

FUEL TURNOVER CONTROL SYSTEM

Concept and implementation



Content and purpose of the presentation

This presentation introduces the **concept of the Petroleum Products Turnover Control System** which built on the basis of the Fuel Sales Recorder.

Fuel turnover control involves collecting information about fuel sales at gas stations, oil depots or any other enterprises and transferring information about this sale (transaction) to a database server where this data can be processed to control fuel turnover (for example, the Ministry of Energy) or control over the accurate payment of taxes (the State TAX Office).

For certainty in the text of the presentation, the State Tax Office is more often used as the owner of the Fuel Turnover Control System.

Why is it necessary to control fuel turnover in the country?

Fuel turnover control plays an important role in the energy policy of the state. It allows the state to control the balance and identify losses in providing the country with fuel, as well as collect a significant part of taxes from fuel sales.

At present, refueling of vehicles at gas stations is carried out separately and regardless of its registration. This allows dishonest business owners to not register part of their sales in the TAX Office system.

This possibility can be eliminated if **refueling and recording fuel sales are performed automatically and simultaneously in one electronic device**, excluding the influence of the human factor (intentional or unintentional errors in data generation).

Fuel Sales Recorder operation principle



To register all sales at a gas station or other company, it is **necessary that the electronic device that controls the sale of fuel, automatically records it at the same time**, i.e. generates an electronic document with an electronic digital signature and transfers this document to the database of the server for collecting and processing sales data of the TAX Office.

This technical solution makes it possible to register all sales of fuel with certainty and completely eliminates the possibility of distorting fiscal data on transactions.

The proposed technical solution corresponds to the modern world experience and practice of registration and protection of fiscal sales data.

Features and benefit

This technology provides:

- Automatic registration of the fuel sale right in the controller that controls fuel dispensing, which is simultaneously performing the function of the Fuel Sales Recorder;
- Creating documents on completed transactions in electronic form in the Fuel Sales Recorder, signed with an electronic digital signature;
- Transferring data to the database server



PTS-2 Forecourt Controller

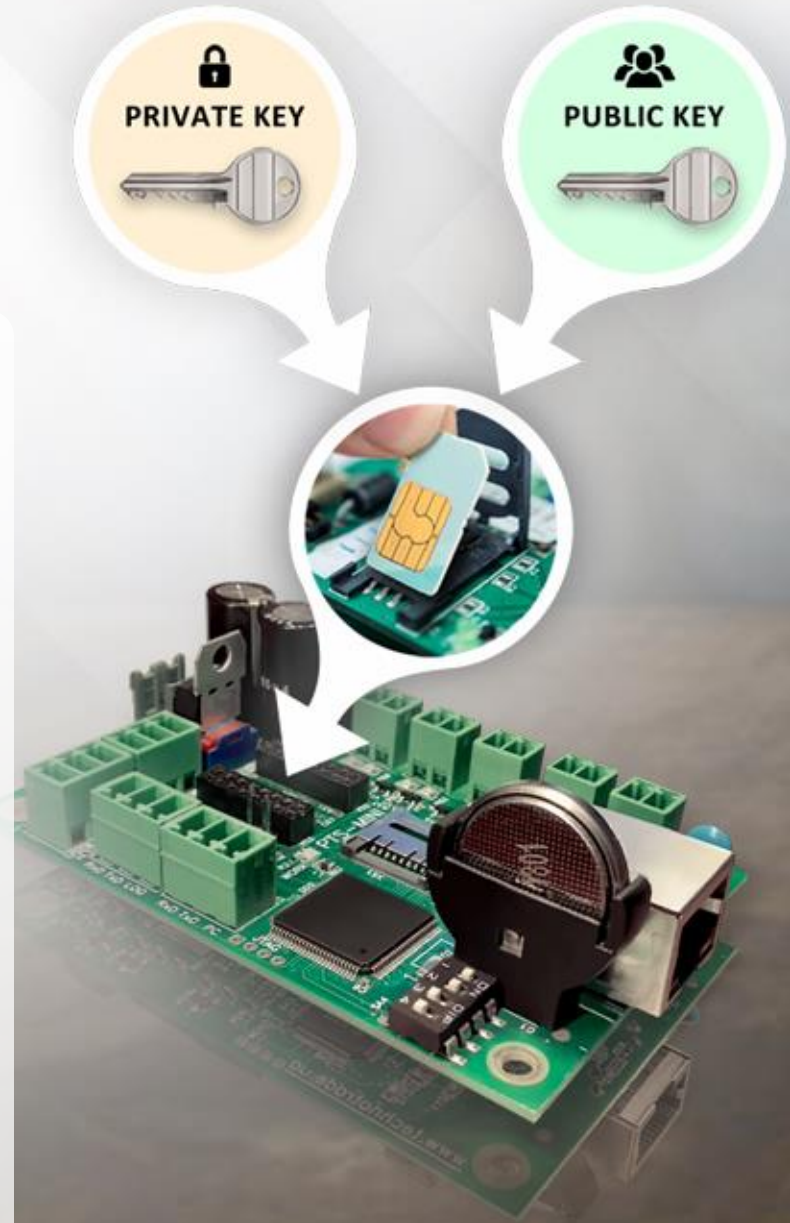


- Guaranteed protection against replacement of the data source origin (of the specific owner of the Fuel Sales Recorder);
- Protection against substitution, loss and modification of information, detection of violations of the integrity of information during storage and transmission over communication channels;
- Protection against unauthorized viewing (as an option) and inability of leak of commercial information while reporting information is transmitted through communication channels.

PTS-2 Forecourt controller is multipurpose Fuel Sales Recorder

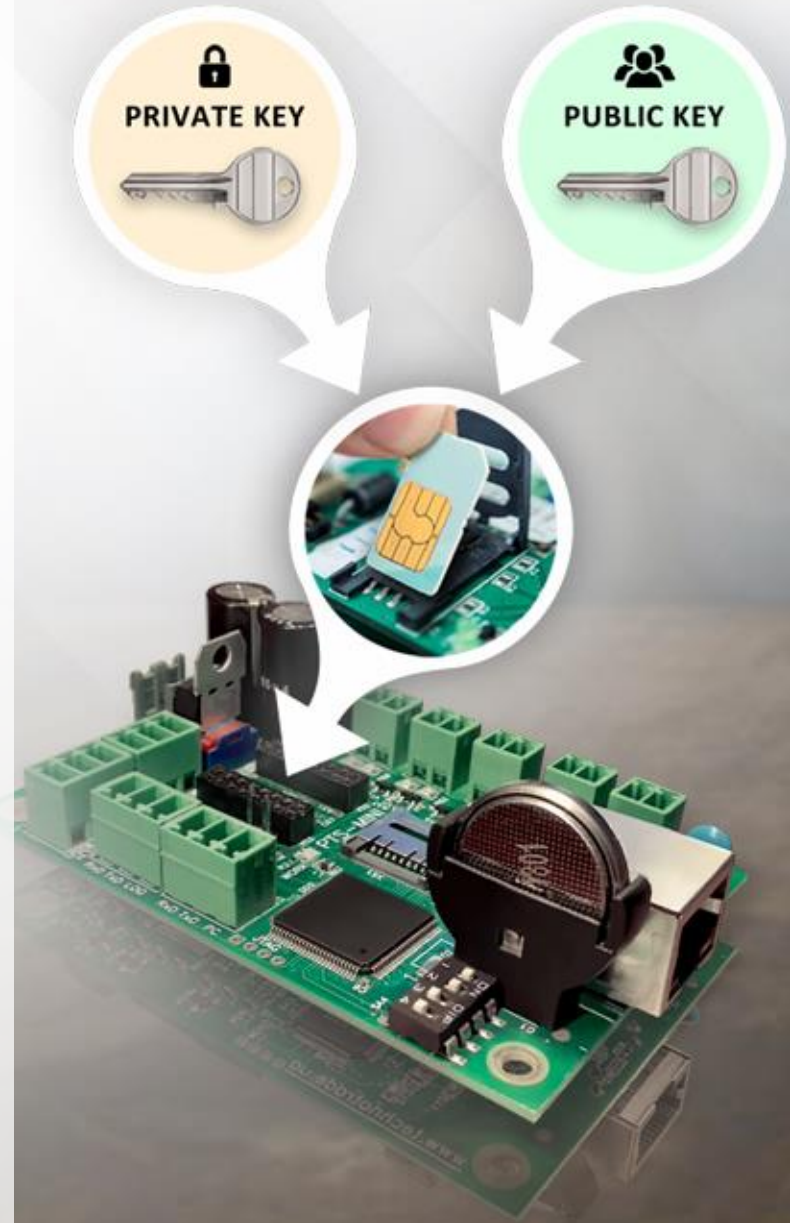
The PTS-2 forecourt controller has all the necessary functions to be qualified as a Fuel Sales Recorder:

- Modern IoT device with a built-in Web Server;
- Built-in Security Module that generates private and public encryption keys;
- Generates an electronic document with an electronic digital signature and its transfer to the database server;
- Supports most of fuel dispensers, flow meters and level gauges;





- Can be integrated with any control system at any gas station
- Able to **remotely set the price of fuel at gas stations**
- **Generates an electronic document** with all the necessary data about the completed transaction:
 - *Information about the owner of the Fuel Sales Recorder;*
 - *Date and time of the transaction;*
 - *Type and dispensed **amount of fuel, price and cost of fuel;***
 - *Volume reduced to 15 deg. C (Fuel level gauges are required);*
 - *Time, date and volume of in-tank fuel delivery (Fuel level gauges are required);*
 - *Daily reports on fuel sales;*
 - *Current fuel balances in the gas station tanks (Fuel level gauges are required);*
 - *Performing **remote technical support***

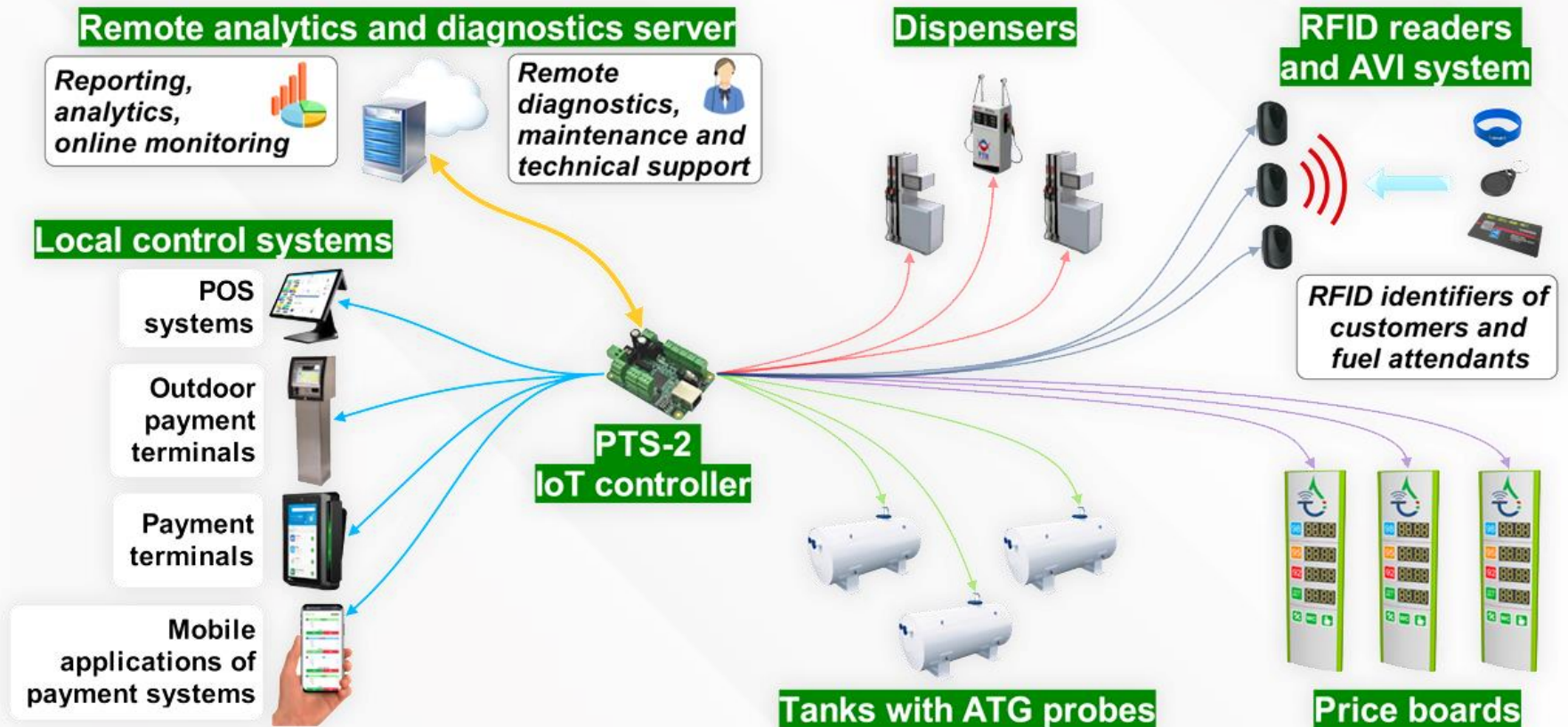


PTS-2 Forecourt controller worldwide



- [PTS-2 forecourt controller](#) is a new generation multifunction controller;
- [PTS-2](#) is supplied to more than 120 countries worldwide;
- [PTS-2](#) has proven to work reliably in countries with extreme weather conditions (used in both Canada and countries of Sub-Saharan Africa);
- [PTS-2](#) is produced in accordance with international standards and requirements.

PTS-2 forecourt controller in the structure of the filling station automation system



Installing the PTS-2 controller on fuel trucks

Remote server

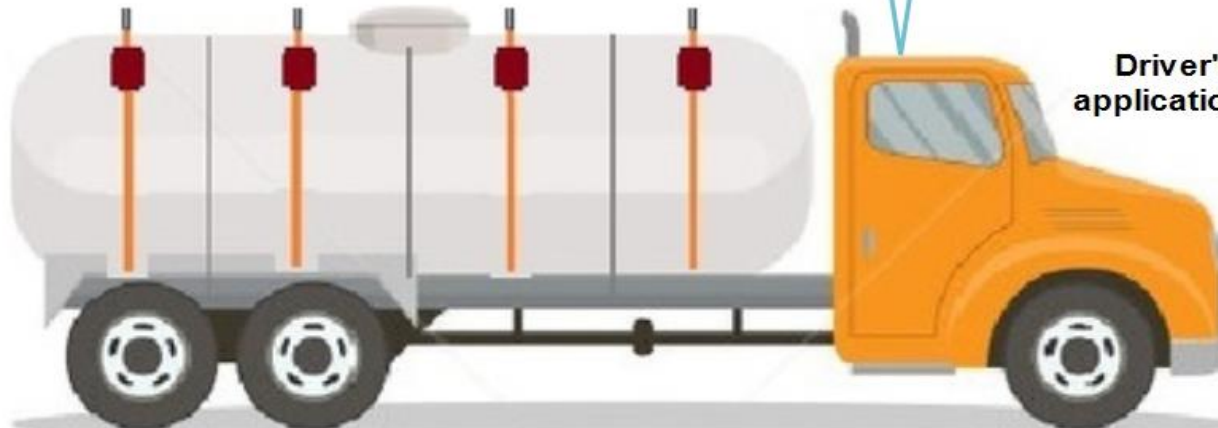
- monitoring
- control
- reporting
- configuration



PTS-2 controller with GPS module



Tank compartments with probes installed

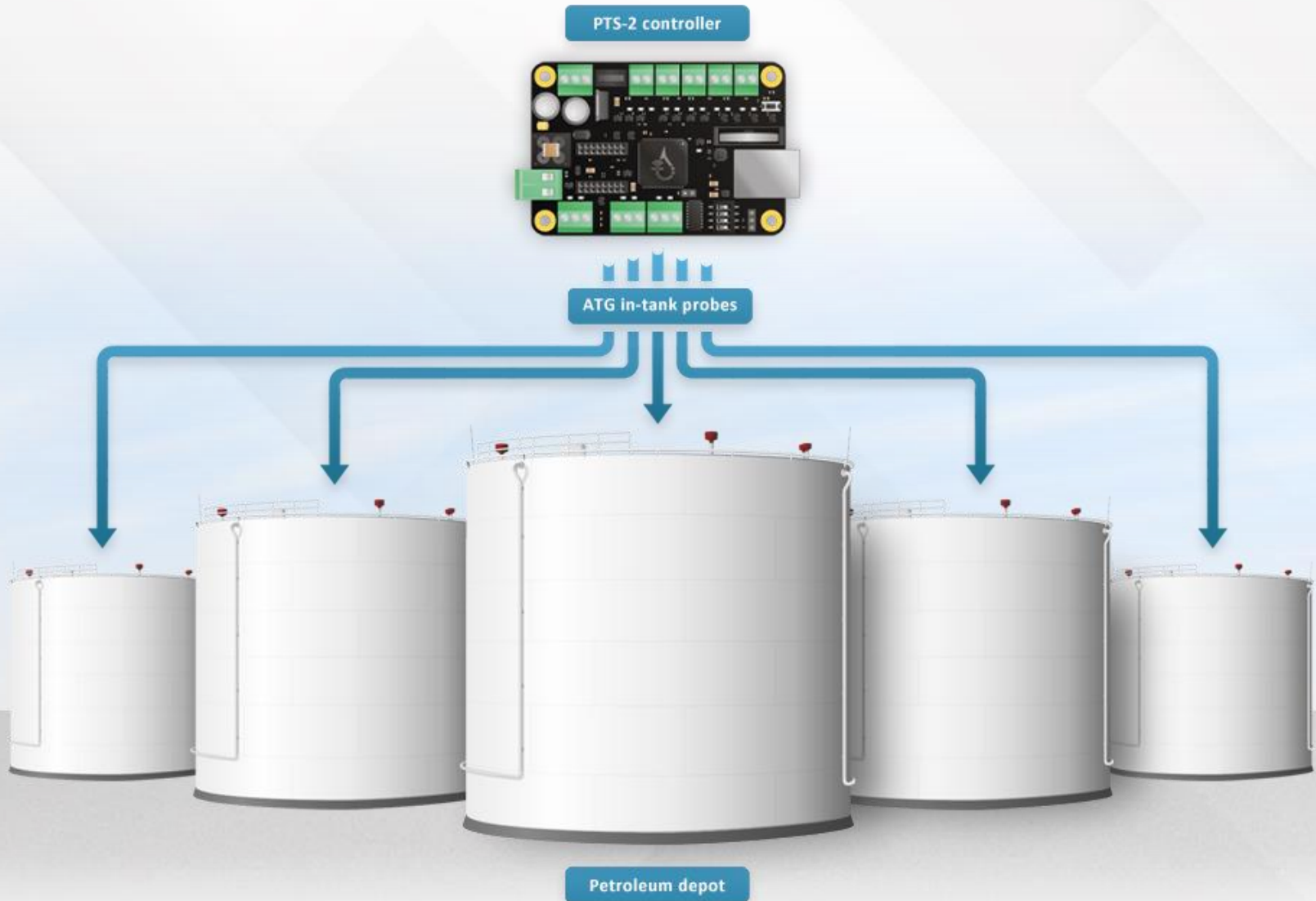


Driver's mobile application for filling

Bowser or electronic meter register for fuel dispensing

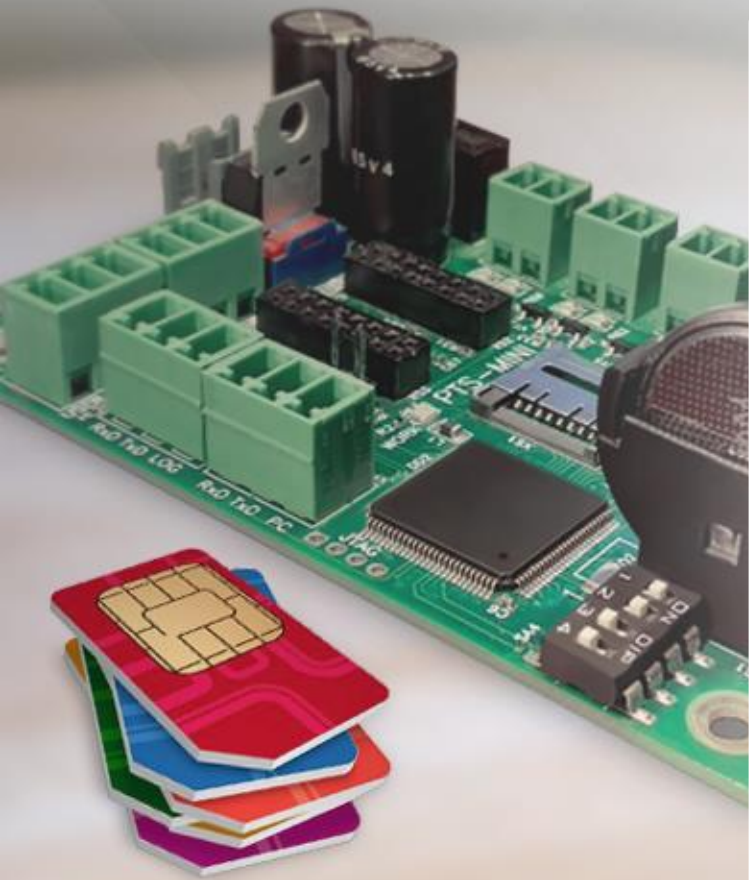
Fuel tanker

Installing the PTS-2 controller for fuel level control in the oil depot tanks



Fuel turnover control system using PTS-2 controller.

Concepts and terms



Security module -

A device for reliable generation and storage of public and private keys, performing cryptographic transformations using asymmetric digital signature algorithms implemented on the basis of secure microcontrollers (smart cards), having international certification in accordance with Common Criteria at a level not lower than EAL5





Fuel Sales Recorder -

A transaction data source, [PTS-2 forecourt controller](#) with a built-in security module, an electronic device that controls fuel dispensing through a fuel pump or other electronic flow meter.

Electronic document -

A document, receipt, transaction record in electronic form .

Electronic digital signature -

An attribute of an electronic document obtained as a result of cryptographic transformation of information using a private key.





Counter of processed documents – used to prevent the loss of electronic documents

Public key certificate – an electronic or paper document containing a public key

Key certification authority – a unit of certification and storage of public key certificates

Business entity – a fuel retailer

The State Tax Office – is the authority that headed the system of state tax service bodies.

Terminal for printing checks – POS-terminal with a program for printing checks and transferring data to the portal of the TAX Office



Goals and objectives of creating an automated fuel turnover control system

- Automate the process of recording fuel sales, creating an electronic document and transferring data to a database server;
- Simplify for a business entity the creation and storage of reporting documents related to fuel sales;
- Minimize the interaction of a business entity with the State TAX office;
- Eliminate the possibility of fraud by trade organizations or a business entity;
- Provide the TAX Office with an automated mechanism to securely record sales of fuels made with assistance of the Fuel Sales Recorder.



Tasks to be solved when creating an automated fuel turnover control system

The proposed technical solution for building an automated fuel turnover control system provides the following tasks:

- Integration with the existing information structure of the State TAX Office;
- Automatic transfer of an electronic document with the results of transactions to the terminal for printing receipts and the e-invoicing platform (receipt printing service software) with its further transfer to the portal of the State TAX Office;
- Use an existing certificate authority and store public key certificates



- Providing the technical capability for the TAX Office to verify the authenticity and integrity of the documents generated in the Fuel Sales Recorder in electronic form during a tax audit;
- Providing the technical tool to the TAX Office to control fuel retail prices and a price management mechanism;
- Ensuring the possibility of further expansion of the functionality of the fuel accounting system in the state;
- Ensuring the possibility of creating a fuel turnover control system and automatic registration of sales at all gas stations and oil depots within the country.

Expected results from the implementation of the system

The introduction of the proposed automated fuel turnover control system for its participants will lead to the following results.

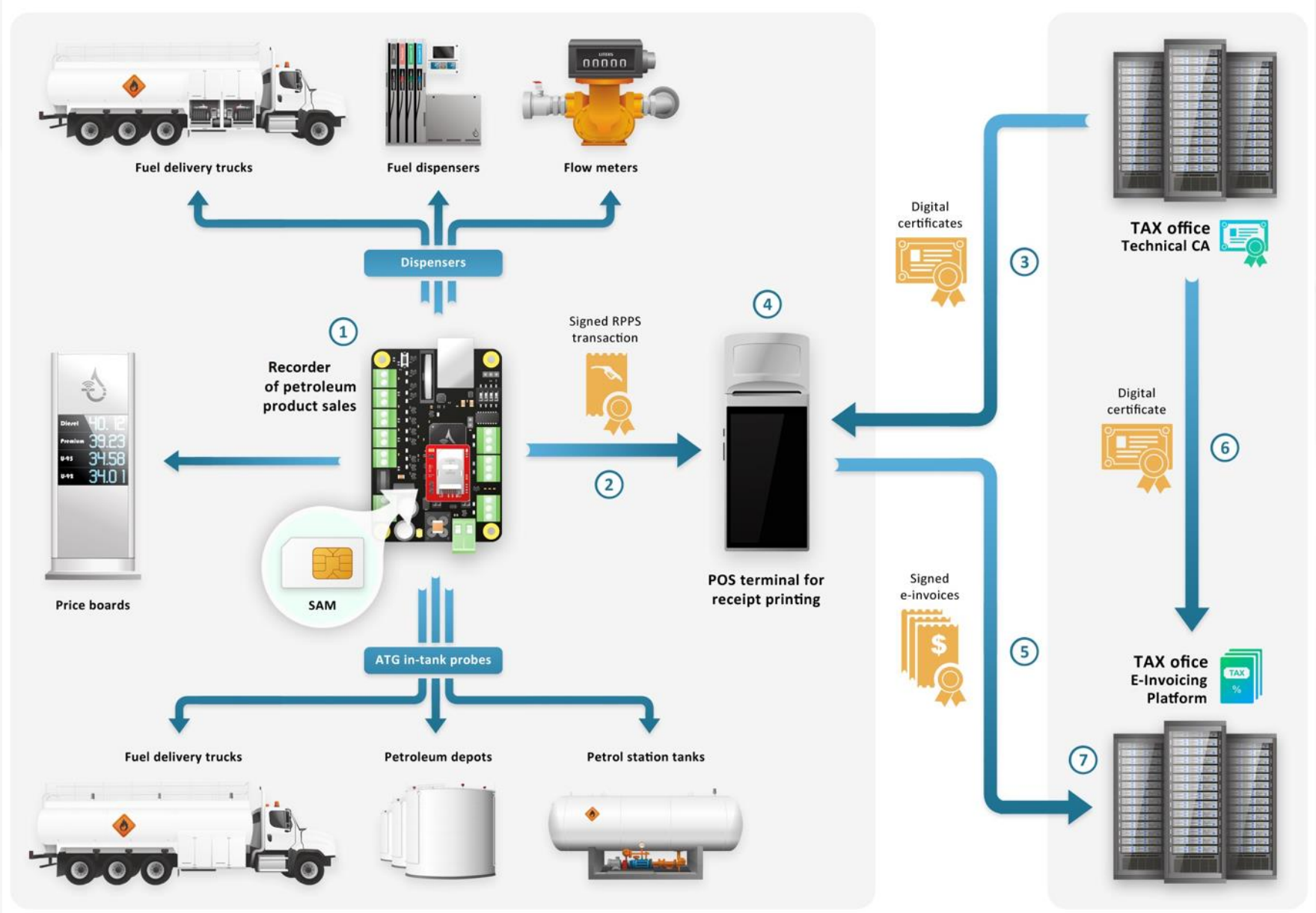
For Business Entity:

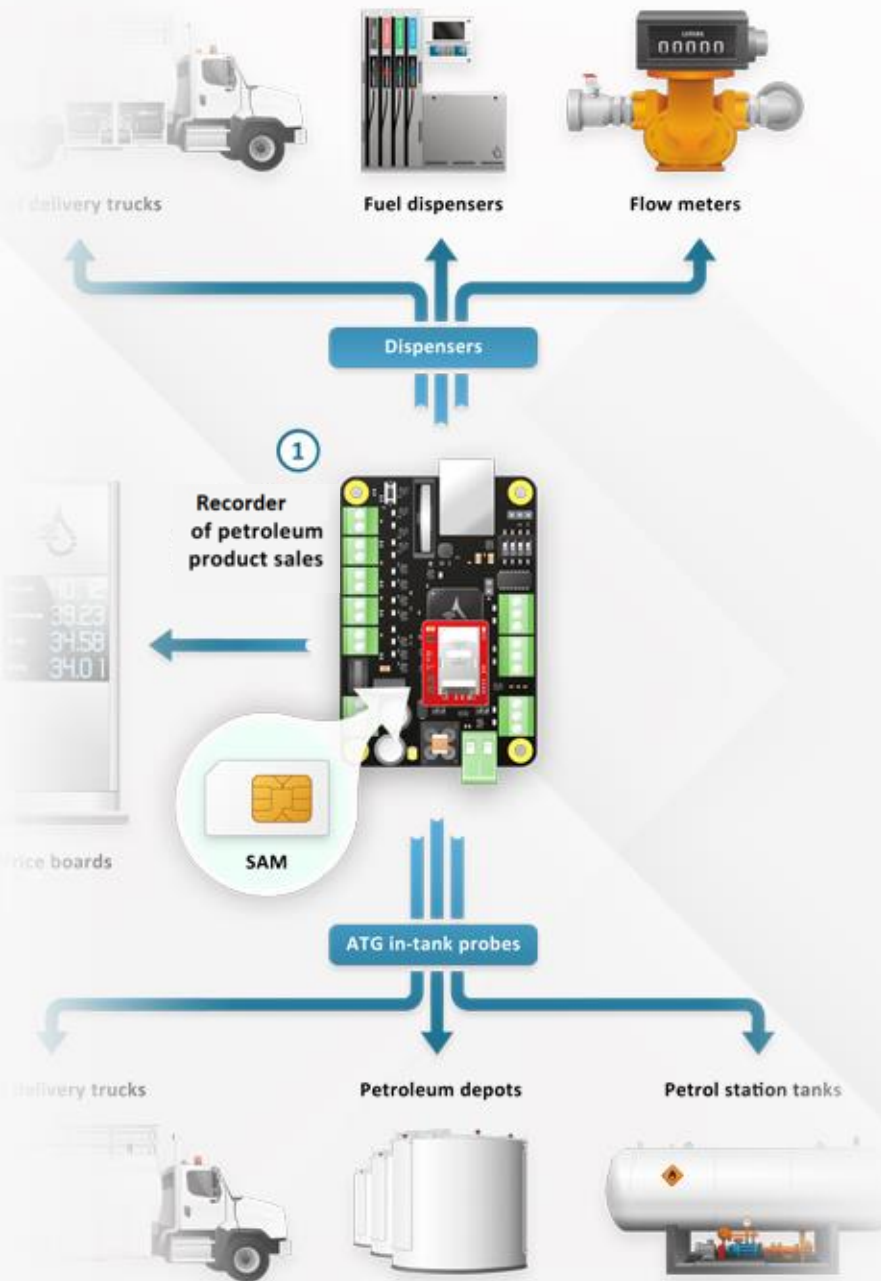
- The number of checks and direct interactions with the TAX Office representatives is reduced;
- Simplified customer service at gas stations.

For State TAX Office:

- Strengthening control over fuel sales using the Fuel Sales Recorder;
- Elimination of fraud of Oil Marketing companies or business entities when using the Fuel Sales Recorder;
- Automation of control of electronic documents generated by Fuel Sales Recorder, including verification of their authenticity and integrity;
- Simplification of the work of TAX Office inspectors who control the operation of the Fuel Sales Recorder through automation.

General scheme and operation of the proposed solution





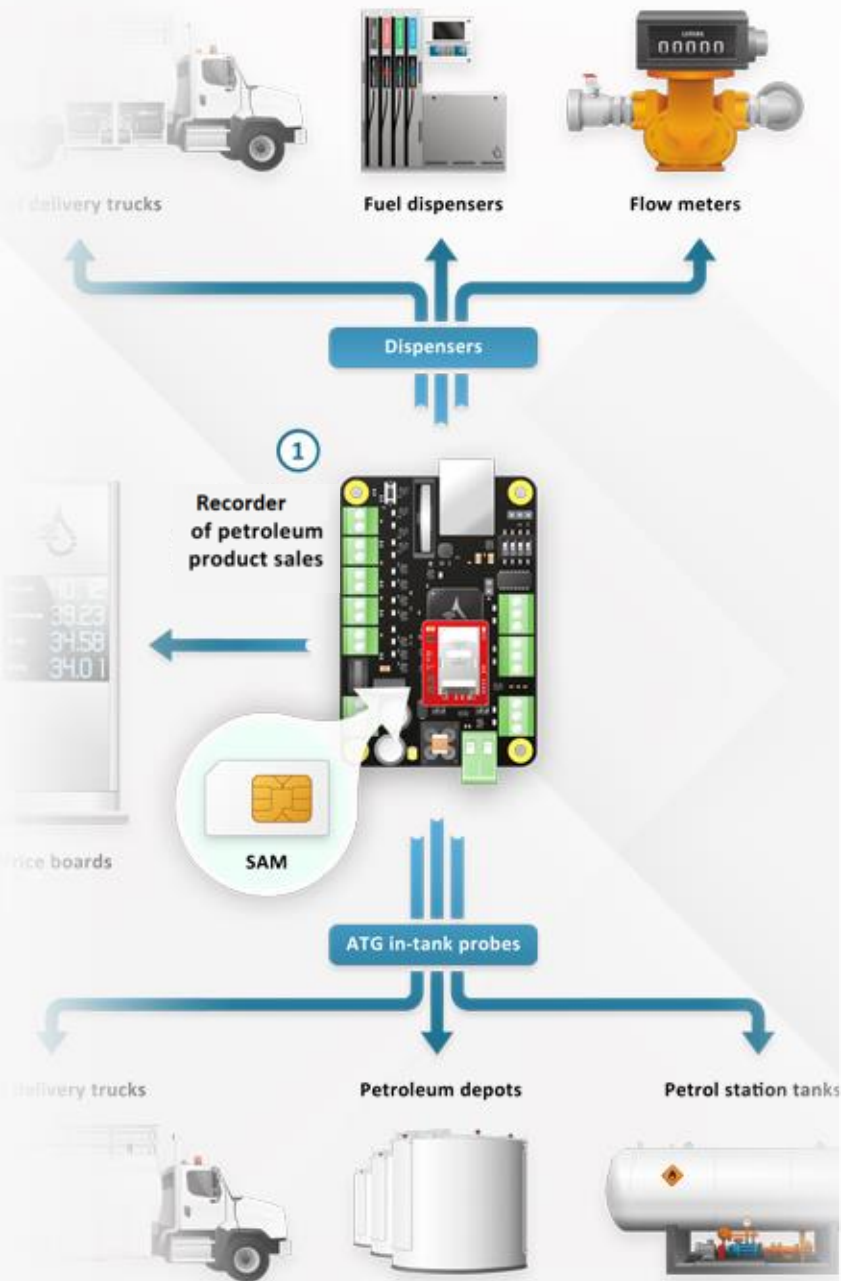
The numbers show the following key steps:

(1) Operation of the Fuel Sales Recorder.

For each fuel dispensing from the pump, the Fuel Sales Recorder generates an information data block (transaction result) in JSON format, including:

- Unique Fuel Sales Recorder number;
- Information about the owner;
- Transaction data (fuel type, volume, price, etc.);
- Date and time of the transaction.

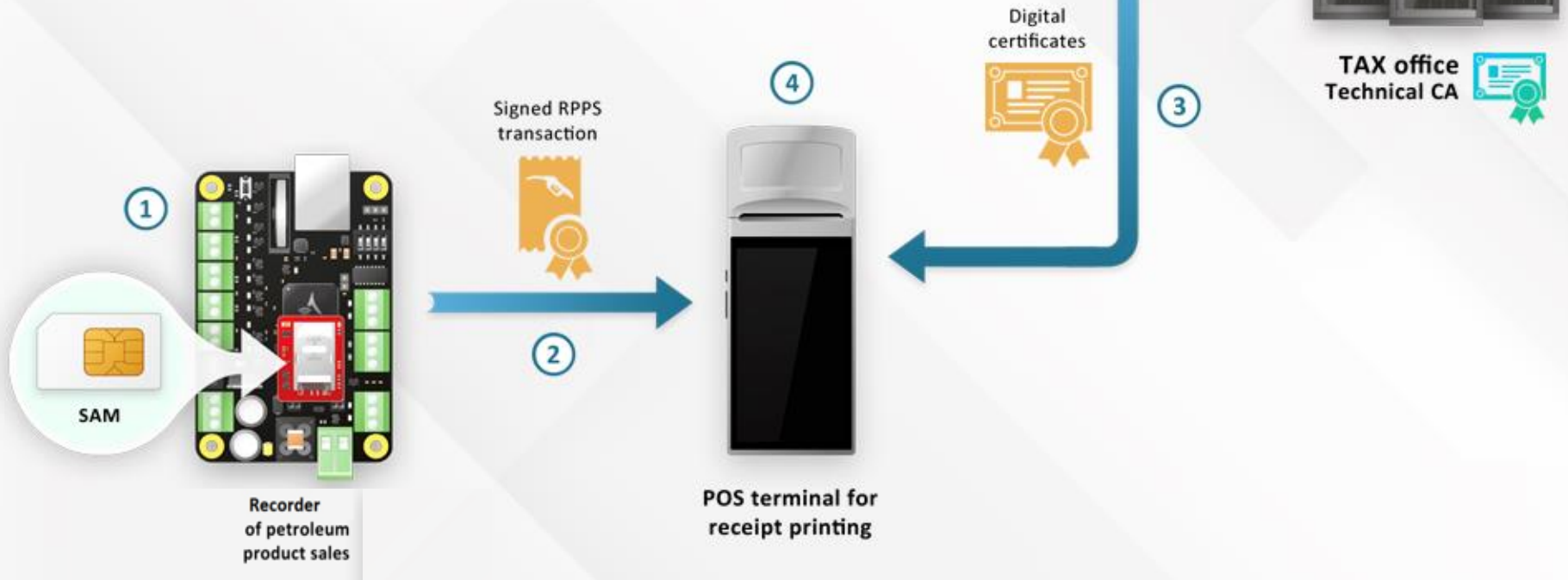




The processor of the Fuel Sales Recorder processes the generated block of information, transfers it to the SAM, which assigns it a serial number according to the counter of processed documents and, using the private key, forms a digital signature of the electronic document of the transaction.

Each signed transaction is stored in the non-volatile memory of the Fuel Sales Recorder until it is transmitted to the terminal and the terminal confirms its receipt/processing.

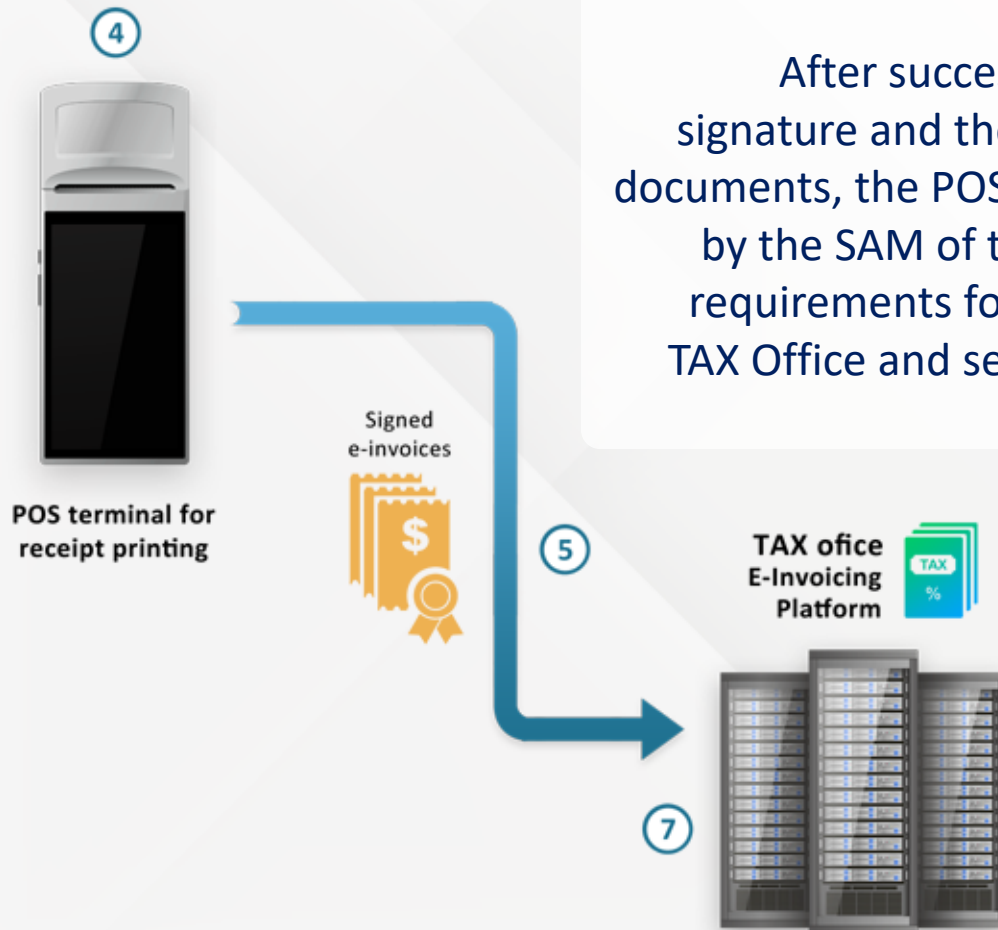
(2) Transfer of signed transactions from the Fuel Sales Recorder to the POS-terminal, which, when necessary, prints a receipt and transfers transactions to the portal of the TAX Office




(3) The POS-Terminal requests the Fuel Sales Recorder certificate from the TAX Office's technological trust center. It ensures its relevance and uses it in the future to verify signed transactions from the Fuel Sales Recorder.

(4) The POS-Terminal checks the electronic digital signature of each received transaction from the Fuel Sales Recorder and controls the continuity of the counter of signed documents. In case of violation of the continuity of the counter (disappearance of transactions carried out by the Fuel Sales Recorder), it generates an “alarm” sign if necessary.

After successful verification of the electronic digital signature and the continuity of the counter of processed documents, the POS-terminal generates an e-invoice signed by the SAM of the POS-terminal in accordance with the requirements for the formation of digital invoices of the TAX Office and sends it to the server of the TAX Office **(5)**





**TAX office
Technical CA** 

Digital
certificate



6

**TAX office
E-Invoicing
Platform** 



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(6) Obtaining POS terminal's certificate to verify e-invoice received from POS terminal.

(7) Verification and registration of the received e-invoice to the TAX Office's server in accordance with the existing procedure.

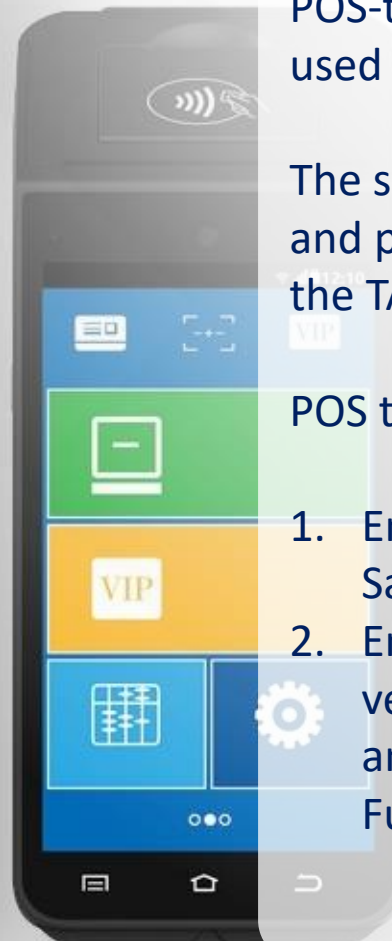
Fuel Sales Recorder in the Tax Office's information structure

To implement the project, it is necessary to integrate the Fuel Sales Recorder [PTS-2](#) into the information structure which is currently deployed, to generate and transfer data on completed sales to the TAX Office's portal using the existing:

- Key Certification Authority
- Data storage and processing software
- POS-terminal software of various developers for printing receipts and transferring data to the TAX Office's portal.



POS-terminals for printing receipts and transferring data to the TAX Office's portal



POS-terminals of various manufacturers can be used in the system.

The software of POS-terminals that generates and prints receipts, as well as transfers data to the TAX Office's server, won't be changed.

POS terminal software must be enhanced:

1. Enable to obtain sales data from the Fuel Sales Recorder [PTS-2](#);
2. Enable to obtain a public key certificate for verifying the electronic digital signature of an electronic document received from the Fuel Sales Recorder [PTS-2](#).

Security Module Description

To carry out cryptographic operations it is necessary to protect information, the Fuel Sales Recorder [PTS-2](#) must include a security module.

The Security Module performs the following functions:

- Key pair generation;
- Secure storage of the private key in a way that excludes the possibility of its leak into the surrounding software and hardware environment.





- Storage of public key certificates:
 - *the Fuel Sales Recorder [PTS-2](#)'s public key certificate digitally signed with the Fuel Sales Recorder's private key, signed by the electronic digital signature of the manufacturer and the electronic digital signature of the TAX Office;*
 - *Public key certificate of the TAX Office;*
 - *Public key certificate of the Fuel Sales Recorder manufacturer;*
 - *As an option, a certificate of the Business Entity;*
- Formation and verification of an electronic digital signature in accordance with cryptographic standards based on elliptic curves;
- Encryption of electronic document data;





- Maintaining an internal counter of processed documents;
- Automatic setting of the value of the counter of processed documents, the factory number of the Fuel Sales Recorder, the unique number of the Security Module.

The DS Security Module must meet the requirements for FIPS 140-2 Level 3 cryptographic devices or be certified to a Common Criteria level of at least EAL5.



Automated fuel turnover control system

The proposed solution to create an automated fuel turnover control system has been successfully implemented in Ukraine as part of specialized fuel sales recorders for filling stations and has been successfully operated in recent years.

TECHNOTRADE LLC is ready to cooperate with the State TAX Offices and with private enterprises to implement this project worldwide.

THANK YOU FOR YOUR ATTENTION



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