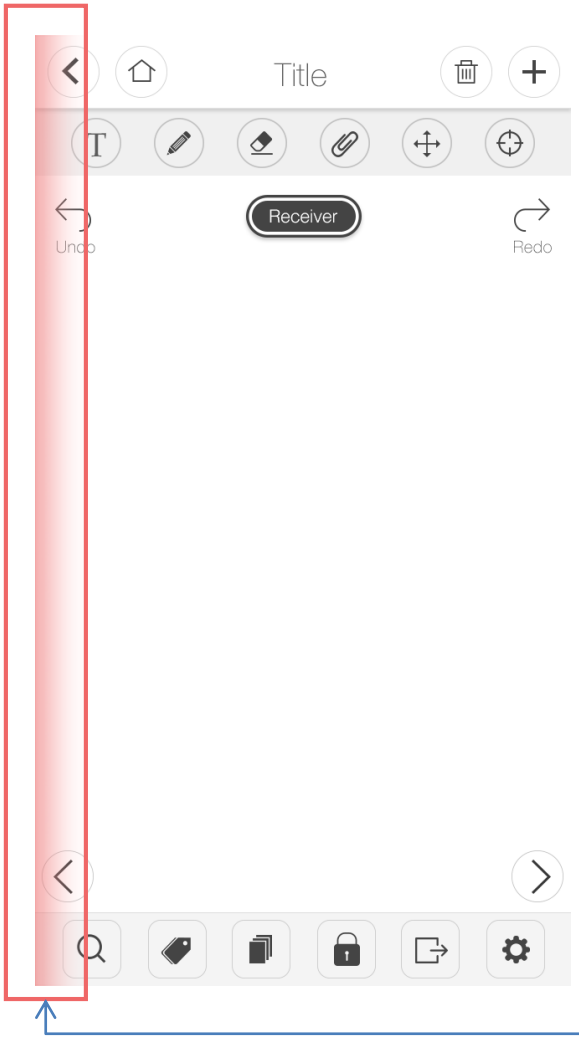
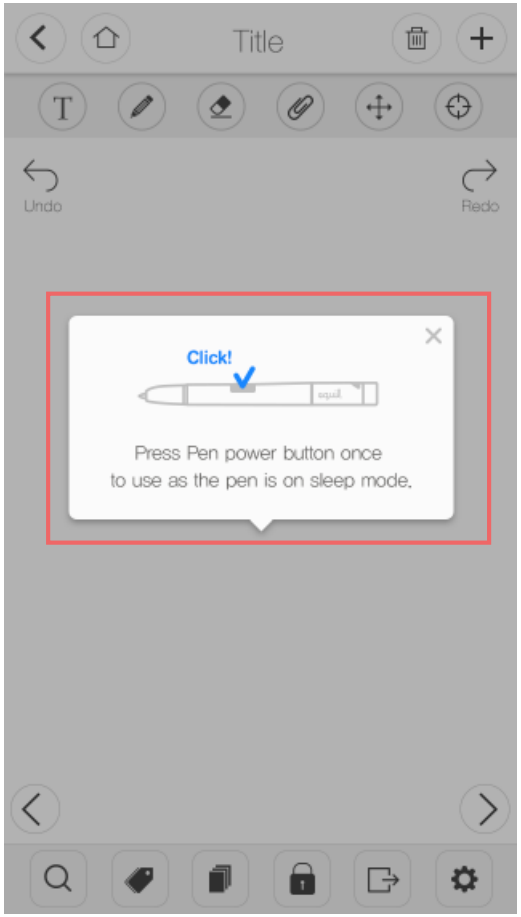
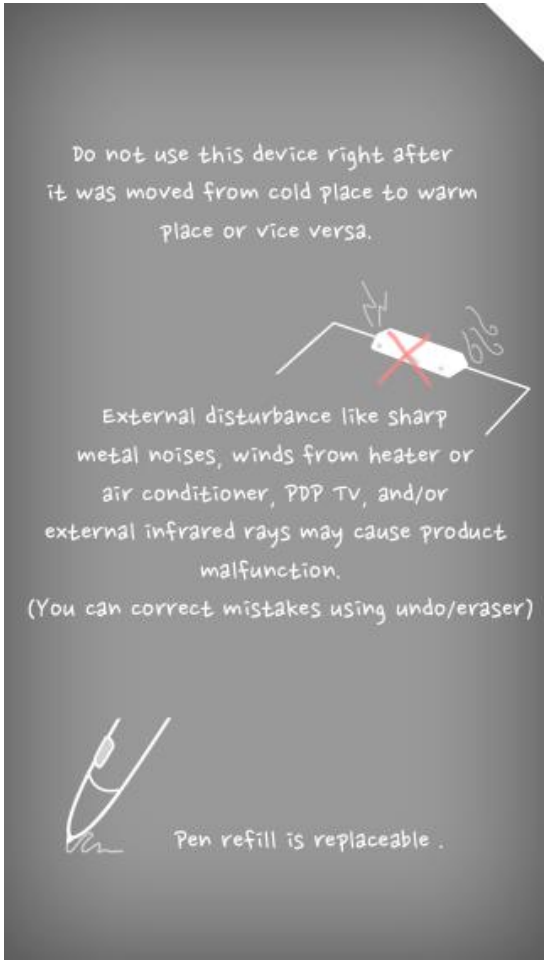
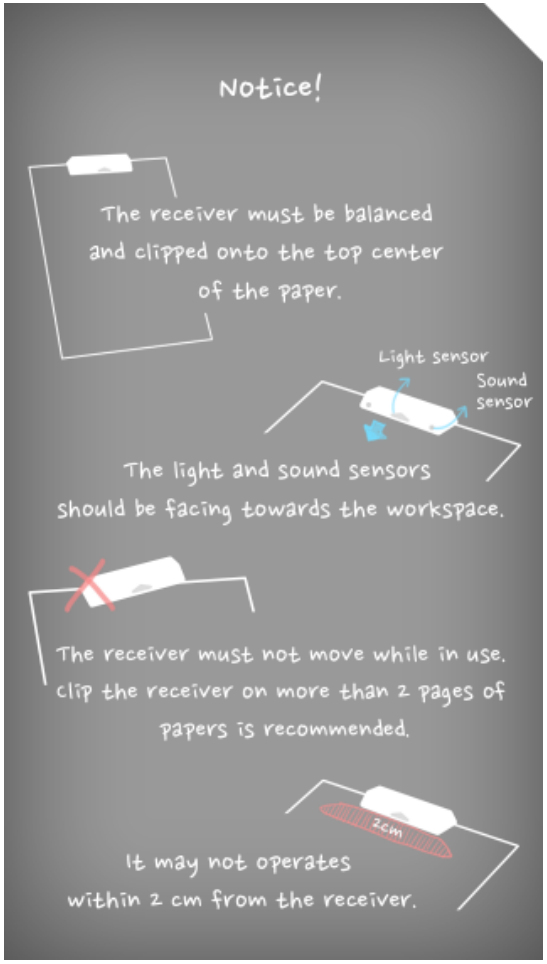
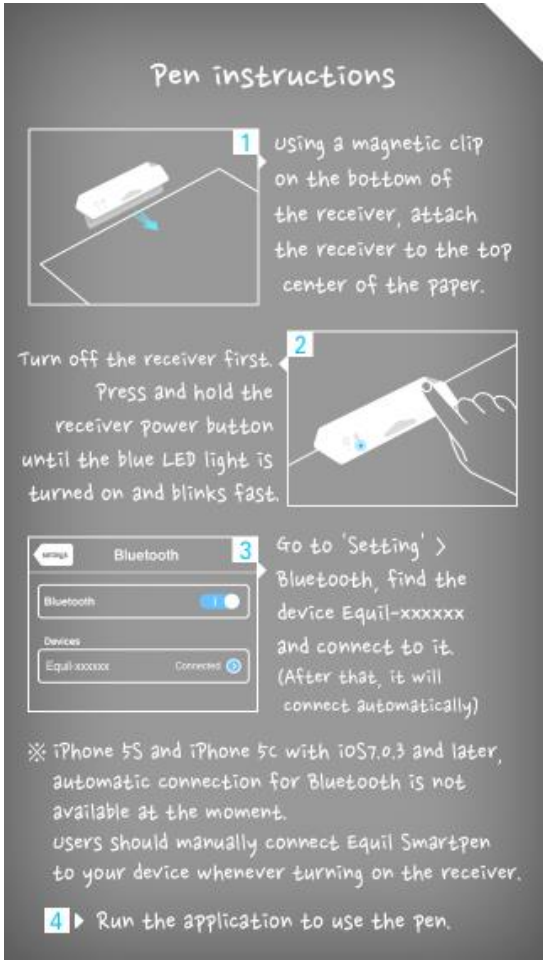
# 1. Screen Mode when it is out of the motion area




When the pen is out of range, it shows in red color. The shape of color is changeable, it lets the users know it is deviated

2. Show message when pen goes to sleep mode (Smart Pen only)



# 3. Tutorial- related to Hardware

The information below must be included in the manual
We can provide source files as .psd format in 9 languages(English, Spanish, French, German, Italian, Japanese, Chinese–Simplified, Chinese-Traditional, Korean )
Please refer to Tutorial_source (Attachment)