

Introduction

Rwanda Revenue Authority is currently using an Integrated Software that collects and manages domestic tax revenues. The said tax system handles the internal taxpayer registry and other tax processes but doesn't manage taxpayers' business transactions as they occur in real time. However, to have a true picture of taxpayer's business transactions and be able to expand our tax base and finance our National needs, RRA wishes to introduce Electronic Billing Machines that will be used by taxpayers at their business premises.

The RRA, through the expression of interest, would like to invite eligible Suppliers to comply with Certified Invoicing Systems (Electronic Cash Register, POS, or any other business machine used to issue invoices) and Sales Data Controller specification.

Area of application

Rwanda Revenue Authority has released requirements for Electronic **Billing Machines (EBM)**. The stipulations on the requirements imposed on **EBM** state that a Certified Invoicing System (Cash Register/POS or any other business machine used to issue invoices) must be connected to a Sales Data Controller. These guidelines include specific requirements concerning the Certified Invoicing System and Sales Data Controller.

Definitions

- “Authority” means Rwanda Revenue Authority
- “User” means a taxpayer, user of CIS
- “TIN” –Tax Identification Number
- “Commissioner General” means the Commissioner General of Rwanda Revenue Authority;
- “Electronic Billing Machines” means a system comprising of Certified Invoicing System and Sales Data Controller connected together;
- “Certified Invoicing System (CIS)” means a machine designated for use in business for efficiency management controls in areas of sales analysis and stock control system which confirms the requirements specified by the Authority;
- “Machine Registration Code (MRC)” means CIS's unique serial number with designation of its certificate;
- “Receipt” means certified retail receipt or a wholesale receipt (where required) or a receipt for the provision of services provided to the customer (private individual or businessman, as applicable);
- “Signature” means receipt data used for integrity verification by Authority;
- “Sales Data Controller (SDC)” is a device connected to CIS used for processing receipts;
- “Receipt data” means every receipt data request by CIS which needs to be processed by SDC;
- “Response data” means every information sent from SDC to CIS;
- “Internal data” means information saved to internal memory of SDC;
- “SDC serial number” - Sales Data Controller's unique serial number with designation of its certificate;

- “Remote audit” - function of SDC to establish two way communication with remote server designated by the Authority in order to transfer required audit information;
- “Local audit” - function of SDC to provide information from its internal memory to a removable storage media (SD card);
- “POS” - Point Of Sale.

CIS specification

- 1 Certified Invoicing System (CIS) can be any electronic cash register, any terminal with cash register software, any computer using invoicing software, or any other similar system used for registration of outbound transactions.
 - 1.2 CIS cannot operate unless connected to a functional Sales Data Controller unit assigned for the same TIN, which preserves on a irrevocable and secure manner all relevant data of the outbound transactions, uses this data to calculate an algorithm that must be printed on the final receipt, in accordance with **Article 4** of this guideline, for the client by the means of CIS printing mechanism
- 2 A Cash Register/POS and similar business machine shall:
 - 2.2 Contain software (PC software or firmware) that controls the functions indicated in this guideline
 - 2.3 be provided with a model name and a manufacturing number through a Machine Registration Code (MRC) described below:
 - 2.3.1 Each CIS shall be provided with MRC (a model designation and serial number). MRC has a unique number by which both the certified invoicing system and the manufacturer are clearly identified. The MRC will be built as follows:
 - i. Cash registers: AAABBNNNNNN, where:
 1. AAA = manufacturer id. (given by the Authority);
 2. BB = manufacturer certificate number (given by the Authority);
 3. NNNNNN = serial number (in ascending order, given by the manufacturer)
 - ii. POS systems: BBBCCNNNNNN, where:
 1. BBB = software developer id. (given by the Authority);
 2. CC = software developer certificate number (given by the Authority);
 3. NNNNNN = serial number (in ascending order, given by the software developer)
- 3 A Certified Invoicing System shall generate receipts, which must show, among others, the data enumerated in Items a to n of this Article as minimum required information:
 - a. Taxpayer’s name;
 - b. Tax Identification Number;
 - c. the address at which the sale takes place;
 - d. tax Identification number of the client(optional);
 - e. receipt type and transaction type;
 - f. serial number of the receipt from an uninterrupted ascending number series per receipt type;
 - g. registered items and/or services with description, quantity, price, with any other action that may be done such as cancellations, corrections;

- h. total sales amount;
 - i. tax rates applied;
 - j. the value added tax added to the sale amount;
 - k. means of payment;
 - l. SDC information:
 - i. Date and time stamped by SDC;
 - ii. Sequential receipt type number;
 - iii. Receipt signatures;
 - iv. SDC identification number;
 - m. Date and time stamped by CIS;
 - n. Machine Registration Code (MRC).
- 4 Each receipt issued by Certified Invoicing System is formed from a combination of receipt type and transaction type
- 4.2 Receipt types are:
- 4.2.1 NORMAL;
 - 4.2.2 COPY;
 - 4.2.3 TRAINING;
 - 4.2.4 PRO FROMA.
- 4.3 Each receipt type is attributed with one of the following transaction type:
- 4.3.1 SALE;
 - 4.3.2 REFUND.
- 4.4 Certified Invoicing System shall assign a unique receipt label to each combination of receipt type and transaction, so that the Sales Data Controller can interpret them unambiguously. The table below gives the combinations of receipt labels:
- | RECEIPT TYPE | TRANSACTION TYPE | RECEIPT LABEL |
|--------------|------------------|---------------|
| NORMAL | SALES | NS |
| NORMAL | REFUND | NR |
| COPY | SALES | CS |
| COPY | REFUND | CR |
| TRAINING | SALES | TS |
| TRAINING | REFUND | TR |
| PRO FORMA | SALES | PS |
- 5 The data flow between the Certified Invoicing System and the Sales Data Controller will be as follows for each receipt type:
- 5.2 the CIS sends the following receipt data to the SDC at the time when the receipt is being produced:
- i. date and time;
 - ii. Tax Identification Number;
 - iii. client's TIN (optional);
 - iv. machine registration code (MRC);
 - v. receipt number;
 - vi. receipt type and transaction type;
 - vii. TAX rates;
 - viii. total amounts with TAX;
 - ix. TAX amounts.
- 5.3 the SDC receives receipt data from CIS

5.4 the SDC generates the following response data and sends them back to the CIS:

- i. SDC ID;
- ii. date and time;
- iii. receipt label;
- iv. receipt counter per receipt type;
- v. receipt counter of all receipts;
- vi. digital signature (except for the receipt types TRAINING and PRO FORMA);

5.5 the CIS finalizes receipt by printing SDC information on designated place within the receipt

5.6 the CIS sends complete journal data of NS and NR receipt labels in text form to SDC.

6 CIS shall:

6.2 contain software (PC software or firmware) that controls the functions indicated in these regulations;

6.3 have reprogrammable TIN under its service mode, for the purpose of ownership transfer, only if the change of TIN is conditioned by the reset which deletes all information saved for previously programmed TIN;

6.4 carry consecutive numbers in order to guarantee the completeness and the inalterability of the journal records. This means that the journal records in the electronic journal or the journal file (which includes all receipts of the various types, among other things) can have maximum one ascending numbering per receipt type. In case of a total reset of the Certified Invoicing System, the aforementioned numbering shall recommence from 1 (one);

6.5 be provided with a model name and a manufacturing number through a Machine Registration Code (MRC);

6.6 have display screen showing the inputs and outputs of the sale, capable of taking at least 13 digits inclusive of 2 decimal places;

6.7 be able to produce receipts and reports with a statement of the registrations during a day of sales and continuous use (Z daily report) and a statement of the registrations since the last Z daily report (the X daily report);

6.8 be issued with a version number which is a unique identifier of the software version and should be adapted for every change made to the software. CIS software version must be enabled for verification by Authority personnel;

6.9 be able to issue receipts only if connected to SDC unit which is functioning under normal circumstances;

6.10 be able to independently detect whether the SDC is operational or not, and inform user of its status in case of error;

6.11 not have any other functions than those stipulated in its documentation. The documentation shall be written in English and accompany the CIS on delivery;

6.12 have inventory control, where user is able to input and/or remove goods from stock and produce independent report showing inventory status;

6.13 be able to register deposits and withdrawals;

6.14 be able to register payment with different kinds of means of payment;

6.15 be equipped with paper journal or electronic journal or the log file which contains all the sales that immediately upon the creation of any printed material are recorded and shall not operate without it;

6.16 not to be constructed in such a way that it is possible to register a sales amount without the simultaneously printing a receipt;

- 6.17 not be able to register amount of the transaction only without identifying the good and /or service;
 - 6.18 not be able to correct or cancel transaction without clear evidence of the event printer on the receipt;
 - 6.19 not exceed 1 (one) copy of the receipt type to print, and copy may be possible only immediately following the printing of the original receipt;
 - 6.20 send receipt data to SDC in prescribed format defined in **Article 21** of this guideline;
 - 6.21 receive response data from SDC and add this information to final receipt structure;
 - 6.22 allow, as programming/servicing function, input of:
 - i. TIN,
 - ii. MRC,
 - iii. Registered company name and address,
 - iv. Date and time,
 - v. TAX rates, labeled as: "A", B, "C" and "D" corresponding to indexes 1-4.
 - 6.23 if tax rate is programmed with value > 0, the tax label and value must be printed on every receipt regardless if sale was including that particular tax rate;
 - 6.24 if tax rate is = 0, the tax label and value must be printed only when item with this particular tax rate is used;
 - 6.25 enable to print in a uniform layout response data received from SDC structured in with following content:
 - i. The designation "SDC Information"
 - ii. Time and date of SDC (Date: dd/mm/yyyy Time: hh:mm:ss)
 - iii. SDC identification "SDC ID: SDCXXXXXXXXXX"
 - iv. Receipt counter "A/B RT"
 - v. Internal data separate by dash after every 4th character
 - vi. Receipt signature separate by dash after every 4th character
 - 6.26 Receipt type counter and total counter shall be presented in the following manner:
 - i. A/B RT where:
 - 1. A = Counter per receipt type;
 - 2. B = Total counter;
 - 3. RT = receipt type label.
 - 6.27 provide the possibility of access for audit purposes for competent auditors, including an overview of software settings and database;
 - 6.28 have an item counter which presents number of items shown on the receipt (excluding voids);
 - 6.29 be compliant with the international safety standards for electronic equipment;
 - 6.30 continue or re-print last line in the case of power failure or after missing paper recovery
- 7 Devices Compliance- Shall be approved by international recognized bodies such as National Research Centre of Italy (C.N.R), European Certification body ACCREDIA, DK in Germany, UKAS for UK and ANAB in US or equivalent bodies
 - 8 Should an accessory or some other piece of equipment be connected to or integrated in the Certified Invoicing System it shall not affect or disrupt the normal operation of any functionalities defined in this guideline.

Receipt specification

- 9 Certified Invoicing System shall not have a possibility to print receipt of any type before the aforementioned data flow in Article 5 has been finalized. This means that it shall be impossible to issue receipt if the CIS did not receive any response from the SDC.
- 10 When a CIS provides a function for printing copies of the receipt, printing training or pro forma tickets, they must be clearly distinguishable from the NORMAL receipt type. The designation COPY, TRAINING, PRO FORMA has to be placed on the invoice bellow receipt header and above item description section. Moreover, in such cases the following text bellow of amount totals of the ticket has to be printed: "THIS IS NOT AN OFFICIAL RECEIPT". It shall not be possible to alter the receipt identifying text, which shall be at least twice as big as the text that indicates the amount.
- 11 All corrections on the receipt of any type must clearly distinguishing negative amounts from positive amounts by using a minus sign.
- 12 **Normal Sale**, defined by receipt label as NS, refers to a receipt that shall be produced and offered to the client. It is understood to be any receipt produced while the Electronic Billing Machine is in its normal registration mode, used to register sales of goods and/or services, including corrections and discounts registered by means of the correction and discount functionalities.

12.2 Following is example of receipt type NORMAL and transaction type SALE (NS):

Trade Name Address, City TIN: 000000000	TAXPAYER'S NAME Shop address Taxpayer Identification number Commercial message CLIENT'S Identification (optional)
----- Welcome to our shop Client ID: 000000000 -----	
Plain Bread 1000.00x 1.00 1000.00A-EX	Item description, unit price, quantity, total price and tax designation
Gouda cheese 33600.00x 0.200 6720.00B	
discount -25% 5040.00	Discount percentage, total price with discount
Coca-cola 1.5l 1800.00x 1.00 1800.00B	
VOID	Void item
Coca-cola 1.5l 1800.00x -1.00 -1800.00B	
Wriggly gum 60.00x 5.00 300.00B	

TOTAL 6340.00	Total price to be paid
TOTAL A-EX 1000.00	Total TAX exempted amount
TOTAL B-18.00% 5340.00	Total amount with TAX per tax rate
TOTAL TAX B 814.58	Total amount of TAX per tax rate
TOTAL TAX 814.58	Total amount of TAX

CASH 6340.00	Payment method
ITEMS NUMBER 3	Number of items sold

SDC INFORMATION	
Date: 25/5/2012 Time: 11:07:35	Date and time originated from SDC
SDC ID: SDC001000001	SDC Serial number
RECEIPT NUMBER: 168/258 NS	Receipt number originated from SDC
Internal Data: TE68-SLA2-34J5-EAV3-N569-88LJ-Q7	Internal data (separate by dash)
Receipt Signature: V249-J39C-FJ48-HE2W	Receipt signature (separate by dash)

RECEIPT NUMBER: 152	Receipt number originated from CIS
DATE: 25/5/2012 TIME: 11:09:32	Date and time originated from CIS
MRC: AAACC123456	Machine Registration Code

THANK YOU COME BACK AGAIN YOUR BEST STORE IN TOWN	Commercial message

- 13 **Normal Refund**, defined by receipt label as NR, refers to a receipt that shall be produced, while Electronic Billing Machine is in refund mode, for a client upon request with information indicating that a previously printed Normal Sale receipt contains incorrect information or information on a refund for returned or discounted goods or services. Such refund receipt contains **only negative**, refunded amounts. Each receipt of this type requires a statement by user inputted to a special refund log book containing receipt details and justification with description and the name of the refund recipient.

13.2 Following is example of receipt type NORMAL and transaction type REFUND (NR)

Trade Name	TAXPAYER'S NAME
Address, City	Shop address
TIN: 000000000	Taxpayer Identification number
-----	TITLE for REFUND
REFUND	Receipt number based on which refund is issued
REF. NORMAL RECEIPT#: NNNN	(optional)
-----	Commercial message
REFUND IS APPROVED ONLY FOR	
ORIGINAL SALES RECEIPT	
Client ID: 000000000	CLIENT'S Identification (optional)

Gravel /t	Item description, unit price, quantity, total price in
9000.00x 5.354 -48186.00B	NEGATIVE amount and tax designation
-25% -36139.50	Reduction of price in percentage and total amount

TOTAL -36139.50	Total amount to be refunded (negative amount)
TOTAL B-18.00% -36139.50	Total amount with TAX (negative amount)
TOTAL TAX B -5512.81	Total amount of TAX per tax rate (negative)
TOTAL TAX -5512.81	Total amount of TAX (negative)
-----	Payment method (negative amount)
CASH -36139.50	Number of items
ITEMS NUMBER 1	

SDC INFORMATION	
Date: 25/5/2012 Time: 11:48:27	Date and time originated from SDC
SDC ID: SDC001000001	SDC Serial number
RECEIPT NUMBER: 12/259 NR	Receipt number originated from SDC
Internal Data:	Internal data (separate by dash)
IR84-99TN-FCYY-CE22-4HWE-V5TA-EE	
Receipt Signature:	Receipt signature (separate by dash)
669X-TBMM-GPE4-445D	

RECEIPT NUMBER: 153	Receipt number originated from CIS
DATE: 25/5/2012 TIME: 11:50:24	Date and time originated from CIS
MRC: AAACC123456	Machine Registration Code
-----	Commercial message
THANK YOU	
WE APPRECIATE YOUR BUSINESS	

- 14 **Copy**, defined by receipt label as CS or CR, refers to a copy of only previously generated receipt of any NORMAL receipt type

14.2 Following is example of receipt type COPY and transaction type REFUND (CR):

Trade Name Address, City TIN: 000000000 COPY	
----- REFUND REF. NORMAL RECEIPT#: NNNN ----- REFUND IS APPROVED ONLY FOR ORIGINAL SALES RECEIPT Client ID: 000000000 -----	TITLE for COPY
Gravel /t 9000.00x 5.354 -48186.00B -25% -36139.50 -----	
THIS IS NOT AN OFFICIAL RECEIPT -----	Warning message
TOTAL -36139.50 TOTAL B-18.00% -36139.50 TOTAL TAX B -5512.81 TOTAL TAX -5512.81 ----- CASH -36139.50 ITEMS NUMBER 1 -----	
COPY -----	TITLE for COPY
SDC INFORMATION Date: 25/5/2012 Time: 11:49:47 SDC ID: SDC001000001 RECEIPT NUMBER: 24/260 CR Internal Data: IR84-99TN-FCYY-CE22-4HWE-V5TA-EE Receipt Signature: REE4-EGMK-DSA2-PKMM ----- RECEIPT NUMBER: 154 DATE: 25/5/2012 TIME: 11:51:44 MRC: AAACC123456 ----- THANK YOU WE APPRECIATE YOUR BUSINESS	

- 15 **Training**, defined by receipt label as TS or TR refers to a printout purely for practice purposes on Electronic Billing Machine and shall be produced only when it is in its training mode, with information similar to that which is to be indicated on a NORMAL receipt type.

15.2 Following is example of receipt type TRAINING and transaction type SALE (TS):

Trade Name			TITLE for TRAINING
Address, City			
TIN: 000000000			
TRAINING MODE			

Welcome to our shop			
Client ID: 000000000			

Plain Bread			
1000.00x	1.00	1000.00A-EX	
Wriggly gum			
60.00x	5.00	300.00B	

THIS IS NOT AN OFFICIAL RECEIPT			Warning message

TOTAL	1300.00		
TOTAL A-EX	1000.00		
TOTAL B-18.00%	300.00		
TOTAL TAX B	45.76		
TOTAL TAX	45.76		

CASH	6340.00		
ITEMS NUMBER	2		

TRAINING MODE			TITLE for TRAINING

SDC INFORMATION			
Date: 25/5/2012	Time: 11:55:12		
SDC ID:	SDC001000001		
RECEIPT NUMBER:	33/261 TS		

RECEIPT NUMBER:	155		
DATE: 25/5/2012	TIME: 11:57:08		
MRC:	AAACC123456		

THANK YOU			
COME BACK AGAIN			
YOUR BEST STORE IN TOWN			

- 16 **Pro forma** or an **advance receipt**, defined by receipt label only as PS refers to a printout from an Electronic Billing Machine while in pro forma mode, with information similar to that contained on a NORMAL receipt type.

16.2 Following is example of receipt type PROFORMA and transaction type SALE (PS):

Trade Name			TITLE for PROFORMA
Address, City			
TIN: 000000000			
PROFORMA			

Welcome to our shop			
Client ID: 000000000			

Cement 42.5/50kg			
11000.00x	65.00	715000.00B	
Clay local made brick			
30.00x	5500.00	16500.00B	

THIS IS NOT AN OFFICIAL RECEIPT			Warning message

TOTAL	880000.00		
TOTAL B-18.00%	880000.00		
TOTAL TAX B	134237.29		
TOTAL TAX	134237.29		

PROFORMA			TITLE for PROFORMA

SDC INFORMATION			
Date: 25/5/2012	Time: 12:17:41		
SDC ID:	SDC001000001		
RECEIPT NUMBER:	25/262 PS		

RECEIPT NUMBER:	156		
DATE: 25/5/2012	TIME: 12:19:38		
MRC:	AAACC123456		

THANK YOU			
WE LOOK FORWARD TO EARNING			
YOUR BUSINESS			

- 17 Certified Invoicing System shall have facility to generate detailed X daily report of the day's sale during which financial transactions were conducted since the previous Z daily report was generated.

17.2 Daily X reports produced by CIS represent a summary of all registrations since the end of the previous Z daily report and it shall at least contain information on:

- i. trade name and tax identification number:

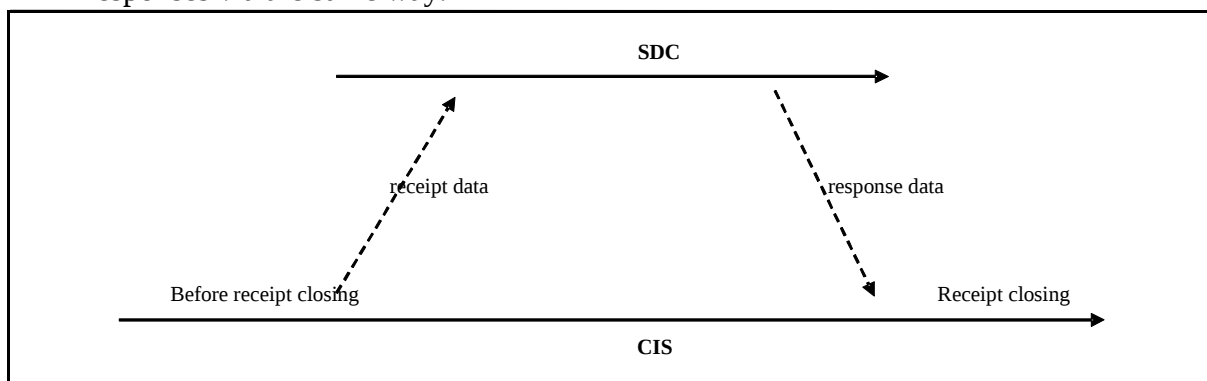
- ii. date and time;
- iii. information showing this is an X daily report;
- iv. CIS designation and MRC;
- v. total sales amount for all sales receipts labeled as NS, including tax;
- vi. total sales amount for all sales receipts labeled as NS, including tax, for the different main groups if main groups are used;
- vii. number of sales receipts labeled as NS;
- viii. total refund amount for all refund receipts labeled as NR, including tax;
- ix. number of refund receipts labeled as NR;
- x. taxable amounts per applicable tax rates divided between sales (NS) and refunds (NR);
- xi. tax amounts per applicable tax rates divided between sales (NS) and refunds (NR);
- xii. opening deposit;
- xiii. number of items sold;
- xiv. number of receipt copies labeled as CS or CR and amount with tax included;
- xv. number of receipts in training mode labeled as TS or TR and amount with tax included;
- xvi. number of advance receipts in proforma mode labeled as PS and amount with tax included;
- xvii. sales total divided according to means of payment for sales (NS) and refund (NR) receipts;
- xviii. all discounts;
- xix. other registrations that have reduced the day's sales and their amount;
- xx. number of incomplete sales.

- 18 Electronic Billing Machine shall have facility to generate detailed Z daily report at the end of each day during which financial transactions were conducted and certified receipts generated. This report will be regarded as a business and accounting record.

18.2 Daily Z report produced by CIS represent a summary of all registrations suitable for account of a day's sale and shall at least contain information on:

- i. trade name and tax identification number;
- ii. date and time;
- iii. information showing this is an Z daily report;
- iv. CIS designation and MRC;
- v. total sales amount for all sales receipts labeled as NS, including tax;
- vi. total sales amount for all sales receipts labeled as NS, including tax, for the different main groups if main groups are used;
- vii. number of sales receipts labeled as NS;
- viii. total refund amount for all refund receipts labeled as NR, including tax;
- ix. number of refund receipts labeled as NR;
- x. taxable amounts per applicable tax rates divided between sales (NS) and refunds (NR);
- xi. tax amounts per applicable tax rates divided between sales (NS) and refunds (NR);
- xii. opening deposit;
- xiii. number of items sold;
- xiv. number of receipt copies labeled as CS or CR and amount with tax included;

- xv. number of receipts in training mode labeled as TS or TR and amount with tax included;
 - xvi. number of advance receipts in proforma mode labeled as PS and amount with tax included;
 - xvii. sales total divided according to means of payment for sales (NS) and refund (NR) receipts;
 - xviii. all discounts;
 - xix. other registrations that have reduced the day's sales and their amount;
 - xx. number of incomplete sales.
- 19 When no report or only one of the above mentioned reports has been generated, the next report shall contain all the data for the entire period (from the time of the previous Z daily report to the time of the new report).
- 20 PLU report contains full details of each item, the quantities sold and the amounts collected for each item and category since the previous PLU report was generated.
- 20.2 PLU report shall at least contain information on:
- i. company name and tax identification number;
 - ii. date and time;
 - iii. information showing this is an PLU report;
 - iv. CIS designation;
 - v. PLU number, item code, item name, unit price, tax rate, quantity on stock.
- 21 Communication Protocol
- 21.2 Certified Invoicing System (CIS) connected to the Sales Data Controller (SDC) will:
- i. send specific receipt data via the serial port;
 - ii. receive response data from SDC.
- 21.3 Protocol type
- 21.3.1 CIS sends a packed message, containing a command for the SDC.
- 21.3.2 SDC executes the command and sends a packed message or a non-packed message (single byte) as a reply. CIS must wait for a reply before sending another message. The non-packed byte codes are used for handling the necessary pauses and error conditions.
- 21.4 Message sequence
- 21.4.1 During communication, the SDC will always act as a slave machine, listening for incoming queries from host machine connected to its port and sending back responses via the same way.



21.5 Non-packed messages, time-out

- 21.5.1 The CIS must ensure a 1000 ms time-out for receiving a reply. If no reply is received during the time-out, the CIS must send the message with the same frame serial number and the same command again. After several failures, the CIS must display a warning for disconnecting or hardware error.
- 21.5.2 The non-packed messages consist of a single byte:
- NAK 15H** - This code is sent by the SDC when it detects a check sum error.
 - SYN 16H** - This code is sent by the SDC when it receives a command, requiring a longer execution time. **SYN** is sent every 500 ms, until the packed reply message is prepared.
- 21.6 Errors while processing the request
- 21.6.1 In the case of an error (other than request checksum error), SDC has to reply with the packed message with the zero data length and status bytes set to the error code.
- 21.7 Data Format
- 21.7.1 Decimal numbers are presented with two decimal places. Decimal separator is dot ('.'). For example: '18.00'. Zero value is always presented as '0.00'.
- 21.7.2 Date format is 'DD/MM/YYYY'. For example: '20/06/2012' for 6th June 2012. Time format is 'HH:mm:ss'. For example: '14:20:35'.

21.8 Packed messages

Messages from the CIS to the SDC	
<01><LEN><SEQ><CMD><DATA><05><BCC><03>	
<01>	Preamble Length: 1 byte; value: 01;
<LEN>	Number of bytes from <01> (excluded) to <05> (included) plus a fixed offset 20h Length: 1 byte;
<SEQ>	Frame serial number Length: 1 byte; value: 20h - 7Fh; The SDC sends the same <SEQ> in the reply message. If the SDC receives a message, including the same <SEQ>, as the last received one, it must do nothing but repeat the last sent reply message.
<CMD>	Command code Length: 1 byte; value: 20h - 7Fh The SDC must send the same <CMD> in the reply message. In case of receiving a code of a non-existing command, the SDC must send in reply a packed message with a zero length data field and set the corresponding status bytes.
<DATA>	Data Bytes value: 20h - 7Fh The data field format and length depend on the command. If a command includes no data the data field length is 0. If a syntax error is found in the data field, the corresponding status bytes must be set and a packed message with a zero data field must be send as a reply.
<05>	Post amble Length: 1 byte; value: 05h;

<BCC>	Check sum (0000h-FFFFh) Length: 4 bytes; value: 30h - 3Fh The check sum is formed by the bytes following <01> (without it) to <05> included, by summing (adding) the values of the bytes. Each digit is sent as an ASCII code. <u>Each digit of hexadecimal sum is sent separately with offset 30h.</u>
<03>	Terminator Length: 1 byte; value: 03h;
Messages from the SDC to the CIS <01><LEN><SEQ><CMD><DATA><04><STATUS><05><BCC><03>	
<01>	Preamble Length: 1 byte; value: 01;
<LEN>	Number of bytes from <01> (excluded) to <05> (included) plus a fixed offset 20h Length: 1 byte;
<SEQ>	Frame serial number Length: 1 byte; value: 20h - 7Fh; The SDC sends the same <SEQ> in the reply message. If the SDC receives a message, including the same <SEQ>, as the last received one, it must do nothing but repeat the last sent reply message.
<CMD>	Command code Length: 1 byte; value: 20h - 7Fh The SDC must send the same <CMD> in the reply message. In case of receiving a code of a non-existing command, the SDC must send in reply a packed message with a zero length data field and set the corresponding status bytes.
<DATA>	Data Bytes value: 20h - 7Fh The data field format and length depend on the command. If a command includes no data the data field length is 0. If a syntax error is found in the data field, the corresponding status bytes must be set and a packed message with a zero data field must be send as a reply.
<04>	Delimiter (only for messages from the SDC to the CIS) Length: 1 byte; value: 04h;
<STATUS>	Status of the SDC Length: 6 bytes
<05>	Post amble Length: 1 byte; value: 05h;
<BCC>	Check sum (0000h-FFFFh) Length: 4 bytes; value: 30h - 3Fh The check sum is formed by the bytes following <01> (without it) to <05>

	included, by summing (adding) the values of the bytes. Each digit is sent as an ASCII code. <u>Each digit of hexadecimal sum is sent separately with offset 30h.</u>
<03>	Terminator Length: 1 byte; value: 03h;

21.9 SDC status bytes

21.9.1 The SDC current state is coded in a 6 byte field, which is sent in the frame of each reply message. These bytes contents are the following:

<Byte 0> General usage	<Byte 1><Byte 2>	<Byte 3>	<Byte 4><Byte 5>
'P' – if command is successfull	Error code	Warning code	Manufacturer specific
'E' – if there is an error with the command			

21.9.2 Error codes are listed by the priority. Whatever error is first detected, it is the one that should be shown as the error code.

21.9.3 Error codes:

- i. 00 – no error;
- ii. 11 – internal memory full;
- iii. 12 – internal data corrupted;
- iv. 13 – internal memory error;
- v. 20 – Real Time Clock error;
- vi. 30 – wrong command code;
- vii. 31 – wrong data format in the CIS request data;
- viii. 32 – wrong TIN in the CIS request data;
- ix. 33 – wrong tax rate in the CIS request data;
- x. 34 – invalid receipt number int the CIS request data;
- xi. 40 – SDC not activated;
- xii. 41 – SDC already activated;
- xiii. 90 – SIM card error;
- xiv. 91 – GPRS modem error;
- xv. 99 – hardware intervention is necessary.

21.9.4 Warning codes:

- i. 0 – no warning;
- ii. 1 – SDC internal memory is near to full (it is at more than 90% of capacity);
- iii. 2 – SDC internal memory is near to full (it is at more than 95% of capacity).

21.10 Detailed command description

21.10.1 This command is used to send CIS receipt data to SDC:

198 (C6h) RECEIPT DATA	
Data field:	<Rtype><TType><MRC>,<TIN>,<Date><Space><Time>,<RNum>,<TaxRate1>,<TaxRate2>,<TaxRate3>,<TaxRate4>,<Amount1>,<Amount2>,<Amount3>,<Amount4>,<Tax1>,<Tax2>,<Tax3>,<Tax4>[,<ClientsTin>]
Response:	<Code><ErrorCode>
Comment:	
RType	Receipt type: N - normal; C - copy; T - training; P - proforma
TType	Transaction type: S – sale; R – refund
MRC	CIS machine registration code - up to 12 characters
TIN	Tax registration number of the taxpayer
Date	Date of issuing the receipt: DD/MM/YYYY
Time	Time of issuing the receipt: HH:MM:SS
RNum	Receipt number
TaxRate1,...,TaxRate4	Percentage Tax rates
<Amount1>,...,<Amount4>	Receipt amounts corresponding to each Tax (taxable amounts)
<Tax1>,...,<Tax4>	Calculated taxes corresponding to each Tax (tax amounts)
ClientsTin	Tax registration number of the client. This field is optional – if there is no client's TIN, this field should not be included in the request
Code	'P' – the command is executed 'E' – error
ErrorCode	Warning number when Code is P. Error number when Code is E

21.10.2 This command is used to get SDC information for the last receipt processed by SDC:

200 (C8h) SDC RESPONSE	
Data field:	<RNumber>
Response:	<SNumber>,<TNumber>,<GNumber>,<RLabel>,<Date><Space><Time>,<Receipt Signature>,<Internal Data>
Comment:	
Rnumber	Receipt number
SNumber	SDC serial number as a string
TNumber	Receipt number per receipt type
GNumber	Total receipt number
RLabel	Receipt label, based on receipt type (N, C, P, T) and transaction type (S, R): <receipt type><transaction type>, for example: NS
Date	Date of accepting the receipt by the SDC: DD/MM/YYYY
Time	Time of accepting the receipt by the SDC: HH:MM:SS
Receipt Signature	Receipt Signature, sent as a string

<i>Internal Data</i>	Internal Data, sent as a string
Exemplary responses:	SDC999123456,300234,234556,NS,19/01/2012 12:39:05,JVPGPLYG DJRSMXF2,2ASSDCZBZ5AH3TZVVIKEXRW6IQ

21.10.3 This command can be used to read the signatures for the last receipt processed by SDC:

199 (C7h) SIGNATURE REQUEST	
Data field:	<Type> <RNumber>
Response:	<Signature>
Comment:	
<i>Type</i>	R – Receipt Signature I – Internal Data
<i>Rnumber</i>	Receipt number
<i>Signature</i>	SDC signature, sent as a string
Exemplary responses:	For the Receipt Signature: JVPGPLYG DJRSMXF2 For the Internal Data: 2ASSDCZBZ5AH3TZVVIKEXRW6IQ

21.10.4 This command can be used to read the counters for the last receipt processed by SDC:

201 (C9h) COUNTERS REQUEST	
Data field:	<RNumber>
Response:	<TNumber>,<GNumber>,<Date> <Space> <Time>
Comment:	
<i>RNumber</i>	Receipt number, sent by the CIS
<i>TNumber</i>	Receipt number per receipt type
<i>GNumber</i>	Total receipt number
<i>Rlabel</i>	Receipt label, based on receipt type (N, C, P, T) and transaction type (S, R): <receipt type><transaction type>, for example: NS
<i>Date</i>	Date of accepting the receipt by the SDC: DD/MM/YYYY
<i>Time</i>	Time of accepting the receipt by the SDC: HH:MM:SS
Exemplary response:	300234,234556,NS,19/01/2012 12:39:05

21.10.5 This command is used to read serial number of SDC:

229 (E5h) SDC ID REQUEST	
Data field:	No data
Response:	<SNumber>
Comment:	
<i>SNumber</i>	SDC serial number as a string

21.10.6 This command is used to read date and time of SDC:

62 (3Eh) SDC DATE AND TIME REQUEST	
Data field:	<i>No data</i>
Response:	<i><Date> <Space> <Time></i>
Comment:	
<i>Date</i>	<i>Current date of SDC: DD/MM/YYYY</i>
<i>Time</i>	<i>Current time of SDC: HH:MM:SS</i>

21.10.521.10.7 EJ data

238 (EEh) EJ DATA	
Data field:	<i><LType> <String></i>
Response:	<i><Flg></i>
Comment:	
<i>LType</i>	Current line type: 'B' mark for begin of the receipt 'N' mark for line into the body of receipt 'E' mark for end of receipt
<i>String</i>	Current line data
<i>Flg</i>	'P' - operation succeed 'E' - operation failure

21.10.521.10.8 SDC Status

231 (E7h) GET SDC STATUS	
Data field:	<i>No data</i>
Response:	<i><Snumber>, <FWver>, <HWrev>, <CurrentZ>, <LastRemoteDate>, <LastLocalDate></i>
Comment:	
<i>Snumber</i>	SDC serial number
<i>FWver</i>	Firmware version
<i>HWrev</i>	Hardware revision
<i>CurrentZ</i>	The number of current SDC daily report
<i>LastRemoteDate</i>	Last remote audit date and time
<i>LastLocalDate</i>	Last local audit date and time

~~21.10~~21.11 A Certified Invoicing System must stop operating, whenever a communication error appears, due to the disconnection from the SDC or due to power failure interruption. After the error has been cleared, the continuation of the printing process must be enabled

SDC specification

1. Sales Data Controller (SDC) is an electronic device connected to Certified Invoicing System (CIS), designed to receive specific receipt data from CIS, performs data processing and generates response data which is sent back to CIS for further actions. Response data provides authenticity of receipt data. SDC also store receipts by the means of encryption to its own internal memory and enables audit.

SDC General Requirements

- 2 SDC must fulfill all requirements stated in this guideline
 - 2.2 SDC shall:
 - 2.2.1 provide audit information in encrypted form when wirelessly transmitting internal data to the designated server of the Authority in case of the remote audit activation;
 - 2.2.2 provide information in encrypted form when copying internal data to a removable SD card media in case of the local audit activation;
 - 2.2.3 provide information by generating digital signature with encrypted information on each receipt which is verifiable by Authority in a manner defined in this guideline.
 - 2.3 Under no circumstances may SDC change its ownership once it is activated for single user, hence TIN as a parameter becomes permanently embedded within SDC. However, SDC can handle receipt data from multiple CIS which are operating for the same SDC user
 - 2.4 If a single SDC belongs to part of a network operating more than one CIS, the receipt processing with each CIS shall be continuous, meaning that every receipt data shall be processed in consecutive order by SDC regardless of MRC, as long as the CIS sending receipt data belongs to the same TIN as SDC
 - 2.5 SDC shall be provided with following information:
 - i. Manufacturer
 - ii. Model name
 - iii. Serial number
 - 2.6 SDC must be constructed in such way so that it can operate normally when registering transactions while simultaneously performing local or remote audit function
 - 2.7 SDC shall be provided with following ports:
 - i. Port 1 – to facilitate communication with CIS;
 - ii. Port 2 – Electronic journal for CIS (optional);
 - iii. Port 3 – Local audit port with SD card connector;
 - iv. Port 4 - Remote audit port facilitating GPR connection with Authority server.
 - 2.8 The SDC receives the receipt data from the CIS through port 1. Through the same port 1, the SDC data are sent back to the CIS to be printed on the receipt. This port is facilitated through physical connection between CIS and SDC made via serial port (RS232). As for the CIS, the serial connection can be virtualized through alternatives, such as USB, RS485 and Ethernet.
 - 2.9 If CIS doesn't have capability to store electronic journal, it may use port 2 of SDC to back up journal data to a removable media designed for the Secure Digital (SD) type standard
 - 2.10 The SDC via port 3, once it is activated, copies data from internal memory to the removable media designed for the Secure Digital (SD) type standard, with

functionality to store files in FAT16 and FAT32 file system when performing Local Audit.

- 2.11 The SDC, once it is activated, transmits data from internal memory to the designated server of Authority using GPRS network of mobile operator via port 4, performing Remote Audit
- 2.12 The SDC must have a communication protocol in which the data format for all four ports are determined
- 2.13 The settings of the ports 1 should be configured during the production of the SDC. Configuration parameters that may be set after the production via the hardware are:
 - speed
 - number of bits
 - number of stop bits
 - parity
- 2.14 SDC shall have configurable settings for Remote Audit
- 2.15 SDC shall provide Authority with mean to configure security settings used for generation of receipt signature
- 2.16 SDC must have its own power supply or it can use port 1 for power supply if applicable
- 2.17 SDC must be provided with real-time clock which shows date and time (including year, month, day, hour, minute, second) according to Rwanda time. Adjustment of the real-time clock accuracy is permitted via NTP server, however SDC must not depend on network availability in order to run all operations excluding remote audit.
- 2.18 SDC shall provide a signal, via its own user interface, as to whether it is functioning or not functioning, its current status and audit progress
- 2.19 SDC shall be able to execute tasks provided by Authority in order to activate and perform Remote Audit
- 2.20 SDC shall be provided with internal memory which can hold internal data

3 SDC data processing

- 3.2 SDC shall receive and process *Receipt data* from CIS
- 3.3 SDC shall send *Response data* to CIS
- 3.4 SDC shall update *Counters* for each receipt.
- 3.5 SDC shall generate *Signature data* for receipts type Normal and Copy.
- 3.6 SDC shall not generate *Signature data* for receipts type Profo and Training.
- 3.7 SDC shall write Receipt data of the receipt type Normal and Copy into its internal memory.
- 3.8 SDC shall update its Internal data before sending response data to CIS
- 3.9 Following algorithms are used during the data processing:
 - 3.9.1 AES-256 (in ECB mode);
 - 3.9.2 HMAC SHA-1;
 - 3.9.3 Base-32 encoding with the RFC 4648 Base-32 alphabet.
- 3.10 Following Individual Keys are used during data processing:
 - 3.10.1 Encryption Key (256 bits) – used for AES-256;
 - 3.10.2 Internal Data Encryption Key (256 bits) - used for AES-256;
 - 3.10.3 Signature Key (256 bits) - used for HMAC SHA-1.

4 SDC Internal data

- 4.2 SDC stores receipt data for each receipt type Normal and Copy
- 4.3 Receipt data shall be in order in which they are received

4.4 SDC stores Counters

4.5 SDC generates Daily Z report for each day during which at least one receipt is registered

4.6 Internal data shall be encrypted, using AES-256 with Encryption Key.

5 SDC Counters

5.2 Counters consists of:

5.2.1 Total Counter;

5.2.2 Counter per Receipt type (Normal, Copy, Training, Proforma);

5.2.3 Total Amounts;

5.2.4 Date and time of the last local audit;

5.2.5 Date and time of the last remote audit.

5.3 Total Counter is incremented for each receipt

5.4 Counter per Receipt type Normal is incremented for each receipt of type Normal

5.5 Counter per Receipt type Copy incremented for each receipt of type Copy

5.6 Counter per Receipt type Training is incremented for each receipt of type Training

5.7 Counter per Receipt type Profo is incremented for each receipt of type Profo

5.8 All counters start with the value 0

5.9 Total counter and Counters per receipt type can only increment by value of 1

5.10 Total Amounts contain:

5.10.1 total Sale Amount registered by SDC for all Normal Sale receipts;

5.10.2 total TAX Sale Amount registered by SDC for all Normal Sales receipts;

5.10.3 total Return Amount registered by SDC for all Normal Refund receipts;

5.10.4 total TAX Return Amount registered by SDC for all Normal Refund receipts.

5.11 All Total Amounts start with the value 0

5.12 Counter cannot be reduced

5.13 Date and time of the last local audit is updated after performing local audit

5.14 Date and time of the last remote audit is updated after performing remote audit

6 SDC Daily Z Report

6.2 For each day during which at least one receipt was registered, SDC shall generate Daily Z report

6.3 Daily Z report shall be generated only from data for the selected day (from the 00:00:00 up to 23:59:59)

6.4 Daily Z report shall contain all data specified in **SDC data File Format** under 13.2.3

7 Receipt data provided by CIS

7.2 For each receipt, CIS shall send data as specified in **SDC data File Format** under 13.2.2, i, items 1-11

8 Response data provided by SDC

8.2 For each receipt of type Normal or Copy, SDC shall send data as specified in **SDC data File Format** under 13.2.3, ii, items 1-8

8.3 For each receipt of type Training or Profo, SDC shall send data as specified in **SDC data File Format** under 13.2.3, ii, items 1-6

9 SDC Signature data

9.2 SDC generates **Internal Data** record and **Receipt Signature** record for the each receipts processed (of the types N - normal and C - copy)

9.3 **Internal Data** record is 26 characters long Base-32 encoded string

9.4 **Receipt Signature** record is 16 characters long Base-32 encoded string

10 SDC Internal data specification

10.2 Internal Input Data is based on the following table:

Field	Description	Length and format
STA	SDC total sale tax amount (excluding decimal part) for all Normal Sale receipts	5 bytes (40 bits) whole number
RTA	SDC total return tax amount (excluding decimal part) for all Normal Refund receipts	5 bytes (40 bits) whole number
ZCNT	SDC number of daily reports	2 bytes (16 bits) whole number
SDCTC	SDC Total Receipt Counter	4 bytes (32 bits) whole number
Following applies:		
- Byte order is big endian - Total length is 128 bits and is fixed		

10.3 Internal Input Data is encrypted with AES-256 using Internal Data Encryption Key in order to get **Encrypted Data** which is 128 bits long

10.4 Encrypted Data is padded with two zero bits (0x0) in order to get **Padded Encrypted Data** which is 130 bits long

10.5 Padded Encrypted Data is encoded with the base - 32 encoding to get **Internal Data** which is 26 characters long. All characters are from base - 32 alphabet

10.6 Only Authority shall be able to decrypt Internal Data

11 SDC Receipt data specification

11.2 Receipt signature provides mean of verifying receipt data integrity and authenticity

11.3 **Receipt Input Data** is based on the following table:

Field	Description	Length and format	Example
CDT	CIS Date and Time on the receipt	14 characters Format: YYYYMMDDhhmmss	'20120605213455'
TIN	Tax Identification Number	9 characters	'123456789'
CTIN	Client's Tax Identification number	9 characters	'123456789' Or, if not present: ' , '
MRC	Machine Registration Code	11 characters	'ABC01012345'
RRN	Receipt Run Number	10 characters	' 12345'
TR1	Tax Rate 1	5 characters amount	'18,00'
TV1	Taxable Amount 1	15 characters amount	' 500,00'
TA1	Tax Amount 1	15 characters amount	' 76,27'
TR2	Tax Rate 2	5 characters amount	' 0,00'
TV2	Taxable Amount 2	15 characters amount	' 500,00'
TA2	Tax Amount 2	15 characters amount	' 0,00'
TR3	Tax Rate 3	5 characters amount	' 0,00'

TV3	Taxable Amount 3	15 characters amount	' 0,00'
TA3	Tax Amount 3	15 characters amount	' 0,00'
TR4	Tax Rate 4	5 characters amount	' 0,00'
TV4	Taxable Amount 4	15 characters amount	' 0,00'
TA4	Tax Amount 4	15 characters amount	' 0,00'
RT	Receipt Type	1 character	'N' or 'C' or 'T' or 'P'
TT	Transaction Type	1 character	'S' or 'R'
SDCID	Sales Data Controller ID	12 characters	'SDC001012345'
SDCDT	SDC Date and Time on the receipt	14 characters Format: YYYYMMDDhhmmss	'20120605213455'
SDCRTC	SDC Receipt Type Counter	10 characters	' 123'
SDCTC	SDC Total Receipt Counter	10 characters	' 1234'
Following applies: • All the fields are padded with spaces (' ') from the left in order to reach the specified length • Total length is 241 bytes and is fixed • Decimal comma (,) is used for amounts • If amount is not present, default value is 0,00 • No leading zeros should be included for RRN and amounts fields			

11.4 HMAC SHA-1 is applied to Receipt Input data in order to get **Data Hash** which is 20 bytes long

11.5 At least 10 bytes are taken of Data Hash in order to get **Receipt Data Hash**

11.6 Receipt Data Hash is encoded with the base - 32 encoding in order to get **Receipt Signature** which is 16 characters long. All characters are from base - 32 alphabet

11.7 Only Authority shall be able to verify data integrity and authenticity by using Receipt signature

12 SDC data for Authority

12.2 SDC generates data for Authority in two manners: Local Audit and Remote Audit

[12.3](#) All data shall be encrypted using AES-256 with Encryption Key

[12.3](#)[12.4](#) [SDC shall always create Status data when Audit is performed](#)

13 SDC data File Format

13.2 SDC shall generate data file in XML format with root element labeled as <report> which consist following 3 sections:

13.2.1 Status labeled as <status> containing following data and labels:

- SDC certified software version <sw_ver>;
- SDC certified hardware version <hw_ver>;
- Date and time of last local audit <ladt>;
- Date and time of last remote audit <radt>;
- Task ID <tid>;
- Tax Identification Number of user <tin>;
- SDC serial number <ssn>;
- Last command which produced this report <cmd>.

13.2.2 Receipt labeled as <rcpt> containing following data and labels for each receipt:

- Information SDC received from CIS <cisreq>;
 - CIS date (year, month, day) and time (hour, minute, second) <dt>;

2. Tax Identification Number <tin>;
 3. Client's Tax Identification Number (optional) <ctin>;
 4. CIS marking MRC <mrc>;
 5. Receipt run number <rrn>;
 6. Receipt type (normal=N, copy=C, training=T, profo=P) <rt>;
 7. Transaction type (sale=S, refund=R) <tt>;
 8. Total tax inclusive sale or return amount <ta>;
 9. Amounts for each tax rate inclusive of tax <va1....va4>;
 10. Tax amounts for each tax rate <vt1....vt4>;
 - ~~11. Tax amounts for each tax rate <vt1....vt4>;~~
 11. Tax rate value for each tax rate <vr1...vr4>
- ii. Information SDC sent to CIS <sdcre>;
1. SDC serial number <ssn>;
 2. SDC date (year, month, day) and time (hour, minute, second) <dt>;
 3. Receipt type (normal=N, copy=C, training=T, profo=P) <rt>;
 4. Transaction type (sale=S, refund=R) <tt>;
 5. SDC counter per receipt type <rtcnt>;
 6. SDC total counter <tcnt>;
 7. Signature, only for receipt type normal or copy <sig>;
 8. Internal data, only for receipt type normal or copy <ind>
- Note: (file shall contain multiple Receipt Section corresponding to the number of receipts issued within the scope of audit period);
- iii. Receipt journal in text format <txt>.
- 13.2.3 Daily report labeled as <zr> containing following data and labels:
- i. Report date (year, month, day) <dt>;
 - ii. Report number (year, month, day) <zrcnt>;
 - iii. Total number of receipts issued <tcnt>;
 - iv. Opening run number <ocnt>;
 - v. Closing run number <ccnt>;
 - vi. Daily report per receipt type <zrtN> for normal, <zrtC> for copy, <zrtT>; for training <zrtP> for proforma, containing:
 1. Total number of receipts issue per Receipt type <rtcnt>;
 2. Total Sale amount per Receipt type including tax <tva>;
 3. Total Return amount per receipt type including tax <tra>;
 4. Total tax for sales amount <stva>;
 5. Total tax for refund amount <rtva>;
 6. Opening run number <rtocnt>;
 7. Closing run number <rtccnt>;
 8. Sale amounts for each tax rate inclusive of tax <sva1....sva4>;
 9. Return amounts for each tax rate inclusive of tax <rva1....rva4>;
 - vii. Counters labeled as <gtotalsgtotal> containing following data and labels:
 1. Total number of receipts <tcnt>;
 2. Total number of receipts type Normal <rtNcnt>;
 3. Total number of receipts type Copy <rtCcnt>;
 4. Total number for receipts type Training <rtTcnt>;
 5. Total number for receipts type Profo <rtPcnt>;
 6. Total sale amount including tax <tva>;
 7. Total sales tax amount <tsvt>;

8. Total return amount including tax <tra>;
9. Total return tax amount <trvt>.

13.3 SDC shall create same file format in both Local or Remote audit cases, however only in Status section under last command <cmd>, designation of audit shall be identified.

14 SDC Local Audit

14.2 SDC shall copy all of its internal data to SD card when Local Audit is performed

14.3 The file name must be in the following format:

"SDCID_YYYYMMDDHHmmss.bin" where:

- SDCID = SDC identification number "SDCXXXXXXXXXX";
- YYYY = year when the audit started;
- MM = month when the audit started;
- DD = day when the audit started;
- HH = hour when the audit started;
- mm = minute when the audit started;
- ss = second when the audit started.

15 SDC Remote Audit

15.2 SDC shall send selected data from its internal data when Remote Audit is performed.

15.3 Data selection is done by Authority by issuing command to SDC which data and which period (from-to date) is of interest

15.4 SDC shall communicate with Authority server by execution of commands received in the following manner:

- a) Command received through activation process enabled by communication protocol command as described in Article 19 of this guideline;
- b) Command received by SMS from a dedicated number assigned to SDC during activation process;
- c) Command received from Authority server upon the SDC connection.

15.5 SDC Remote Audit SMS Command formats

15.5.1 SDC command format received by SMS is based on the following table:

No.	Field description	Length and format
1	SDC ID	16 characters, String
2	Task to be executed	2 characters, String
3	Task ID	16 characters, Number
4	Starting date and time	19 characters, (YYYY-MM-DDThh:mm:ss)
5	Ending date and time	19 characters, (YYYY-MM-DDThh:mm:ss)
6	Interval in minutes	5 characters, number
Following applies: - fields are separated by row separator (one field per row) - if request period has elapsed parameter 6 is ignored, and command is executed immediately		

15.5.2 Following table represents flags which are combined in sequence of 2 characters in order to execute task:

Char.	Description
Z	Sends Z report
0	None
1	Normal
2	Copy
3	Normal + Copy
4	Training
5	Training + Normal
6	Training + Copy
7	Training + Normal + Copy
8	Profo
9	Profo + Normal
A	Profo + Copy
B	Profo + Normal + Copy
C	Profo + Training
D	Profo + Training + Normal
E	Profo + Training + Copy
F	Profo + Training + Normal + Copy
Following is example: "Z1" - sends Z report + Normal receipts + Status "02" - sends copy receipts without Z report + Status	

15.6 SDC Remote Audit Server protocol

15.6.1 Encrypted audit files can be sent through HTTP POST requests to the URL of the Authority server. In the HTTP request header must be specified field 'content-type' with value 'text / xml'.

15.6.2 To identify which SDC is the sender the following fields must be provided in the http header:

- TSN - SDC serial number;
- TMM – SDC hardware version;
- TSW – SDC software version;
- TSS – Specification version with fixed value prescribed by Authority “1.00”.

15.6.3 The files must indicate the XML standard and encoding. SDC will generate and use <?xml version="1.0" encoding="ISO-8859-1"?>.

15.6.4 Server shall return errors according the HTTP protocol in case SDC fails to establish communication.

15.6.5 If case of no error at HTTP level, server shall return answer or confirmation in CML format.

15.6.6 The return response can contain a new task for the SDC or general status only. The general response is used to indicate errors or success. Error code and optional message can be provided. Following table is defining universal format for response:

XML (root element is "general")	Type	Description
status	32-bit	Status code. Success = 0, any non-zero value indicates

		error
message	string	Optional text message

15.6.7 When a new task is returned, no status is indicated. SDC shall start working in accordance with new task and consider the current one to be completed.

Following table is defining task command format:

XML (root element is "task")	Type	Description
ssn	string	SDC serial number
pat	Char-2	Task (see SMS table)
tid	32-bit	Task ID
SD	DateTime	Starting date and time for the task
ED	DateTime	Ending date and time for the task
prd	32-bit	Interval in minutes

16 SDC requirements on performance

- 16.2 SDC memory shall be such that it does not need electrical power for the stored data to be retained
- 16.3 The Authority encryption keys shall be stored in SDC so that the risk of them becoming compromised is minimized
- 16.4 The Authority encryption keys shall be stored in SDC memory that cannot be modified or read by unauthorized persons or read using an oscilloscope or any other tool
- 16.5 SDC internal data shall be stored in memory so that it cannot be modified or deleted without visible traces
- 16.6 SDC shall keep internal data for at least 10 years, starting from January 1st following the tax year in which data was produced, even when power supply is not present
- 16.7 SDC shall not overwrite or erase internal data that is less than 10 years old calculating from January 1st following the tax year in which data was produced.
- 16.8 SDC shall implement all stated functions in an internal software that cannot be read, modified or deleted without visible traces.
- 16.9 SDC functions shall not delay normal CIS operations so that it affects user comfort.
- 16.10 SDC shall signal if it is functioning or not.
- 16.11 SDC shall signal if remote audit or local audit is complete or error during this operation occurred.
- 16.12 SDC real-time clock should not differ by more than 5 minutes maximum per year at an ambient temperature of 20°C
- 16.13 SDC shall withstand operating temperature range from +5°C to +40°C.
- 16.14 SDC shall withstand storage temperature range from -10°C to +55°C.
- 16.15 SDC shall withstand operating humidity range from 10% to 85%.
- 16.16 SDC cabinet shall be constructed in such manner that its opening should leave visible traces.

17 SDC documentation

- 17.2 SDC unit shall be validated by Authority as fulfilling the requirements of these guidelines
- 17.3 Documentation shall be made available for validation purposes.
- 17.4 Documentation shall include, but not limited to:

- a) Installation Guide for SDC;
- b) User Manual;
- c) Tax Officer User Manual;
- d) Operating Environment;
- e) Bill of Material;
- f) SDC Functional Specification;
- g) Vulnerability Analysis and List of Counter Measures;
- h) Test Cases;
- i) Code Review;
- j) Security on Hardware;
- k) additional information might be required during validation period.

17.5 All documentation shall be available in English language

18 SDC manufacturing

18.2 SDC manufacturer shall comply with a certified version of the product

18.3 SDC real-time clock is set during production

18.4 Unique serial number shall be saved/stored in the SDC while in production

18.5 SDC shall have label firmly set on the outside of the cabinet indicating:

- a) manufacturer and model;
- b) serial number;
- c) software version;
- d) hardware revision;
- e) certificate designation.

19 Communication Protocol

19.2 SDC connected to CIS will:

- a) receive specific receipt data via the serial port;
- b) generate response data;
- c) send response data back to the CIS;
- d) additionally, SDC has parameters that can be configured using the communication protocol.

19.3 **Protocol type:**

19.3.1 CIS sends a packed message, containing a command for the SDC.

19.3.2 SDC executes the command and sends a packed message or a non-packed message (single byte) as a reply. CIS must wait for a reply before sending another message

19.3.3 The non-packed byte codes are used for handling the necessary pauses and error conditions.

19.4 **Message sequence:**

19.4.1 During communication, the SDC will always act as a slave machine, listening for incoming queries from host machine connected to its port and sending back responses via the same way.

19.5 **Non-packed messages, time-out:**

19.5.1 The CIS must ensure a 1000 ms time-out for receiving a reply. If no reply is received during the time-out, the CIS must send the message with the same frame serial number and the same command again. After several failures, the CIS must display a warning for disconnecting or hardware error.

19.5.2 The non-packed messages consist of a single byte:

- i. **NAK 15H** - this code is sent by the SDC when it detects a check sum error.

- ii. **SYN 16H** - this code is sent by the SDC when it receives a command, requiring a longer execution time. **SYN** is sent every 500 ms, until the packed reply message is prepared.

19.6 Errors while processing the request:

- 19.6.1 In the case of an error (other than request checksum error), SDC has to reply with the packed message with the zero data length and status bytes set to the error code.

19.7 Data format:

- 19.7.1 Decimal numbers are presented with two decimal places. Decimal separator is dot ('.'). For example: '18.00'. Zero value is always presented as '0.00'.
- 19.7.2 Date format is 'DD/MM/YYYY'. For example: '20/06/2012' for 6th June 2012
- 19.7.3 Time format is 'HH:mm:ss'. For example: '14:20:35'

19.8 Packed messages:

Messages from the CIS to the SDC	
<01><LEN><SEQ><CMD><DATA><05><BCC><03>	
<01>	Preamble Length: 1 byte; value: 01;
<LEN>	Number of bytes from <01> (excluded) to <05> (included) plus a fixed offset 20h Length: 1 byte;
<SEQ>	Frame serial number Length: 1 byte; value: 20h - 7Fh; The SDC sends the same <SEQ> in the reply message. If the SDC receives a message, including the same <SEQ>, as the last received one, it must do nothing but repeat the last sent reply message.
<CMD>	Command code Length: 1 byte; value: 20h - 7Fh The SDC must send the same <CMD> in the reply message. In case of receiving a code of a non-existing command, the SDC must send in reply a packed message with a zero length data field and set the corresponding status bytes.
<DATA>	Data Bytes value: 20h - 7Fh The data field format and length depend on the command. If a command includes no data the data field length is 0. If a syntax error is found in the data field, the corresponding status bytes must be set and a packed message with a zero data field must be send as a reply.
<05>	Post amble Length: 1 byte; value: 05h;
<BCC>	Check sum (0000h-FFFFh) Length: 4 bytes; value: 30h - 3Fh The check sum is formed by the bytes following <01> (without it) to <05> included, by summing (adding) the values of the bytes. Each digit is sent as an ASCII code. <u>Each digit of hexadecimal sum is sent separately with offset</u>

	30h.
<03>	Terminator Length: 1 byte; value: 03h;
Messages from the SDC to the CIS <01><LEN><SEQ><CMD><DATA><04><STATUS><05><BCC><03>	
<01>	Preamble Length: 1 byte; value: 01;
<LEN>	Number of bytes from <01> (excluded) to <05> (included) plus a fixed offset 20h Length: 1 byte;
<SEQ>	Frame serial number Length: 1 byte; value: 20h - 7Fh; The SDC sends the same <SEQ> in the reply message. If the SDC receives a message, including the same <SEQ>, as the last received one, it must do nothing but repeat the last sent reply message.
<CMD>	Command code Length: 1 byte; value: 20h - 7Fh The SDC must send the same <CMD> in the reply message. In case of receiving a code of a non-existing command, the SDC must send in reply a packed message with a zero length data field and set the corresponding status bytes.
<DATA>	Data Bytes value: 20h - 7Fh The data field format and length depend on the command. If a command includes no data the data field length is 0. If a syntax error is found in the data field, the corresponding status bytes must be set and a packed message with a zero data field must be send as a reply.
<04>	Delimiter (only for messages from the SDC to the CIS) Length: 1 byte; value: 04h;
<STATUS>	Status of the SDC Length: 6 bytes
<05>	Post amble Length: 1 byte; value: 05h;
<BCC>	Check sum (0000h-FFFFh) Length: 4 bytes; value: 30h - 3Fh The check sum is formed by the bytes following <01> (without it) to <05> included, by summing (adding) the values of the bytes. <u>Each digit is sent as an ASCII code. Each digit of hexadecimal sum is sent separately with offset 30h.</u>
<03>	Terminator Length: 1 byte; value: 03h;

19.9 SDC status bytes:

19.9.1 The SDC current state is coded in a 6 byte field, which is sent in the frame of each reply message. These bytes contents are the following:

<Byte 0> General usage	<Byte 1><Byte 2>	<Byte 3>	<Byte 4><Byte 5>
'P' – if command is	Error code	Warning code	Manufacturer

successfull			specific
'E' – if there is an error with the command			

19.9.2 Error codes are listed by the priority. Whatever error is first detected, it is the one that should be shown as the error code.

19.9.3 Error codes:

- i. 00 – no error;
- ii. 11 – internal memory full;
- iii. 12 – internal data corrupted;
- iv. 13 – internal memory error;
- v. 20 – Real Time Clock error;
- vi. 30 – wrong command code;
- vii. 31 – wrong data format in the CIS request data;
- viii. 32 – wrong TIN in the CIS request data;
- ix. 33 – wrong tax rate in the CIS request data;
- x. 34 – invalid receipt number int the CIS request data;
- xi. 40 – SDC not activated;
- xii. 41 – SDC already activated;
- xiii. 90 – SIM card error;
- xiv. 91 – GPRS modem error;
- xv. 99 – hardware intervention is necessary.

19.9.4 Warning codes:

- i. 0 – no warning;
- ii. 1 – SDC internal memory is near to full (it is at more than 90% of capacity);
- iii. 2 – SDC internal memory is near to full (it is at more than 95% of capacity)

19.10 Detailed Command Description:

19.10.1 This command is used to send CIS receipt data to SDC:

198 (C6h) RECEIPT DATA	
Data field:	<Rtype><TType><MRC>,<TIN>,<Date><Space><Time>,<RNum>,<TaxRate1>,<TaxRate2>,<TaxRate3>,<TaxRate4>,<Amount1>,<Amount2>,<Amount3>,<Amount4>,<Tax1>,<Tax2>,<Tax3>,<Tax4>[,<ClientsTin>]
Response:	<Code><ErrorCode>
Comment:	
<i>RType</i>	Receipt type: N - normal; C - copy; T - training; P - proforma
<i>TType</i>	Transaction type: S – sale; R – refund
<i>MRC</i>	CIS machine registration code - up to 12 characters
<i>TIN</i>	Tax registration number of the taxpayer
<i>Date</i>	Date of issuing the receipt: DD/MM/YYYY
<i>Time</i>	Time of issuing the receipt: HH:MM:SS
<i>RNum</i>	Receipt number

<i>TaxRate1</i> ,..., <i>TaxRate4</i>	Percentage Tax rates
< <i>Amount1</i> >, ..., < <i>Amount4</i> >	Receipt amounts corresponding to each Tax (taxable amounts)
< <i>Tax1</i> >, ..., < <i>Tax4</i> >	Calculated taxes corresponding to each Tax (tax amounts)
<i>ClientsTin</i>	Tax registration number of the client. This field is optional – if there is no client's TIN, this field should not be included in the request
<i>Code</i>	'P' – the command is executed 'E' – error
<i>ErrorCode</i>	Warning number when <i>Code</i> is P. Error number when <i>Code</i> is E

19.10.2 This command is used to get SDC information for the last receipt processed by SDC:

200 (C8h) SDC RESPONSE	
Data field:	< <i>RNumber</i> >
Response:	< <i>Snumber</i> >, < <i>TNumber</i> >, < <i>GNumber</i> >, < <i>RLabel</i> >, < <i>Date</i> > < <i>Space</i> > < <i>Time</i> >, < <i>Receipt Signature</i> >, < <i>Internal Data</i> >
Comment:	
<i>Rnumber</i>	Receipt number
<i>SNumber</i>	SDC serial number as a string
<i>TNumber</i>	Receipt number per receipt type
<i>GNumber</i>	Total receipt number
<i>RLabel</i>	Receipt label, based on receipt type (N, C, P, T) and transaction type (S, R): <receipt type><transaction type>, for example: NS
<i>Date</i>	Date of accepting the receipt by the SDC: DD/MM/YYYY
<i>Time</i>	Time of accepting the receipt by the SDC: HH:MM:SS
<i>Receipt Signature</i>	Receipt Signature, sent as a string
<i>Internal Data</i>	Internal Data, sent as a string
Exemplary responses:	SDC999123456,300234,234556,NS,19/01/2012 12:39:05,JVPGPLYG DJRSMXF2,2ASSDCZBZ5AH3TZVVIKEXRW6IQ

19.10.3 This command can be used to read the signatures for the last receipt processed by SDC:

199 (C7h) SIGNATURE REQUEST	
Data field:	< <i>Type</i> > < <i>RNumber</i> >
Response:	< <i>Signature</i> >
Comment:	
<i>Type</i>	R – Receipt Signature I – Internal Data
<i>Rnumber</i>	Receipt number
<i>Signature</i>	SDC signature, sent as a string
Exemplary responses:	For the Receipt Signature: JVPGPLYG DJRSMXF2 For the Internal Data: 2ASSDCZBZ5AH3TZVVIKEXRW6IQ

19.10.4 This command can be used to read the counters for the last receipt processed by SDC:

201 (C9h) COUNTERS REQUEST	
Data field:	<RNumber>
Response:	<TNumber>,<GNumber>,<Date> <Space> <Time>
Comment:	
<i>RNumber</i>	Receipt number, sent by the CIS
<i>TNumber</i>	Receipt number per receipt type
<i>GNumber</i>	Total receipt number
<i>Rlabel</i>	Receipt label, based on receipt type (N, C, P, T) and transaction type (S, R): <receipt type><transaction type>, for example: NS
<i>Date</i>	Date of accepting the receipt by the SDC: DD/MM/YYYY
<i>Time</i>	Time of accepting the receipt by the SDC: HH:MM:SS
Exemplary response:	300234,234556,NS,19/01/2012 12:39:05

19.10.5 This command is used to read serial number of SDC:

229 (E5h) SDC ID REQUEST	
Data field:	No data
Response:	<SNumber>
Comment:	
<i>SNumber</i>	SDC serial number as a string

19.10.6 This command is used to read date and time of SDC:

62 (3Eh) SDC DATE AND TIME REQUEST	
Data field:	No data
Response:	<Date> <Space> <Time>
Comment:	
<i>Date</i>	Current date of SDC: DD/MM/YYYY
<i>Time</i>	Current time of SDC: HH:MM:SS

19.10.519.10.7 EJ data:

238 (EEh) EJ DATA	
Data field:	<LType> <String>
Response:	<Flg>
Comment:	
<i>LType</i>	Current line type: 'B' mark for begin of the receipt 'N' mark for line into the body of receipt 'E' mark for end of receipt
<i>String</i>	Current line data
<i>Flg</i>	'P' - operation succeed 'E' - operation failure

19.10.519.10.8 SDC Status:

231 (E7h) GET SDC STATUS	
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Data field:	<i>No data</i>
Response:	<i><Snumber>,<FWver>,<HWrev>,<CurrentZ>,<LastRemoteDate>,<LastLocalDate></i>
Comment:	
<i>Snumber</i>	SDC serial number
<i>FWver</i>	Firmware version
<i>HWrev</i>	Hardware revision
<i>CurrentZ</i>	The number of current SDC daily report
<i>LastRemoteDate</i>	Last remote audit date and time
<i>LastLocalDate</i>	Last local audit date and time

~~19.10.5~~19.10.9 This command is used to write configuration parameters to

221 (DDh) WRITE CONFIGURATION

Data field:	<i><param>,<value></i>
Response:	<i><Code> <ErrorCode></i>
Comment:	
<i>param</i>	Parameter name
<i>value</i>	Parameter value
<i>Code</i>	'P' 'E' – error
<i>ErrorCode</i>	Nothing when <i>Code</i> is P. Error number when <i>Code</i> is E

~~19.10.5~~19.10.10 This command is used to read all configuration parameters from

208 (D0h) READ CONFIGURATION

Data field:	<i><param></i>
Response:	<i><param>,<value></i>
Comment:	
<i>param</i>	Parameter name
<i>value</i>	Parameter value

~~19.10.5~~19.10.11 This command is used to activate device:

170 (AAh) SDC ID REQUEST

Data field:	<i>No data</i>
Response:	<i><Code> <ErrorCode></i>
Comment:	
<i>Code</i>	'P' 'E' – error
<i>ErrorCode</i>	Nothing when <i>Code</i> is P. Error number when <i>Code</i> is E

~~19.10~~19.11 **Parameters:**

Parameter Name	Description	Parameter Format	Read/write value	Example
td	Time and date (cannot be written after activation)	DD/MM/YYYY HH:mm:ss	value	12/06/2012 13:45:33
tin	TIN (cannot be written after activation)	string	value	123456789

ssn	SDC Id (can be read only)	string	value	SDC999123456
vr1	Tax rate 1	decimal	value	0.00
vr2	Tax rate 2	decimal	value	18.00
vr3	Tax rate 3	decimal	value	0.00
vr4	Tax rate 4	decimal	value	0.00
rurl	Report server URL	string	value	http://12.34.56.78:3000/report
ntp	NTP server address	string	value	1.pool.ntp.org
msisdn	MSISDN of the SIM card	phone number*	value	00250781234567
key	Encryption key for audit data and internal memory (cannot be written after activation)	hex encoded binary data**	writing: value reading: checksum of the value***	writing: 0001020304050607...0E0F reading: 313435
intkey	Encryption key for Internal Data (cannot be written after activation)	hex encoded binary data**	writing: value reading: checksum of the value***	
shakey	Signature key for Receipt Signature (cannot be written after activation)	hex encoded binary data**	writing: value reading: checksum of the value***	
apnname	APN Name	string	value	internet
apnopcode	APN opcode	string	value	00987
apnuser	APN user	string	value	gprs
apnpass	APN password	string	value	gprs
sms1	SMS1 telephone Number	phone number*	value	00250781234567
sms2	SMS2 telephone Number	phone number*	value	00250781234567
sms3	SMS3 telephone Number	phone number*	value	00250781234567
taskpat	Task data Selection	string	value	ZF
taskid	Task id	numeric	value	123
tasksd	Task start date	DD/MM/YYYY HH:mm:ss	value	12/06/2012 13:45:33
tasked	Task end date	DD/MM/YYYY HH:mm:ss	value	12/06/2012 13:45:33
taskprd	Task period in	numeric	value	1440

	minutes			
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* Phone number contains only digits (no spaces or any other characters). It is always presented in international format, with leading '00' instead of '+' sign.

** Binary data is presented in hexadecimal format. For example, sequence of bytes [0x12 0xA0 0x00] is presented as a string '12A000'

*** Checksum is created by summing (adding) all the bytes. Each digit of the sum is sent as an ASCII code