

Automatic Gate Machine (AGM)

OVERVIEW

Automatic Gate (AG) is separated with entry gate, exit gate, and reversible (bi-directional/unidirectional) gate. And according to type of door, AG is separated with normal gate and wide gate (this can also use as luggage gate). By installed AG, a station is separated with free area and paid area. When a passenger tries to enter into paid area, or come out from paid area, AG checks the validity of ticket. If the ticket is valid, AG opens sector door for the passenger to pass over the gate. And if the ticket is invalid, AG stays closed for prohibition of the passenger's passage, and guides the passenger to ticket office. When a passenger pass exit gate with a token, the token is captured, and in case of card, electronic value is deducted.



GATE TYPE

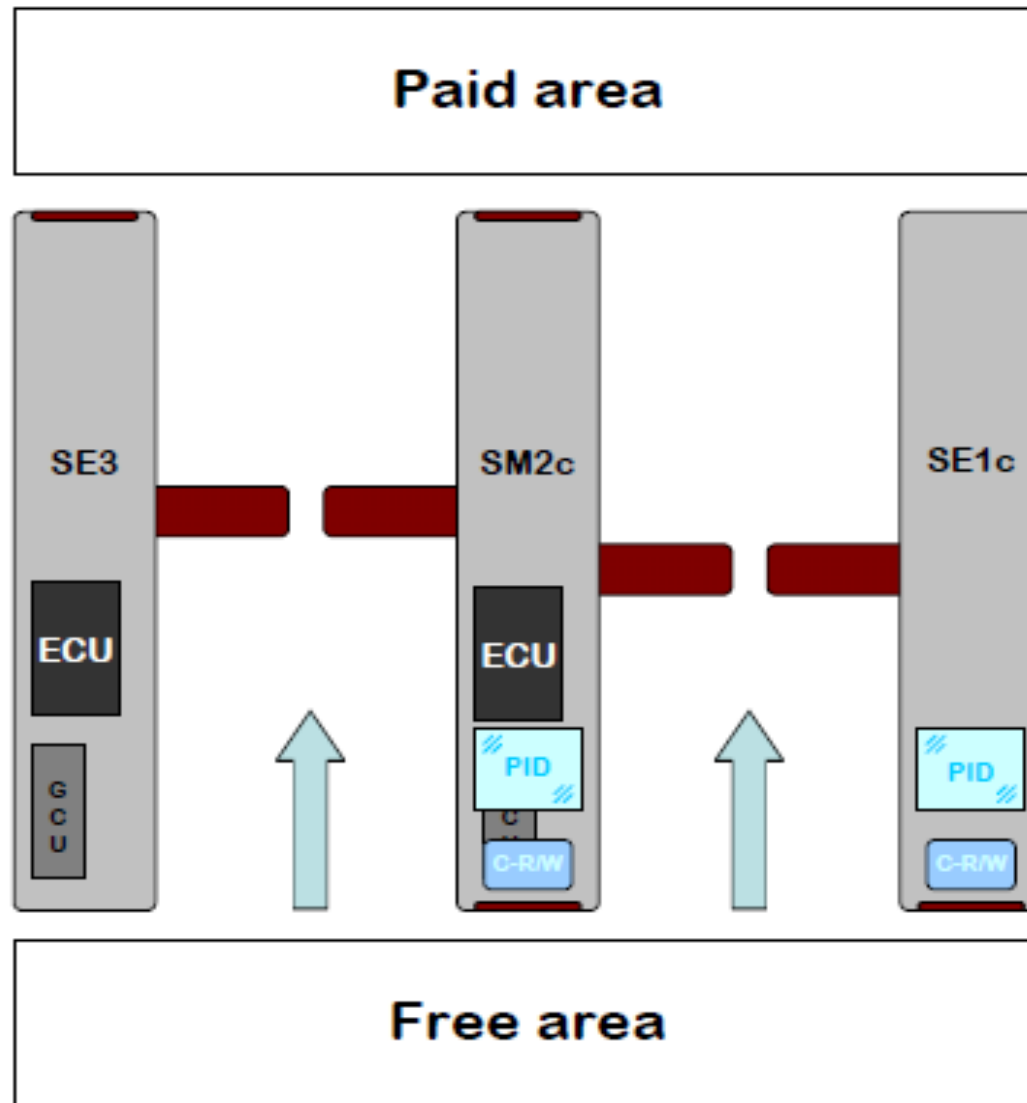
■ Aisle type

Gates are installed on the station in a typical array of aisles. Four types of aisles are as follows:

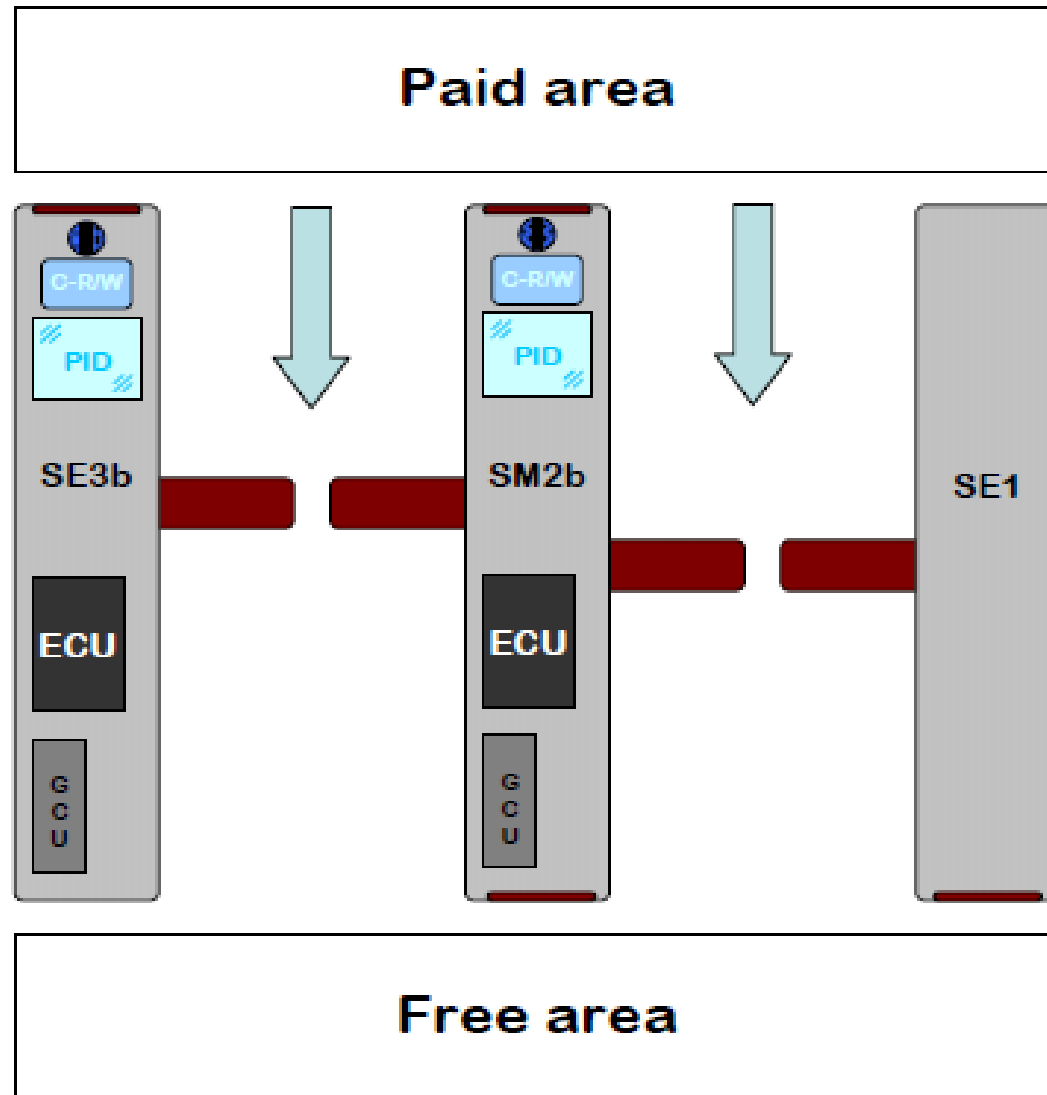
- (1) Entry Gate
- (2) Exit Gate
- (3) Reversible Gate (bi-directional)
- (4) Wide Gate

The Entry Gate, Exit Gate and Reversible Gate consist of common hardware modules and have the same physical size. The cabinet size of gate is 1900 X 1100 X 300mm (W X H X D), the aisle width is 550mm. (Wide Gate : 900mm)

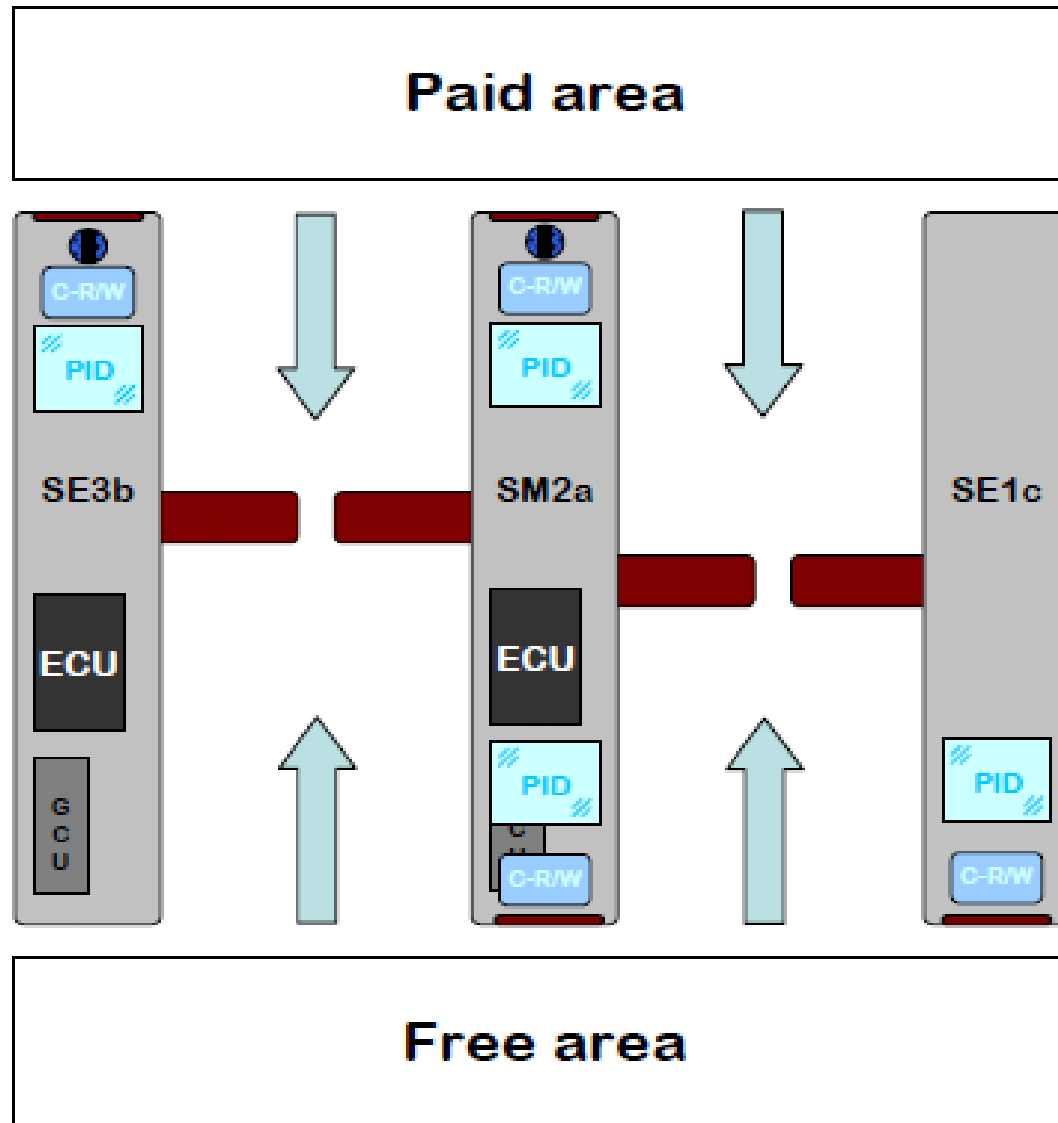
ENTRY GATE



EXIT GATE

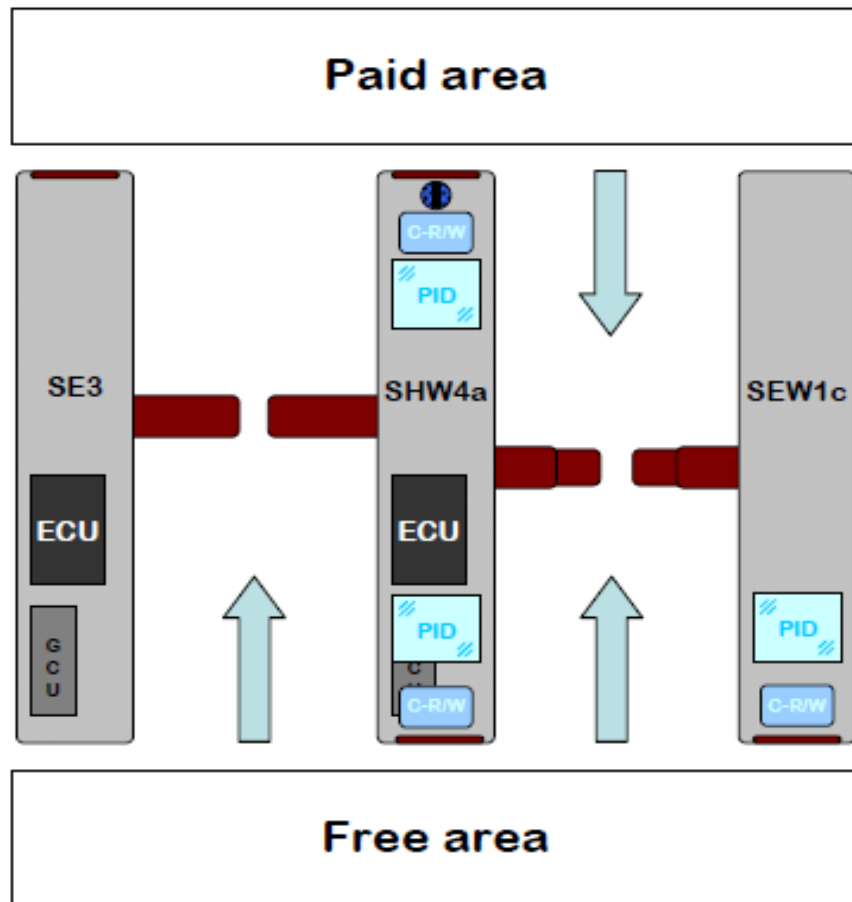


REVERSIBLE GATE

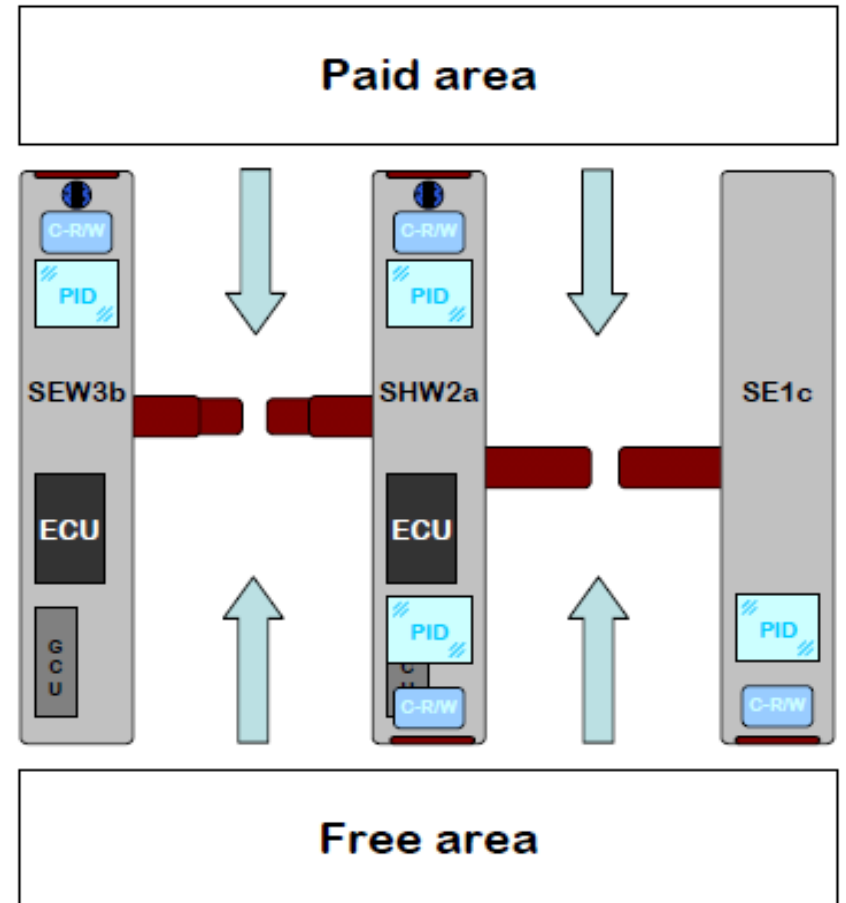


WIDE GATE

Basically, there are two types of wide gates:



TYPE A



TYPE B

Basic Functions

Basic Functions are following:

- Mode Control
- Processing Ticket
- Passenger Service
- Staff Service

MODE CONTROL

AG has following modes and can be set to selected mode in according to the operation purpose.

1. Operation mode : In Service, Out Of Service, Failure, Maintenance
2. Aisle mode: Entry, Exit, Bi-Directional
3. Door mode: Normally Closed, Normally Open
4. Special mode: Time Override, Entry/Exit Override, Station Close, Emergency, Incident, High Security

PROCESSING TICKET

AG CRW reads/writes data on a ticket and checks the validity of it based on the business rule of Jaipur AFC system. Passengers presenting a valid ticket can pass the gate, and passengers with an invalid ticket should go to EFO to adjust the ticket.

Types of fare media can be used at the gate are as follows:

1. Contactless Smart Token (CST, ISO 14443 Type A)
 - a) Single Journey Ticket
 - b) Child Ticket
 - c) Paid Ticket
 - d) Free Ticket

2. Contactless Smart Card (CSC, ISO 14443 Type A)

- a) Stored Value Card (SV)
- b) Tourist Ticket (Tour)
- c) Staff / Employee Pass (EP)
- d) Test Ticket (TT)
- e) Group Ticket (GT)
- f) Prepaid Card
- g) Weekly / Monthly Pass
- h) Trip Pass
- i) Promotional Ticket

3. NFC Media (ISO 18092 compliant)

- a) For test purpose.

PASSENGER SERVICE

AG provides services for passenger as follows;

- 1.Displaying mode of AG on the passenger information display
- 2.Indicating the availability of AG on the Direction Indicator
- 3.Ticket processing base on the business rule
- 4.Collecting valid token to token container
- 5.Returning invalid token to return cup
- 6.Displaying ticket processing result on the passenger information display
- 7.Passenger safety

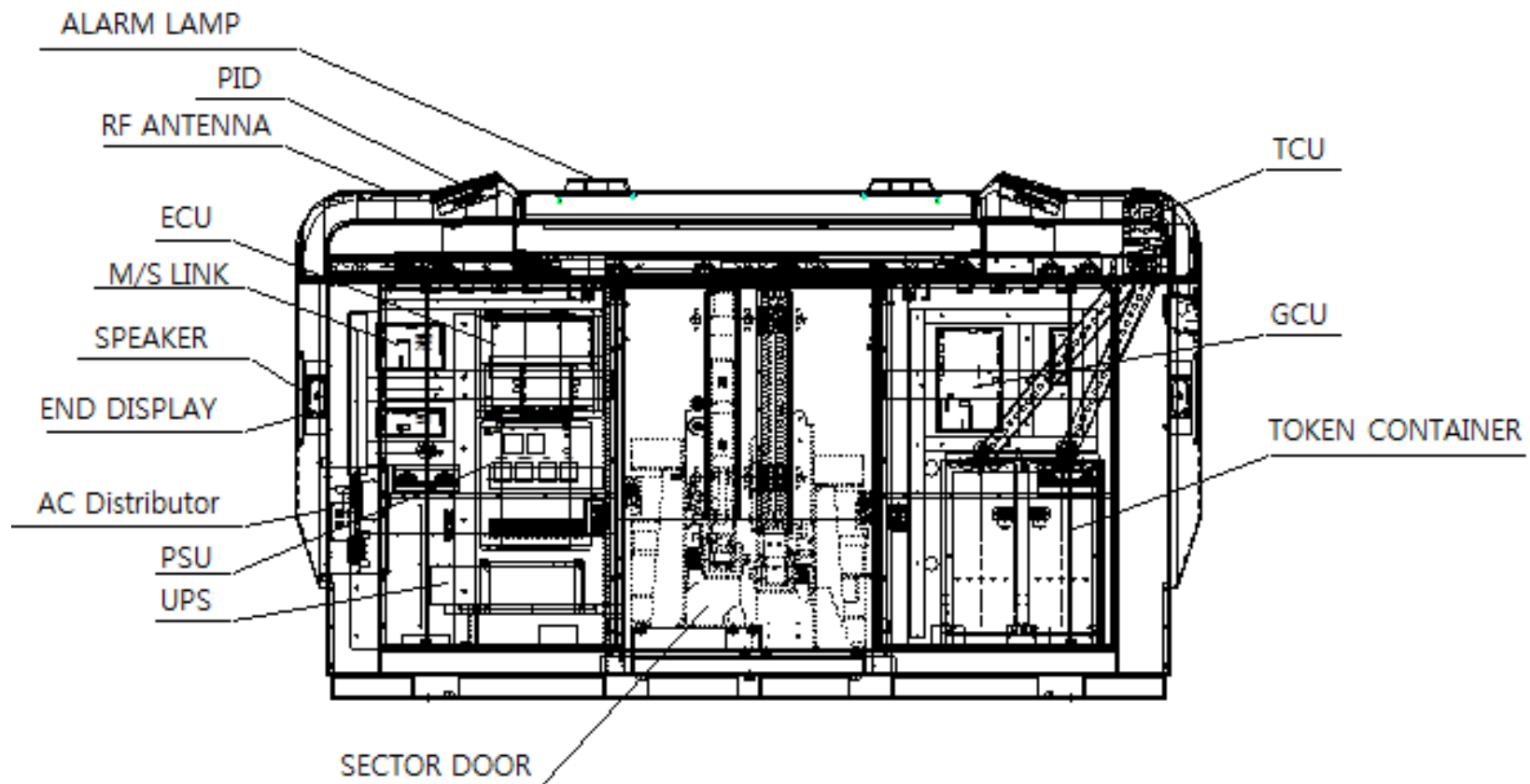
STAFF SERVICE

AG provides following categories of maintenance service for staffs;

- 1.Operation Management
- 2.Data inquiry
- 3.Mode control
- 4.Module Test
- 5.AG configuration
- 6.Error reset

SYSTEM ARCHITECTURE

Hardware Configuration



Internal and External layout of the AG

System	Item	Specification
Cabinet (Enclosure)	Dimension(mm)	1900±2.0(W) * 1100±2.0(H) * 300±2.0(D)
	Width of aisle	550mm(Normal), 900mm(Wide)
	Material, Color	1) Outside steel of enclosure <ul style="list-style-type: none"> • Material: ANSI 304 grade Stainless steel 2.0 mm • Finishing: Hairline Brushed 2) Plastic top cover (for Entry, Exit, Dummy) <ul style="list-style-type: none"> • Material: PC-ABS • Color: Pantone 2425c
	Control method	Sector Door barrier
	Passenger Sensing	20 infrared sensors Sensor height : 910mm
Electronic Control Unit (ECU)	Processor	ULV Celeron-600M CPU
	Memory	512MB
	Disk	1GB CF Card, 256MB DOM
Gate Control Unit(GCU)	Processor	32 Bit Processor (ARM7TDMI) Internal clock – 44.2368Mhz About 40MIPS (Million Instructions Per Second: MIPS is processing time of instruction. This specification is provided by processor manufacturer.)
	Memory	256KB Flash, 64KB SRAM
Card Reader / Writer	CPU	32bit RISC
	Communication Protocol with Host	RS232 or RS422
	RF Module Method	ISO14443 TYPE A

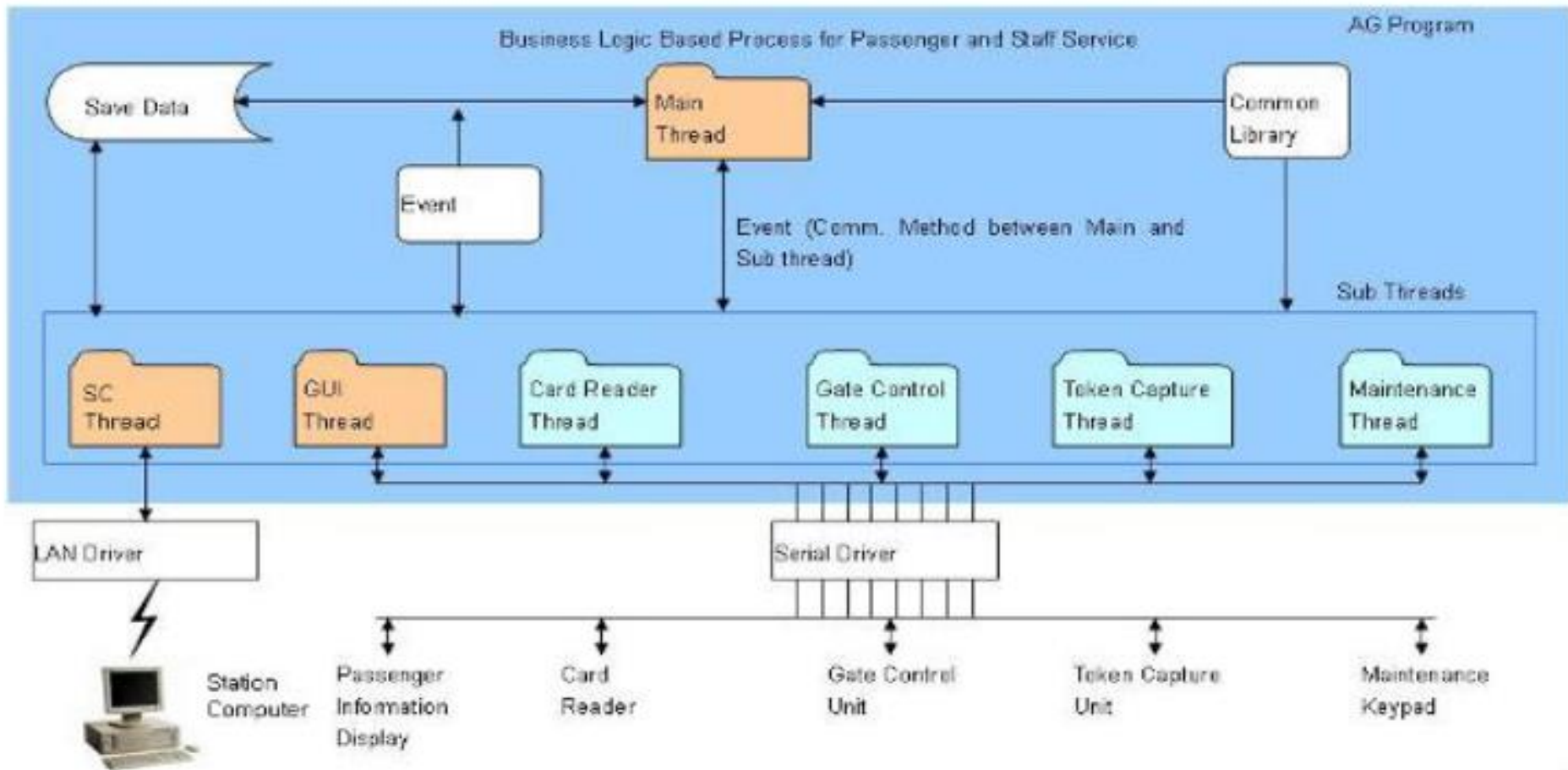
Sector Door	Type	Normal Type	Wide Type
	Operation speed of Door	≤ 0.5 sec	≤ 0.7 sec
	Dimension	-Open 270.0 ±4.0(D) * 703.7 ±1.5(H) * 290.4±1.5(W) mm -Close 526.7±4.0(D) * 703.7±1.5(H) * 290.4±1.5(W) mm	- Open 292.2±4.0 (D) * 753.7±1.5 (H) * 291.4±1.5 (W) mm - Close 665±6.0 (D) * 753.7±1.5 (H) * 291.4±1.5 (W) mm
	Weight	< 18 Kg	< 30 Kg
	Material, Color	<ul style="list-style-type: none">Material: Outer layer of flaps constructed from polyurethane foamColor : Pantone 361c	
Token Capture Unit(TCU)	TCU Size(mm)	135±0.5(W)*175.6±0.5(H)*110±0.5(D)	
	Token Container Capacity	2000 pieces/container, We can be designed according client requirements	
Passenger Information Display(PID)	PID is a LCD screen type.		
	Screen Size	6.4 Inch (Diagonal)	
	Display Format	640(W) * 480(H)	
End display	LED	Red, Green, Yellow lamp	
Passenger Detecting Sensor	Sensor	20 sets	
	Weight	17g	
Buzzer	Min. Sound Pressure	90dB at 12VDC/30cm	

System	Item	Specification	
	Level		
Speaker	Type	YDT5090-1	
	Output S.P.L	84±3Db	
Power Supply Unit(PSU)	Input voltage (V)	AC176 ~ 265	
	Output Rated Voltage (V)	5.3, 12.5, 24 (according to Input voltage)	
Uninterrupted Power Supply(UPS)	Rated Capacity	500VA (300Wat)	
Alarm Lamp	LED	Yellow/ Red/ Green LED	
Power Consumption	Power Consumption of AG	Normal Operation -Voltage: 220.00 AC -Current: 1.22 A -Power: 199.12W	Peak Operation -Voltage: 221.00 AC -Current: 1.71 A -Power: 331W

Description of Internal configurations

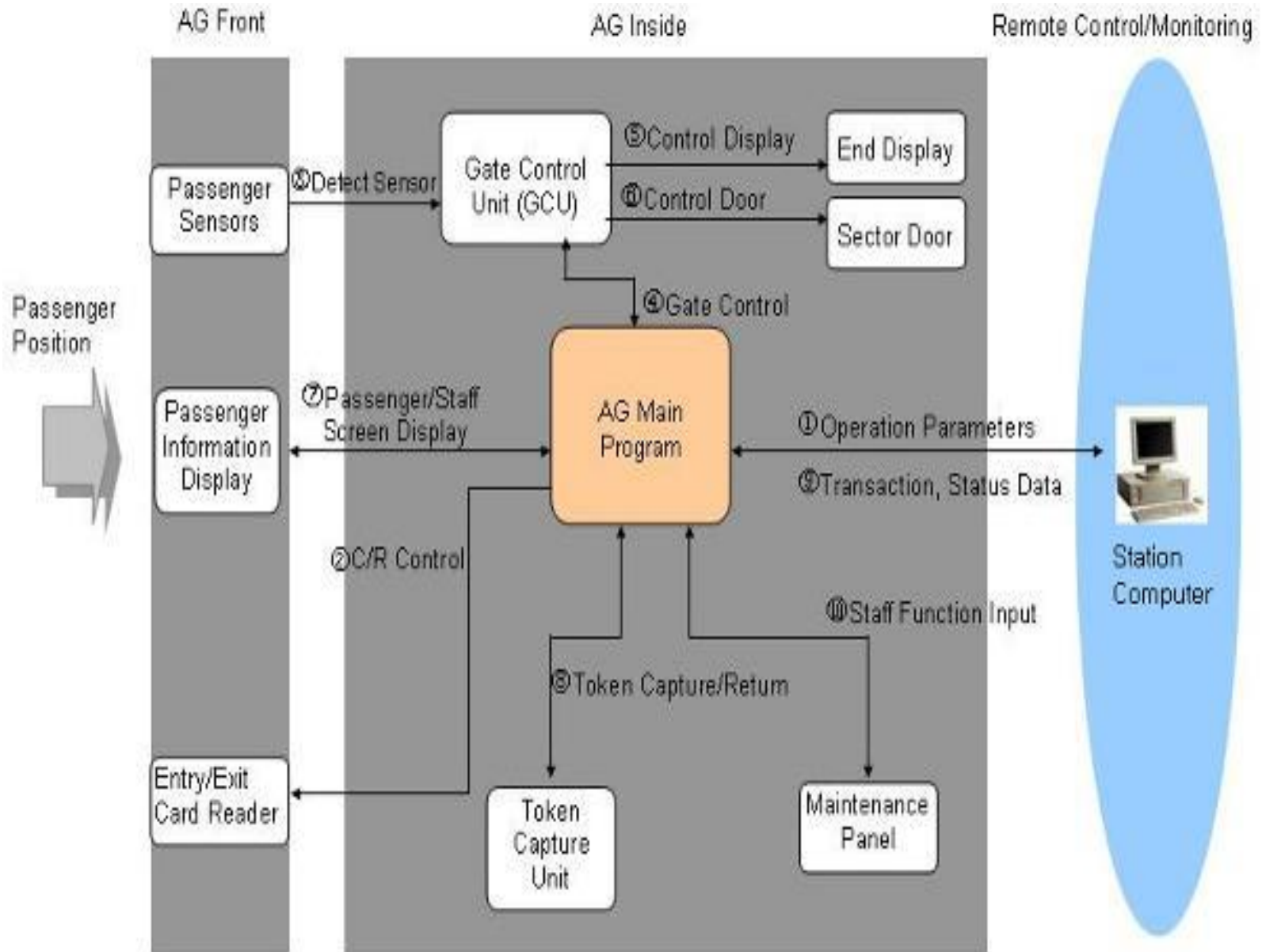
Software Architecture

Process Architecture



Software Architecture of AG

Thread	Descriptions
Main Thread	Main control thread of AG. It monitors AG operation status and make a passenger service.
SC Thread	Station Computer Communication Thread. It receives the parameter data and commands from Station Computer. It sends a transaction data, AG Status, and events generated in the AG.
GUI Thread	GUI Processing thread. It receives a display information and event from Main Thread, and displays information on the PID.
CRW Thread	CRW Communication and Control Thread. It sends command and receives a response from entry/exit CRW. It controls CRW and processes reading and writing a card.
Gate Control Thread	Gate Control Unit Communication and Control Thread. It monitors pass of passenger in a gate passage by communicating with a gate control unit. It controls Direction Indicator and Sector door.
Token Capture Thread	Token Capture Unit Communication and Control Thread. It detects token insertion by monitoring status of token capture unit. It controls token collection and return by sending command to token capture unit.
Maintenance Thread	Maintenance Thread. It receives key value entered by staff, and executes the matched maintenance function.



Block Diagram of AG

- (1) Operation Parameters:** When AG runs the AG main application, the AG main program will download the operation parameters from Interface Server.
- (2) CRW Control:** The AG main program initializes the CRW and process tickets.
- (3) Detect Sensor:** 20 sets of sensors detect a passenger flow and throw the information to Gate Control Unit (GCU)
- (4) Gate Control:** The AG main program sends appropriate command to GCU. If a passenger is valid, AG main program will send open command to GCU. When the sector door is about to close, if a passenger is in safety zone, the door will stay open until passenger pass over because of safety for passenger. But passenger will stay at safety zone more than predefined time like as 10seconds, gate will close door.
- (5) Control Display:** It shows if the gate is available or not.
- (6) Control Door:** GCU controls the status of sector door. (open or close)

(7) Passenger / Staff Screen Display: It shows information of ticket status, balance, validity or operation status.

(8) Token Capture Unit: At the exit gate, when a passenger inserts a token into Token Capture Unit(TCU),TCU takes and moves the token to the antenna for processing token. If the token is valid,TCU captures the token to token container. If the token is invalid,TCU returns the token to the return JP/JS 21 A&B Design Overview / Automatic Gate

(9) Transaction and Status Data: If a transaction data is made, AG main program saves the transaction data and sends a transaction data to SCS immediately. Status data is sent to SC in real time basis from equipment. Whenever SCS receives status data from equipment, SCS transmits it to CCS in real time basis. Event data will transmit to SCS in real time basis from equipment. AG upload transaction data, status data and event data to SCS using TCP/IP socket communication. When it is communication failure between AG and SCS, SCS cannot receive any data from equipment. But when recover communication, equipment upload its current status and transaction stored at AG to SCS.

(10) Staff Function Input: Maintenance staff operates functions through the maintenance panel

Software configuration

AG software is stored in DOM (Disk on Module). Following figure describes configuration of AG main application.

DOM (E:\)	Folder	Description
AGApp (Folder)	Bin	<ul style="list-style-type: none">- Execution file (Main application)- DLL files (Module control / fare analysis API)- INI files (Display information / Maintenance script files)
	Data	<ul style="list-style-type: none">- Transaction Data- Cutoff data- Token Stock Data
	Image	<ul style="list-style-type: none">- GUI images- Advertisement images
	NTP	<ul style="list-style-type: none">- Time synchronization program with SC
	Param	<ul style="list-style-type: none">- Parameter files

Function

Gate Modes

Gate Modes can be classified into operation mode, aisle mode, door mode and special mode.

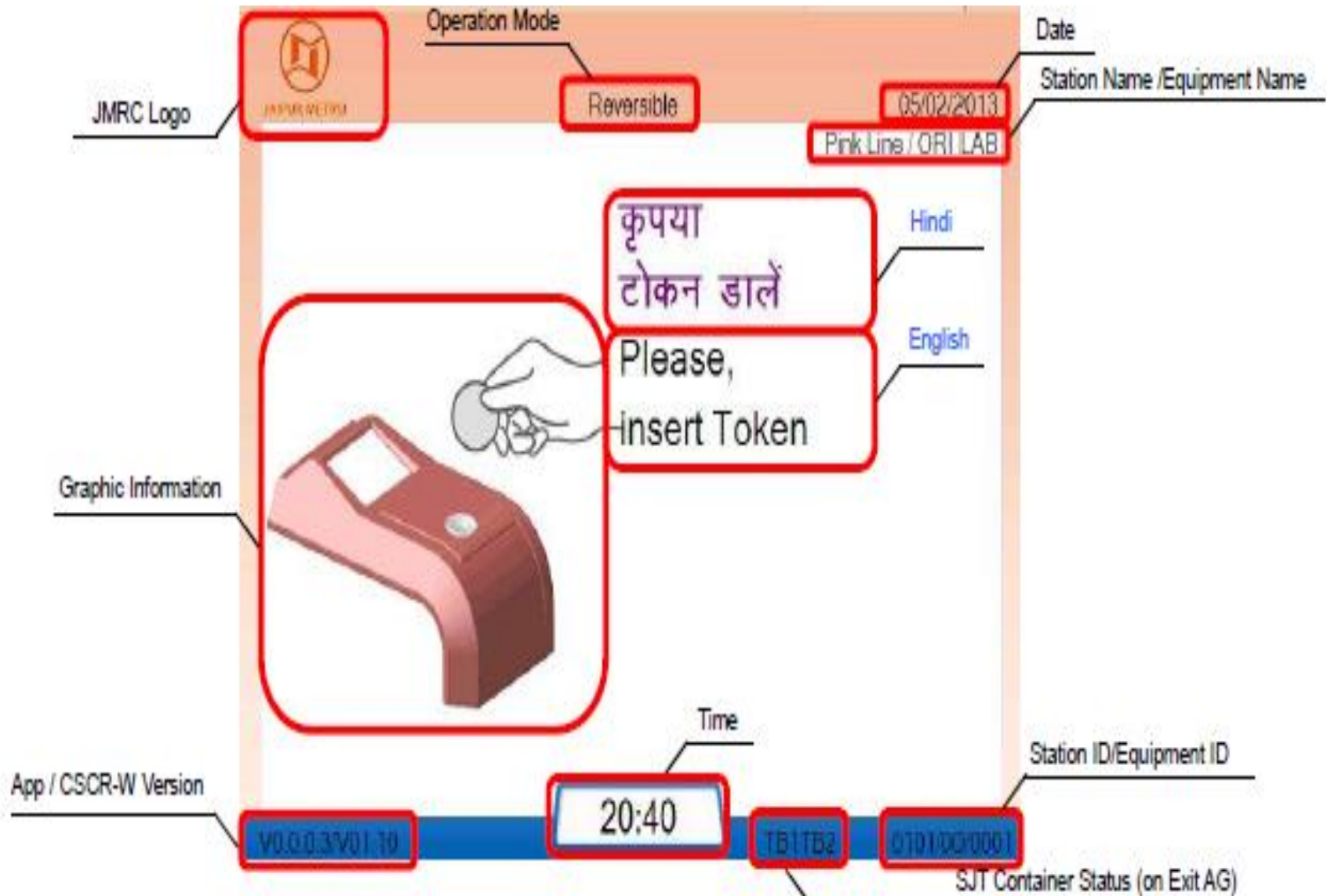
Operation Mode

The operation mode of gate is as follows:

- ☐ IN SERVICE
- ☐ OUT OF SERVICE
- ☐ FAILURE
- ☐ MAINTENANCE

The operation mode can be set by a control command from the Station Computer and by a local command on the maintenance menu.

IN SERVICE




OUT OF SERVICE



FAILURE



MAINTENANCE




04/02/2013

Maintenance

Pink Line / OR / LAB

रखा रखाव के अंतर्गत, अन्य गेट का प्रयोग करे

Under Maintenance
please use other gate



17:32

Aisle Mode

The Aisle Mode of gate is as follows:

- ☐ ENTRY
- ☐ EXIT
- ☐ REVERSIBLE

The Aisle Mode can be set by a control command from the Station Computer and by a local command on the maintenance menu

Door Mode

The door mode defines the door stand-by state at the idle time in the “IN SERVICE” mode.

The door mode of gate is as follows:

- ☐ NORMALLY CLOSED
- ☐ NORMALLY OPEN

The Aisle Mode can be set by a control command from the Station Computer and by a local command on the maintenance menu.

Special Mode

The special mode of the gate defined as followings:

☐ Time mode override

- Under this mode, exit gate let the passenger enter or leave in case of overstaying in the paid area.

☐ Entry / Exit override

- Under this mode, gate will not check of ticket entry / exit sequence.

☐ Station Close

- “STATION CLOSE” is the mode that can be set after closing operation of station until next operation is started. In this mode, gate operates as follows:

1) PIDM displays the message of “STATION CLOSED”

2) Entry Direction Indicator shows red cross which means that passage is unavailable. And CRW is deactivated and stops to process a ticket in entry.

3) Exit Direction Indicator shows green arrow which means that passage is available And Only valid exit is permitted.

4) Sector door is closed and any attempt to pass the gate is prohibited.

Emergency Mode

- There are 3 ways to set emergency mode as following.

1) Hard wired Emergency Button

If AG receives emergency signal from the hard wired emergency button, AG changes mode into EMERGENCY.

2) Emergency message from SCS

If the SCS sends EMERGENCY message to AG, AG changes mode into EMERGENCY.

3) Loss of Power

If AG receives loss of power signal from UPS, AG changes mode into EMERGENCY.

- “EMERGENCY” is the mode that provides an emergency evacuation of passengers and staffs. In this mode, gate operates as follows:

1) PIDM displays the message of “EMERGENCY”.

2) Direction Indicator at the exit side shows green arrow and Direction Indicator at the entry side shows red cross.

3) CRW is deactivated and stops to process a ticket.

4) Sector door is opened and gate can be freely passed to any direction.

5) In EMERGENCY mode, AG does not open shutter even though sensor detect a token in emergency case.



☐ Incident Mode

- 1) No entry is possible through gates.
- 2) Token is captured at exit gate as in normal mode.
- 3) Exit checks are bypassed. No value or trip is deducted from CSC at exit gate.

☐ High Security Mode

- Under this mode, gate will announce special warning when the card listed on High security list is presented at gate. Any card can be put in High Security list

Passenger Service

Valid Passenger at the Entry Gate

Valid Passenger at the Exit Gate

Invalid Ticket at the Entry Gate

Invalid Ticket at the Exit Gate

Illegal entrance of Gate

Passenger Safety

Passenger safety is the most important function of the gate. When a passenger is detected on the safety zone while closing the sector door, gate basically opens the sector immediately to prevent the passenger from being injured by the movement of the sector door. (Under safety function activated) But if the safety function is deactivated, after gate detects passenger at safety zone more 10 seconds (configurable), gate will close sector door in force. Safety function is configurable by parameter.

Tailgating

If a passenger tries to get in the gate before previous passenger's pass, AG regards next passenger as tailgating passenger. Then AG makes an alarm (Buzzer sound, Alarm lamp) and prohibits the passenger by closing door.

The AG guarantees approximately 20cm distances for recognition of tailgating pass

Automatic Top-up

Process Method

There will be two types of method for automatic top up of card as below:

- ☐ Credit before debit
- ☐ Debit before credit

Staff Service

Gate provides following categories of maintenance service for staffs;

- ☐ Operation Management
- ☐ Data inquiry
- ☐ Mode control
- ☐ Module Test
- ☐ AG configuration
- ☐ Error reset

These staff services can be accessed after login of authorized staff.

Operation Management

Gate provides following staff services for operation management;

- ☐ Token retrieval from token container 1
- ☐ Token retrieval from token container 2
- ☐ Change Container1 ID
- ☐ Change Container2 ID

5.1.2 Data Inquiry

Gate provides following staff services for data inquiry;

- ☐ AG Operation status inquiry
- ☐ Parameter inquiry
- ☐ Entry transaction data inquiry
- ☐ Exit transaction data inquiry
- ☐ Register data inquiry
- ☐ Import/Export data inquiry

Mode Control

Gate provides following staff services for mode control;

- ☐ Operation mode: IN SERVICE, OUT OF SERVICE, TEST MODE
- ☐ Aisle Mode: ENTRY, EXIT, REVERSIBLE
- ☐ Door mode: NORMALLY CLOSE, NORMALLY CLOSE
- ☐ Fare mode: Entry/Exit Override, Time Override, Incident, Station Close, Emergency, High Security

5.1.4 Module Test

Gate provides following staff services for module test;

- ☐ CRW
- ☐ GCU: Passenger sensors, Sector doors, lamps, Direction Indicators
- ☐ TCU: Sensors, Solenoids, Return lamp, Capture test. TCU solenoid is a shutter located at the token insertion slot. AG test and diagnose status of all modules.
- ☐ Sound
- ☐ Shutdown
- ☐ Reboot

AG Configuration

Gate provides following staff services for AG configuration;

- ☐ Device Configuration: Station ID, Device ID, IP Address
- ☐ SC IP Address Set
- ☐ Software version inquiry
- ☐ Parameter version inquiry

5.1.6 Error Reset

Gate provides following staff services for error reset;

- ☐ All reset
- ☐ Entry CRW reset
- ☐ Exit CRW reset
- ☐ GCU reset
- ☐ TCU reset

Interface

6.1 SCS Interface

AG communicates with SCS by using LAN communication. AG downloads several files and message from SCS, and uploads data and message

Upload

AG uploads the following data to SCS. AG will back up data for minimum 7 days. Those data will be not purged before transferred to SCS.

- ☐ Transaction data
- ☐ Token Retrieval data
- ☐ Cut off data
- ☐ Audit register data
- ☐ Status data
- ☐ Event data
- ☐ Non-Resettable Registers

Non-Resettable Registers

AG uploads the following registers to SCS. There will be at least 25% spare registers available for future use.

- ☐ Number of passenger for different ticket type entered / exited.
- ☐ Value charged to different ticket types.
 - ☐ Number of tokens processed.
- ☐ Individual register on the number of transactions failed
- ☐ Number of times out of service
- ☐ Number of times in maintenance mode
- ☐ Number of times gate forced open.
- ☐ Number of times tailgating

Download

AG downloads the following data from SCS.

- ☐ Parameter Files (Fare table, Blacklist and operation parameters)
- ☐ AG application and image files
- ☐ Control command from SCS