

SMART CARD READER/WRITER SAM-CRM-14

System Manual Ver 1.2

SAM-CRM-14_MANUAL

Rev. 1.2

Dec. 05, 2013

SAMSUNG SDS



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This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

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1 Overview

1.1 General Description

The validator is installed on the bus and has a role of fare collection. It has a RF card reader/writer which comply the EMV standard and ISO 14443 Type A. The validator has a 5.7" touch screen display for passenger interface.

It is compatible to a peripheral device through a multiple external interface such as Wi-Fi, Bluetooth and etc.

This document informs and defines each module and specification of validator.



Figure 1 Drawing of validator

1.2 Outside Dimension

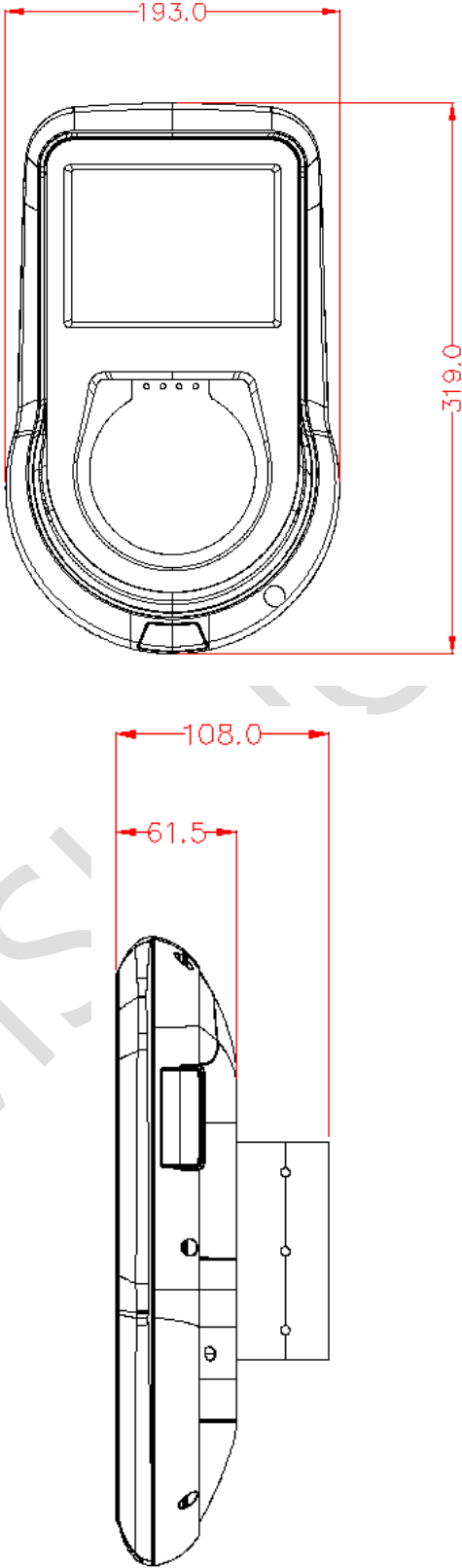


Figure 2 Outside dimension

1.3 System Configuration

1.3.1 Block Diagram

The following figure is the validator block diagram.

Smartcard Reader/Writer Block diagram

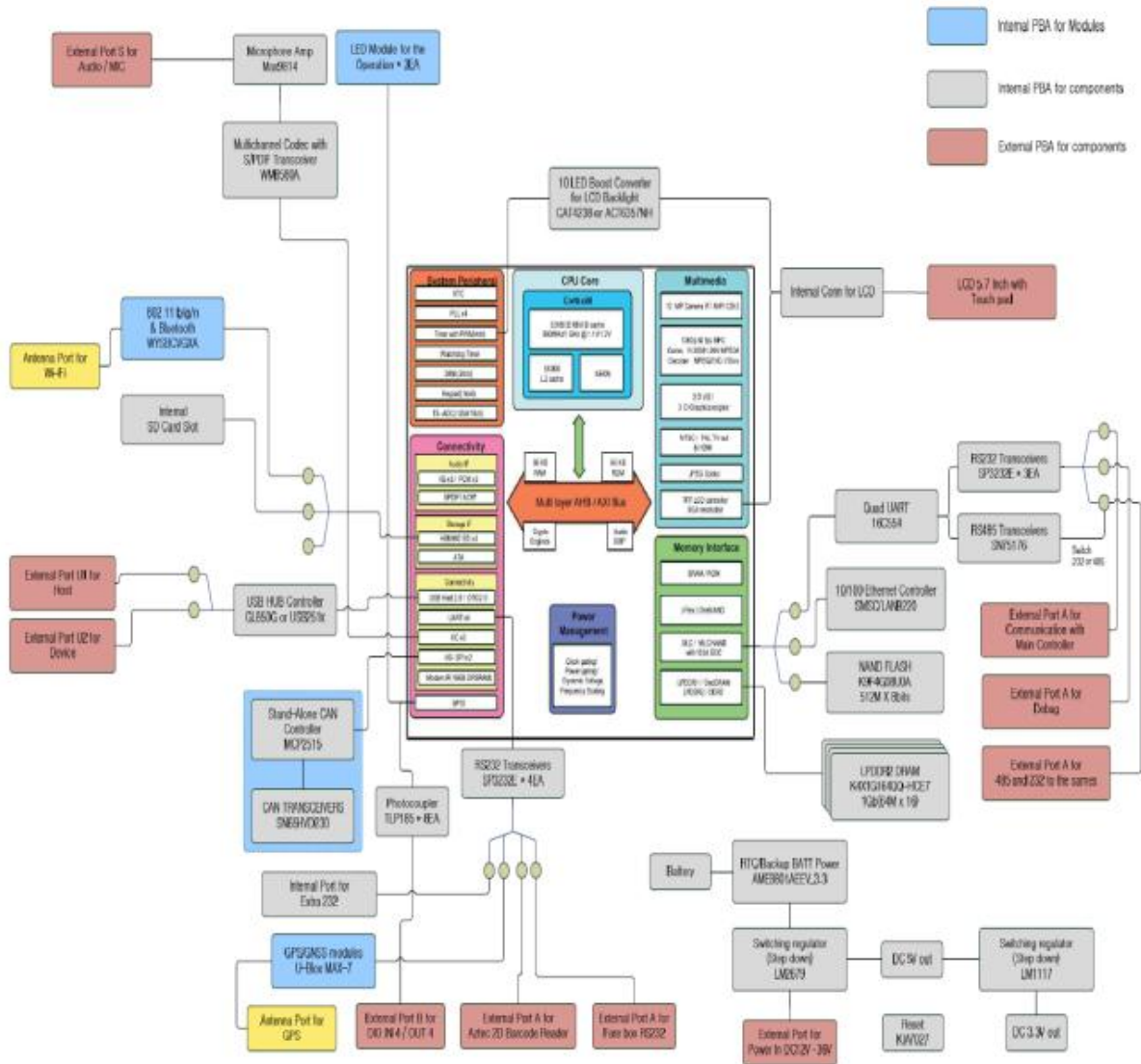


Figure 3 Validator Block Diagram

1.4 General Specification

The table below shows the general specifications of the validator.

System	Item	Specification
Enclosure	Dimension(mm)	193.0(W) * 319.0(H) * 61.5(D)
	Material	Outside steel of enclosure : Material: PC-ABS
CPU Module	Processor	Samsung S5PV210, Cortex-A8 1GHz
	Memory	RAM: 512MB, NAND Flash: 512MB
	OS	ANDROID 4.0
Base Board Module	WiFi/Bluetooth Module	IEEE802.11b/g/n, Bluetooth 3.0+HS
	GPS module	GPS RX Sensitivity: -164dBm GPS Accuracy: 3m
Card Reader/Writer	CPU	STM32F417Zxx, ARM Cortex-M4
	Program Memory	1024KBytes Flash Memory
	Data Memory	192KBytes SRAM + BACK UP(4KBytes)
	SRAM	512KBytes (model : CS18LV40963ECR70)
	Display	LED for Display – 4EA (Green, Blue, Red, Yellow) LED for Debug – 1EA (Red) LED for Power – 2EA (Red)
	Communication	RS232 * 2
	RF I/F	PN512 SIC9310 RC-S940
	Standard	ISO14443 A/B, FeliCa, Mifare, ISO15693
	Input Power	12V, 300mA
	SAM	SIM socket 8EA
Barcode Reader	Image Sensor	CMOS Sensor, Max. 752*480, 8-bit grayscale
	Target Distance	5~32.5Cm: Depends on code size
	Symbologies	1/2 Dimensional
Touch screen display	5.7 inch Resolution: 640 * 3(RGB) * 480 Touch method: 4-wire resistive	
External Interface	USB 2.0 Host * 1 LAN * 1 RS232/485 * 2 CAN interface * 1 Antenna port *2	
Speaker	Rated Input Power	1W, 8ohm
Power	Input voltage (V)	24 VDC

Table 1 General specification

2 Module Configuration

The configuration of validator is as follows:

- CPU Module
- Base Board Module
- Card Reader/Writer
- Barcode Reader
- Touch Screen Display
- Speaker

2.1 CPU Module

2.1.1 General Description

The CPU Module controls all the sub-modules and processes all the data in the validator. They have sufficient space for Operating System (OS) and the application data.

CPU Module is assembled with some parts as follows;

- CPU (Samsung S5PV210, Cortex-A8 1GHz)
- RAM (LDDR2 1Gbit *4)
- NAND Flash 512MB

2.1.2 Block diagram

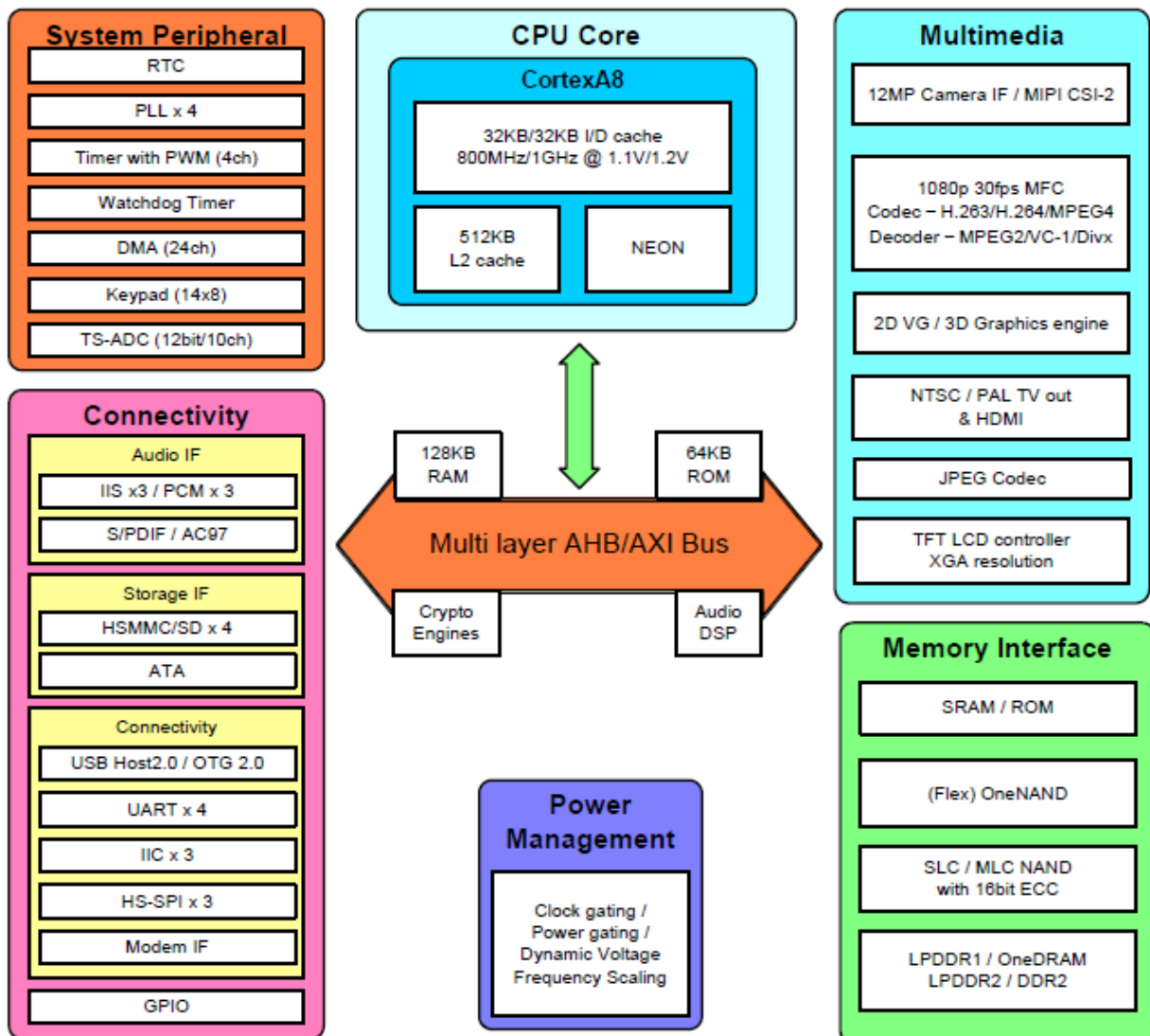


Figure 4 Block diagram of CPU Module

2.2 Base board module

2.2.1 General Description

Base board module performs major functions of validator device controlling. The Wi-Fi/BT module, CAN module and etc. are installed on the base board.

2.2.2 Layout of Base board module

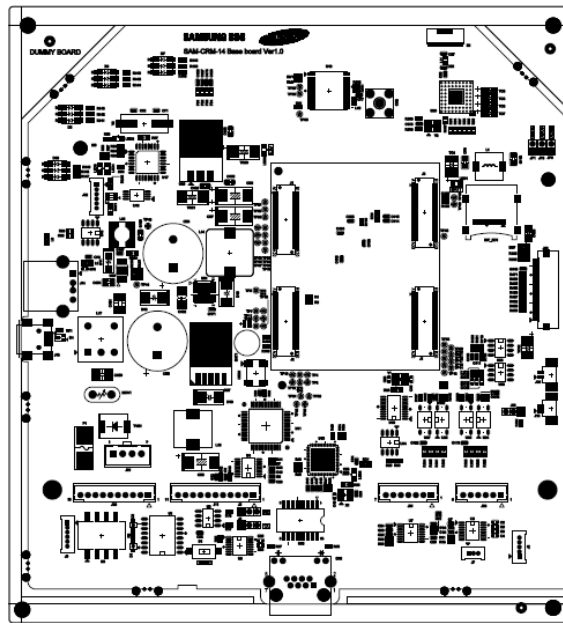


Figure 5 Top Layout of Base board module (Example)

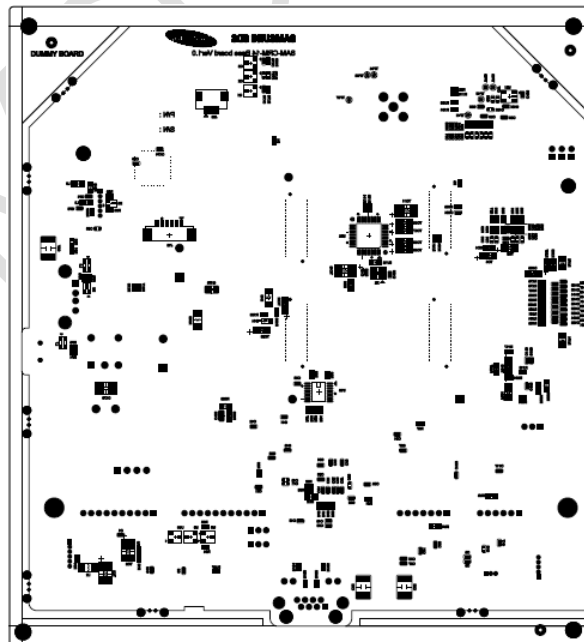


Figure 6 Bottom Layout of Base board module (Example)

2.2.3 Wi-Fi/Bluetooth module

The validator has the Wi-Fi/Bluetooth module to communicate with the server (in the garage) and peripheral devices. The key features are as below;

- IEEE802.11b/g/n standard conformity, BT3.0,2.1+EDR
- Low standby current (with advanced power save and sleep mode)
- Transmit speed : 11/5.5/2/1 Mbps(11b), 54/48/36/24/18/12/9/6 Mbps(11g),
150~6.5 Mbps (11n)
- Channel Number : 1 to 13 channel (11bg), 79 channel (BT)
- Interface : SDIO
- Built-in EEPROM, 2G-PA, Crystal, BPF
- Security: WEP (64/128), TKIP, AES, WPA/WPA2, WAPI
- Small Outline: 9.0 x 8.8 x 1.35(Max) mm
- Package: Metal case package
- Utilizes 88W8787 IC
- RoHS Conformity

2.2.4 GPS module

The specification of GPS module is as below.

Item	Specification
RX Sensitivity	-164dBm
Cold start autonomous	-147dBm
Hot start autonomous	-161dBm
Tracking mode	-166dBm
Accuracy	3m
TTFB from cold start	42 sec
TTFB from warm start	30 sec
TTFB from hot start	1.8 sec

Table 2 Specification of GPS module

2.3 Card Reader/Writer

2.3.1 General Description

Card Reader/Writer is a high-end RF reader and it is the world first device which supports all three specification as following, (1) Contactless card spec_Mifare, ISO14443 Standard A/B, (2)Payment spec_Paywave, Paypass, JSMART, American Express and (3) EMVCo Type Approval Contact less Level 1 , NFC forum spec complaint.

It also has 8(EA) of SIM slot for secure communication, RS-232(2ea) as interface method.

- Purpose (Use)

It is multi-purpose smartcard reader mainly use for credit card transaction at auto-gate at subway station or automatic ticket vending machine

- Communication & Operation

It controls credit card transaction by sending command to Host Controller via RS232.

This terminal operates LED and Buzzer of the transaction operating and result.

The operation of LED & Buzzer can be different by each specification (refer to the Paypass, JSMART, American Express specification for detail information)

- RF interface

Contactless card spec_Mifare,
ISO14443 Standard A/B

- SAM interface

It is designed to capable of communicating SAM (ISO 7816) by attaching extended parts for future use.

2.3.2 Specification

System	Item	Specification
Card Reader/Writer	CPU	STM32F417Zxx, ARM Cortex-M4
	Program Memory	1024KBytes Flash Memory
	Data Memory	192KBytes SRAM + BACK UP(4KBytes)
	SRAM	512KBytes (model : CS18LV40963ECR70)
	Display	LED for Display – 4EA (Green, Blue, Red, Yellow) LED for Debug – 1EA (Red) LED for Power – 2EA (Red)

System	Item	Specification
	Communication	RS232 * 2
	RF I/F	PN512 SIC9310 RC-S940
	Standard	ISO14443 A/B, FeliCa, Mifare, ISO15693
	Input Power	12V, 300mA
	SAM	SIM socket 8EA
	Switch	Case open switch (PCB tamper)

Table 3 Specification of Card reader/writer

2.4 Touch Screen Display

2.4.1 General Description

The Touch screen display is a color graphic touch screen (5.7" inch TFT LCD) that allows passenger to input their selection. The Touch screen display is positioned ergonomically for passenger to operate easily.

2.4.2 Layout

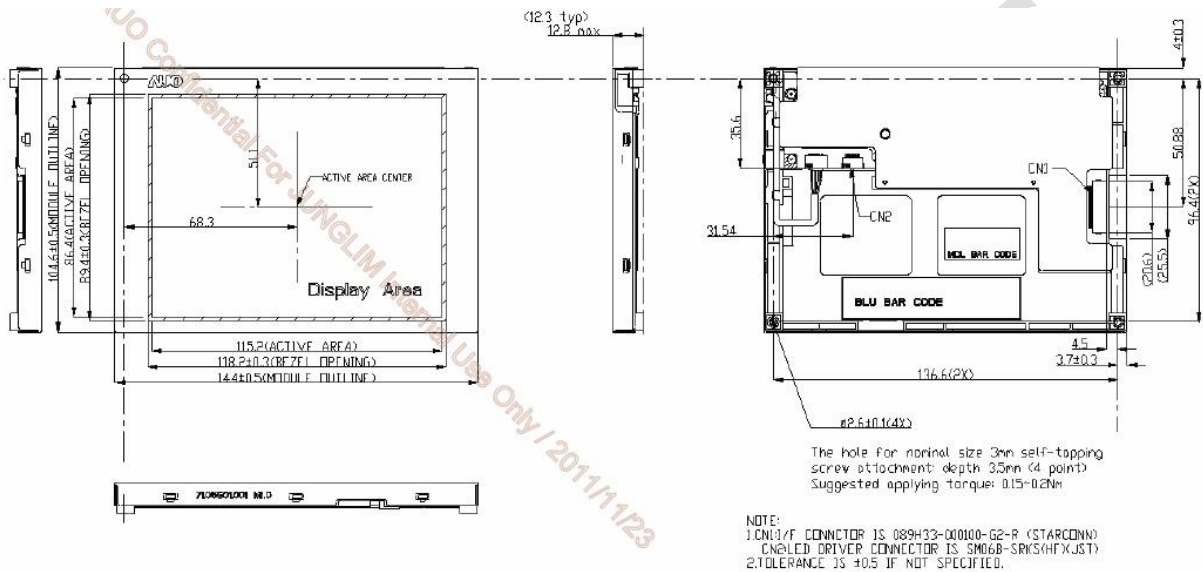


Figure 7 Layout of LCD display

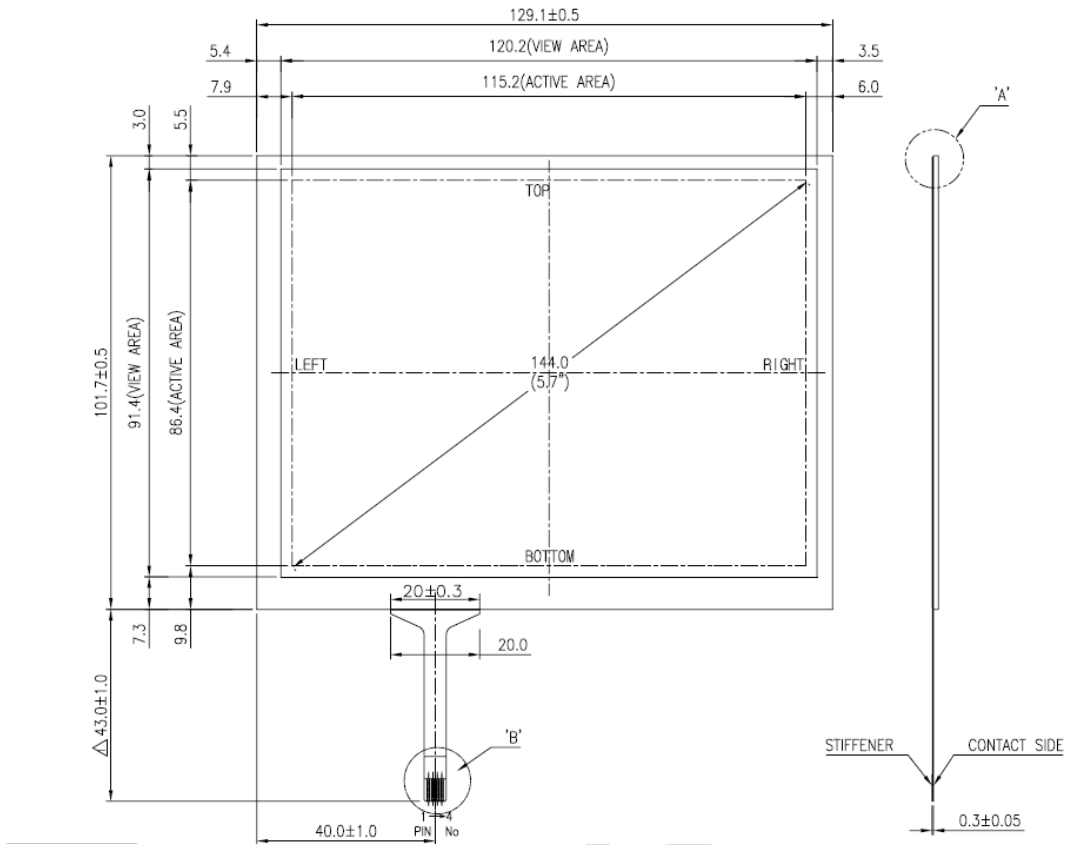


Figure 8 Layout of Touch panel

2.4.3 LCD display specification

Item	Specification
Screen Diagonal	5.7 inch
Active Area	115.2(H) x 86.4(V) (mm)
Pixels HxV	640 x 3(RGB) x 480
Pixel Pitch	0.18 x 0.18 (mm)
Pixel Arrangement	R.G.B Vertical Stripe
Display Mode	TN, Normally White
Nominal Input Voltage VDD	3.3 typ. (Volt)
Typical Power Consumption	3.74W (LCD:0.5W/LED BLU:3.24W) @ All black pattern, Full Load and $V_{LED}=12V$
Weight	150g(typ.), 165g(max.)
Physical Size	144.0(H) x 104.6(V) x 12.3(D)(typ.) (mm)
Electrical Interface	CMOS 6-bit Parallel RGB
Surface Treatment	Anti-Glare, Hardness 3H
Support Color	262K colors

Item	Specification
The most suitable view angle	12 o'clock
Temperature Range	Operating: -30℃~+85℃ Storage: -30℃~+85℃
RoHS Compliance	RoHS Compliance

Table 4 Specification of LCD Display

2.4.4 Touch panel specification

Item	Specification
Glass THK	1.1mm
Film type	Non-glare
Tail	FPC (Ni+Au)
Method	4-wire resistive touch

Table 5 Specification of Touch panel

2.5 Barcode Reader

2.5.1 General Description

The validator has the barcode reader to read the barcode type ticket (1D or 2D).

2.5.2 Layout



Figure 9 Layout of Barcode reader

2.5.3 Specification

Item	Specification
Image Sensor	CMOS Sensor, Max. 752*480, 8-bit grayscale
Target Distance	5~32.5cm: Depends on code size.
Viewing Angle	Wide $\pm 53^\circ$, Standard $\pm 40^\circ$
Aiming Pattern	Laser Aiming
Ambient Lighting	Total darkness to full sunlight
Directions	360 $^\circ$ omni-directional
1 Dimensional	Code11, Code32, Code39, Code93, Code128, UPC/JAN/EAN, Codabar, Interleaved 2 of 5, STF, RSS14, RSS Limited, RSS Truncated
2 Dimensional	PDF-417, Data Matrix, QR Code (including Chinese QR)
OCR	Application-specific OEM only
Operating Temperature	-10 $^\circ$ C to +50 $^\circ$ C (-14 $^\circ$ F to 122 $^\circ$ F)
Storage Temperature	-20 $^\circ$ C to +60 $^\circ$ C (-4 $^\circ$ F to 140 $^\circ$ F)
Shock	Multiple 4ft/1.2M drop to concrete
Humidity	0 to 95%
Certifications	FCC Class A & CE

Table 6 Specification of Barcode reader

2.6 Speaker

2.6.1 General Description

The speaker is installed in the validator. It makes a sound for driver's recognition.



Figure 10 Layout of Speaker

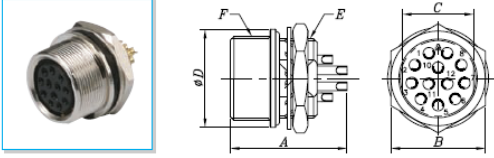
Items	Description
Rated Input Power	1.0W (Max. 1.5W)
Impedance	8±15%(Ohm)
Output SPL @ 0.1W/0.1M	87±2dB
Resonant frequency	800±20% Hz
Magnet size (mm)	11.5 * 1.5
Weight	10g
Dimension (mm)	40(W) * 20(H) * 8.2(D)

Table 7 Specification of Speaker

2.7 Connector and Power switch

2.7.1 Signal & Power connector

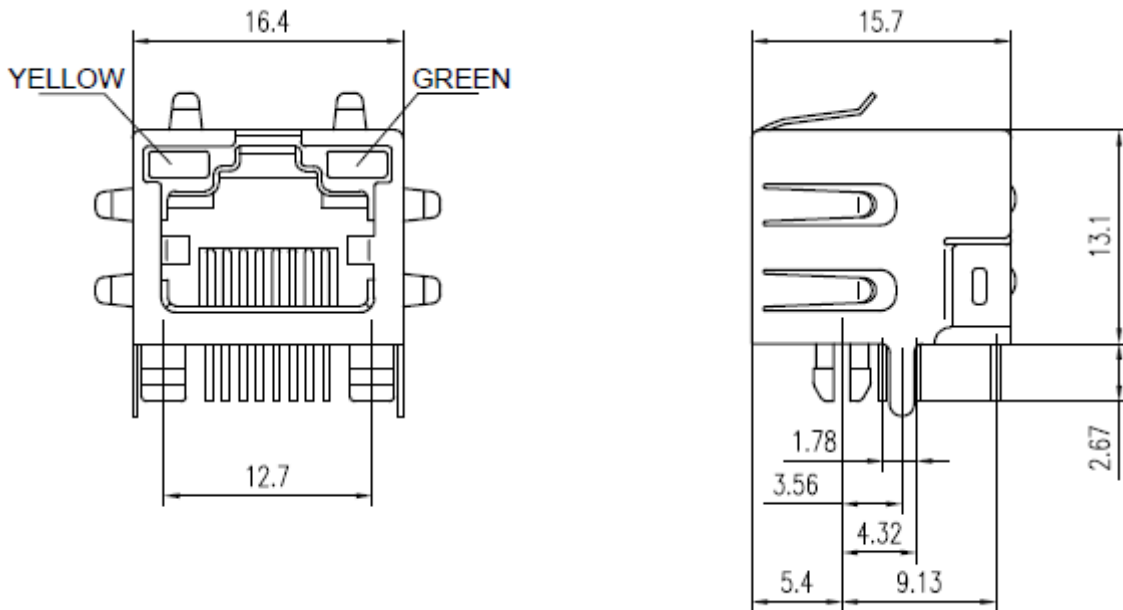
SW Solder Type Receptacle



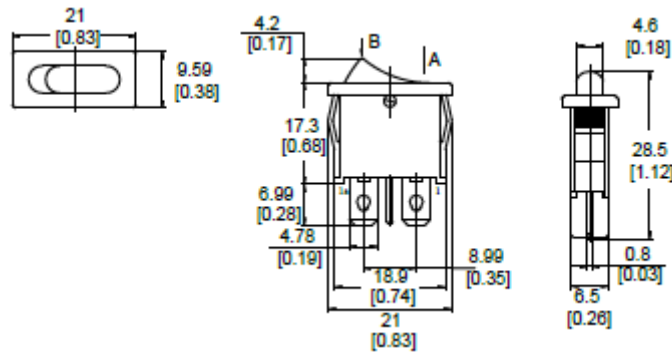
SW-10W-12 (R)

Part Number	A	B	C	ØD	E	F
SW- 8W-4 (R)	14.2	10	7.5	11	M8×0.5P	M10×0.5P
SW- 8W-5 (R)						
SW- 8W-6 (R)						
SW-10W-2 (R)	15.8	13	9.8	14.5	M11×0.75P	M12.5×0.5P
SW-10W-3 (R)						
SW-10W-4 (R)						
SW-10W-9 (R)						
SW-10W-10 (R)	16.2					
SW-10W-12 (R)						

2.7.2 LAN connector

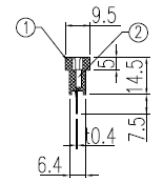
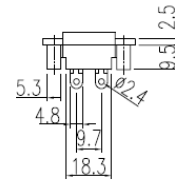
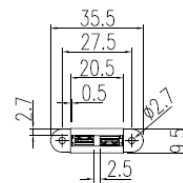


2.7.3 Power switch & Fuse holder



BR-FHAM

(발주 Lot : 100ea)



No	Component Part	Material	Remark	Plated
1	Frame	P.B.T.	UL94V-0	-
2	Terminal	BRASS	t0.4	Sn
4	Rating	-	32V 40A	-

2.8 Connection Diagram

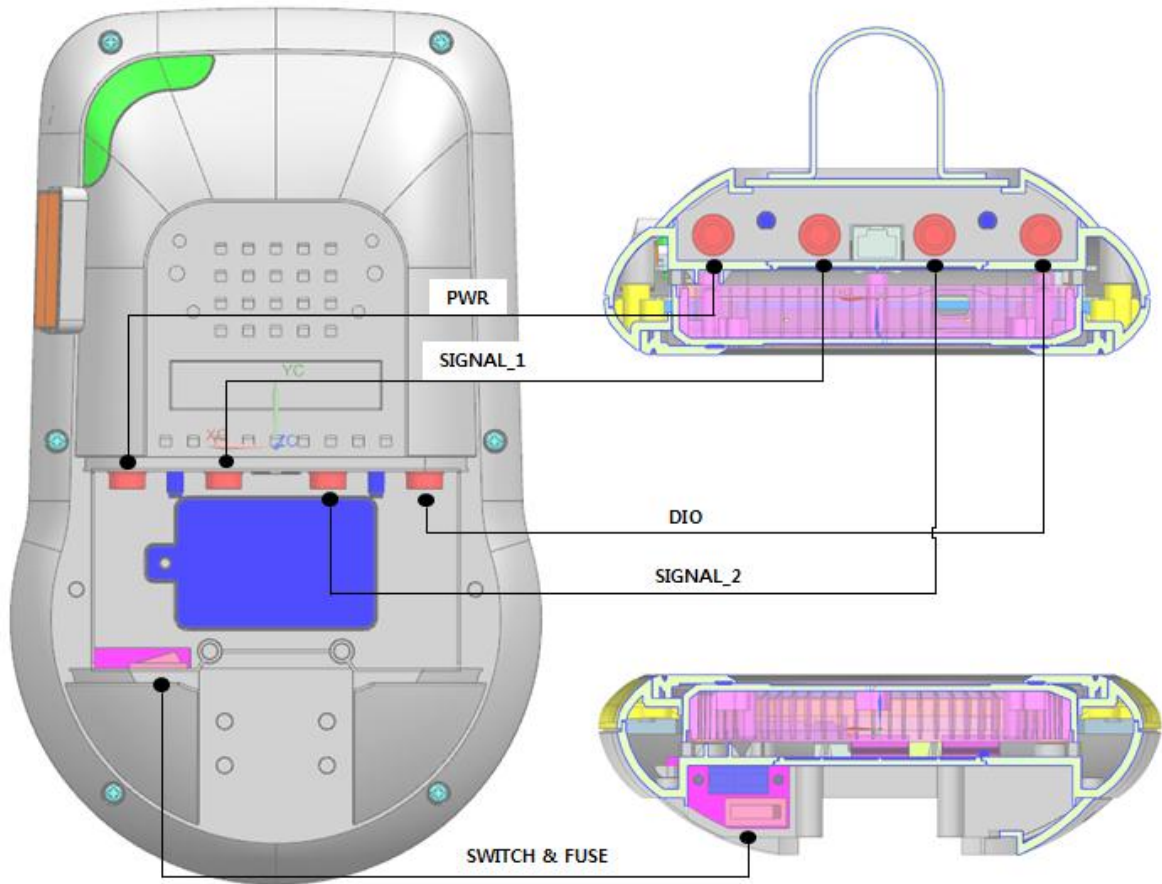
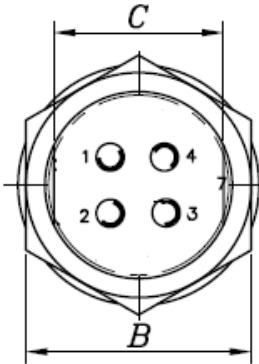


Figure 11 Connector Layout of Rear Cover

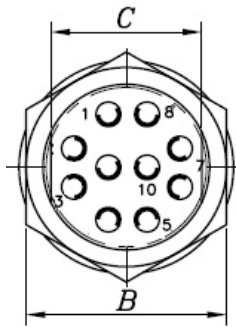
2.8.1 Rear Cover connector – PWR



Pin No	Name	Description	Connector Option
1	PWR	DC_IN	DC POWER IN 24V
2	PWR	DC_IN	
3	GND	GND	
4	GND	GND	

Table 8 Specification of PWR Connector

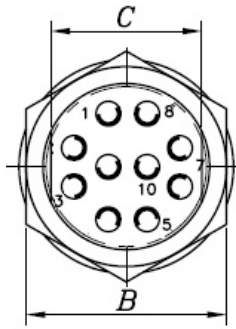
2.8.2 Rear Cover connector – SIGNAL_1



Pin No	Name	Description	Connector Option
1	RXD	Comm	RS232 Comm
2	TXD	Comm	
3	GND	Comm	
4	RXD	GND	
5	TXD	Comm	
6	GND	Comm	
7	485_A	Comm	RS 485 Comm
8	485_B	Comm	
9	485_A	RS232 & 485	RS232 or 485 (Optional)
10	485_B	RS232 & 485	

Table 9 Specification of SIGNAL_1 Connector

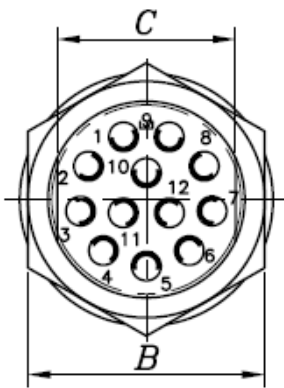
2.8.3 Rear Cover connector – SIGNAL_2



Pin No	Name	Description	Connector Option
1	VDD	DC_OUT 3.3V	RS232 Comm
2	RXD	Comm	
3	TXD	Comm	
4	GND	GND	
5	GND	GND	
6	VDD	DC_OUT 5.0V	
7	485_A	Comm	RS 485 Comm
8	485_B	Comm	
9	485_A	RS232 & 485	RS232 or 485 (Optional)
10	485_B	RS232 & 485	

Table 10 Specification of SIGNAL_2 Connector

2.8.4 Rear Cover connector – DIO



Pin No	Name	Description	Connector Option
1	VDD	VDD_IN0	Digital In/Out 2 ports
2	DIO	GPIO_IN0	
3	DIO	GPIO_OUT0	
4	GND	GND0	
5	VDD	VDD_IN1	
6	DIO	GPIO_IN1	
7	DIO	GPIO_OUT1	
8	GND	GND1	
9	CANH	CAN Comm	
10	CANL	CAN Comm	
11	N.C.		
12	N.C		

Table 11 Specification of DIO Connector

2.9 Operation & Usage

1. Turn on the validator, check the android OS booting by the LCD display. After boot-up, the operator can use the validator.
2. When the validator turned on, the card r/w makes beep sound 1 time.
3. There are three (3) colors LED (Red, Blue, and Green) on the rear cover. The LED color can be configured by setting.



Figure 12 LED configuration of rear cover

4. There are four (4) LED on the front cover indicate the card process according to the EMV process like as below;
 - Ready LED (Blue color)
 - Process LED (Yellow color)
 - Success LED (Green color)
 - Error LED (Red color)

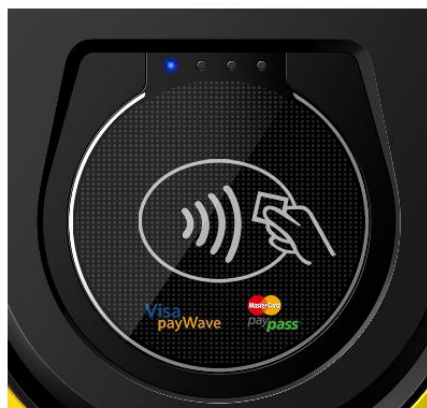


Figure 13 LED of Card processing

5. The LCD display has a resistive touch panel for operator to operate the validator by using his finger.

6. There are USB port and External Micro SD card slot on the right side of validator.
7. There are Digital In/Output port, Serial communication port and LAN (Ethernet) port on the rear cover of validator. So, it supports variable interface.
8. The validator has audio feedback to support the announcement for passenger.

FCC STATEMENT

CAUTION: Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Modifications not expressly approved by the manufacturer could void the user's authority to operated the equipment under FCC rules.

Thank You

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