2400 MHz WIRELESS OPTICAL PEN - MOUSE
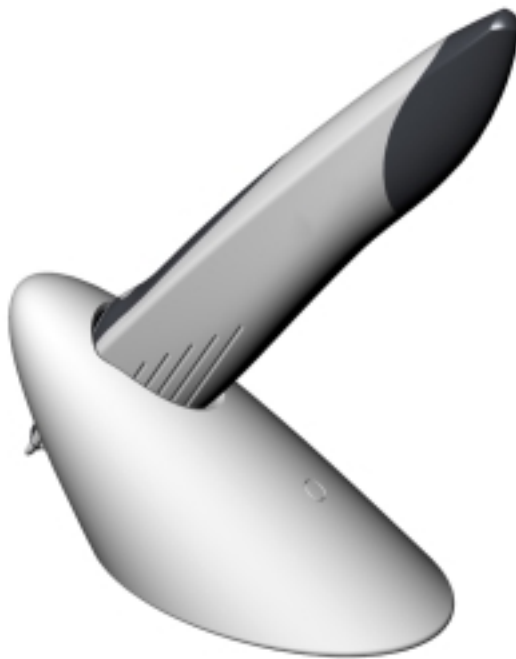## MODEL : I-PEN PRO

International Science Venture
2.4GHz Wireless Optical Pen–Mouse

General Description

2400 MHz WIRELESS OPTICAL PEN - MOUSE
MODEL : I-PEN PRO

Basic Feature List

WIRELESS OPTICAL PEN MOUSE

HIGH FASHIONABILITY DESIGN

40 CHANNEL OPERATION

400 CPI RESOLUTION

2^16 SECURITY CODES AUTO-SECURITY CODE COMBINATION

RANDOM ID SETTING

FIEXIBLE APPLICATION SOFTWARE

LONG RANGE (15m)

IN-USE USB PORT

Transmitter Unit feature List (pen-mouse)

INNER ANTENNA

ACTIVE / STAND BY / POWER SAVE   THREE MODE

AUTO STAND-BY & POWER SAVE

FAST WAKE-UP

LOW BATTERY INDICATOR(LED BLINKING)

POWER ON/OFF SWITCH

Receiver Unit Feature list (PC USB interface & Charger)

INNER ANTENNER.

CHARGING INDICATOR LED.

BATTERY LEVEL DISPLAY.

   - RED -> EMPTY.

   - ORANGE(RED+GREEN) -> MIDDLE.

   - GREEN -> GOOD

2400 MHz WIRELESS OPTICAL PEN - MOUSE
MODEL : I-PEN PRO

Specification

1. Reference Specifications

Designed to conform to RF regulations

Designed to conform to SAFETY regulations

POWER : 5V DC 100mA USB POWER ON COMPUTOR

I NTERCONNECTION : USB PORT

2. General specifications

DESCRIPTION		TX	RX
Frequency range	TRANSMITTER	2402.76~2405.10MHz	
	RECEIVER		2402.76 ~ 2405.1MHz
Number of RF Channels		40 Channels	
Channel spacing		60KHz	
Frequency Stability		Within± 2.5ppm	
RF Output power		Less than 0.1mW	
Usable sensitivity		-100dBm	
Type of Data modulation		FM (F3E)	
ID Code Element		EEPROM	
Supply voltage	Transmitter	3.7VDC, 400mA Li-Polymer Battery	
	Receiver	5VDC USB Power	
Operating Temperature		0℃ ~ 50℃	

Frequency Table

2400 MHz WIRELESS OPTICAL PEN - MOUSE
MODEL : I-PEN PRO

Channel space   : 60KHz

1st I.F   : 21.69MHz

CH	RECEIVER(MHz)	TRANSMITTER(MHz)	REMARK
	RX	TX	
1	2402.76	2402.76	
2	2402.82	2402.82	
3	2402.88	2402.88	
4	2402.94	2402.94	
5	2403.00	2403.00	
6	2403.06	2403.06	
7	2403.12	2403.12	
8	2403.18	2403.18	
9	2403.24	2403.24	
10	2403.30	2403.30	
11	2403.36	2403.36	
12	2403.42	2403.42	
13	2403.48	2403.48	
14	2403.54	2403.54	
15	2403.60	2403.60	
16	2403.66	2403.66	
17	2403.72	2403.72	
18	2403.78	2403.78	
19	2403.84	2403.84	
20	2403.90	2403.90	
21	2403.96	2403.96	
22	2404.02	2404.02	
23	2404.08	2404.08	
24	2404.14	2404.14	
25	2404.20	2404.20	
26	2404.26	2404.26	
27	2404.32	2404.32	
28	2404.38	2404.38	
29	2404.44	2404.44	
30	2404.50	2404.50	

I   S   V

2400 MHz WIRELESS OPTICAL PEN - MOUSE

MODEL : I-PEN PRO

CH	*RECEIVER(MHz)*	*TRANSMITTER(MHz)*	*REMARK*
	RX	*TX*	
31	*2404.56*	*2404.56*	
32	*2404.62*	*2404.62*	
33	*2404.68*	*2404.68*	
34	*2404.74*	*2404.74*	
35	*2404.80*	*2404.80*	
36	*2404.86*	*2404.86*	
37	*2404.92*	*2404.92*	
38	*2404.98*	*2404.98*	
39	*2405.04*	*2405.04*	
40	*2405.10*	*2405.10*	

Block Diagram

2400 MHz WIRELESS OPTICAL PEN - MOUSE
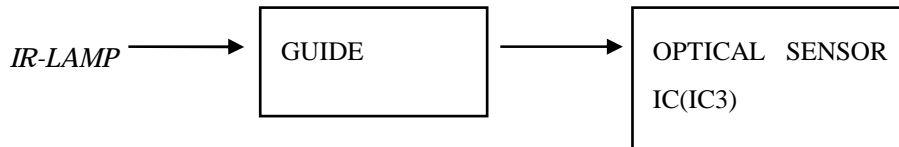## MODEL : I-PEN PRO

Circuit Diagram

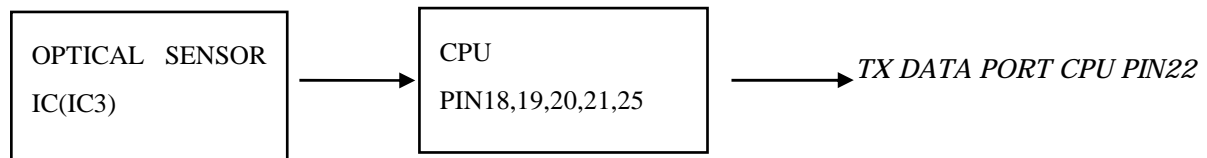# Circuit Explanation

2400 MHz WIRELESS OPTICAL PEN - MOUSE
MODEL : I-PEN PRO

Transmitter Circuit Description

The data which inputted in optical-sensor is transformed to X,Y co-ordinate data at IC3.

```
IR-LAMP ──────▶ ┌──────────┐         ┌──────────────────┐
                │  GUIDE   │ ──────▶ │ OPTICAL   SENSOR │
                │          │         │ IC(IC3)          │
                └──────────┘         └──────────────────┘
```
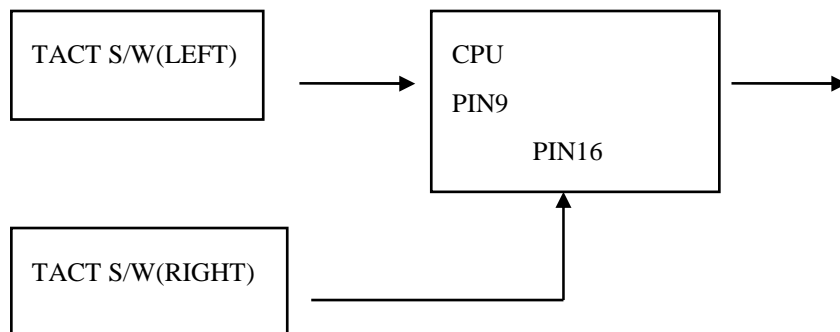
FIG.1

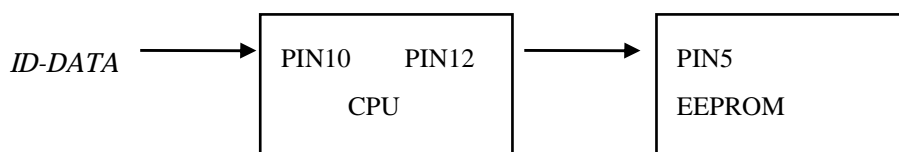X,Y co-ordinate data which is transformed into Digital signal at CPU(IC4) and transmitted to TX DATA port.

```
┌──────────────────┐     ┌──────────────────┐
│ OPTICAL   SENSOR │     │ CPU              │
│ IC(IC3)          │ ──▶ │ PIN18,19,20,21,25│ ──────▶ TX DATA PORT CPU PIN22
└──────────────────┘     └──────────────────┘
```

FIG.2

The data which inputted by tact switch is transformed to "click data" at IC4 and transmitted to TX DATA port.

```
┌──────────────────┐     ┌──────────────────┐
│ TACT S/W(LEFT)   │ ──▶ │ CPU              │
│                  │     │ PIN9             │ ──────▶
└──────────────────┘     │      PIN16       │
                         │                  │
┌──────────────────┐     │                  │
│ TACT S/W(RIGHT)  │ ──▶ └──────────────────┘
│                  │
└──────────────────┘
```

FIG.3

Transmitter is set on receiver then id-data, which inputted to id-data port, is transferred to CPU and id-data is transferred to EEPROM.
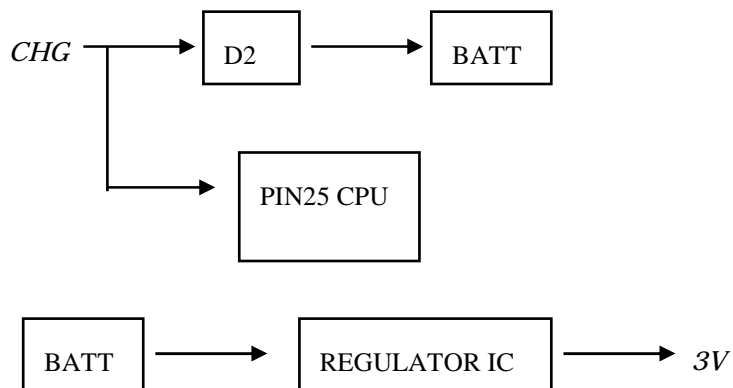
```
ID-DATA ──────▶ ┌──────────────────┐     ┌──────────────┐
                │ PIN10    PIN12   │ ──▶ │ PIN5         │
                │     CPU          │     │ EEPROM       │
                └──────────────────┘     └──────────────┘
```

FIG.4

I   S   V

2400 MHz WIRELESS OPTICAL PEN - MOUSE
MODEL : I-PEN PRO

The output voltage of battery is regulated 3.7v and is used by main supplying voltage of transmitter CPU and TX-power.

If transmitter is placed on the receiver, resistor R1, R2 and diode D2 control charge current.

```
CHG ──┬──────▶ ┌──────┐ ──────▶ ┌──────┐
      │        │  D2  │         │ BATT │
      │        └──────┘         └──────┘
      │
      └──────────▶ ┌──────────────┐
                   │  PIN25 CPU   │
                   │              │
                   └──────────────┘


┌──────┐          ┌──────────────┐
│ BATT │ ──────▶  │ REGULATOR IC │ ──────▶  3V
└──────┘          └──────────────┘
```

FIG.5

Receiver Circuit Description

The signal from RF circuit are transmitted the DATA-DETECTION-CIRCUIT and detected data.

```
RF ──→  ┌──────────────────────────┐        ┌──────────────┐
        │  DATA-DETECTION-CIRCUIT  │  ──→   │  PIN3 CPU    │
        │  Q3,Q4                   │        └──────────────┘
        └──────────────────────────┘
```
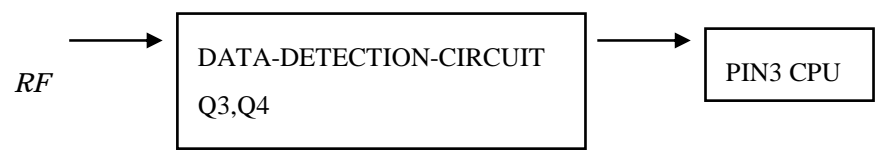
FIG.6

A CPU receives the data from the DATA-DETECTION-CIRCUIT and process USB data, which is processed by CPU and transfer USB port.

```
┌──────────────────────────┐        ┌──────────────┐
│  DATA-DETECTION-CIRCUIT  │  ──→   │  PIN3 CPU    │
│  Q3,Q4                   │        │              │        ┌──────────────┐
└──────────────────────────┘        │     PIN17    │ ──→ D+ │  USB PORT    │
                                     │     PIN18    │ ──→ D- └──────────────┘
                                     └──────────────┘
```
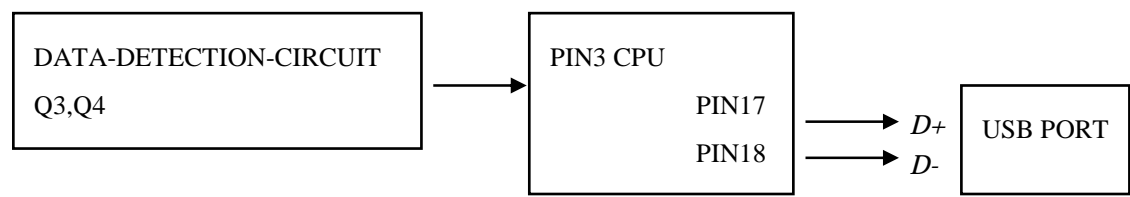
FIG.7

The transmitter send BATTERY-LEVEL-DATA to the receiver then the receiver display BATTERY-LEVEL by LED color.

```
┌──────────────┐  BAT-LEVEL-DATA   ┌──────────────┐
│ TRANSMITTER  │ ────────────────→ │  RECEIVER    │ ──→ LED DISPLAY
└──────────────┘                   └──────────────┘
```
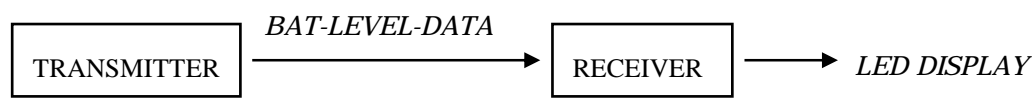
FIG.8

The output voltage of USB port is regulated 5v, which is voltage is used by main supplying voltage of receiver CPU and RX power.

If transmitter is placed on the receiver, resistor R1, R3 detects charging and resistor R10 control charge current.
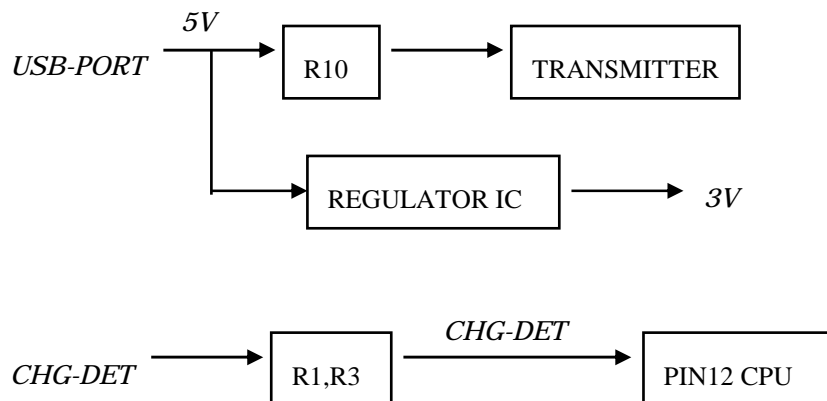
FIG.8

If transmitter is placed on the receiver, CPU makes a new ID-CODE by random processing and store EEPROM and transfer transmitter using ID-DATA port.
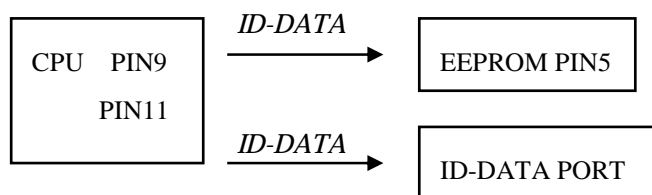
FIG.9

2400 MHz WIRELESS OPTICAL PEN - MOUSE
MODEL : I-PEN PRO

RF Circuit Description

TX Part

The signal that made in the CPU enters into the TX-DATA port on RF circuit.

The signal is modulated by the L917(21.24MHz).This signal is mixed with the VCO frequency.

The RF signal enters into the transmission power AMP transistor (Q1).

The signal amplified in the Q1, Q905 enter by the BAND-PASS-FILTER U906 (2403MHz).

After passing the BAND-PASS-FILTER U906, transmit toward to the antenna.

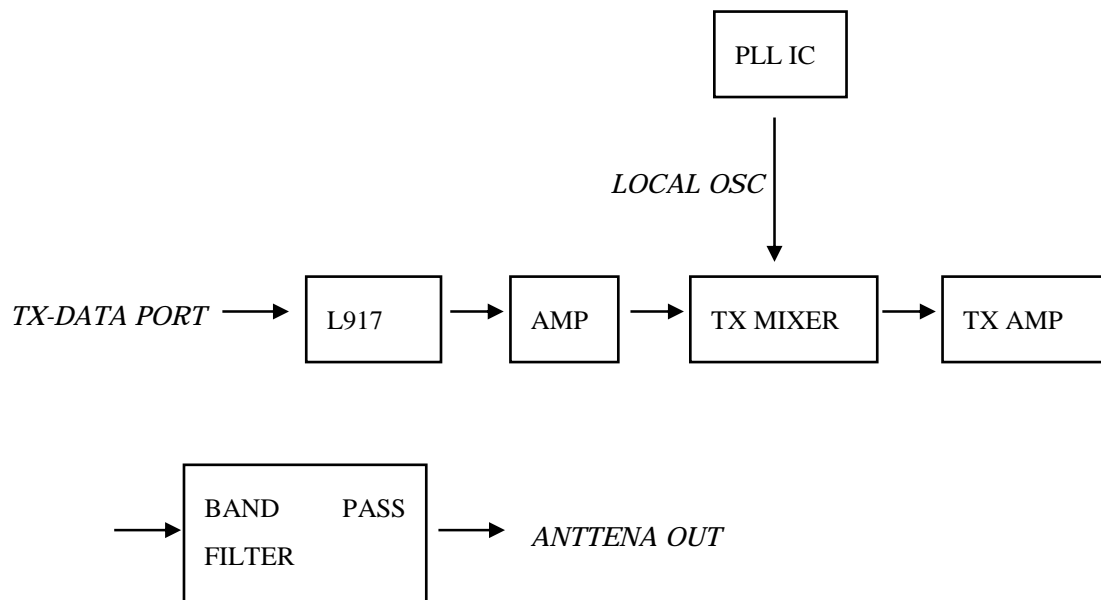The final transmission RF signal is 2402.76MHz ∼ 2405.10MHz.

FIG.10

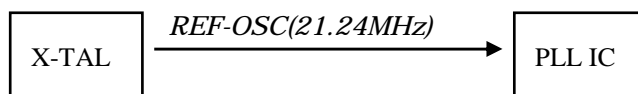X901 is X-RAL generating RF–reference signal and should be adjusted by TC901 accurately.

FIG.11

2400 MHz WIRELESS OPTICAL PEN - MOUSE
MODEL : I-PEN PRO

RX Part

The receiver front-end contain BPF, a RF low noise amplifier and 21.69MHz IF amplifier. Also this part includes buffer amplifiers for the generation of local oscillator power.

This front-end receiver receive the RF signal from the antenna, and RF signals passed through RF AMP (Q901, Q910) and band-pass-filter is within frequency range 2402.76MHz ~ 2405.10MHz.

After passing the band pass filter, the signal is mixed with 1'st local frequency from voltage-controlled-oscillator (VCO) through the monolithic crystal filter (21.69MHz).

After passing the MCF, the IF signal enter into the FM IF (INTERMEDIATE FREQUENCE) IC. And the signal is mixed in the FM IF IC (U903). The signals pass through the ceramic-filter (450KHz). Finally the output signal (903, pin9) streams to the CPU.
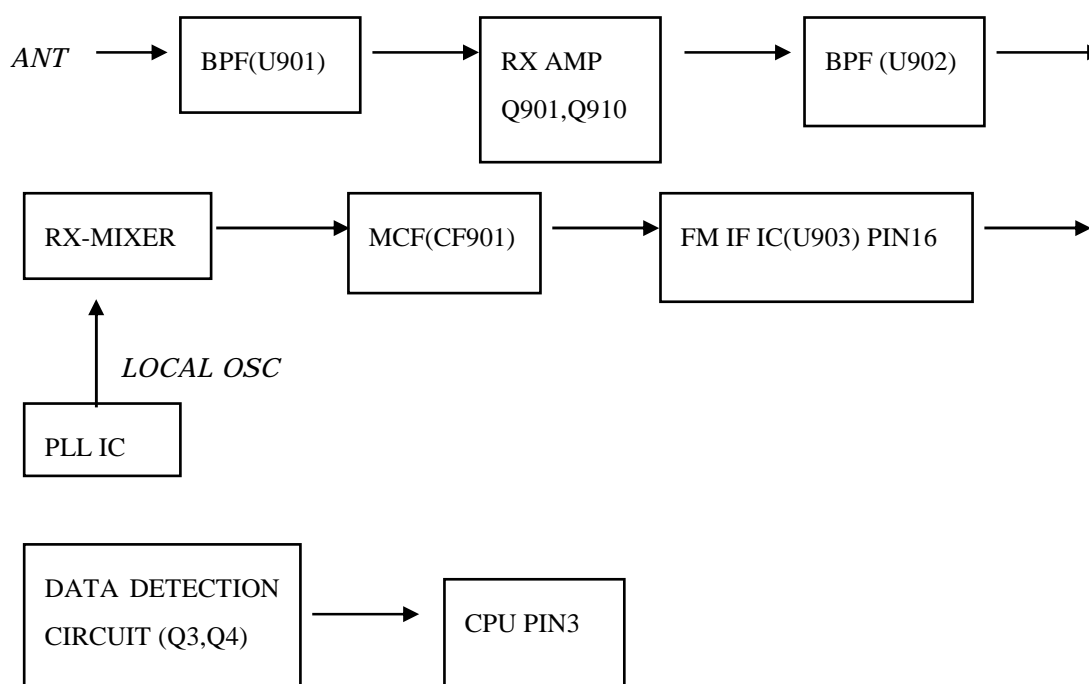
FIG.12

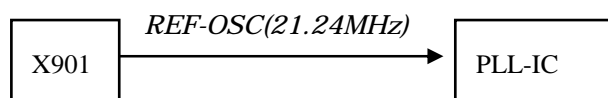*X901 is X-TAL generating RF-reference signal and should be adjusted by TC901 accurately.*

FIG.13