PUBLIC

KENYA REVENUE AUTHORITY

ISO 9001:2015 CERTIFIED

REVISED ELECTRONIC TAX REGISTER SPECIFICATIONS

CONTROL UNIT REQUIREMENTS & COMMUNICATION PROTOCOLS

Version 2.0

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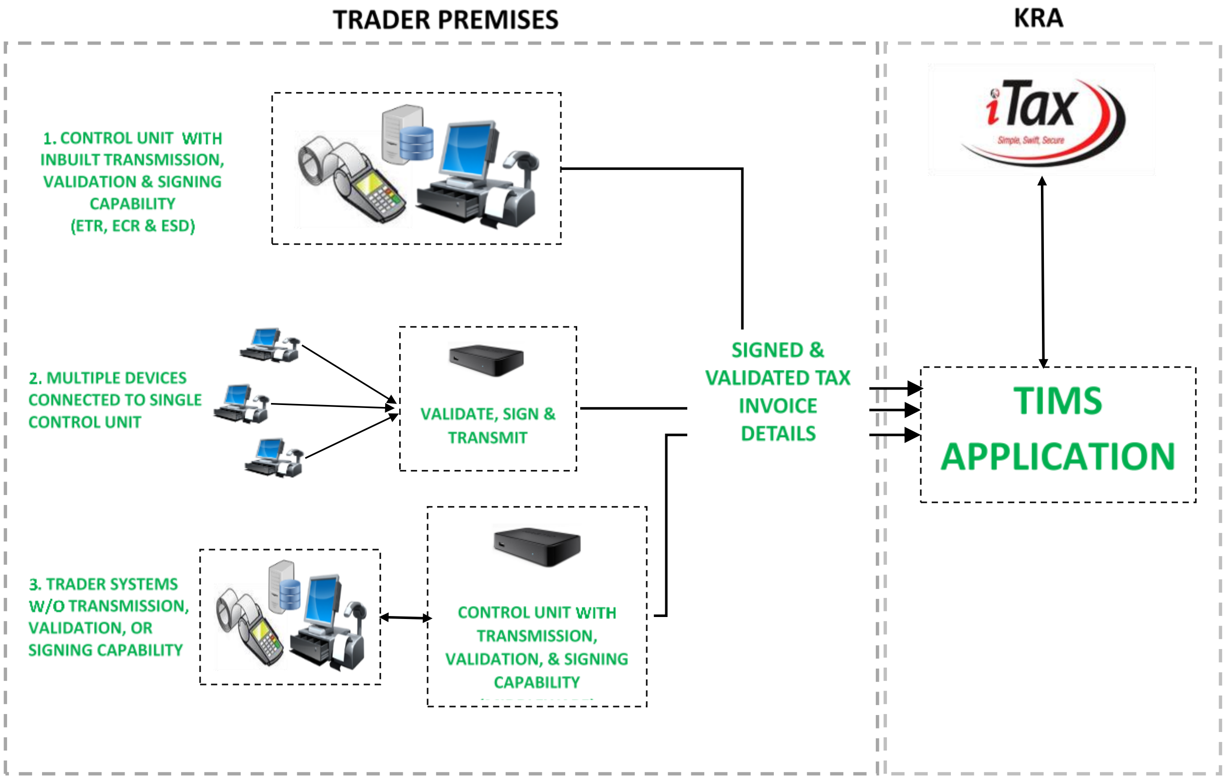
1. INTRODUCTION

KRA is implementing a Tax Invoice Management System to achieve validations and authentications of tax invoices at trader tills before generation of invoice along with their real time or near real time transmission. TIMS is an information technology integration system that will integrate trader systems (Electronic Tax Registers, Point of Sale, and ERP-Billing/Invoicing system) with iTax to monitor the generation of electronic tax invoices and their transmission through the internet to it. TIMS will enable KRA to make enhancements to iTax to increase its efficiency and effectiveness in tax administration through simplification of its users' interaction.

This is accomplished by use of a Control Unit connected or integrated to existing trader systems. The Control Unit will perform the functions of tax invoices validation, encryption, signing, transmission and storage. The communication between the Control Unit and the TIMS Application server at KRA will be over the Internet. However, the connection between the Control Unit and the Trader System does not have to be over the Internet as it can either be integrated into the Trader System or attached to it.

1.1 Conceptual Framework


TRADER PREMISES
KRA
1. CONTROL UNIT WITH INBUILT TRANSMISSION, VALIDATION & SIGNING CAPABILITY (ETR, ECR & ESD)
iTax
Simple, Swift, Secure
2. MULTIPLE DEVICES CONNECTED TO SINGLE CONTROL UNIT
VALIDATE, SIGN & TRANSMIT
SIGNED & VALIDATED TAX INVOICE DETAILS
TIMS APPLICATION
3. TRADER SYSTEMS W/O TRANSMISSION, VALIDATION, OR SIGNING CAPABILITY
CONTROL UNIT WITH TRANSMISSION, VALIDATION, & SIGNING CAPABILITY

2. CONTROL UNIT REQUIREMENTS

The Basic requirements for the Control Units are as outlined below;

1. Invoice Validations as per the required validations:
   a. HS Code & VAT Rate Validations
   b. Invoice Sequence Validations
   c. PIN of the user of the Control Unit
   d. Time and date of the tax invoice
   e. Tax invoice serial number
   f. Buyer's PIN
   g. Invoice Type (Original/Duplicate)
   h. Payment Mode (Cash, Debit Card, Credit Card, Pre-paid Card, Mobile Money, EFT, RTGS, Credit Note)
   i. Tax invoice total gross amount
   j. Tax invoice total tax amount
   k. Tax invoice total net amount
   l. Brief description of goods or services
   m. Quantity
   n. Unit of measure
   o. Tax Rate charged
   p. Control Unit serial number
2. Encrypted Storage of:
   a. TIMS Server Issued RSA Key and "PKI Ready"
   b. Invoice Data
   c. Control Unit Details e.g. Serial Number, Owner PIN
3. Support for Offline Extraction of Encrypted Invoice data
4. Support for Upgrades or update over the air including;
   a. Communication Protocol
   b. HS Code
   c. VAT Rate
5. Internet Capable (Wireless, Ethernet, GSM)
6. At least 24hr Power Backup on continuous usage for portables
7. Control Unit should be serviceable e.g. "Display screen/Ethernet port can fail which can be a minimal cost replacement VS replacing the whole unit"
8. Date & Time zone Synchronization with TIMS server
9. Control Unit API & Technical Documentation (Mandatory)
   a. This will be needed for Control Units used for Invoicing Systems/POS systems where ERP developer requires to integrate with the Control Unit

   b. Test API for Security flaws/gaps/ or

10. User Access Control based on ID & password
11. 100% Support for the TIMS Communication Protocol for communications with TIMS Server.
12. Generate a QR Code for each invoice corresponding to the value of the Control unit invoice number.

No.	Component	Minimum Specifications
1.	**Central Processing Unit (CPU)**	CPU Type -- Open CPU Cores -- Open
2.	**Memory**	Any combination of RAM/Flash memory Any storage media Minimum Memory Size: 8 GB. **Note:** The Memory size will depend with the number of invoices a user generates. The invoice data is supposed to be stored for a minimum of 5 years.
3.	**Crypto Memory**	RSA key and serial number issued by TIMS should be stored in secure memory location with manufacturer providing technical details on sufficient measures of security. The crypto chip should be FIPS Certified.
4.	**Display**	Able to display clear messages
5.	**Networking**	To have transmission capability to both the trader system and to TIMS Application. The following are the standards to follow; **Internet (At least two options with GSM as Mandatory for all Types)** **1. GSM (**3G or 4G**) - Mandatory (Removable SIM Card)** **2. Ethernet** a. Compliance with the iEEE 802.3 standards b. Minimum speed – 10 MBs **3. Wireless** Compliance with iEEE 802.11 standards **Local Connection** Any industry standard connection is acceptable (USB, serial, Ethernet, Bluetooth, SD cards, etc.)
6.	**Clock**	RTC (Internal Clock) -- Mandatory
7.	**OS & Fiscal Database**	OS -- Any Database –Encrypted/Protected and documented by Manufacturer

No.	Component	Minimum Specifications
8.	**Power Supply**	Appropriate for Kenya's Mains power
9.	**UPS**	Internal rechargeable battery of sufficient capacity to protect data from power interruptions
10.	**Environmental Specifications**	Commercial temperature -- 0 to 70⁰ Extended temperature -- -20 to 70⁰ Industrial temperature -- -40 to 85⁰
11.	**Cabinet / Case**	Case should be protected by a visible seal that should prevent opening the case without visibly destroying the seal
12.	**OS Update**	Operating System Updates -- Optional Over the Air PKI Certificate, Key Pairs & Security Updates -- Over the Air HS Code Table -- Over the Air from Manufacturer System VAT Table -- Over the Air from Manufacturer System SSL update – Manufacturer responsible for updates
13.	**Technical Intervention**	Only by Authorized Technicians by breaking the SEAL and documenting service in Dedicated Service Booklet.
14.	**User API**	API documentation should be made available to KRA in all cases where control unit is an external device to trader's system. In embedded cases, no API exists.
15.	**PKI (Public Key Infrastructure) integration**	Control unit should be PKI enabled/ready. RSA encryption should be performed in such a way as to meet encryption/decryption algorithms used in TIMS server side.

3. COMMUNICATION PROTOCOL

The purpose of this document is to describe the communication transmission protocol between any Control Unit and the TIMS Server Web Services.

The Control Unit will identify itself for transmission to TIMS using a Manufacturer embedded CSN (Control Unit Serial Number) that shall have been obtained from KRA. The Control Unit will periodically call the TIMS Server based on Number of Invoices Threshold, or Time Threshold sequentially.

The process below should be followed in order to get the Control Unit Serial Number from the TIMS testing environment:

1. Manufacturer needs to register their profile using the "Manufacturer Authorization" functionality available from iTax Portal.

2. The Manufacturers need to contact KRA to be given access to the "TIMS Prototyping Environment".

3. Once Manufacturer is registered successfully, the TIMS Prototyping Environment sends the online credentials (Login ID and password) to the respective email address given by the Manufacturer such that Manufacturer can log in to the TIMS Prototyping Environment to access the other testing environment.

4. Manufacturer logs in to TIMS Prototyping Environment and requests for Control Unit Serial Number (CSN) generation using "Request for Control Unit Serial Numbers". System acknowledges the manufacturer for the respective CSN generation application.

5. Once CSNs are generated, system sends the notification to the Manufacturer such that manufacturer can log in to the TIMS Prototyping Environment and download the Control Unit Serial Numbers using "Download Control Unit Serial Numbers" functionality.

6. Manufacturer needs to nominate himself as Supplier such that CSN (Control Unit Serial Numbers) can be transferred to Supplier using "Nomination of Supplier" functionality.

7. Manufacturer needs to transfer the CSN to the nominated supplier using "Manufacturer Declaration of Control Unit Supply" functionality.

8. Supplier needs to nominate himself as VAR (Value Added Retailer) such that CSN (Control Unit Serial Numbers) can be transferred to VAR using "Nomination of VAR" functionality.

9. Supplier needs to transfer the CSN to the nominated VAR using "Supplier Declaration of Control Unit Supply" functionality.

10. VAR needs to sell the respective Control Unit by passing the respective CSN to the VAT registered taxpayer using “Sales Declaration of Control Unit” functionality.

11. Once CSN is transferred to taxpayer, Manufacturer can use the same CSN to handshake with the TIMS system using Invoice Transmission Web Service.

12. Once handshaking is done successfully, Manufacturer can transmit the invoices to the TIMS system using Invoice Transmission Web Service.

13. Once all the invoices are transmitted successfully to TIMS for a day, Manufacturer can close the respective day using End of Day Transmission Web Service.

Notes

i. Non-Resident Manufacturers will require a resident supplier with VAT obligation.
ii. Once a manufacturer has a Control Unit prototype ready for testing, they should get in touch with KRA through the channels provided below.
iii. Trader System’s functions & its communicating with Control Unit (CU) should not be having any dependency on TIMS System and on the communication of CU with TIMS. i.e. in scenario where due to some technical or other issue if CU has not transmitted invoices to TIMS then in such case Trader System should continue generating and storing invoices in the CU without any interruption.
iv. Control Unit should send EOD Summary for the day after all the Invoices for the respective day have been transmitted, and before starting Invoice Transmission for the next Day.
v. Manufacturer should ensure that Date and Time are in sync with the time zone of Kenya or any time zone provided by KRA.

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Tel: 0709012729, 0709012730

4. INVOICE TRANSMISSION BASIC COURSE

1. The use case is initiated when the Automatic Scheduler is executed at predefined criteria set in the Control Unit system to transfer the invoices generated by the respective Control Unit system.
2. The Control Unit system calls TIMS Web Service by passing all pending Invoices as per the defined threshold, (**EP.1** Connectivity problems occur between Control Unit and TIMS or TIMS Web Service is not available) (**SR.1** Scheduled service Frequency) (**SR.2** Web Method Hosted by TIMS System) (**SR.6** Time Out Rule).
3. The TIMS Web Service validates the respective Control Unit Serial Number (AP.1 The Control Unit Serial Number is not authenticated).
4. If Control Unit is authenticated and not paired, then TIMS Web Service gets the details (As given in <HandshakingDetails> tag) from the VAR Sales declaration for the respective Control Unit Serial Number and passes the same to the Control Unit System with response code as "60005". The use case continues from Basic Course 9 (**SR.4** TIMS Response Format) (**SR.5** Response Code from TIMS System) (**SR.7** System Rules).
5. If the Control Unit is authenticated and already paired, and has already closed transmission for the previous day, then TIMS Web Service gets the XML String passed by Control Unit system and starts parsing each invoice sent.
6. The TIMS Web Service validates all passed information for each sent invoices (**SR.4** TIMS Response Format) (**SR.5** Response Code from TIMS System) (**AP.2** The XML response in not in proper format) (**AP.3** The Invoice Data is not getting validated) (**AP.4** The HASH is not getting validated).
7. Once all passed information for each invoice is validated, system would store the respective information of each sent invoice and passes the "60000" status to the Control Unit system (**SR.4** TIMS Response Format) (**SR.5** Response Code from TIMS System) (**SR.7** System Rules).
8. The TIMS system logs the audit trail of the same request along with its sent response in the audit table of TIMS system.
9. End of Use Cases.

5. INVOICE TRANSMISSION ALTERNATE PATHS

5.1 AP.1 The Control Unit Serial Number is not authenticated

1. The TIMS system logs the audit trail of the same request with response as “Invalid Control Unit Serial Number” and Response Code as “60004”.
2. The TIMS Web Service passes the Response Code as “60004” to the Control Unit system (**SR.4** TIMS Response Format) (**SR.5** Response Code from TIMS System).
3. The use case ends.

5.2 Hash Generation Logic

- Hash would be generated using SHA256 algorithm
- Hash should be calculated based on signature given below

Signature:

TypeofMiddleware+DateOfTransaction+NumberOFLastInvoiceSent+PINOfSupplier + MiddlewareSerialNumber

5.3 AP.2 The XML response in not in proper format

1. The TIMS system logs the audit trail of the same request with response as “XML Syntax Error” and Response Code as “60001”.
2. The TIMS Web Service passes the Response Code as “60001” to the Control Unit system (**SR.4** TIMS Response Format) (**SR.5** Response Code from TIMS System).
3. The use case ends.

5.4 AP.3 The Invoice Data is not getting validated

1. The TIMS system logs the audit trail of the same request with response as “Data Validation Error” along with its exact error and Response Code as “60002”.
2. The TIMS Web Service passes the Response Code as “60002” to the Control Unit system (**SR.4** TIMS Response Format) (**SR.5** Response Code from TIMS System).
3. The use case ends.

5.5 AP.4 The Hash is not getting validated

1. The TIMS system logs the audit trail of the same request with response as “Hash Code Validation Failed” and Response Code as “60003”.
2. The TIMS Web Service passes the Response Code as “60003” to the Control Unit system (**SR.4** TIMS Response Format) (**SR.5** Response Code from TIMS System).
3. The use case ends.

6. INVOICE TRANSMISSION EXCEPTION PATHS

6.1 EP.1 Connectivity Problems

Connectivity problems occur between Control Unit and TIMS when TIMS Web Service is not available

1. The Control Unit system logs the audit trail of the same request with response as “Request Timed Out”.
2. The use case continues for **BC.2**.
3. The use case ends if Control Unit system gets failure 3 times consecutively.

7. INVOICE TRANSMISSION PROTOCOL RULES

7.1 SR.1 Scheduled Service Frequency

The scheduler will run based on following two criteria:

1. Number of Invoice Threshold – Scheduler will run once the respective threshold of number of invoices is reached. i.e. if threshold is set to 50, then scheduler will run after every 50 invoices. CU should allow taxpayer to configure the value of threshold. However, this threshold value should not be higher than the maximum threshold value and lower than the minimum threshold value suggested by KRA.

   Minimum Invoice Threshold: 1.

2. Time Threshold – Scheduler will run once the respective threshold of time is reached. i.e. if threshold is set to 1 hour, the scheduler will run after every 1 hour. CU should allow taxpayer to configure the value of threshold. However, this threshold value should be not be higher than the maximum threshold value and lower than the minimum threshold value suggested by KRA.

   Maximum Time Threshold: 1 Hour.

Control Unit's scheduler should check the value of these two Number thresholds sequentially. The scheduler will first check if number of invoices pending to transfer is greater than Number of Invoice Threshold, then CU will send number of invoice as per the threshold in the Invoice Transmission request. Else the schedule should check when it has made the last Invoice Transmission request and if the time duration of the last request and current time is greater than the Time threshold, then send the invoices. However, at a time in one request CU will send number of invoices as per Number of Invoice threshold in the Invoice Transmission request.

Minimum Number of Invoice allowed for triggering the scheduler of Invoice transmission should be 5, and the Minimum Time for triggering the scheduler of Invoice transmission should be 60 minutes, in the sequential manner. i.e. the case when the total number of Invoices are less than 5, then CU should call the scheduler of Invoice Transmission when the count reaches 5 or at the end of 60 minutes of the last Invoice Transmission whichever happens earlier.

7.2 SR.2 Web Method Hosted by TIMS System

Below is the signature of the method that TIMS system will invoke:

Parameter	Type	Remark
MiddlewareSerialNumber	String	Serial Number of respective Control Unit System
TypeOfMiddleware	String	Type of the Control Unit

Parameter	Type	Remark
		Possible values: • A : For Type-A (Control Unit which integrates with ETR – Electronic Tax Register) • B : For Type-B (Control Unit which integrates with PoS – Point of Sales) • C :For Type-C (Control Unit which integrates with ERP Software) • D :For Type-D (Control Unit which integrates with ETR, PoS and ERP Software)
INVOICE	String	XML String having entire details of Invoices (SR.3 TIMS Response Format) This will be optional in case of handshaking with TIMS server for the first time. This data will be passed and validated by TIMS only if handshaking is successfully done.

This hand shaking between the TIMS system and Control Unit System will take place over secured http protocol (https) over TLS 1.2 and 256 bit encryption SHA2 algorithm.

7.3 SR.3 Invoice Request Format

Note: We have given both XML and JSON structure for better understanding of requirement and each respective field. However, system would be implemented based on JSON structure.

Request XML:

```
<?xml version="1.0" encoding="UTF-8"?>
<REQUEST>
      <HASH>
      </HASH>
      <BATCHHEADER>
            <DateOfTransmission></ DateOfTransmission >
            <DateOfTransaction></DateOfTransaction>
            <NumberOFLastInvoiceSent></NumberOFLastInvoiceSent>
            <NumberofInvoicesRecords></NumberofInvoicesRecords>
            <PINOfSeller></PINOfSeller>
            <MiddlewareSerialNumber></MiddlewareSerialNumber>
      </BATCHHEADER>
      <BATCHDETAILS>
            <INVOICE>
               <TraderSystemInvoiceNumber></TraderSystemInvoiceNumber>
      <MiddlewareInvoiceNumber></MiddlewareInvoiceNumber >
      <RelevantInvoiceNumber></RelevantInvoiceNumber>
      <QRCode></QRCode >
      <Discount></Discount>
      <InvoiceType></InvoiceType>
      <InvoiceCategory></InvoiceCategory>
      <InvoiceDate></InvoiceDate>
      <PINOfBuyer></PINOfBuyer>
      <ExemptionNumber></ ExemptionNumber >
      <TotalInvoiceAmount></TotalInvoiceAmount>
      <TotalTaxableAmount></TotalTaxableAmount >
      <TotalTaxAmount></TotalTaxAmount>
      <ItemDetails>
            <HSCode></HSCode>
           <HSDesc></ HSDesc >
            <Category></Category>
            <Quantity></Quantity>
            <UnitPrice></UnitPrice>
            <ItemAmount></ItemAmount>
            <TaxRate></TaxRate>
            <TaxAmount></TaxAmount>
      </ItemDetails>
      <ItemDetails>
            <HSCode></HSCode>
           <HSDesc></ HSDesc >
            <Category></Category>
            <Quantity></Quantity>
            <UnitPrice></UnitPrice>
            <ItemAmount></ItemAmount>
            <TaxRate></TaxRate>
            <TaxAmount></TaxAmount>
      </ItemDetails>
      ...
</INVOICE>
<INVOICE>
   <TraderSystemInvoiceNumber></TraderSystemInvoiceNumber>
      <MiddlewareInvoiceNumber></MiddlewareInvoiceNumber>
      <RelevantInvoiceNumber></RelevantInvoiceNumber>
      <QRCode></QRCode >
      <Discount></Discount>
      <InvoiceType></InvoiceType>
      <InvoiceCategory></InvoiceCategory>
      <InvoiceDate></InvoiceDate>
      <PINOfBuyer></PINOfBuyer>
      <ExemptionNumber></ ExemptionNumber >
      <TotalInvoiceAmount></TotalInvoiceAmount>
      < TotalTaxableAmount></TotalTaxableAmount >
      <TotalTaxAmount></TotalTaxAmount>
      <ItemDetails>
            <HSCode></HSCode>
           <HSDesc></HSDesc>
            <Quantity></Quantity>
            <UnitPrice></UnitPrice>
            <ItemAmount></ItemAmount>
            <TaxRate></TaxRate>
            <TaxAmount></TaxAmount>
      </ItemDetails>
      <ItemDetails>
            <HSCode></HSCode>
           <HSDesc></HSDesc>
```

```
                        <Quantity></Quantity>
                        <UnitPrice></UnitPrice>
                        <ItemAmount></ItemAmount>
                        <TaxRate></TaxRate>
                        <TaxAmount></TaxAmount>
                  </ItemDetails>
                  ...
            </INVOICE>
            ...
      </BATCHDETAILS>
</REQUEST>
```

<u>Request JSON:</u>

```
{
   "REQUEST": {
      "HASH": "",
      "BATCHHEADER": {
         "DateOfTransmission": "",
         "DateOfTransaction": "",
         "NumberOFLastInvoiceSent": "",
         "NumberofInvoicesRecords": "",
         "PINOfSupplier": "",
         "MiddlewareSerialNumber": ""
      },
      "BATCHDETAILS": {
         "INVOICE": [
            {
               "TraderSystemInvoiceNumber": "",
               "MiddlewareInvoiceNumber": "",
               "RelevaentInvoiceNumber": "",
               "QRCode": "",
               "Discount": "",
               "InvoiceType": "",
               "InvoiceCategory": "",
               "InvoiceDate": "",
               "PINOfBuyer": "",
               "ExemptionNumber": "",
               "TotalInvoiceAmount": "",
               "TotalTaxAmount": "",
               "ItemDetails": [
                  {
                     "HSCode": "",
                     "HSDesc": "",
                     "Category": "",
                     "Quantity": "",
                     "UnitPrice": "",
                     "ItemAmount": "",
                     "TaxRate": "",
                     "TaxAmount": ""
                  },
                  {
                     "HSCode": "",
                     "HSDesc": "",
                     "Category": "",
                     "Quantity": "",
                     "UnitPrice": "",
                     "ItemAmount": "",
                     "TaxRate": "",
                     "TaxAmount": ""
                  }
               ]
            },
            {
               "TraderSystemInvoiceNumber": "",
               "MiddlewareInvoiceNumber": "",
               "RelevantInvoiceNumber": "",
               "QRCode": "",
               "Discount": "",
               "InvoiceType": "",
               "InvoiceCategory": "",
               "InvoiceDate": "",
               "PINOfBuyer": "",
               "ExemptionNumber": "",
               "TotalInvoiceAmount": "",
               "TotalTaxAmount": "",
               "ItemDetails": [
                  {
                     "HSCode": "",
                     "HSDesc": "",
                     "Quantity": "",
                     "UnitPrice": "",
                     "ItemAmount": "",
                     "TaxRate": "",
                     "TaxAmount": ""
                  },
                  {
                     "HSCode": "",
                     "HSDesc": "",
                     "Quantity": "",
                     "UnitPrice": "",
                     "ItemAmount": "",
                     "TaxRate": "",
                     "TaxAmount": ""
                  }
               ]
            }
         ]
      }
   }
}
```

No	Parent Tag	Field/Attribute	Description
1	REQUEST	HASH	Hash will be generated using SHA256 Algorithm (Mandatory) (Hash Generation **Logic**). Hash will be encrypted by the Control Unit using the respective key assigned to

No	Parent Tag	Field/Attribute	Description
			respective Control Unit (Hash Encryption Logic). TIMS is required to decrypt the encrypted Hash with the respective stored key for the respective Control Unit and compare the Hash.
2	BATCHHEADER	DateOfTransmission	It represents the date and time on which invoices are sent to the TIMS Server (Mandatory) Following format need to be followed: YYYY-MM-DDTHH:MM:SS
3	BATCHHEADER	DateOfTransaction	It represents the date for which invoices are sent to the TIMS Server (Mandatory) Following format need to be followed: YYYY-MM-DD
4	BATCHHEADER	NumberOFLastInvoiceSent	It represents the Control Unit Invoice Number of last invoice sent successfully to the TIMS Server (Mandatory)
5	BATCHHEADER	NumberofInvoicesRecords	It represents the number of invoices sent in the respective request (Mandatory)
6	BATCHHEADER	PINOfSeller	PIN of the Seller who is using the respective Control Unit. Following format need to be followed: • First character should start with “A”/”P” • Next 9 characters should be Numerals • Last characters should be any alphabet
7	BATCHHEADER	MiddlewareSerialNumber	It represents the Unique Serial Number of the Control Unit configured in the respective Control Unit used by the seller (Mandatory)
8	BATCHDETAILS	INVOICE	This tag represents the details of each individual invoice (Mandatory) (Optional – In case Activation is not done)
9	INVOICE	TraderSystemInvoiceNumber	Number generated for respective invoice from Trader System (Mandatory)
10	INVOICE	MiddlewareInvoiceNumber	Unique sequential number generated for respective invoice from Control Unit (Mandatory)

No	Parent Tag	Field/Attribute	Description
11	INVOICE	RelevantInvoiceNumber	Invoice number to be passed in case of Debit/Credit Note (Mandatory) (Optional – In case of Tax Invoice)
12	INVOICE	QRCode	Unique QR Code details for the invoice (Mandatory)
13	INVOICE	Discount	It represents the discount given on respective invoices. The same should be used while identifying the discrepancy to get the correct invoice amount after discount (Mandatory)
14	INVOICE	InvoiceType	Type of the Invoice (Mandatory) Possible Values Are: 1: Original 2: Copy 3: Proforma
15	INVOICE	InvoiceCategory	Category of Invoice (Mandatory) Possible Values Are: 1: Tax Invoice 2: Credit Note 3: Debit Note
16	INVOICE	InvoiceDate	Date on which Invoice is generated (Mandatory) Following format need to be followed: YYYY-MM-DDTHH:MM:SS
17	INVOICE	PINOfBuyer	PIN of the Purchaser (Optional). To be captured either manually or using Near Field Communication technology. Following format need to be followed: • First character should start with "A"/"P" • Next 9 characters should be Numerals • Last character should be any alphabet
18	INVOICE	ExemptionNumber	It represents the respective exemption number given to the Buyer (Optional).
19	INVOICE	TotalInvoiceAmount	Total amount of Invoice (Mandatory)

No	Parent Tag	Field/Attribute	Description
20	INVOICE	TotalTaxableAmount	Total taxable amount without Tax (Mandatory)
21	INVOICE	TotalTaxAmount	Total VAT amount of Invoice (Mandatory) Total Tax Amount should be the total of Tax Amount for each item.
22	INVOICE	ItemDetails	This represents the details of each respective item sold for respective invoice. This can be multiple for each invoice.
23	ItemDetails	HSCode	HS Code of the Item (Optional) as HS Codes are not given from Trader System, then the system would be defaulted to 16%. However, the same is Mandatory for the Zero Rated and Exempted Items.
24	ItemDetails	HSDesc	Description of HS Code (Mandatory if HSCode is provided) and the same should not be more than 20 characters
25	ItemDetails	Quantity	Quantity of respective Item (Mandatory)
26	ItemDetails	UnitPrice	Unit Price of respective Item (Mandatory)
27	ItemDetails	ItemAmount	This will be total amount (Quantity * Unit Price) (Mandatory) System should accept negative values. This is to handle the voiding of respective item.
28	ItemDetails	TaxRate	Tax rate of respective Item (Mandatory)
29	ItemDetails	TaxAmount	Tax Amount of respective Item (Mandatory)

Hash Encryption Logic

1) Convert HASH of the respective request into Byte array using UTF-8.
2) Take instance of Cipher “RSA/ECB/OAEPWithSHA-256AndMGF1Padding”.
    a. RSA - PKCS#1 Ver. 1.5
    b. ECB - is a place holder or use NONE (FIPS 140-2)
    c. OAEPWithSHA-256
    d. AndMFG1Padding (SHA1 is used for OAEP’s MFG1Padding)
3) Convert TIMS Public key string (2048 Bit RSA Public Key as sent during Handshaking by TIMS while pairing) to Byte array using Base64 decoder.
4) Get X509 specification Key object from Byte array derived from Step 3.
5) Generate public key object from X509 specification key object as derived from Step 4 using RSA algorithm.

6) Encrypt Byte array data as derived from step 1 using Cipher initiated from step 2 and X509 specification Public Key as derived from step 5.
7) Convert encrypted byte array data as derived from step 6 to Character array using Hex encoding.
8) Convert the character array as derived from step 7 to String.
9) The string as derived from step 8 is the final encrypted HASH which needs to be sent in <HASH/> tag of the respective request.

Hash should be calculated based on signature given below:

Signature:

TypeofMiddleware + DateOfTransaction + NumberOFLastInvoiceSent + PINOfSeller + MiddlewareSerialNumber

7.4 SR.4 TIMS Response Format

Note: We have given **both XML and JSON** structure for better understanding of requirement and each respective field. However, system would be implemented based on JSON structure.

Response XML:

```
<?xml version="1.0" encoding="UTF-8"?>
<RESPONSE>
      <RESULT>
            <ResponseCode></ResponseCode>
            <Message></Message>
            <Status></Status>
            <HandshakingDetails>
                  <PINOfSeller></ PINOfSeller >
                  <NameOfSeller></ NameOfSeller >
                  <DeviceNumber></ DeviceNumber >
                  <ProductionKey></ ProductionKey >
            </HandshakingDetails >
            <InvalidDataExceptions>
                  <Exception>
                        <ErrorCode></ErrorCode>
                        <ErrorDescription></ErrorDescription>
                        <MiddlewareInvoiceNumber></
MiddlewareInvoiceNumber>
                  </Exception>
                  <Exception>
                        <ErrorCode></ErrorCode>
                        <ErrorDescription></ErrorDescription>
                        <MiddlewareInvoiceNumber></
MiddlewareInvoiceNumber >
                  </Exception>
                  ...
            </InvalidDataExceptions>
        </RESULT>
</RESPONSE>
```

Response JSON:

```
{
   "RESPONSE": {
      "RESULT": {
         "ResponseCode": "",
         "Message": "",
         "Status": "",
         "HandshakingDetails": {
            "PINOfSupplier": "",
            "NameOfSupplier": "",
            "DeviceNumber": "",
            "ProductionKey": ""
         },
         "InvalidDataExceptions": {
            "Exception": [
               {
                  "ErrorCode": "",
                  "ErrorDescription": "",
                  "MiddlewareInvoiceNumber": ""
               },
               {
                  "ErrorCode": "",
                  "ErrorDescription": "",
                  "MiddlewareInvoiceNumber": ""
               }
            ]
         }
      }
   }
}
```

Below table describes each field in the above XML.

Sr. No.	Parent Tag	Field/Attribute	Description
1	RESULT	ResponseCode	It represents the code for different messages which can be received from TIMS system (Mandatory)
2	RESULT	Message	It represents the description of the Response Code received from the TIMS system (Mandatory)
3	RESULT	Status	OK/NOK (Mandatory)

Sr. No.	Parent Tag	Field/Attribute	Description
4	RESULT	HandshakingDetails	It represents the details of pairing in case Control Unit communicates with TIMS first time. TIMS will send the response back to Control Unit in case of successful pairing.
5	HandshakingDetails	PINOfSeller	PIN of the Seller to whom respective Control Unit is sold
6	HandshakingDetails	NameOfSeller	Name of the Seller to whom respective Control Unit is sold
7	HandshakingDetails	DeviceNumber	Device Number of the Supplier to whom respective Control Unit is sold i.e. 1, 2,3 etc.
8	HandshakingDetails	ProductionKey	Production key generated for respective Control Unit. System finds the respective production key stored in the database based on received Control Unit Serial Number and sends as a response.
9	InvalidDataExceptions	Exception	This tag contains data of a single exception/case (Mandatory)
10	Exception	ErrorCode	It represents the code for different error messages which can be received from TIMS system (Mandatory) • 001: Invalid Date Format • 002: Invoice is already received • 003: Date is a future date • 004: PIN of Supplier and Control Unit are not in sync • 005: Number of Invoices are not matching with the number of invoice sent • 006: Number of Last Invoice is not matched. <Last Invoice Number> is last successfully received invoice • 007: <Control Unit Serial Number> is suspended. Please contact the respective supplier. • 008: <Control Unit Serial Number> is retired. Please contact the respective supplier. • 009: This will be sent in case where respective <Tag> is missing from the xml file. • 010: This will be sent in case where value of respective Tag is not provided in expected format. • 011: This will be sent in case where system finds other error while validating the invoices request sent. • 012: This will be sent in case where Control Unit sends the

Sr. No.	Parent Tag	Field/Attribute	Description
			invoices without closing for the previous day.
11	Exception	ErrorDescription	It represents the description of the Error Code received from the TIMS system (Mandatory)
12	Exception	MiddlewareInvoiceNumber	The Unique Reference Number of Invoice passed in the request and having the issue

7.5 SR.5 Response Code from TIMS System

Response Code	Status	Message
60000	OK	Successfully Received Invoice Data
60001	NOK	XML Syntax Error
60002	NOK	Data Validation Error
60003	NOK	Hash Code Validation Failed
60004	NOK	Control Unit Serial Number is Invalid
60005	OK	Successfully Paired

7.6 SR.6 Time Out Rule

TIMS system should respond to the Control Unit system within X m sec. Thereafter Control Unit system will consider no response coming out from TIMS system. Hence Control Unit system would consider the respective request as “Response Time Out”.

Where X is a configurable value in the TIMS and Control Unit system. Its default value is 30000 ms. However same needs to be set as suggested by KRA as and when communicated.

7.7 SR.7 System Rules

1. System should check the status of respective Control Unit serial number and if status is suspended or retired, then system should send the data validation error.
2. System should not consider the “INVOICE” string if respective Control Unit is not paired with the TIMS Server.

3. System should check the respective sent Control Unit Serial Number (CSN) and fetch the details of the taxpayer (buyer of the respective CSN) from the sales details provided by VAR through iTax Portal while selling the CSN to the respective taxpayer. The system sends the respective fetched details of taxpayer to the Control Unit with response code as "60005".

4. System should send the "<HandshakingDetails>" tags details only in case where Control Unit has requested handshaking and all the details are validated.

5. System should not send the "<HandshakingDetails>" tags once the Control Unit is paired and started sending invoice details.

6. System should set the type of Control Unit as per the type sent in the request on successful pairing.

7. System should flag the respective Control Unit if system does not receive any invoice in configured days which should be by default 3 days. System should add this configurable parameter in system parameters for update. However, Control Unit will still be allowed to continue with the transmission on even fourth day as system will not block the Control Unit.

8. System should not accept the invoice request if Control Unit has not sent the end of day summary of the previous day.

9. In case, when CU will send EOD summary in next day or after "N" number of days, backlog of invoices should be sent in multiple request with each request not sending more than the number of Invoices as per the threshold defined. CU should not send all backlog invoice in single request but at a time should send up to the Maximum Number of Invoice Threshold.

10. <QRCode> will be having the Control Code generated by the Control Unit uniquely. Following is the URL for the respective QR Code on the invoice where Control Code will be generated by Control Unit and the same will be unique for each generated invoices. It will be alphanumeric with Special Chars (&,/,\,(,),{,},[,]) https://<TIMS Domain>/<ControlCode or Control Unit Invoice Number > For the Sandbox, the URL is as follows: https://tims-test.kra.go.ke/KRA-Portal/invoiceChk.htm?actionCode=loadPage&invoiceNo=**<Invoice_Number>** where **<Invoice_Number>** is the actual control unit invoice number.

11. Following is the format of the Control Unit Invoice Number:

    - <MAN><SEQ6><SEQ10>
        - <MAN> should be last 3 letters of Manufacturer Login ID or 6 to 8 letters of Control Unit Serial Number
        - <SEQ6> should be 6-digit sequence number generated for the respective Control Unit
        - <SEQ10> should be 10-digit sequence number starting from 0000000001 assigned to first invoice and incrementing so on

12. We have given **both XML and JSON** structure for better understanding of requirement and each respective field. However, system would be implemented based on JSON structure instead of XML.

8. END OF DAY SUMMARY TRANSMISSION

This Web Service has to be called by Control Unit systems to transmit the end of day summary of respective day to TIMS Server. Control Unit calls the TIMS Web Service before starting transmission of next day. TIMS Server considers the closure of the respective day if TIMS Server receives the end of day summary successfully for that day.

TIMS server will not accept the invoices if Control Unit has not transmitted the previous day summary.

8.1 End of Day Basic Course

1. The use case is initiated when the Automatic Scheduler is executed as per predefined criteria set in the Control Unit system to transfer the end of day summary by the respective Control Unit system.

2. The Control Unit system calls TIMS Web Service by passing summary of the respective day along with the respective Control Unit Serial Number. (**EP.1** Connectivity problems occur between Control Unit and TIMS or TIMS Web Service is not available) (**SR.5** Time Out Rule).

3. The TIMS Web Service validates the respective Control Unit Serial Number (**AP.1** The Control Unit Serial Number is not authenticated).

4. If the Control Unit is authenticated, then TIMS Web Service gets the XML String passed by Control Unit system and start parsing the respective summary sent.

5. The TIMS Web Service validates all passed information (**SR.4** Response Code from TIMS System) (**SR.4** Response Code from TIMS System) (**AP.2** The XML response in not in proper format) (**AP.3** The End of Day Summary is not getting validated) (**AP.4** The HASH is not getting validated).

6. Once TIMS Web Service validates the end of day summary successfully, then system stores the summary of respective day for respective taxpayer and Control Unit and passes the “70000” status to the Control Unit system (**SR.3** TIMS Response Format) (**SR.4** Response Code from TIMS System) (**SR.6** System Rules).

7. The TIMS system marks the status as “Closed” for the respective day for which end of day summary is received.

8. The TIMS system logs the audit trail of the same request along with its sent response in the audit table of TIMS system.

9. End of Use Case

8.2 Triggers of the End of Day Transmission

End of Day transmission will be triggered by either of the following criteria;

1. At Mid-night: If the control unit is still up and running at mid-night, the End of Day is automatically transmitted OR
2. Where the Control Unit is switched on for start of day and the Control Unit had not transmitted End of Day of the previous day.

8.3 End of Day Alternative Paths (AP)

AP.1 The Control Unit Serial Number is not authenticated

1. The TIMS system logs the audit trail of the same request with response as "Invalid Control Unit Serial Number" and Response Code as "70004".

2. The TIMS Web Service passes the Response Code as "70004" to the Control Unit system (**SR.3** TIMS Response Format) (**SR.4** Response Code from TIMS System).

3. The use case ends.

AP.2 The XML response in not in proper format

1. The TIMS system logs the audit trail of the same request with response as "XML Syntax Error" and Response Code as "70001".

2. The TIMS Web Service passes the Response Code as "70001" to the Control Unit system (**SR.3** TIMS Response Format) (**SR.4** Response Code from TIMS System).

3. The use case ends.

AP.3 The End of Day Summary is not getting validated

1. The TIMS system logs the audit trail of the same request with response as "Data Validation Error" along with its exact error and Response Code as "70002".

2. The TIMS Web Service passes the Response Code as "70002" to the Control Unit system (**SR.3** TIMS Response Format) (**SR.4** Response Code from TIMS System).

3. The use case ends.

AP.4 The HASH is not getting validated

1. The TIMS system logs the audit trail of the same request with response as "Hash Code Validation Failed" and Response Code as "70003".

2. The TIMS Web Service passes the Response Code as "70003" to the Control Unit system (SR.**3** TIMS Response Format) (**SR.4** Response Code from TIMS System).

3. The use case ends.

8.4 End of Day Exception Paths (EP)

EP.1 Connectivity problems occur between Control Unit and TIMS or TIMS Web Service is not available

1. The Control Unit system logs the audit trail of the same request with response as "Request Timed Out".

2. The use case continuous for **BC.2**.

3. The use case ends if Control Unit system gets failure 3 times consecutively.

8.5 SR.1 End of Day System Summary Rules

Below is the signature of the method that Control Unit will invoke:

Parameter	Type	Remark
MiddlewareSerialNumber	String	Serial Number of respective Control Unit System
TypeOfMiddleware	String	Type of the Control Unit Possible values: • A : For Type-A (Control Unit which integrates with ETR – Electronic Tax Register) • B : For Type-B (Control Unit which integrates with PoS – Point of Sales) • C : For Type-C (Control Unit which integrates with ERP Software) • D : For Type-D (Control Unit which integrates with ETR, PoS and ERP Software)
Summary	String	XML String having details of summary of invoices sent throughout the day (SR.2 End of Day Summary Request Format)

8.6 SR.2 End of Day Summary Request Format

Note: We have given **both XML and JSON** structure for better understanding of requirement and each respective field. However, system would be implemented based on JSON structure.

Request XML

```
xml version="1.0" encoding="UTF-8"?>
<REQUEST>
      <HASH>
      </HASH>
      <EODSummaryHeader>
            <DateOfTransmission></DateOfTransmission>
            <DateOfEODSummary></DateOfEODSummary>
            <PINOfSeller></PINOfSeller>
            <NumberOfInvoicesSentOfTheDay></
NumberOfInvoicesSentOfTheDay>
            <TotalInvoiceAmountOfTheDay></TotalInvoiceAmountOfTheDay>
            <TotalTaxableAmountOfTheDay></
TotalTaxableAmountOfTheDay>
            <TotalTaxAmountOfTheDay></TotalTaxAmountOfTheDay>
                  </EODSummaryHeader>
</REQUEST>
```

Request JSON:

```
{
   "REQUEST": {
      "HASH": "",
      "EODSummaryHeader": {
         "DateOfTransmission": "",
         "DateOfEODSummary": "",
         "PINOfSeller": "",
         "NumberOfInvoicesSentOfTheDay": "",
         "TotalInvoiceAmountOfTheDay": "",
         "TotalTaxableAmountOfTheDay": "",
         "TotalTaxAmountOfTheDay": ""
      }
   }
}
```

Sr. No.	Parent Tag	Field/Attribute	Description
1	REQUEST	HASH	Hash will be generated using SHA256 Algorithm (Mandatory) (Hash Generation **Logic**).
2	EODSUMMARYHEADER	DateOfTransmission	It represents the date and time on which end of day summary is sent to the TIMS Server (Mandatory) Following format need to be followed: YYYY-MM-DDTHH:MM:SS
3	EODSUMMARYHEADER	DateOfEODSummary	It represents the date for which end of day summary is sent to the TIMS Server (Mandatory) Following format need to be followed: YYYY-MM-DD
4	EODSUMMARYHEADER	PINOfSeller	PIN of the Seller who is using the respective Control Unit (Mandatory). Following format need to be followed: • First character should start with "A"/"P" • Next 9 characters should be Numerals • Last character should be any alphabet
5	EODSUMMARYHEADER	NumberOfInvoicesSentOfTheDay	It represents the number of invoices sent for the respective day for which end of day summary is being sent (Mandatory)
6	EODSUMMARYHEADER	TotalInvoiceAmountOfTheDay	It represents the total invoice amount for the respective day for which end of day summary is being sent (Mandatory)
7	EODSUMMARYHEADER	TotalTaxableAmountOfTheDay	It represents the total taxable amount for the respective day for which end of day summary is being sent (Mandatory)
8	EODSUMMARYHEADER	TotalTaxAmountOfTheDay	It represents the total tax amount for the respective day for which end of day summary is being sent (Mandatory)

Hash Generation Logic:

- Hash would be generated using SHA256 algorithm
- Hash should be calculated based on signature given below

Signature**:**

TypeofMiddleware + DateOfEODSummary + NumberOfInvoicesSentOfTheDay + PINOfSeller + MiddlewareSerialNumber

8.7 SR.3 TIMS Response Format

Note: We have given **both XML and JSON** structure for better understanding of requirement and each respective field. However, system would be implemented based on JSON structure.

RESPONSE XML

```
<?xml version="1.0" encoding="UTF-8"?>
<RESPONSE>
      <RESULT>
            <ResponseCode></ResponseCode>
            <Message></Message>
            <Status></Status>
      </RESULT>
      <InvalidDataExceptions>
                  <Exception>
                        <ErrorCode></ErrorCode>
                        <ErrorDescription></ErrorDescription>

                  </Exception>
                  <Exception>
                        <ErrorCode></ErrorCode>
                        <ErrorDescription></ErrorDescription>

                  </Exception>
                  ...
      </InvalidDataExceptions>
</RESPONSE>
```

RESPONSE JSON:

```
{
   "RESPONSE": {
      "RESULT": {
         "ResponseCode": "",
         "Message": "",
         "Status": ""
      },
      "InvalidDataExceptions": {
         "Exception": [
            {
               "ErrorCode": "",
               "ErrorDescription": ""
            },
            {
               "ErrorCode": "",
               "ErrorDescription": ""
            }
         ]
      }
```

```
        }
}
```

Sr. No.	Parent Tag	Field/Attribute	Description
1	RESULT	ResponseCode	It represents the code for different messages which can be received from TIMS system (Mandatory)
2	RESULT	Message	It represents the description of the Response Code received from the TIMS system (Mandatory)
3	RESULT	Status	OK/NOK (Mandatory)
4	InvalidDataExceptions	Exception	This tag contains data of a single exception (Mandatory)
5	Exception	ErrorCode	It represents the code for different error messages which can be received from TIMS system (Mandatory) • 001: Invalid Date Format • 002: End of Day Summary is already received • 003: Date is a future date • 004: PIN of Seller and Control Unit are not in sync • 005: <Control Unit Serial Number> is suspended. Please contact the respective supplier. • 006: <Control Unit Serial Number> is retired. Please contact the respective supplier. • 007: This will be sent in case where respective <Tag> is missing from the xml file. • 008: This will be sent in case where value of respective Tag is not provided in expected format. • 009: This will be sent in case where system finds other error while validating the end of day summary request sent. • 010: This will be sent in case where Control Unit sends the invoices without closing for the previous day.
6	Exception	ErrorDescription	It represents the description of the Error Code received from the TIMS system (Mandatory)

8.8 SR.4 Response Code from TIMS System

Response Code	Status	Message
70000	OK	Successfully Received End of Day Summary

70001	NOK	XML Syntax Error
70002	NOK	Data Validation Error
70003	NOK	Hash Code Validation Failed
70004	NOK	Control Unit Serial Number is Invalid

8.9 SR.5 Time Out Rule

TIMS system should respond to the Control Unit system within X m sec. Thereafter Control Unit system will consider no response coming out from TIMS system. Hence Control Unit system would consider the respective request as “Response Time Out”.

Where X is a configurable value in the TIMS and Control Unit system. Its default value is 30000 ms.

8.10 SR.6 System Rules

1. System should check the status of respective Control Unit serial number and if status is suspended or retired, then system should send the data validation error.

2. System should not receive the end of day summary if the previous day end of day summary is not received.

3. **We have given the both XML and JSON structure for better understanding of requirement and each respective field. However, system would be implemented based on JSON structure.**

9. APPENDIX 1: MANUFACTURERS APPROVAL CHECKLIST

No.	Question	YES	NO
1.	Required Invoice Validations done as per the Control Unit requirements.		
2.	Control Unit has encrypted storage.		
3.	Control Unit Supports Offline Extraction of Encrypted Invoice data.		
4.	Control Unit Supports for upgrades and updates of operating systems.		
5.	Control Unit is Internet Capable.		
6.	Control Unit has at least 24hr Power Backup on continuous usage (Portable Control Units).		
7.	Control Unit is serviceable.		
8.	Control Unit is capable of Date & Time synchronization with TIMS server.		
9.	API & Technical Documentation provided.		
10.	User Access Control based on ID & password.		
11.	Control unit should be PKI enabled/ready		
12.	Control Unit is capable of transmitting End of Day Summary as per the requirements.		
13.	Control Unit is capable of updating HS Codes and VAT rates.		
14.	Control Unit capable of generating QR Codes as per the Specifications.		

10. APPENDIX 2: SAMPLE INVOICE

Trade Name/Logo	TAXPAYER'S NAME AND/OR LOGO
Address, City Welcome to our Shop	Shop address Commercial message by Trader
PIN: 000000000 Buyer PIN: 000000000	Taxpayer (Trader) PIN Buyer/Customer PIN (Optional)
FISCAL RECEIPT	Invoice Label (Either FISCAL RECEIPT or CREDIT NOTE or DEBIT NOTE)
Mosquito Repellent 1000.00x 1.00 1000.00B-EX	Item description, unit price, quantity, total price and tax designation
Vacuum Flask 560.00x 12.00 6720.00A	
Discount -25% 5040.00	Discount percentage & total price after discount
Canned Soda 60.00x 5.00 300.00A	
TOTAL 6340.00	Total Amount to be paid
TAXABLE AMT A 4,603.45 TAXABLE AMT B 0.00	
TOTAL A-16.00% 5340.00	Total amount with TAX per tax rate
TOTAL B-EX 1000.00	Total TAX exempted amount
TOTAL TAX A 736.55	Total amount of TAX per tax rate
TOTAL TAX 736.55	Total amount of TAX
CASH 6340.00	Payment method
ITEMS NUMBER 3	Number of items sold
Control Unit Info	
Date: 25/5/2012 Time: 11:07:35	Date and time originated from Control Unit
CU Serial No: KRAMW582201907007181	Control Unit Serial Number
CU Invoice Number: 58207181000000003	Invoice number originated from Control Unit
	QR Code
RECEIPT NUMBER: 152	Receipt number originated from trader's system
DATE: 25/5/2012 TIME: 11:09:32	Date and time originated from trader's system
THANK YOU COME BACK AGAIN YOUR BEST STORE IN TOWN	Commercial message by trader

NOTE:

The invoice labels and details 'FISCAL RECEIPT', 'TOTAL TAX' and 'CU Invoice Number' must appear in ***bold*** *on every receipt.*