

Technical Guidelines for POS and Cash Register Developers

Version 1.0

Change Log

Author	Change	Date
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Introduction

Each POS, Cash register, ERP or invoice generation software (Accredited POS) should be able to connect to V-SDC or E-SDC and issue a fiscal invoice. Accredited POS are developed for different software and hardware platforms, designed to use variety of communication standards to connect to other software or hardware components. As wide acceptance and low cost of integration are crucial for success of fiscalization Tax Authority is dedicated to provide detailed integration instructions for all manufacturers and software developers.

This document gives technical guidelines for implementation of Accredited POS and integration with TaxCore V-SDC service or E-SDC devices. These guidelines set standards that will enable seamless integration of third-party Accredited POS or E-SDC with TaxCore.

V-SDC service will be widely available and accessible from the variety of Accredited POS devices and software solution.

Interpretations

Accredited POS (Accredited POS) is computer program, electronic devices or information systems for issuing of receipts, which conforms to the requirements of the Regulation.

Electronic Fiscal Device (EFD) composes of Accredited POS and SE connected in one system. EFD produces fiscal receipts and reports audit data to Tax Authority.

TaxCore is set of web services, sites and database management software installed on the side of the tax Authority for communication with Accredited POS and SE devices;

Invoice, see Receipt.

Receipt is digitally signed acknowledgment that a specified payment has been received. A receipt records the sale of goods or provision of a service. In this Law, receipt is used interchangeable with term invoice.

Sales Data Controller (SDC) is connected to Secure Element and used to sign invoices received from Accredited POS and produce audit data. It stores audit data to its own internal memory and enables local and remote audit. There are two implementations of SDC

- a) **External SDC (E-SDC)** is black box that contains Secure Element and enables semi-connected fiscalization scenarios;
- b) **Virtual Sales Data Controller (V-SDC)** is web service operated by Tax Authority that expose via internet SDC functionality to authorized taxpayers. It contains Secure Element used to sign invoices.

Secure Element (SE) is fiscal component in form of a special software or device which is designed to receive specific receipt data, performs signing and data processing and generates response data, which is sent back to caller for further actions. Response data provides authenticity of receipt data. Secure Element is issued and controlled by Tax Authority. Main purpose of Secure Element is to sign invoices using taxpayer's digital certificate, control audits and maintain set of fiscal counters.

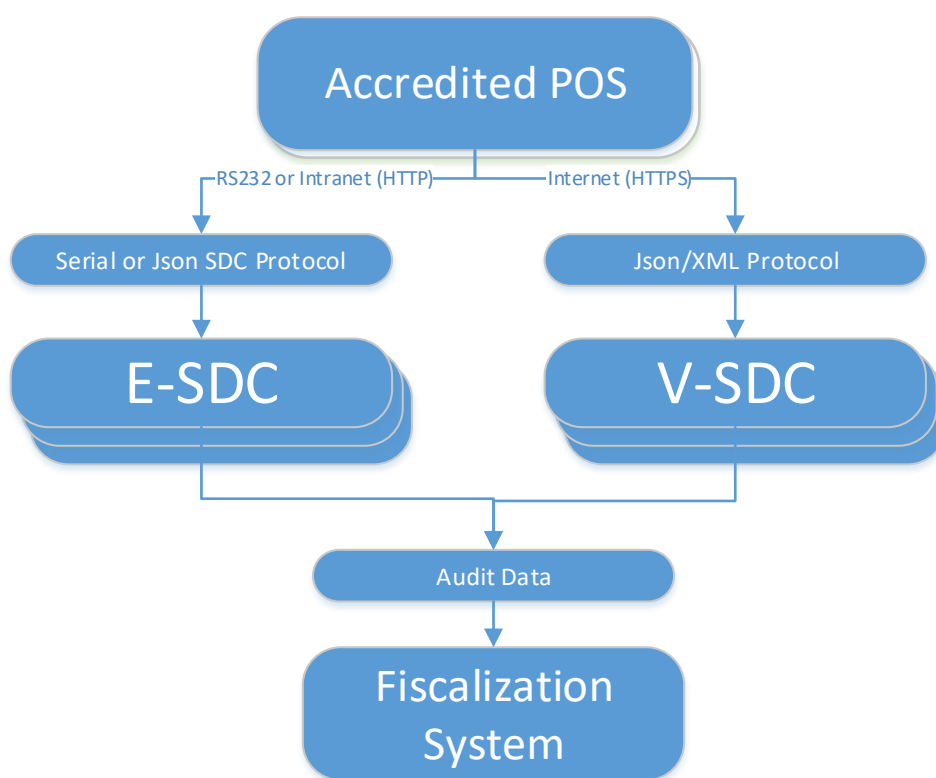
Verification URL is unified resource location used to verify particular invoice using web service provided by Tax Authority.

High Level Architecture of TaxCore

The electronic monitoring system for billing is an initiative undertaken by many countries for the purpose of reducing gray economy and tax evasion. An important and new component of this initiative is certified systems put in place for taxpayers to electronically secure each transaction at the moment of sale.

TaxCore is built as set of semi-connected services exposing public APIs to enable integration of third-party solutions into the fiscalization ecosystem.

In order to have a true picture of taxpayer's business transactions and be able to expand tax base and finance national needs, we are building electronic invoicing systems that will be used by taxpayers at their business premises.



In this document, we will describe high level requirements for Accredited POS for all possible scenarios. In chapter Clients, we will give examples of different POS systems and preferred methods of integration with TaxCore.

Target audience are software developers and manufacturers of all software applications and hardware used to create invoices or receipts.

Development Environment

Development environment is accessible to all developers of Accredited POS components. Development Environment exposes same APIs and uses same protocols as production environment.

Obtaining Test Certificates

Everyone who registers as developer of Accredited POS on Tax Authority web site should receive set of test certificates and technical documentation. Test certificates should make possible to test failing scenarios like trying to fiscalize invoice with expired certificate.

Obtaining E-SDC devices

Tax Authority will publish notification to interested parties.

Obtaining Smart Cards

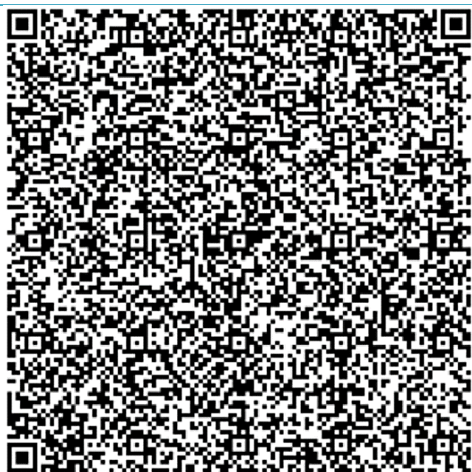
Accredited POS Vendors will be able to apply to Tax Authority and get test smart cards and digital certificates in PKCS 11 format to use for development, integration and testing purposes.

Anatomy of the Fiscal Invoice

Fiscal invoice or refund is, by definition, digitally signed acknowledgment that a specified payment has been received or refunded. A receipt records the sale of goods or provision of a service.

POS is free to print any content (coupons, logos, etc) before begin and after end mark of the fiscal invoice.

Textual representation of Fiscal Invoice	Explanation of fiscal invoice section
===== FISCAL INVOICE =====	Title line – marks the beginning of the fiscal part of receipt
TIN: 444555888 Company: DTI Store: DTI Dev Team Address: Kruzni put 7 Province: Serbia Cashier: Sladjan	Header data is provided by V-SDC or E-SDC during fiscalization of the invoice and returned to POS as part of the InvoiceFiscalizationResult object. Required
Buyer TIN 5123456789 Buyer Cost Center 123 POS number: ASD238/2017 POS time: 6/6/2017 5:53:45 PM	Provided by POS as part of InvoiceFiscalizationRequest. Buyer TIN is required in case of B2B transaction and Buyer Cost Center is optional and reserved for further use. POS Invoice Number and POS Invoice date and time are optional fields.
Ref no: 7AF4D9-E3B30A-1430133	Reference Document Number is required only in case of Refund or Copy. In both cases, this field must contain Invoice Number of previously published Invoice or Refund in RequestedBy-SignedBy-OrdinalNumber format. In any other case (for example Normal Sale invoice is referencing to Proforma Sale Invoice) this field is optional.
-----NORMAL SALE-----	Invoice and transaction type description is required. Normal Sale and Normal Refund will be the most common types. Other types of transactions and invoices are defined by TransactionType and InvoiceType enumerations.
Items =====	List of items with gross price and tax labels submitted by POS as part of Invoice Request.
Name Price Qty. Total Sport-100 Helmet, Blue (F) 34.99 10.00 349.90 Mountain Bike Socks, M (A) 9.03 4.00 36.10 HL Road Frame - Red, 58 (A, G) 1431.50 2.00 2863.00	Tax Labels and validity dates will be published by Tax Authority.
----- Total: 3249.00 =====	Total amount, Tax amounts and Tax Totals are calculated by V-SDC or E-SDC during fiscalization of the invoice and returned to POS as part of the response.
Label Rate % Tax G 16.00 394.90 A 9.00 211.90 F 0.00 0.00 ----- Total Tax: 606.80	Taxpayer's tax liability is calculated based on the tax amounts returned by V-SDC or E-SDC during fiscalization.
=====	Fiscal metadata added to the invoice during fiscalization is required on each invoice.
SDC Time: 2017-06-06 17:53:48 SDC Invoice No: 7AF4D9-E3B30A-150493 Invoice Counter: 1430271/150493NS	Combination of Requested By (7AF4D9), Signed By (E3B30A) and Ordinal Invoice Number (150493) is system-wide unique identification of fiscal document. As such, it can be used instead of current receipt/invoice number generated by POS.
=====	SDC Time is the official date and time relevant to the tax calculation and reporting.



QR Code contains Invoice verification URL. QR Code also contains Internal data and digital signature used for invoice verification.

Invoice is verifiable by customer immediately after fiscalization.

In case invoice/receipt is delivered as electronic document (email) QR Code should be substituted with Invoice verification URL in (clickable) hyperlink format.

===== END OF FISCAL INVOICE =====

Title line – marks the end of the fiscal part of receipt

Choosing Appropriate Model

This diagram should help you decide which fiscalization model is the most appropriate for your clients

V-SDC Pros and Cons

Pros

1. No specialized hardware is required
2. Accredited POS can be implemented as mobile app
3. Existing ERP systems can integrate quickly
4. Cost of fiscalization is reduced

Cons

1. Internet connection is required to issue invoice

E-SDC Pros and Cons

Pros

1. Works without internet connection
2. Supports older Cash registers with serial connection

Cons

1. Required specialized hardware
2. Prone to physical destruction
3. Requires network of maintenance shops

Clients

This section gives examples of the most common implementation scenarios.

Small Shops

In small shops, it is possible to use all kind of devices from tablets to POS applications. Choice of device is mostly dependent on number of articles which are on sale list (PLU) or of the environmental conditions. Bucher or fish shops requires more robust Accredited POS than bookstores.

Agencies and Individuals

Agencies are not issuing large number of receipts and issuing is not time critical; mobile POS application connection to V-SDC will probably cover their needs.

Supermarkets

Supermarkets are using high volume POS systems with additional different peripherals. Due the very nature of supermarket or shop sale process (on the counter) it is required to have offline capabilities to overcome interruptions of internet connection.

Restaurants and Hotels

Restaurants have very specific applications, very often are pro-forma invoices are issued while orders are served and there is a final invoice that sums up all previous proforma invoices. Offline capabilities are also important because invoices have to be printed on demand.

Taxi Drivers and Travelling Salesmen

This category of taxpayers presents the biggest challenge for fiscalization. In case of mobile users mobile POS application would be the best and cheapest solution but it might be unavailable in case invoice has to be issued in area with bad or no internet coverage. For that reason, taxi drivers will have to have taximeters or small POS devices connected to E-SDC adapted to work with car electric plugs (5V or 12V)

Remote Sites

POS on the remote or underground sites with no reliable internet connection will have to work with E-SDC devices to provide customers with fiscal invoices. Local audits would be conducted by tax inspectors or taxpayers on regular basis.

Malls, Shopping Areas

Areas with high concentration of small shops can contain wireless access point with dedicated V-SDC for that area.

Enterprises

ERPs and Invoicing systems could employ both V-SDC and on-site E-SDC device to fiscalize invoices. It is safe to assume this kind of establishments have permanent (or even redundant) internet connection. Fiscalization using V-SDC service would probably be the most appropriate solution.

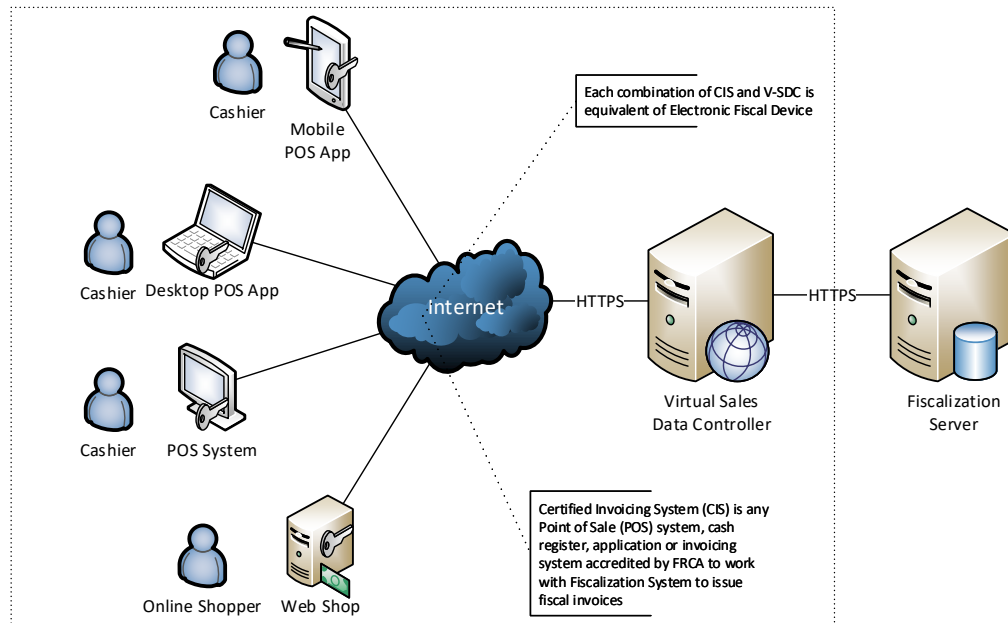
Web Shops

Web Shop applications could connect to V-SDC service using digital certificate issued to Taxpayer to fiscalize invoice at the moment of payment. Separate guide will cover Web Shops and Online POS applications

Connected Scenarios

The simplest scenario is software application (Client) creates invoice, applies tax labels and calls V-SDC web service to fiscalize invoice. V-SDC authenticates caller (verifies taxpayer's digital certificate), performs initial validation, calculate taxes based on applied tax labels, signs invoice and returns response to Client.

V-SDC response consists of digital signature of invoice data, internal data field containing encrypted message to Tax authority, digital certificate metadata, textual representation of invoice and verification URL. V-SDC generates QR code from verification URL.



Accredited POS prints textual representation of invoice and QR code. In case fiscal invoice is delivered in electronic form Verification URL should be rendered as 'clickable' hyperlink in email or web page.

Basically, the receipt fiscalization process consists of following steps:

1. POS creates receipt (standard fields like receipt items, see Data Structures)
2. POS Submits invoice (JSON or XML format) to V-SDC REST service for fiscalization. POS and V-SDC are mutually authenticated using digital certificates
3. V-SDC authenticates caller (taxpayer), performs validations and returns result of fiscalization (see Data Structures)
4. POS prints textual representation of receipt and QR code containing Verification URL. Paper width should be 58mm / 2.28in or wider.

Accessing V-SDC API

Once valid Test certificate(s) are obtained you can access online help page for V-SDC API on the following URL: <https://vsdc.staging.vms.frca.org.fj/Swagger>

This help page contains *SignInInvoice* Api details, invoice format and some basic examples.

API is built with support for Swagger (<http://swagger.io/>). You can use Swagger Codegen to quickly build proxy library for almost any programming language and platform.

Client Authentication

Accredited POS Systems are authenticated by V-SDC servers using client digital certificates distributed as PKCS11 file (*.pfx or *.p11) or on the Smart Cards.

You will be able to access test system using test digital certificates only.

Example

This example illustrates how to create and initialize instance of `HttpClient` class and use it to authenticate against V-SDC and submit invoice.

```
private void GetClientAndHandler(out WebRequestHandler handler, out HttpClient client)
{
    handler = CreateWebRequestHandler();
    client = new HttpClient(handler);
    client.BaseAddress = new Uri(Properties.Settings.VSDCApiUrl);
    client.DefaultRequestHeaders.Accept.Clear();

    // Use 'client' object to make HTTP POST call
}

private WebRequestHandler CreateWebRequestHandler()
{
    var handler = new WebRequestHandler();
    var cert = GetClientCertificate();

    handler.ClientCertificateOptions = ClientCertificateOption.Manual;
    handler.ClientCertificates.Add(cert);

    return handler;
}

private X509Certificate2 GetClientCertificate()
{
    string certName = "9AH3 My Store inc.";
    var store = new X509Store(StoreName.My, StoreLocation.CurrentUser);
    store.Open(OpenFlags.OpenExistingOnly | OpenFlags.ReadOnly);

    return store.Certificates.Find(X509FindType.FindBySubjectName, certName, true);
}
```

V-SDC API and Data Structures

Fiscal invoice consists of two parts – Invoice Request and Invoice Response. Together, those two object represents complete fiscal invoice.

Invoice Request

First part (Invoice Request) is created by Accredited POS and contain usual information like items, tax labels and number of invoice. Invoice request is submitted by Accredited POS using standard, publicly available protocol for communication to V-SDC, depending on implementation specifics of Accredited POS system and targeted audience.

Model

```
InvoiceFiscalizationRequest {
    DateAndTimeOfIssue (string, optional),
    Cashier (string, optional),
    BD (string, optional),
```

```

BuyerCostCenterId (string, optional),
IT (string) = ['Normal', 'ProForma', 'Copy', 'Training']stringEnum:"Normal", "ProForma", "Copy",
"Training",
TT (string) = ['Sale', 'Refund']stringEnum:"Sale", "Refund",
PaymentType (string, optional) = ['Other', 'Cash', 'Card', 'Check', 'WireTransfer', 'Voucher',
'MobileMoney']stringEnum:"Other", "Cash", "Card", "Check", "WireTransfer", "Voucher", "MobileMoney",
InvoiceNumber (string, optional),
ReferentDocumentNumber (string, optional),
PAC (string, optional),
Items (Array[Item], optional)
}
Item {
GTIN (string, optional)stringMin. Length:8 Max. Length:14,
Name (string),
Quantity (number),
Discount (number),
Labels (Array[string]),
TotalAmount (number)
}

```

Example

```

{
  "DateAndTimeOfIssue": "2017-06-07T08:56:23.286Z",
  "Cashier": "Oliver",
  "BD": "8902798054",
  "BuyerCostCenterId": "",
  "IT": "Normal",
  "TT": "Sale",
  "PaymentType": "Cash",
  "InvoiceNumber": "POS 2017/998",
  "ReferentDocumentNumber": "",
  "PAC": "46P8R5",
  "Items": [
    {
      "Name": "Sport-100 Helmet, Blue",
      "Quantity": 2,
      "Discount": 0,
      "Labels": [
        "A"
      ],
      "TotalAmount": 68.46
    }
  ]
}

```

Invoice Response

Invoice Response is generated by V-SDC after data validation. It constitutes an integral part of any fiscal invoice. Without this information, invoice could not be considered a fiscal invoice.

Model

```

InvoiceFiscalizationResult {
RequestedBy (string, optional),
DT (string),
IC (string, read only),
InvoiceCounterExtension (string, optional),
IN (string, read only),
TaxItems (Array[TaxItem], optional),
VerificationUrl (string, optional),
VerificationQRCode (string, optional),
Journal (string, optional),
Messages (string, optional),
SignedBy (string),
ID (string),
S (string, optional),
TotalCounter (integer, optional),
TransactionTypeCounter (integer, optional),

```



```
TotalAmount (number, optional)
}TaxItem {
Label (string),
Amount (number)
}
```

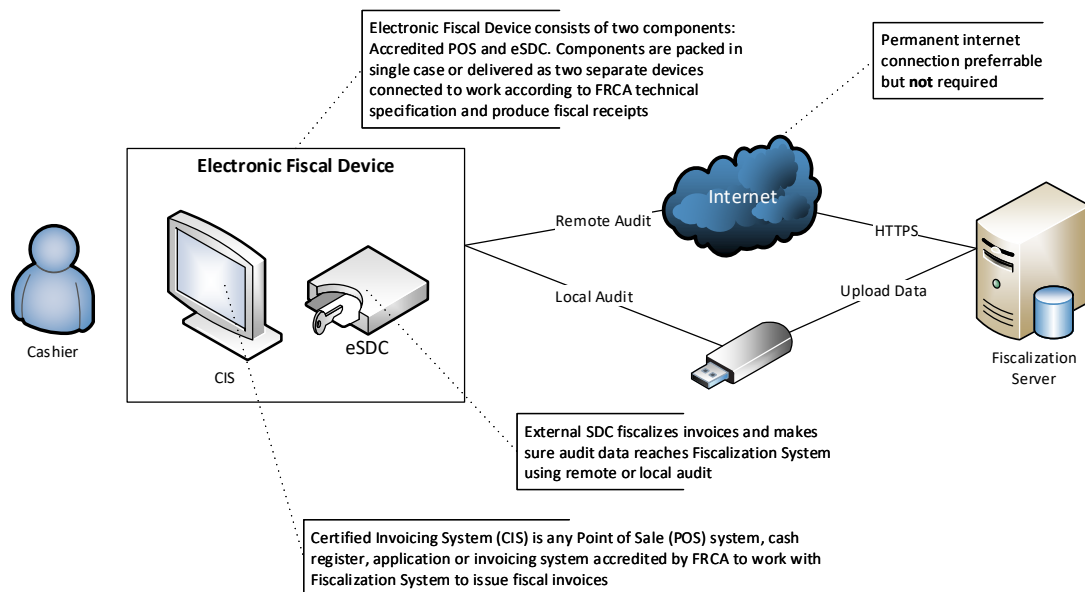
Example

```
{
  "RequestedBy": "LZPGDVKU",
  "DT": "2017-07-24T11:24:29.5077215+02:00",
  "IC": "1/1NS",
  "InvoiceCounterExtension": "NS",
  "IN": "LZPGDVKU-RND9Q5LX-1",
  "TaxItems": [
    {
      "Label": "A",
      "Amount": 31.36788990825688
    },
    {
      "Label": "E",
      "Amount": 11.081818181818182
    },
    {
      "Label": "F",
      "Amount": 8.09433962264151
    }
  ],
  "VerificationUrl":
    "https://frontendui.test.taxcore.dti.rs/v/?v1=AUXaUEdEVktVUK5E0VE1TFgBAAAAQAAANj30QAAAAFddFdwAAAG4WsaIPS
    E8HmTndTK8cqXlyYfqaiqYbazJw30ovU4%2BYwXbLlfyJAT7sczJswt27ImnRJCho71jVdHE0ifMU3P5amXcXGnuhxwgIHeCF8J0VdqaWop
    ochGvUbrWSDGONl9zjkIr%2BroF8HNZ46jQ%2BZxYmZbSOY%2FzvbpFF4pZczj4KGizvi2NE3qcvJaS8XdDpX2NlZL6gt66RC7pj6Qn8A4S
    JvtNuAZRzJdcp0NwEJAS53RATShYY2B9MHGSMRWiZSLngnDgnjmCZYAsfz2cfb52GG%2BUZJ6y1uHieJSrgQL3LVhmXqbZRRMUxe8ditxDU
    5zEcLKrUErdATL8GAjDY%2FXfEGxRaGHMIkfxYgu%2Fes%2FuF8lNbNpcSKiQSkTiKZTxe0Ifk01aE7Bzk%2BAPpg7T%2FFFhW70r9wC%2
    FOKpgvAtP%2BOFDU1RBZxYcf7jUfe3tCXUjmjtjgnuly6CQWnwWex099N1njK%2BK7tv1%2BOFKwSmZbQSOYtXW%2FTLnPPSEKK30r00AhD
    8tJQb6IkocCpjb%2FVu%2F0yCGgBFL1hIFI9VQHKTMEGArh8BAkOAHWKR2PbVKhk0jMn4mkAajgc%2B3Kv7ouI9p43PTgrg%2FqIMxjXbxsA
    pE6Gzg6hY80qBUQ%2FgTG63bka70dlNRAQNkDyDAwuvyJuItSUhJN3YsDt0xxzm6oiUkgdXr",
  "VerificationQRCode": "[8Kb of data, Base64 encoded gif image, shortened for clarity
  reasons]R0lGODlhIwEJafcAAAAAAM...",
  "Journal": "===== FISCAL INVOICE =====\r\nTIN:
  021131682\r\nCompany: Premier Sport Inc.\r\nStore: Premier Sport
  Inc.\r\nAddress: Boston\r\nProvince:
  Massachusetts\r\n\r\nCashier: Ivan P.\r\nInvoice no: 89347230-
  2016\r\nInvoice time: 7/17/2017 12:22:00 PM\r\n\r\n-----NORMAL SALE-----
  \r\n\r\nItems\r\n===== \r\nName Price Qty.
  Total\r\nPlazma keks (A)\r\n 115.00 1.00 115.00\r\nZvake (A, E)\r\n 121.90
  1.00 121.90\r\nHleb (A, F)\r\n 143.00 1.00 143.00\r\n-----
  ----- \r\nTotal:
  379.90\r\n===== \r\nLabel Rate % Vat\r\nA
  9.00 31.37\r\nE 10.00 11.08\r\nF 6.00
  8.09\r\n===== \r\nRequested By:
  LZPGDVKU\r\n===== \r\nSigned By: RND9Q5LX\r\nSDC
  time: 2017-07-24 11:24:29\r\nSDC Invoice No: LZPGDVKU-RND9Q5LX-1\r\nInvoice Counter:
  1/1NS\r\n===== \r\n===== END OF FISCAL INVOICE ===== \r\n",
  "Messages": "Success",
  "SignedBy": "RND9Q5LX",
  "ID":
    "bhaxog9ITweZ0t1MrxypXGVh+pqKphtrMnDc6i9Tj5jBdsuV/IkBPuxzMmx3bsiadEkKGjvWNV0cTSJ8xTc/lqZdxcae6HHCAGd4IXwnR
    V2ppaihmYEZW4GvBIMY42X300Qiv6ugXwc1njqND5nFgxltI5j/09s8UXillzOPgoaLO+LY0Tepy8lpLxd001fY2XMvqC3rpELumPpCfWdh
    Im+024B1HM11ynQ3AQKcZndEBNKFhYH0wcawxFajlIueCcMaeOYJlgCx/PZx9vnYYb5RknrLW4ch41KuBAvctWGZeptlFExTF7x2K3ENTn
    MRwsqtQSt0BMvWYCMnj9dw=",
    "S":
      "xBsUWhzCJH8ILV3rP7hfJTzwaXEiokEpE4imU8cHjiH5DtWhOwc5PgD6Y00/xRYVuzq/cAvziqYLwLT/jhQ1NUQWcWHH+41H3t7Q1I5
      o7Y4J7i8ugkFp8FnsdPfTdZ4yviu7b5fjynsEpmW0EjmLV1v0y5zz0hCitzzqzjgIQ/LSUG+iJKAHQY2/1bv9MghoARS9YSBSPVUBykzBBgK
      4fAQJDgB1iq9j21SoZdozJ+JpAI4HPTyr+6LiPaeNz04K4P6iDMY128bAKR0hs40owPNKgVEP4Exut25GuznZTUQEDZA8gwMLr8pCbiLULI
      Std2LA7dMcc5uqIlJIHV6w=",
      "TotalCounter": 1,
      "TransactionTypeCounter": 1,
      "TotalAmount": 379.9
}
```

Semi-Connected Scenarios

Taxpayers will be encouraged to use online capabilities whenever possible – V-SDC service will be widely available and accessible from the variety of Accredited POS devices and software solution. But, in order to rollout fiscalization system have to have ability to close any possible gaps in fiscal discipline that may have arisen from bad network coverage or internet unavailability.

External Sales Data Controller (E-SDC) devices exposes serial and/or Json-based protocols for communication with Accredited POS via RS232, USB-to-serial or UTP cable. E-SDC is using Secure Element to digitally sign invoices received from Accredited POS and produce audit data. Audit data is stored on E-SDC own internal memory which enables local and remote audit.



Choosing Protocol

Serial Protocol Communication

For older Accredited POS devices E-SDC will support serial port data transfer.

Accredited POS must be connected to the E-SDC by using NULL MODEM (crossover) serial cable with Transmit (Tx), Receive (Rx) and common ground (GND) cores. Also cables with integrated “Serial to USB” converters can be used. Physical parameters of serial protocol are defined by following parameters:

Databits	8
Parity	Non
Stopbits	1
Baudrate	115200 b/s
Handshake	Non

Above mentioned parameters are defined during manufacturing process and they are hardcoded in hardware, so they can't be changed later. Automatic baud rate detection is not possible.

The order of transmission of bits is LSB (least significant bit) first.

Serial transmission protocol doesn't have implemented errors detection mechanism, so it is necessary to implement BCC (Block Check Character).

It's necessary to implement BCC as Longitudinal Redundancy Check LRC, respectively CRC polynomial x^8+1 , using the algorithm:

Set LRC = 0

For each byte b of the DATA (message)

do

Set LRC = (LRC + b) AND 0xFF

end do

Set LRC = (((LRC XOR 0xFF) + 1) AND 0xFF)

Initialization of serial communication is always done by POS, it is never started by E-SDC. In normal working mode, when process of communication is undisturbed, every request from POS to SDC is followed with appropriate response in opposite direction.

Due to physical characteristic of serial data transmission it is important to notice that all information is represented as array of bytes, and that appropriate conversions must be done.

Serial port protocol defines specific commands that will be executed by POS like Verify PIN or Sign Invoice.

ACK and NAK signals

Usage of ACK and NAK signals, transmitted from E-SDC to POS, enable transmission monitoring of messages which are sent from POS to E-SDC. Length of ACK and NAK signals are 1 byte, and their hexadecimal values are:

ACK: 0x06h

NAK: 0x15h

In case that E-SDC successfully receive message from POS, ACK signal is generated by E-SDC. Elapsed time between successful reception of message and sending of ACK signal should be in 1 ms to 300 ms range. In case that ACK is not generated during that time, it is considered that message is not successfully transmitted.

After ACK signal generation, maximum allowed time for transmission of response signal by E-SDC is 2500 ms.

In case of error, e.g. BCC value is not correct, E-SDC generates NAK signal which is indication to POS that message should be re-transmitted (and value of Retry Counter is increased). If Retry Counter reaches maxim allowed value of 4 (0x04), further transmission of message is not possible.

In case of incomplete message reception, e.g. ETX signal is not received, procedure is the same as in previous example, NAK signal is generated, Retry Counter is increased and POS should again transmit message.

Request

Every request from POS with serial port communication will consist of the following words:

<STX><Retry Counter><Command><Data Length><Request Data><ETX><BCC>

Word	Description
STX	Serial Transfer Start byte, STX is always set "0x02", length 1 byte
Retry Counter	Allowed number of retries 0-4, length 1 byte (numerical)
Command	Specified command, length 1 byte (alphanumeric)
Data Length	Number of bytes of Request Data, length 5 bytes (numerical)
Request Data	Data converted to byte (char) array, according to description below
ETX	Message End Byte, indicates end of Request Data, ETX is always set to "0x03", length 1 byte
BCC	Block check character (XOR value of previous received bytes excluding STX and ETX)

Response

Every response from POS will consist of the following words:

<Start Byte><Retry Counter><Command><Data Length><Response Data><End Byte><BCC>

Word	Description
STX	Serial Transfer Start byte, STX is always set "0x02", length 1 byte
Retry Counter	Allowed number of retries 0-4, length 1 byte (numerical) (Identical as one in Request)
Command	Specified command, length 1 byte (alphanumeric) (Identical as one in Request)
Data Length	Number of bytes of Response Data, length 5 bytes (numerical)
Response Data	Data converted to byte (char) array, according to description below
ETX	Message End Byte, indicates end of Request Data, ETX is always set to "0x03", length 1 byte

BCC	Block check character (XOR value of previous received bytes excluding STX and ETX)
------------	--

Commands

This section describes commands supported by E-SDC serial protocol.

GetStatus

Command Identifier: S ("0x53h" in hexadecimal)

Request Data

None

Response Data

Start	Offset (Bytes)	Field	Desc
0	1	IsPinRequired	
1	1	AuditRequired	
2	8	DateAndTime	
10	24	LastInvoiceNumber	UID RequestedBy-UID Signed By-Ordinal Number (Example: Signed By SE ORG674J1-ORG674J1-98637, Signed by V-SDC ORG674J1-G800PA43-887)
34	4	ProtocolVersion	
38	4	SecureElementVersion	
42	4	HardwareVersion	
46	4	SoftwareVersion	
50	8	DeviceSerialNumber	
58	1	Number of Returned Manufacturer Specific Status Codes	Manufacturer Specific Errors, Warnings and info messages...
List of Manufacturer Specific Status Codes			
59	4	ManufacturerSpecificStatusCode	
?	1	Number of Returned General Status Codes	
List of General Status Codes			
?	4	GeneralStatusCode	Predefined Errors, Warnings and Info messages...
?			

Verify PIN

Command Identifier: Command identifier: P ("0x50h" in hexadecimal)

Request Data

Start	Offset (Bytes)	Field	Desc
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0	16	PIN	alphanumeric PIN, leading 0xFF characters
16			

Response Data

Start	Offset (Bytes)	Field	Desc
0	4	General Status Code	0100,1300,2110,2220 or 2230
4			

Sign Invoice

Command Identifier: Command identifier: I ("0x49h" in hexadecimal)

Request Data

Start	Offset (Bytes)	Field	Desc
Invoice Header			
0	8	POSDateAndTime	Unix Timestamp (number of milliseconds)
8	1	InvoiceType	Normal=0, ProForma=1, Copy=2, Training=3
9	1	TransactionType	Invoice=0, Refund=1
10	1	PaymentType	Other=0,Cash=1,Card=2,Check=3,WireTransfer=4,Voucher=5,MobileMoney=6
11	1	CashierLengthInBytes	Min value is 0
12	?	Cashier	Unicode, Max Length 50 characters/100 bytes
?	1	BuyerIdLengthInBytes	Min value is 0
?	?	BuyerId	ASCII, Max Length 20 characters/20 bytes
?	1	BuyerCostCenterIdLengthInBytes	Min value is 0
?	?	BuyerCostCenterId	Unicode, Max Length 15 characters
?	1	POSInvoiceNumberLengthInBytes	Min value is 0
?	?	POSInvoiceNumber	Unicode, Max Length 15 characters
?		Invoice Items (n)	
Invoice Items			
0	8	TotalAmount	unsigned int 64bit big endian, Value * 10000
8	8	Quantity	unsigned int 64bit big endian, Value * 10000
16	8	Discount	unsigned int 64bit big endian, Value * 10000
24	1	GTINLengthInBytes	Min value is 0, max value is 13
25	?	GTIN	
?	1	NameLengthInBytes	Min value is equal to or greater than 2 and less than 254
?	?	Name	
?	1	LabelsLengthInBytes	Min value is 0
?	?	Labels	ASCII, max 26 characters
?			

Response Data

Start	Offset (Bytes)	Field	Desc
0	8	SDCDateAndTime	Unix Timestamp (number of milliseconds)
8	8	RequestedByUID	
16	8	SignedByUID	
24	1	EncryptedInternalDataLengthInBytes	0=256 and 1=512 bytes
25	?	EncryptedInternalData	Length is 256 or 512 bytes
?	256	Signature	
?	1	TINLengthInBytes	
?	?	TIN	ASCII
?	4	InvoiceCounter	
?	1	InvoiceNumberLengthInBytes	
?	?	InvoiceNumber	ASCII
?	2	VerificationUrlLengthInBytes	
?	?	VerificationUrl	ASCII
?	1	MessagesLengthInBytes	
?	?	Messages	Unicode
?	2	JournalLengthInBytes	
?	?	Journal	Unicode, new line character is ASCII(10)+ASCII(13), carriage return + line feed
?	2	VerificationCodeLengthInBytes	
?		VerificationCode	b/w GIF image, byte array
?	1	TaxItems (n)	
0	1	Label	
1	8	Amount	unsigned int 64bit big endian, Value * 10000
?			
0	4	General Status Code	0100,1300,2110,2220 or 2230. Last 4 bytes are always status code, no matter if other fields are returned in response.

Status and Error Codes

Code	0-Info 1-Warning 2-Error
INFO	
0000	All OK
0100	Pin OK

0210	Internet Available
0220	Internet Unavailable
WARNINGS	
1100	Storage 90% Full
1200	RequestAlreadyAnswered
1300	SE is not present
1999	Undefined Warning
ERRORS	
2100	Pin Not OK
2210	SE Locked
2220	SE Communication Failed
2230	SE Protocol Mismatch
2310	Invalid tax labels
2811	Invalid Invoice Type
2812	Invalid Transaction Type
2813	Invalid Payment Type
2814	BuyerIdLenghtInBytes Lenght Exceeded
2815	BuyerCostCenterId Lenght Exceeded
2816	POSInvoiceNumber Lenght Exceeded
2817	GTIN Lenght Exceeded
2818	Name Lenght Exceeded
2819	Name is Required
2820	Labels Lenght Exceeded

Json via HTTP Protocol

Second way of communication between POS and E-SDC is via LAN using HTTP protocol.

Accredited POS device should be equipped with Ethernet port or Wireless controller in accordance with IEEE 802.3, with speed no less than 100Mb/s, by which it can access local area network.

Physical connection with network can be done with through standard LAN cable, Cat.6 or with better characteristics. The ends of the cables should be equipped with RJ-45 plug male connectors, while on POS female RJ-45 connector is located.

POS should have globally unique MAC-48 address in accordance with IEEE 802, which is stored on a specialized MAC Address chip, or address obtained by the authorized vendor written in the permanent memory during production.

Possibility to manually enter IP address on POS is mandatory. Also, POS terminal should have possibility to enter IP address of targeted E-SDC device.

Technical implementation of these functionalities is in scope of POS manufacturer.

When HTTP connection is used between POS and E-SDC, communication is done exchanging data formatted as JSON text. POS device must have possibility to send JSON formatted data to specified E-SDC IP address using HTTP protocol and to receive response data from E-SDC using the same protocol.

As in case of serial connection there are 3 types of requests/responses that can be used for communication between POS and E-SDC:

- Get Status
- Sign Invoice
- Verify PIN

Sign Invoice

Structure of Sign Invoice request and response JSON data is already described in chapter V - SDC API and Data Structures.

Verify PIN

This command is used to verify PIN entered on POS. Verification is done by E-SDC.

Request Data

Data sent from POS.

Example

```
{
  "VPIN": "1234"
}
```

Response Data

JSON string returned from E-SDC, content can be one of General Status Codes: 0100, 1300, 2110, 2220 or 2230.

Example

```
{
  "VPIN_GSC": "0100"
}
```

Get Status

This command is used to get status information from E-SDC.

Request Data

JSON data field with string "GetStatus".

Example

```
{
  "GS": "GetStatus"
}
```

Response Data

JSON formatted data in accordance with Get Status Response Data table.

Example

```
{
  "IsPinRequired": true,
  "AuditRequired": false,
  "DT": "2017-06-07T13:48:26.6048082+02:00",
  "LastInvoiceNumber" : "ORG674J1-ORG674J1-98637",
  "ProtocolVersion" : "1.2.7.21",
  "SecureElementVersion" : "1.7.6.5",
  "HardwareVersion" : "1.2.7.21",
  "SoftwareVersion" : "1.7.6.5",
  "DeviceSerialNumber" : "1289A24EB67F22C1",
  "NRMSSC" : 1,
  "MSSC" : "5440",
  "NRGSC" : 1,
  "GSC" : "1100"
}
```

Test Cases

No matter which type of invoicing system you are building same test cases will apply.

Issue Normal Sale Invoice

Receipt must contain visible markings Receipt Type “NORMAL”.

Steps

Cashier on Accredited POS is selecting NORMAL type of the receipt, than registering sale by: typing articles, selecting articles from previously made list or scanning with bar code reader. At the end cashier chose way of payment and finishes receipt.

Accredited POS is sending message to SDC. After positive receipt data verification, receipt is signed, counters and totals are updated and internal data is finished.

SDS is sending back Invoice response to Accredited POS.

Receipt is delivered to the customer.

Expected Result

Fiscal receipt is the final result of this procedure. Receipt can be printed or sent by SMS or email message if customer is asking for it. Normal receipt is digitally signed. Internal data is stored in data base of the TaxCore. Internal data is present on the end of the receipt in form of QR code. Receipt counter is in the form 5/7NS (5-number of normal sale receipts/ 7-total number of receipts issued by SDC or SDC, NS – designation of Normal Sale.)

Issue Normal Refund Invoice

Receipt must contain visible Receipt Type “REFUND”.

Totals on refund receipt are negative, starting with (-).

Steps

Cashier on Accredited POS is selecting Refund type of the receipt, than registering sale by: typing articles, selecting articles from previously made list or scanning with bar code reader. At the end cashier chose way of payment and finishes receipt.

Accredited POS is sending message to SDC. After positive receipt data verification, receipt is signed, counters and totals are updated and internal data is finished.

VSDS is sending back Invoice response to Accredited POS.

Receipt is delivered to the customer.

Expected Result

Fiscal receipt is the final result of this procedure. Receipt can be printed or sent by SMS or email message if customer is asking for it. Refund receipt is digitally signed. Internal data is stored in data base of the TaxCore. Internal data is present on the end of the receipt in form of QR code. Receipt counter is in the form 5/7NR (5-number of normal sale receipts/ 7-total number of receipts issued by SDC or SDC, NR – designation of Normal Refund.)

Issue Copy Invoice

Receipt must contain visible Receipt Type “COPY”.

Steps

Cashier on Accredited POS is selecting Copy type of the receipt. Depending on the implementation method, Accredited POS may offer to select already issued receipt from the journal memory or recall receipt number. At the end cashier chooses, the selected receipt to produce a copy of it.

Accredited POS is sending message to SDC. After positive receipt data verification, receipt is signed, receipt counters are updated.

VSDS is sending back Invoice response to Accredited POS.

Copy of a Receipt is issued.

Expected Result

Copy of already issued receipt is the final result of this procedure. Receipt counter is in the form 1/9 CS (1-number of copy sale receipts/ 9-total number of receipts issued by SDC or SDC, CS – designation of Copy Sale.)

Issue Training or Proforma Invoice

Receipt must contain visible markings of the ReceiptType “TRAINING” or “PROFORMA”.

Training or proforma receipt is produced in the same way as normal, with an exception that totals are not accounted for.

Steps

Cashier on Accredited POS is selecting Training or Proforma type of the receipt, then registering sale by: typing articles, selecting articles from previously made list or scanning with bar code reader. At the end cashier chose way of payment and finishes receipt.

Accredited POS is sending message to SDC. After positive receipt data verification, receipt is signed and receipt counters are updated.

VSDS is sending back Invoice response to Accredited POS.

Receipt is issued.

Expected Result

Training receipt or proforma is the final result of this procedure. Receipt counter is in the form 3/8TS (3-number of training receipts/ 8-total number of receipts signed by SDC or SDC, TS – designation of Training Sale.)

Issue Normal Sale or Refund B2B Invoice

Receipt must contain visible markings ReceiptType “NORMAL”, or “REFUND”.

Receipts contains business customer data, name and TIN.

Steps

Cashier on Accredited POS is selecting Receipt type, asking customer and inputting provided TIN, than registering sale by: typing articles, selecting articles from previously made list or scanning with bar code reader. At the end cashier chose way of payment and finishes receipt.

Accredited POS is sending message to SDC. After positive receipt data verification, receipt is signed, counters and totals are updated and internal data is finished.

VSDS is sending back Invoice response to Accredited POS.

Receipt is delivered to the customer.

Expected Result

Fiscal receipt is the final result of this procedure. Receipt can be printed or sent by SMS or email message if customer is asking for it. Refund receipt is digitally signed. Internal data is stored in data base of the TaxCore. Internal data is present on the end of the receipt in form of QR code. Receipt counter is in the form 5/7NS or NR number of normal sale, refund receipts/ 7-total number of receipts issued by SDC or SDC, NS or NR – designation of Normal Sale or Normal Refund.)