

## Jaipur Metro Contract JP/JS 21 A&B

### Detail Hardware Specification

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(Ticket Office Machine / Excess Fare Office)

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SAMSUNG SDS

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# 1 Introduction

## 1.1 Purpose

The purpose of this document is to specify the hardware for the Ticket Office Machine (TOM)/ Excess Fare Office (EFO) of the Jaipur Metro AFC System. This document is primarily intended for using by SAMSUNG SDS who will design, develop, test and integrate the equipment into the Jaipur Metro AFC System and related persons of Jaipur Metro.

## 1.2 Scope

This document covers generally the physical specification of the TOM/EFO and describes technical explanation and functions of each module. Also, appearance, configuration and interconnectivity between modules are introduced in the form of pictures and diagrams.

## 1.3 Definitions, Acronyms, and Abbreviations

A/C	Alternating Current
AFC	Automatic Fare Collection
AG	Automatic Gates
AMP	Controls the speaker of AG
ATIM	Automatic Ticket Issuing Machine
AVM	Add Value Machine
BIM	Bulk Initialization Machine
BIOS	Basic Input/Output System
CA	Certificate Authority
CC	Central Computer
CF	Compact Flash
CPU	Central Processing Unit
CS	Central System
CSC	Contactless Smart Card
CST	Contactless Smart Token
CRW	Card Reader/Writer
DLP	Defect Liability Period
DMRC	Delhi Metro Rail Corporation
DTC	Delhi Transport Corporation
DVD	Digital Versatile[Video] Disk
ECU	Electronic Control Unit
EFO	Excess Fare Office

E&M	Electrical and Mechanical
EOD	Equipment Operating Data
EP	Employee Pass
FAT	Factory Acceptance Test
GCU	Gate Control Unit
GUI	Graphical User Interface
GS	General Specification
HA	High-Availability
HDD	Hard Disk Drive
HTML	Hyper Text Markup Language
IO	Input/Output
ISO	International Organization for Standardization
JTAG	Joint Test Action Group
LAN	Local Area Network
LCD	Liquid Crystal Display [Diode]
LED	Light Emitting Diode
MAC	Message Authentication Code
MCU	Main Control Unit
MCBJ	Mean Cycle Between Jam
MCBF	Mean Cycle Between Failure
MMI	Man Machine Interface
NMC	Network Management Console
M/S	Master/Slave
M/T KEY	Offers staff a interface to maintenance
MTBF	Mean Time Between Failure
MTTR	Mean Time to Repair
NFC	Near Field Communication
NPT	Network Time Protocol
NRIC	National Registration Identification Card
OS	Operating System
OCC	Operation Control Center
OFS	Offline Server
OLS	Online Server
PDF	Portable Document Format
POM	Passenger Operated Machine



PID	Passenger Information Display
PS	Particular Specification
PSU	Power Supply Unit
PTD	Portable Ticket Decoder
PTO	Public Ticket Operator
RAID	Redundant Array of Independent Disks
RDBMS	Relational Database Management System
SAM	Secured Access Module
SC	Station Computer
SDC	Software Development Center
SMS	Short Message Service
SJT	Single Journey Ticket
SLE	Station Level Equipment
SV	Stored Value
SVT	Stored Value Ticket
TCU	Token Capture Unit
TDS	Transaction Delivery Server
TOM	Ticket Office Machine
TR	Ticket Reader
TT	Tourist Ticket
TVM	Ticket Vending Machine
USB	Universal Serial Bus
UPS	Uninterruptible Power Supply
VPN	Virtual Private Network

**Table 1 List of Abbreviations**

## 2 Overview

Ticket Office Machine/Excess Fare Office have functions of Ticket Issuance/Sale, Add-value (on smart card), Consultation/Analysis, Upgrade, Refund, Replacement and handling passenger's enquiry.

Each TOM and EFO operated by station staff. TOM will be installed in the booking office and EFO will be installed at Customer Care Centre at stations. TOM/EFO consists of Main PC, Touch Screen Monitor, Passenger Information Display, Token Dispensing Mechanism, Receipt Printer, Speaker (Only for EFO), Keyboard, and Mouse.

The following figure represents the appearance of TOM/EFO detailed. (All the equipment presented in the below figure will be provided to the Employer except the table, chair and dispensing hole of table. The table, chair and dispensing hole of table are out of scope.)

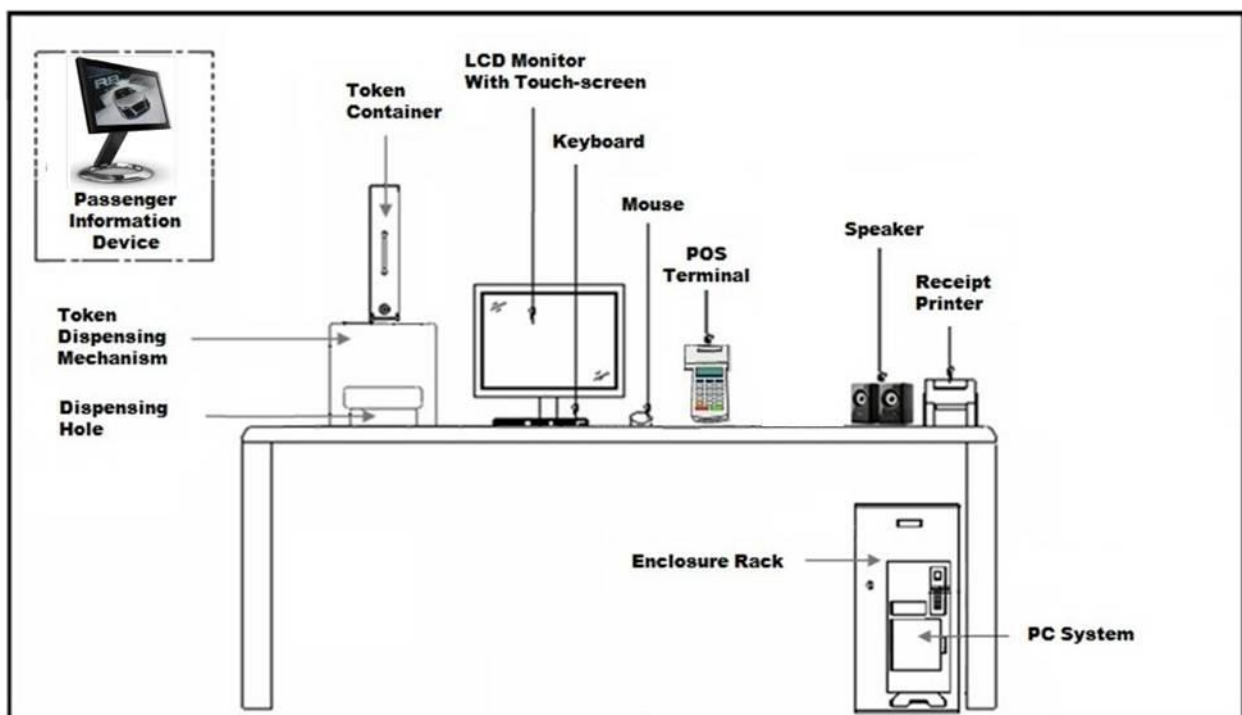


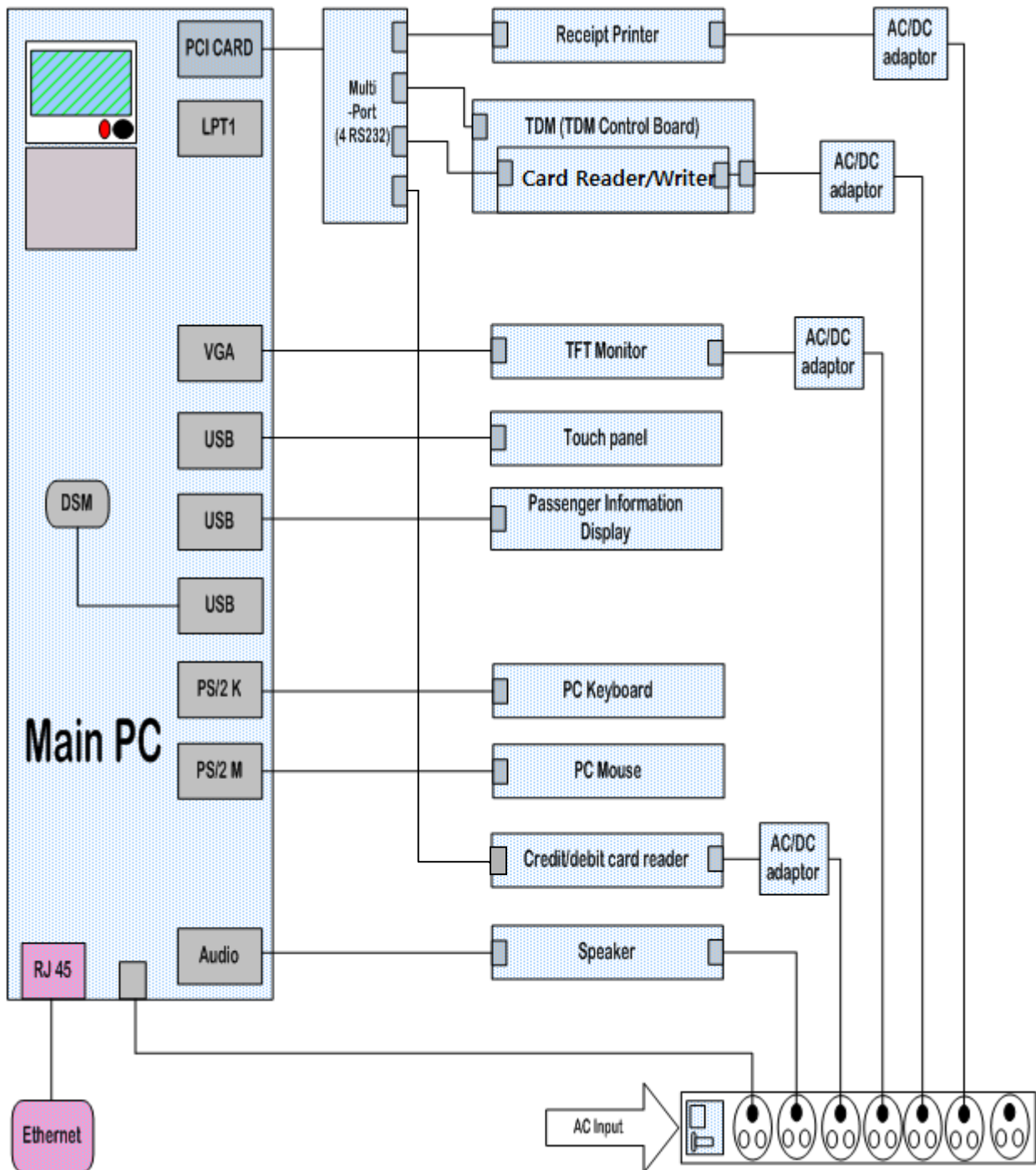
Figure 1 Typical TOM/EFO

TOM/EFO will be supplied with power by UPS, which was already set in Station office.

TOM/EFO will be composed of the following units:

- Main PC
- Touch Screen Monitor
- Passenger Information Display(PID)
- Ticket Dispensing Mechanism(TDM)
- Receipt Printer
- Speaker (only for EFO)
- Credit/debit Card reader
- AC/DC Power

The following figure shows electronic block diagram of TOM/EFO.



**Figure 2 Electronic Block Diagram of TOM/EFO**

## 3 Main PC and Monitor

### 3.1 PC

Main PC on TOM/EFO is for operating TOM/EFO applications and communicating with Touch Screen Monitor, Card Reader/Writer, PID and Receipt Printer. It will also communicate with SC by TCP/IP protocol.

The following figure is the appearance of Main PC on TOM/EFO.



Figure 3 Appearance of Main PC

Main PC on TOM/EFO will have the following specification.

Item	Specification
CPU	Intel i3-2120 3.3GHz
Memory	3GB RAM
HDD	500 GB
O/S	Windows 7 Professional (32-bit)
Input device	Keyboard & Mouse
Port	4 Port Multi-port & USB Ports

Table 2 Specification of Main PC on TOM/EFO

### 3.2 Touch screen monitor

Touch Screen Monitor will show GUI of TOM/EFO and operate TOM/EFO by tapping his/her finger on the screen. Touch Screen Monitor will display the following information:

- Ticket processing instruction
- Ticket encoding information
- Service status information
- Failure message

The following figure is the appearance of Touch Screen Monitor (LCD Monitor and touch screen panel).



Figure 4 Appearance of Touch Screen Monitor

Touch Screen Monitor will have the following specification.

Item		Specification
Monitor	Type	17" TFT-LCD
	Resolution	1280(W)*1024(H)
	Power	12V DC(AC/DC Adaptor)
Touch Screen Panel	Type	4-wire Resistive Touch
	Interface	USB 1.1/2.0
	Response Time	5ms

Table 3 Specification of Touch Screen Monitor

## 4 Token Dispensing Mechanism (TDM)

### 4.1 Enclosure and layout

#### 4.1.1 Enclosure

The following figures show appearances of Ticket Dispensing Mechanism (TDM)

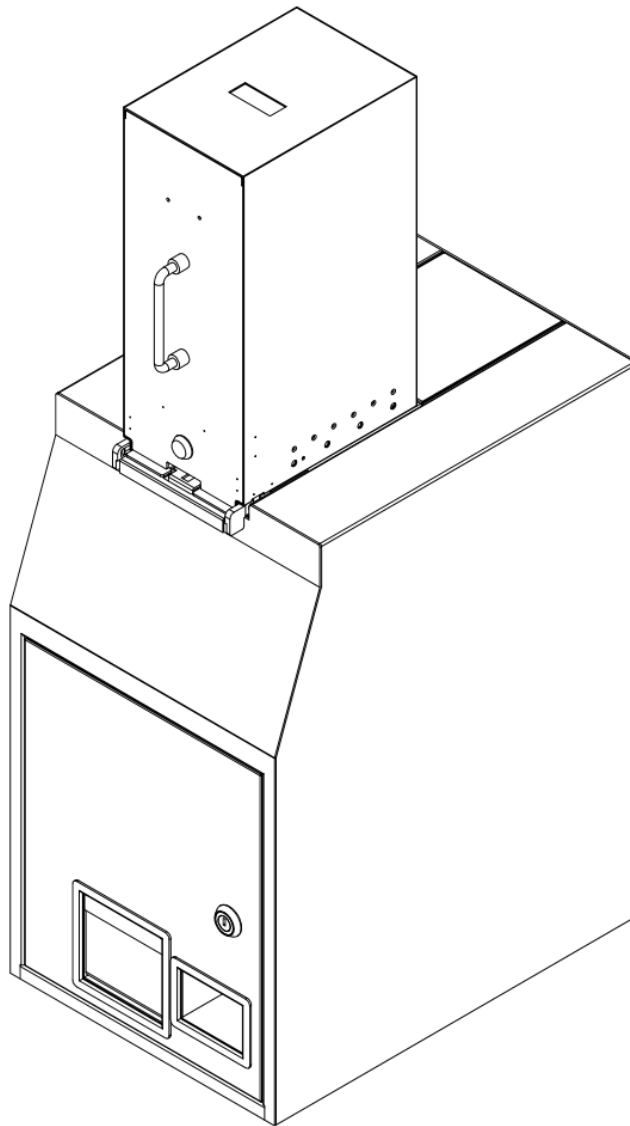
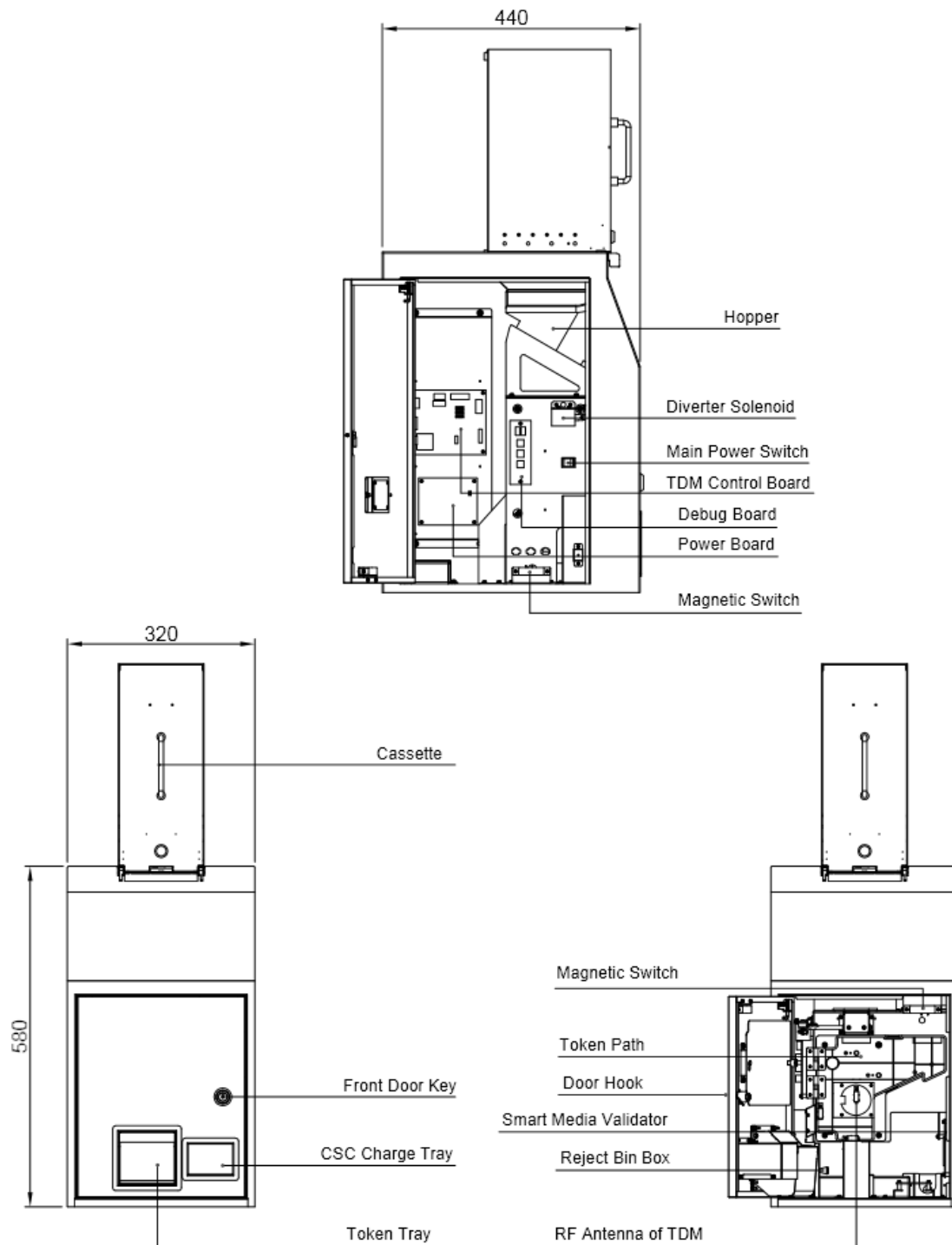


Figure 5 Appearance of TDM

### 4.1.2 Layout

The following figures show layout of TDM.



**Figure 6 Layout of TDM**

## 4.2 Block Diagram

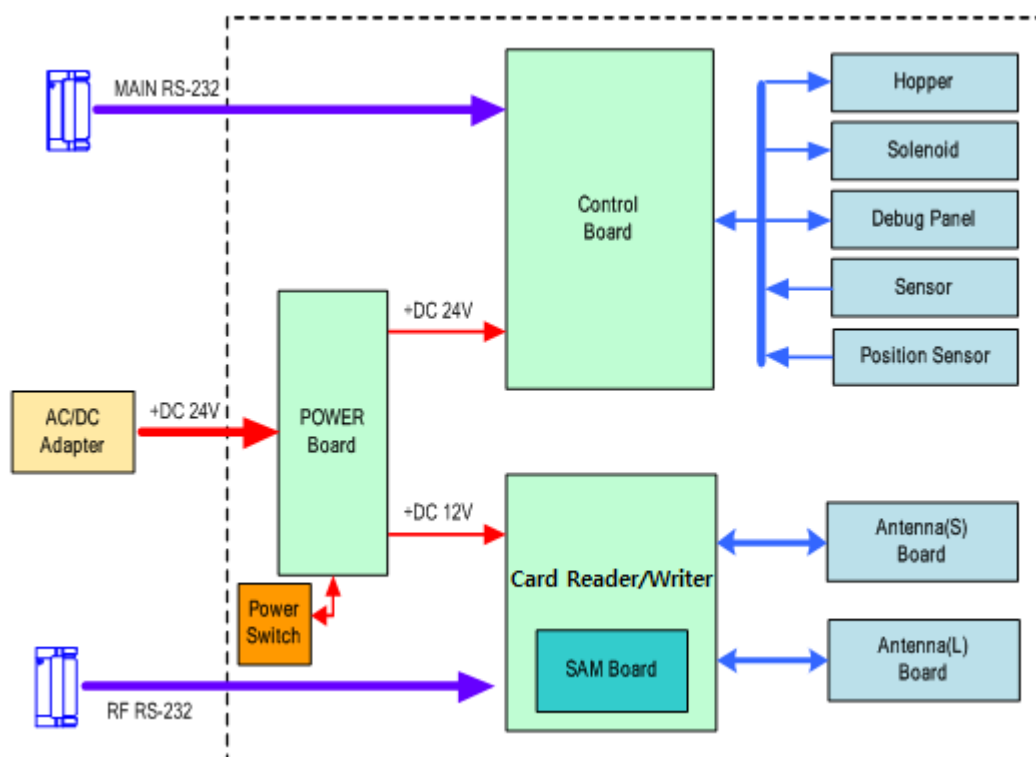


Figure 7 Electronic Block-diagram of TDM

## 4.3 Specification

Item		Description
Weight		24kg
Dimension		580*320*440(H*W*D)mm
Environment condition	Temperature	0℃ ~ +55℃
	Humidity	10~ 90% (no condensation)
Power		AC 220 ~ 260V, 50Hz ±2%
Control Interface		RS232
Noise	Idle	> 50 dB (1m front-line areas)
	Operation	> 70 dB (1m front-line areas)
CST Loading Capacity	Hopper	CST 300 EA
	Container	CST 2000 EA
Token issuing speed		About 1Token/ 1sec.

Table 4 Specification of TDM



## 4.4 TDM Control Board

The TDM control board controls all of the TDM components. (Hopper motor, sensors, solenoids and etc.) The table below shows the specifications of TDM control board

Item	Specification
<b>CPU</b>	STR710FZ2, 32-bit ARM7 Micro-processor
<b>Memory</b>	Internal 256KB flash, 64KB RAM
<b>Actuator</b>	Solenoid, Hopper
<b>Sensor</b>	Photo Sensors
<b>Power</b>	DC 24V
<b>Interface</b>	RS-232

Table 5 Specification of TDM Control Board

## 4.5 Token Container

A token container will be capable of 2000 tokens. The same Token Container will be able to be used for both AG and TOM/EFO. In other words, the token container of Gate will be able to be directly replaced with the token container of TDM on TOM/EFO. Material of token container is stainless steel.

Item	Description
<b>Material</b>	Stainless Steel
<b>Capacity</b>	2000Tokens/Container
<b>Quantity</b>	1EA

Table 6 Specification of Token Container

## 4.6 Card Reader/Writer

TOM/EFO has a Card Reader/Writer that supports ISO 14443 TYPE A.

Card Reader/Writer as RF interfaces for contactless card reading and 4 SAM interface for security of card data.

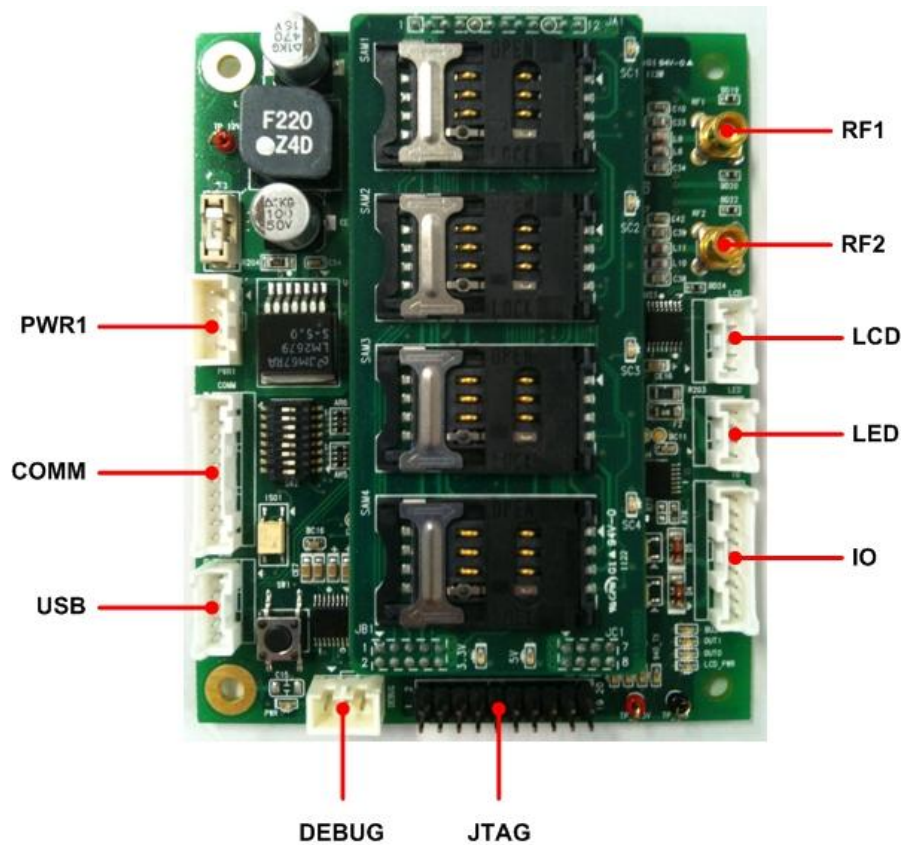


Figure 8 Appearance of Card Reader/Writer

### 4.6.1 Specification

Item	Description
<b>CPU</b>	32bit RISC Internal Flash : 256KB Internal SRAM : 64KB
<b>Communication</b>	RS232 or RS422
<b>Standard support</b>	ISO14443 TYPE A
<b>Operation Frequency</b>	13.56MHz
<b>Sub-carrier Frequency</b>	847.5KHz
<b>Input Power</b>	DC 12V
<b>Internal Module</b>	4 SIM Socket on SAM Board

Table 7 Specification of Card Reader/Writer

### 4.6.2 Pin Assignment

- 1) Main Power( PWR1) : **SMW250-04P**

No	Description
1	+12V
2	+5V
3	GND
4	GND

Table 8 Pin Assignment of the Main Power

- 2) Debug Port(DEBUG) : **SMW250-03P**

No	Description
1	TX
2	RX
3	GND

Table 9 Pin Assignment of the Debug Port

- 3) External Communication(COMM) : **B10B-PASK**

No	Description	No	Description
1	TX	6	RXD-
2	RX	7	TXD+
3	GND	8	TXD-
4	GND	9	HW_RST+
5	RXD+	10	HW_RST-

Table 10 Pin Assignment of the External communication

4) RF Antenna 1(RF1) : **SMA-Right Angle**

No	Description
1	RF Signal
2	GND

Table 11 Pin Assignment of the RF Antenna 1

5) RF Antenna 2(RF2) : **SMA-Right Angle**

No	Description
1	RF Signal+
2	GND

Table 12 Pin Assignment of the RF Antenna 2

### 4.6.3 SAM Interface Board

This module includes SAM Interface Board that embeds 4 SIM sockets for each SAM and it will secure and keep key data of the RF card. Each SAM connects to different communication channel. It is processed independently without interference when reads a ticket because it communicates only with related SAM.

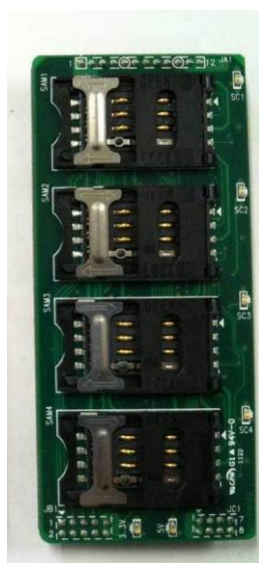


Figure 9 Appearance of SAM Interface Board

#### 4.6.4 Antenna Board

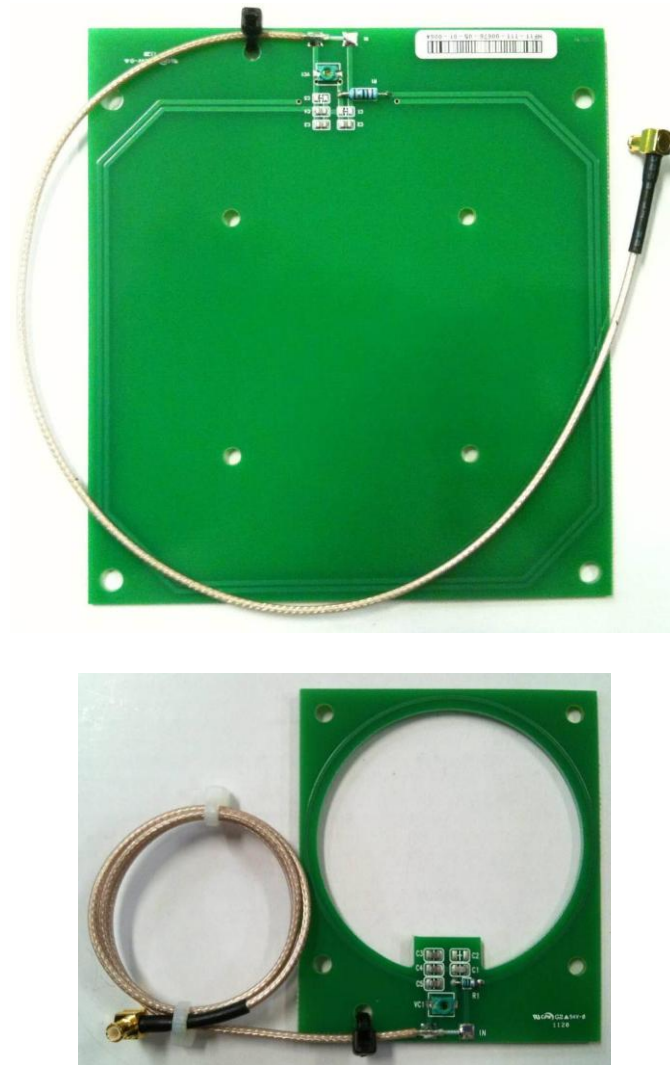


Figure 10 Appearance of Antenna (Large and Small)

Items	Specification
Antenna Type	Loop Antenna for PCB
PCB Dimension	Large: 110.00(W) * 120.00(H)mm
Carrier Frequency	13.56MHz
Impedance Matching	50Ω

Table 13 Specification of Large Antenna

## 4.7 AC Adaptor & Power Board

Ac adaptor supply DC24V power to power board in TDM and Power board supply DC24V and DC12V to CSM issuer

### 4.7.1 AC Adaptor Specification

Item	Specification
Input Voltage	AC 90V~264V
Input Frequency	47 ~ 63Hz
Efficiency	80%(Min.)
Output Voltage	24V
Output Current	5A(Max.)
Over Current Protection	Output is short-circuited continuously with 100 milliohms or less. The output current shall be internally limited to $6 \pm 0.6A$ .

Table 14 Specification of AC Adaptor

### 4.7.2 Power Board



Figure 11 Layout of power board

## 4.8 Debug Panel Board

7-segment 2ea (Error Code display), button 3ea (operation/Maintenance)



Figure 12 Layout of Debug Panel Board

## 5 Passenger Information Display(PID)

Passenger Information Display will be used to inform passenger of the relevant ticket and cash information. PID will have some features. It will display letters in English and Hindi characters, pictograms, alphanumeric and symbols. And it will display information visible from all angles in broad day light. Also display information will be able to be easily configurable in local situation.

The following messages will be displayed on PID:

- Ticket amount messages
- Current transactions messages
- Error codes and corresponding messages

The following figure shows the appearance of PID.



Figure 13 Appearance of PID

The specification of PID is as follows:

Item	Specification
<b>Display size</b>	7inch wide screen
<b>Resolution</b>	800 x 480(WVGA)
<b>Brightness</b>	375cd
<b>Contrast Ratio</b>	350:1
<b>Response time</b>	30ms
<b>USB Connector</b>	USB Mini 5-pin B type
<b>Power</b>	USB Power(5V),3.3~4.9W
<b>Function</b>	USB Sub Monitor, Pivot
<b>Color</b>	High Glossy Black

Table 15 Specification of PID

## 6 Credit/Debit Card Reader

### 6.1 General Description

The credit/debit card reader is consisting of credit/debit card module and PIN Pad. The credit/debit card module can accept the credit/debit card from the passenger and read the data from the credit/debit card. The PIN Pad gets the PIN from passenger and then tries to receive the approval message from Bank server.

### 6.2 Layout

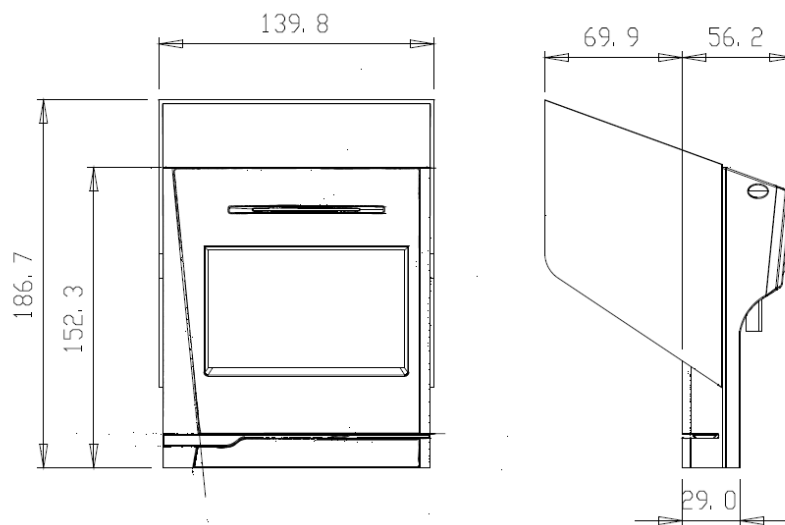


Figure 14 Layout of Credit/Debit Card Reader

### 6.3 Specification

Item	Specification
Display	graphical LCD
Security	3DES encryption, etc
Power	DC 12V, 2A
Key Pad	Touch Key Input
Interfaces	RS232 serial port Ethernet host ports
Dimension	186.7mm * 139.8mm * 56.2mm (L * W * H)

Table 16 Specification of Credit/Debit Card Reader



## 7 Other Modules

### 7.1 Receipt Printer

Receipt Printer will be used to print receipt for shift end report, group tickets and all transactions. Also it will be able to print the transaction receipt on demand of passenger. These are printed in English.



Figure 15 Appearance of Receipt Printer

Item	Specification	
<b>Printing Type</b>	Serial Impact Dot Matrix, 9-Pin	
<b>Printing Font</b>	Font	7 * 9 / 9 * 9
	Columns	40/42, 33/35
<b>Interface</b>	RS232C, Bi-directional parallel	
<b>Data buffer</b>	16KB	
<b>Printing speed</b>	5Lines/sec	
<b>Paper</b>	Roll paper	
<b>Inked ribbon</b>	ERC-38(Black/Red, Black)	
<b>Power</b>	DC 24V (AC adapter)	
<b>Auto Cutter</b>	Guillotine type, Full/Partial cut	

Table 17 Specification of Receipt Printer

## 7.2 Keyboard / Mouse

A small keyboard and a standard mouse will be equipped on TOM/EFO. The following figure shows a small keyboard.



Figure 16 Appearance of Keyboard

## 7.3 Multi-port (4 port)

Multi-port is a universal PCI multi-port serial board and installed in PC. Multi-port enables 4 port serial ports to be expandable for each board.

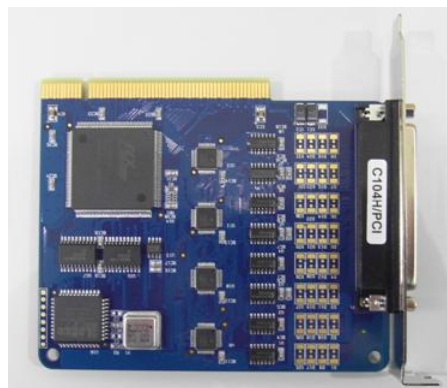


Figure 17 Appearance of Multi-port

Item	Specification
Circuit interface	RS232C
The number of port	4 ports
Transmission speed	Maximum 921.6kbps
Bus interface	PCI
Connector type	DB9 Male

Table 18 Specification of Multi-port

## 7.4 Speaker

The Speaker would be used for audio feedback to passenger. It will be used for EFO only.



Figure 18 Appearance of Speaker

Item	Specification
Power Output	3W * 2
Frequency response	80Hz~18KHz
Power Input	AC220V/60Hz
Controller	Power, Volume

Table 19 Specification of Speaker

## 8 DSM (Data Security Module)

### 8.1 DSM Specification

DSM is made up of DSM READER and SIM CARD.

SIM CARD which is used in DSM complies with ISO7816.

DSM READER provides DSM function by inserting SIM TYPE CARD inside itself and connecting it to PC or ECU.



Figure 19 DSM

DSM will have the following specification.

Item	Specification
Host Interface	<ul style="list-style-type: none"> <li>- Plug and Play, USB full speed(12Mbps)</li> </ul>
Smart card interface	<ul style="list-style-type: none"> <li>- Supports ISO7816 Class A, B and C</li> <li>- Supports all ISO7816 TA1 parameters(up to 344 kbps )</li> <li>- Reads from and writes to all ISO7816-1,2,3,4 microprocessor cards, T=0 and T=1</li> </ul>
Smart Card Connector	<ul style="list-style-type: none"> <li>- 8 Frictions contacts – ISO location</li> <li>- 10,000 insertion cycles</li> </ul>
Human Interface	<ul style="list-style-type: none"> <li>- LED one color (Green) Standards/Certifications</li> <li>- ISO/IEC 7816-1,2,3,4: IC cards with contacts</li> <li>- Microsoft Windows Hardware Quality Labs (WHQL)</li> <li>- USB2.0 Full Speed</li> <li>- CCID – Chip Card Interface Device 1.0</li> </ul>
APIs	<ul style="list-style-type: none"> <li>- Microsoft PC/SC environment with associated drivers</li> <li>- Other environments (OCF, CT-API) upon request</li> </ul>
Operating System Support	<ul style="list-style-type: none"> <li>- Windows 98, 98se, Me, 2000, XP</li> <li>- Other OS supported upon request (Linux, MacOS X)</li> </ul>
Cable/Power Supply	<ul style="list-style-type: none"> <li>- USB type A connector</li> <li>- Power supply thru USB port</li> <li>- Operating voltage 4.4 ~ 5.5V</li> </ul>
Environmental Performances	<ul style="list-style-type: none"> <li>- CE, FCC part 15Class B, VCCI, BSMI, C-Tick</li> <li>- EN 60950/UL950/CSA950</li> <li>- Operating Temperature: +5℃ to +55℃</li> </ul>
Dimensions (mm)	<ul style="list-style-type: none"> <li>- 64(H) * 16(W) * 8(D)</li> </ul>

Table 20 Specification of DSM

## 8.2 How to interface

### 8.2.1 For TOM/EFO

In case of TOM/EFO, as shown in the below figure, add USB extension cable to USB port inside TOM/EFO PC and connect DSM to this USB's extension cable. This device is installed inside.

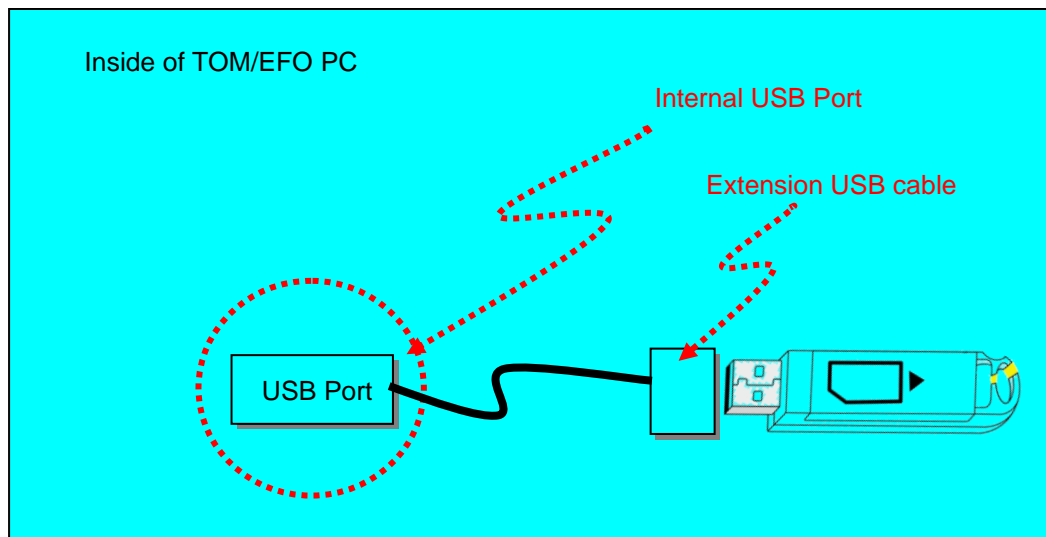


Figure 20 Block diagram of DSM