Installation and Configuration Manual

POS Network Management R2

03.52.30

11.06.2021

Contents

A payment terminal (Point-of-Sale, POS) is a hardware-software device used for making transactions with bankcards or mobile devices supporting NFC (Near Field Communication) technology.

The POS controller is responsible for POS network interaction with the processing center: receiving and processing messages from POS terminals, searching for and registering necessary information in the Way4 database, sending POS terminals response messages for operation results, etc.

The Way4 POS controller is a software component operating on the Way4 Transaction Switch platform.

This document is intended for Way4 system administrators (bank and processing center employees) responsible for configuring the POS network.

When working with this document, it is recommended to use the following resources from the OpenWay documentation series:

- "Acquiring Module User Manual"
- "Terminal Key Management"
- "Way4 Transaction Switch. Platform Overview"
- "Terminal Device Attribute Setup"
- "Importing and Exporting Advanced Applications R2 (XML Format)"
- "Configuring Dynamic Key Change on POS Terminals in Way4" (provided according to an additional agreement with OpenWay)
- "Scheduler Manual"
- "Standing Payment Orders"

The following notation is used in the document:

- Screen form field labels are shown in italics.
- Screen form button labels are shown in square brackets; for example [Approve].
- Sequences for selecting user menu items are shown using arrows as follows: "Acquiring → Acquiring Contracts → Client".
- Sequences for selecting system menu items are shown using arrows as follows: "Database => Change password".
- Key combinations in DB Manager are shown in angular brackets, for example <Ctrl>+<F3>.
- Variables that differ for each local instance, for example, directory and file names, as well as file paths, are shown in angular brackets; for example, <OWS_HOME>.

Warnings about potentially hazardous situations or actions are marked with a special icon and highlighted.

Information about important features, additional options, or the best use of certain system functions is marked with a special icon and highlighted.

1 POS Controller dictionaries

Dictionaries are important sources of information used in POS controller operation. Dictionaries are tables stored in the database (DB) that contain information of one type, for example, the POS types dictionary, POS messages dictionary, etc.

Two types of dictionary are used in the system:

- Custom – dictionaries whose content may be modified by the user.
- Fixed – dictionaries whose content can only be modified by OpenWay; in some cases, dictionary data can be modified by authorized specialists of the bank or processing center, under the supervision of OpenWay representatives.

1.1 Custom dictionaries

A list of Way4 database custom dictionaries used by the POS controller is shown below.

1.1.1 POS Types dictionary

All types of POS terminals interacting with Way4 must be registered in a special POS Types dictionary.

A POS type is selected from a list during device configuration (see the section "Information about Devices" of the document "Acquiring Module").

To access the POS Types dictionary, select the user menu item "Full → Configuration Setup → Merchant Device Setup → POS Types".

The "POS Types" form will open.

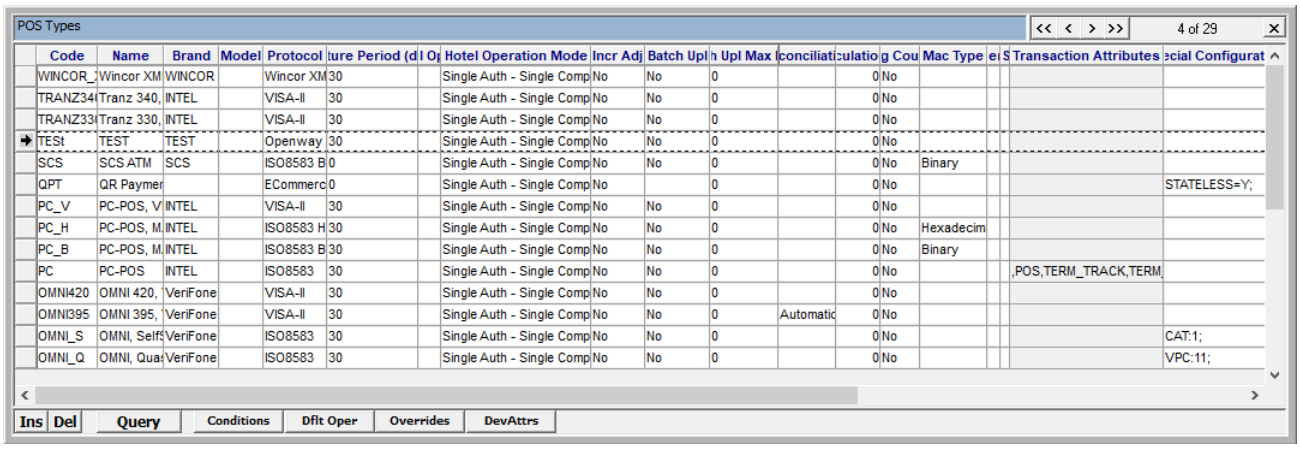


Table of POS types registered in the system

This table contains the following fields:

- *Code* – terminal type code used when loading acquiring module applications with the Advanced Applications R2 module (see the document "XML Applications (R2)").

- *Name* – POS type name in the system.
- *Brand* – POS manufacturer brand name: Bull, Datacard, Hypercom, Intel, Nurit, Olivetti, SCS, VeriFone, etc.
- *Model* – POS model.
- *Protocol* – protocol name (see the section "POS Protocols dictionary").
- *Capture Period (days)* – period (in calendar days) following the date of a preauthorization ("Pre-Auth") during which its confirmation ("Authorization Confirmation") or reversal ("Pre-Auth Reversal") is expected. When this period expires, processing of operations related to "Pre-Auth" will be completed with the error "Capture period expired". The "0" value means the period is not limited.
- *All Ops* – the "Yes" value in this field allows all operations compatible with this terminal type for be enabled for this POS type (according to the settings in the form "Operations for <POS terminal name>", see the section "Configuring executable operations"). It is not recommended to set the "No" value in this field.

When the "No" value is set in the *All Ops* field, a custom list of operations will be used for the terminal. This functionality is obsolete and remains for backward compatibility.

It is recommended to limit the list of allowed operations for a POS terminal in the device's Service Package (see the document "Way4 Service Packages").

- *Hotel Operation Mode* – hotel operation mode (class of operations related to deferred payment for services when the final amount is generated according to the results of using these services; for example: car rental, hotel room booking, etc., with the ability to prolong the term of using the service):
  - "Single Auth – Single Compl" – preauthorization ("Pre-Auth") is made, after which the "Authorization Confirmation" operation is executed, corresponding to authorization (the amount of the financial operation may differ from the amount of preauthorization; either increased or decreased).
  - "Multiple Auth – Single Compl" – several preauthorization operations are executed sequentially (for example, when a guest extends his or her hotel stay) after which the final operation "Authorization Confirmation" is executed, generating a financial document (the amount of the financial document may be smaller or larger than the amount of preauthorization documents created earlier).
  - "Multiple Auth – Multiple Compl" – mode in which several preauthorization operations "Pre-Auth" and several "Authorization Confirmation" operations are executed sequentially. The procedure for processing operations is determined by the sequence of client and hotel personnel actions. For example, the hotel may make intermediate "Authorization Confirmation" operations, debiting funds from the client account for additional services after a certain number of days following the first or subsequent authorizations. The amount

of generated financial documents may differ from the amount blocked on the card for authorizations belonging to this chain.

Support of processing operations in "Multiple Auth – Multiple Compl" mode is optional functionality and is provided according to a separate agreement with OpenWay.

Way4 supports the ability to process several chains of hotel operations made with the same card if settlement operations ("Authorization Confirmation") were made in an order differing from that of preauthorizations. For example, a client, using the same card within a certain time interval reserves several hotel rooms, uses services related to them and pays for them at different points in time. In this case, authorization and settlement operations are linked by a booking number that must be transmitted by the hotel's POS terminal.

For the corresponding terminal type, limits can be set on the permissible difference between the amounts of preauthorization and the final financial operation. If the amount of the financial operation does not meet these conditions, this operation will be declined. Limits are set in the "Conditions for <POS terminal name>" form (opened by clicking the [Conditions] button).

The absence of limits assumes that the amount of a financial operation must correspond exactly to the amount of the preauthorization operation(s). This condition is significant for "Single Auth – Single Compl" or "Multiple Auth – Single Compl" scenarios. For "Multiple Auth – Multiple Compl" mode, it is mandatory to specify a limit for the permissible difference in operation amounts. Otherwise, it is not guaranteed this mode will operate correctly.

"Multiple Auth – Multiple Compl" mode is not intended for processing e-commerce operations in which a client makes one payment (one preauthorization) for purchases through a merchant aggregator's interface but the goods are shipped separately (several settlement operations). Support of such operations ("Single Auth – Multiple Compl") is optional functionality and is provided according to an additional agreement with OpenWay. There is no guarantee the system will operate correctly if "Multiple Auth – Multiple Compl" is used to support partial shipments.

- *Incr Adj* – the "Yes" value in this field allows an adjustment document increasing the transaction amount to be created (for the "Hypercom" protocol).
- *Batch Upl* – the "Yes" value in this field enables the mode to maintain this type of POS terminal's financial cycles in Way4 (generation of operation counters, reconciliation and export of totals (Batch Upload)).

- *Reconciliation* – reconciliation mode (for more information, see the section "Reconciliation"). This parameter regulates processing of possible discrepancies between data generated online in the DB and data received from a POS terminal when totals for a financial cycle are uploaded ("Batch Upload" operation):
  - "Automatic" – adjustment documents for automatic processing are generated (*Posting Status* = "Waiting"). Documents are generated on the condition that the transaction information received on upload is correct.
  - "Manual All" (default) – adjustment documents are generated that must be processed manually (*Posting Status* = "Under Workflow").
  - "Manual Reversal" – adjustment documents are generated; only reversal documents must be manually processed.

    For more information on the principles of generating reconciliation documents, see the table:.

Discrepancy	Reconciliation operation type	Automatic	Manual Reversal	Manual All
The operation is present in the upload (according to Batch Upload data), but is missing according to online data	All	A document with the "Waiting" status is created	A document with the "Waiting" status is created	A document with the "Under Workflow" status is created
The operation is missing in the upload (according to Batch Upload data), but is present according to online data	Direct transaction	A reversal document with the "Waiting" status is created	A reversal document with the "Under Workflow" status is created	A reversal document with the "Under Workflow" status is created
	Reversal	The status of a reversal document is changed to "Rejected"	The status of a reversal document is changed to "Under Workflow"	The status of a reversal document is changed to "Under Workflow"

If an online operation registered in the database is missing in upload and "Automatic" mode is set, a reversal document is only created for a document in the "Posting" status. If a document was in the "Waiting" status, a reversal document is not created and depending on the value of the global parameter SOFT_BATCH_UPLOAD:

- "N" (default) – the document goes to the "Rejected" status.
- "Y" – the document goes to the "Suspended" status.

- *Totals Calculation Scheme* mode for calculating totals. Possible values: "0" or "1" (Mode 1), "2" (Mode 2) (see the section "Totals calculation modes"). The default value is "0". The recommended value is "2".

> Note that POS terminal software must support the selected scheme.

- *Batch Upl Max Days* – maximum number of days with respect to the date of opening a cycle during which batch upload must be executed for this cycle. If upload was not executed within the set period, the POS terminal will be prohibited from further making online operations (until Batch Upload is executed). The "0" value means the period is not limited.
- *Strong Counters* – mode for checking POS counters:
  - "No" – amounts of internal POS counter values are compared with the amounts of counters in the database.
  - "Yes"– total financial amounts of internal POS counters are compared with the amounts of the corresponding counters in the database; the number of operations recorded by the corresponding counters is also compared.
- *Mac Type* – MAC (Message Authentication Code) calculation mode:
  - "Binary"
  - "Hexadecimal"
- *Key Hierarchy* – key hierarchy, see the document "Configuring Dynamic Key Change on POS Terminals in Way4" (optional feature, provided according to an additional agreement with OpenWay).
- *Key Idt Scheme* – key identification scheme, see the document "Configuring Dynamic Key Change on POS Terminals in Way4" (optional feature, provided according to an additional agreement with OpenWay).
- *Transaction Attributes* – additional parameters of a transaction.
- *Special Configuration* – list of tags affecting the processing of data received from POS (the ";" character is used as a delimiter). A list of some tags is provided in the document "Acquiring Module. Terminal Device Attribute Setup".
  The tag values specified in this field can be redefined depending on the transaction conditions in the "Overrides for <device type>"form that opens using the [Overrides] button (see the description for the figure).
- *AutoRepeat/Reversal Time* – the period of time (in minutes) during which a request from a terminal to execute an operation is interpreted as an AutoRepeat, AutoReversal or AutoAdvice message, on the condition that:
  - The message contains an indicator of the corresponding automatic operation (AutoRepeat/ AutoReversal/AutoAdvice).
  - The operation's STAN matches the corresponding number of the earlier operation.
  - The operation's amount matches the amount of the earlier operation.

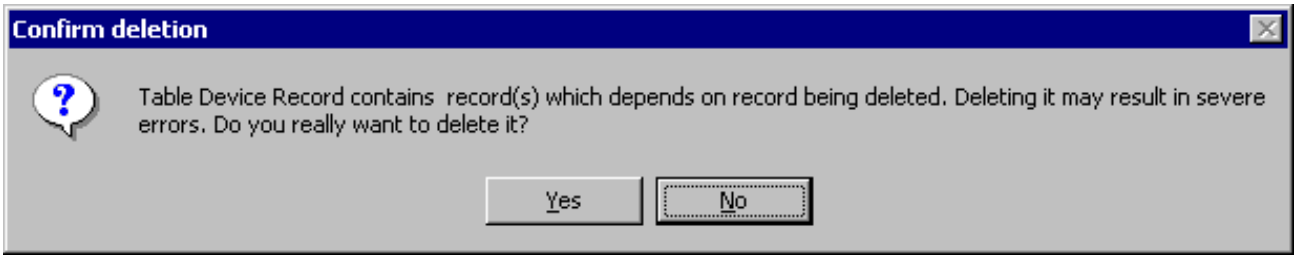
  If the parameter's value is "0":

- For terminal types with Batch Upload capability (*Batch Upl* = "Yes"), the period is not limited.
- For terminal types with *Batch Upl* = "No" – 1440 minutes (24 hours).

- *Repeat Time (min)* – this field is not used. It is shown for backward compatibility.

In this form, click the [Ins] button to add a record to this table; click [Del] to delete a record.

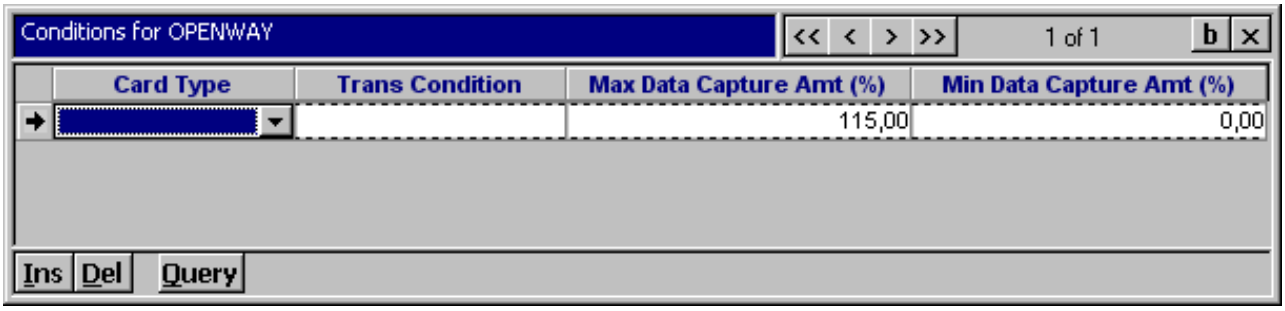
If an attempt is made to delete a "POS Types" table record that corresponds to a POS type for which a device contract is registered in Way4 (see the section "Information about Device Contracts Information about Device Contracts" of the document "Acquiring Module User Manual), the following warning message may be displayed:



Warning that an attempt has been made to delete a record to which device contracts refer

To confirm deletion, click [Yes]; to cancel deletion, click [No].

The [Conditions] button opens the "Conditions for <POS terminal name>" form containing a list of conditions for setting the permissible difference between the amounts of "Authorization Confirmation" and "Pre-Auth" operations.



List of operation conditions

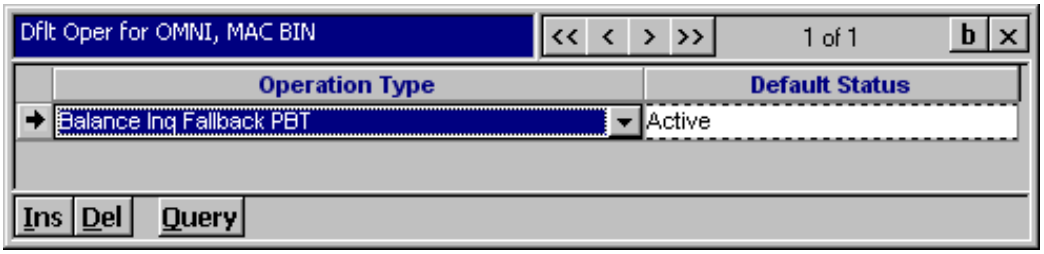
This table contains the following fields:

- *Card Type* – card contract type ("Full → Configuration Setup → Contract Types → Card Contract Types").
- *Trans Condition* – transaction condition; the "Transaction Conditions" dictionary contains a list of all conditions registered in the system.
- *Max Data Capture Amnt (%)* – maximum difference (as a percentage) in the value of an "Authorization Confirmation" operation from a "Pre-Auth" operation.
- *Min Data Capture Amnt (%)* – minimum difference (as a percentage) in the value of an "Authorization Confirmation" operation from a "Pre-Auth" operation.

In this form, click the [Ins] button to add a record to this table; click [Del] to delete a record.

The [Dflt Oper] button opens the "Dflt Oper for <POS terminal name>" form (see figure), containing a list of operations that will be applied by default to the terminal.

This setting is relevant if the *All Ops* field of the "POS Types" form (see figure) contains a value other than "Yes" (see the section "Configuring executable operations").



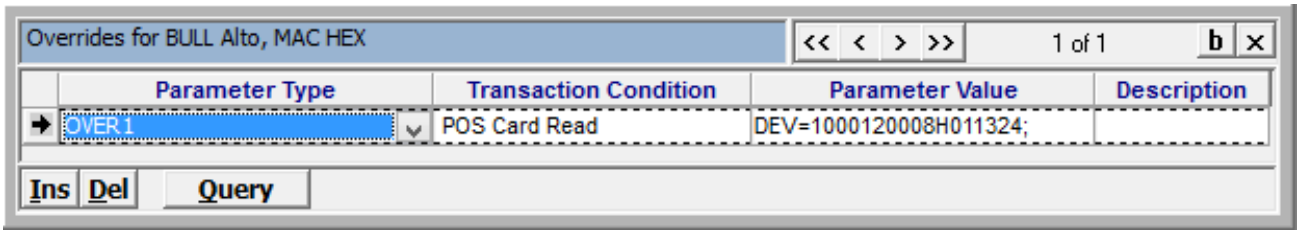
List of default operations

This table contains the following fields:

- *Operation Type* – operation type. The "POS Operations" system dictionary contains a list of all POS operations.
- *Default Status* – operation status. The field may have the "Active", "Inactive" or "Closed" status.

In this form, click the [Ins] button to add a record to this table; click [Del] to delete a record.

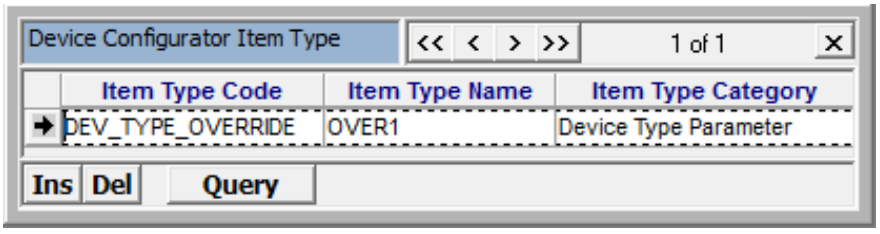
The [Overrides] button opens the "Overrides for <device type>" form that is used to redefine the tag values set in the *Special Configuration* field for the corresponding terminal type depending on transaction conditions.



Redefining the parameters for a terminal type

The form contains the following fields:

- *Parameter Type* – drop-down list to select a parameter type registered in the system.
  New parameter types can be registered in the "Device Configurator Item Type" form (the user menu item "Full → Configuration Setup → Merchant Device Setup → Device Configurator Item Type").



Registering a configuration parameter type

Parameter types to redefine tags in the *Special Configuration* field must be registered with the DEV_TYPE_OVERRIDE code.

- *Transaction Condition* – drop-down list to select a transaction condition registered in the "Transaction Conditions" system dictionary.
- *Parameter Value* – parameter value of the specified type that will be used in the appropriate transaction conditions; the example in the figure shows that when a transaction is made with a card on the devices of the corresponding type, the DEV tag's value will be redefined.
- *Description* – arbitrary description.

The [Ins] and [Del] button in the "Overrides for <device type>" form are used to add and delete records.

The [DevAttrs] button in the "POS Types" form makes it possible to set a list of device attributes that will be recorded in documents for transactions at this type of terminal (which can then be included in clearing information that is exported). The list is created on the basis of values selected in the "DevAttrs for <terminal type>" form:

DevAttrs for PC-POS << < > >> 2 of 21

Attribute Name	Attribute Presence or Value
Terminal Type	POS
Card data input capability: Magnetic stripe	Yes
Card data input capability: Bar code	No
Card data input capability: OCR	No
Card data input capability: Chip	No
Card data input capability: Key entry	No
Card data input capability: Contactless Chip	No
Card data input capability: Contactless Magnetic stripe	No
Card data input capability: 3-D Secure	Yes
Card data input capability: Wallet	No
Cardholder authentication capability: Manual signature verification	No
Cardholder authentication capability: Electronic signature analysis	No
Cardholder authentication capability: Online PIN (default for simple PIN)	No
Cardholder authentication capability: Offline PIN (default for offline PIN)	No
Cardholder authentication capability: Soft PIN-Pad	Yes
Cardholder authentication capability: No capability	No
Card capture capability	No card capture capability
Location indicator	
Card data output capability	
Terminal output capability	Display
PIN capture capability	No PIN capture capability

Ins Del Query Set

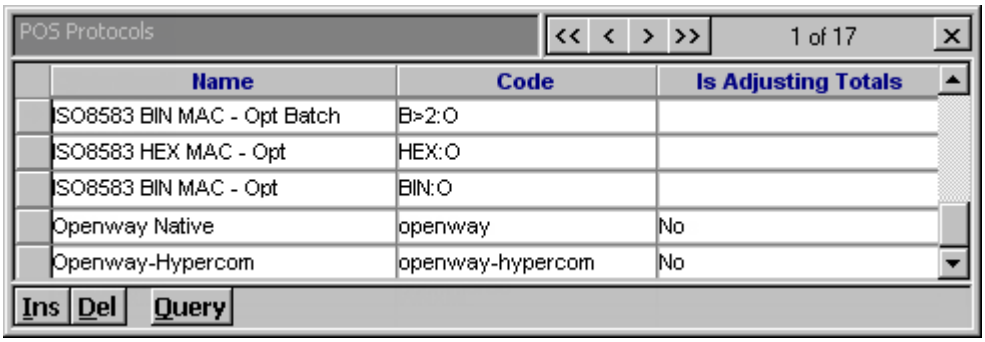
To confirm the list of selected values, click [Set]. The list of codes for the corresponding attributes will be shown in the *Transaction Attributes* field of the "POS Types" form.

1.2 Fixed dictionaries

Fixed Way4 DB dictionaries used by the POS controller are described below.

1.2.1 POS Protocols dictionary

POS protocols regulate message formats and rules for information exchange between POS terminals and the processing center.



Protocol types for information exchange between POS terminals and the processing center

The protocol dictionary table contains the following fields:

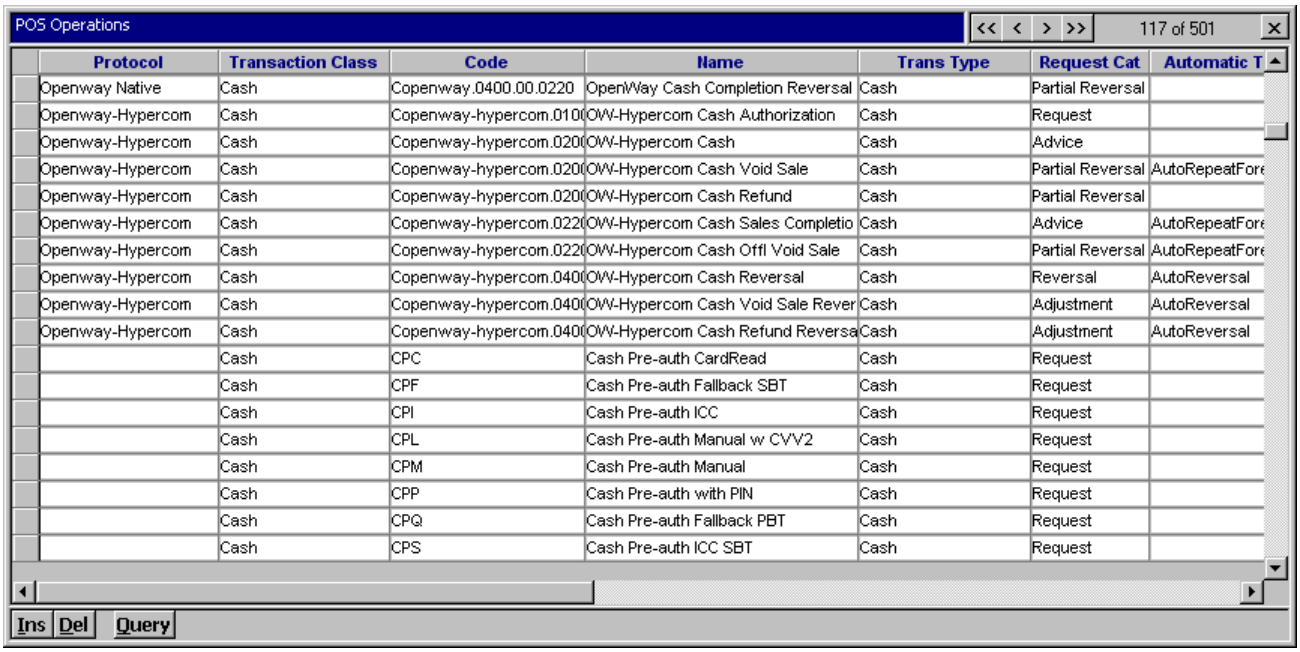
- *Name* – protocol name.
- *Code* – protocol code, unique within the system.
- *Is Adjusting Totals* – specifies the mode for recording reversals and adjustments in counters generated in a cycle. Possible values:
- "Yes" – reversals and adjustments are recorded in the same counters as the original operations, decreasing the number of operations recorded by the counter and the total financial amount..
- "No" – reversals (including adjustments) will be recorded in counters separate from those for the corresponding original operations.

Note that it is not permitted to change the values in the fields of this form.

For terminals using an OpenWay protocol, the "Openway Native" protocol must be used. In other cases, it is recommended to contact OpenWay Support for additional consultation.

1.2.2 POS Operations dictionary

Each POS terminal contract in the system is assigned a set of operations and a set of hardware components (see the section "POS Hardware Types dictionary"), required to execute these operations.


POS Operations

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Protocol	Transaction Class	Code	Name	Trans Type	Request Cat	Automatic T
Openway Native	Cash	Copenway.0400.00.0220	OpenWay Cash Completion Reversal	Cash	Partial Reversal	
Openway-Hypercom	Cash	Copenway-hypercom.0100	OW-Hypercom Cash Authorization	Cash	Request	
Openway-Hypercom	Cash	Copenway-hypercom.0200	OW-Hypercom Cash	Cash	Advice	
Openway-Hypercom	Cash	Copenway-hypercom.0200	OW-Hypercom Cash Void Sale	Cash	Partial Reversal	AutoRepeatFore
Openway-Hypercom	Cash	Copenway-hypercom.0200	OW-Hypercom Cash Refund	Cash	Partial Reversal	
Openway-Hypercom	Cash	Copenway-hypercom.0220	OW-Hypercom Cash Sales Completio	Cash	Advice	AutoRepeatFore
Openway-Hypercom	Cash	Copenway-hypercom.0220	OW-Hypercom Cash Offl Void Sale	Cash	Partial Reversal	AutoRepeatFore
Openway-Hypercom	Cash	Copenway-hypercom.0400	OW-Hypercom Cash Reversal	Cash	Reversal	AutoReversal
Openway-Hypercom	Cash	Copenway-hypercom.0400	OW-Hypercom Cash Void Sale Rever	Cash	Adjustment	AutoReversal
Openway-Hypercom	Cash	Copenway-hypercom.0400	OW-Hypercom Cash Refund Reversa	Cash	Adjustment	AutoReversal
	Cash	CPC	Cash Pre-auth CardRead	Cash	Request	
	Cash	CPF	Cash Pre-auth Fallback SBT	Cash	Request	
	Cash	CPI	Cash Pre-auth ICC	Cash	Request	
	Cash	CPL	Cash Pre-auth Manual w CVV2	Cash	Request	
	Cash	CPM	Cash Pre-auth Manual	Cash	Request	
	Cash	CPP	Cash Pre-auth with PIN	Cash	Request	
	Cash	CPQ	Cash Pre-auth Fallback PBT	Cash	Request	
	Cash	CPS	Cash Pre-auth ICC SBT	Cash	Request	

Ins Del Query

POS Operations dictionary

The table of POS terminal operations contains the following fields:

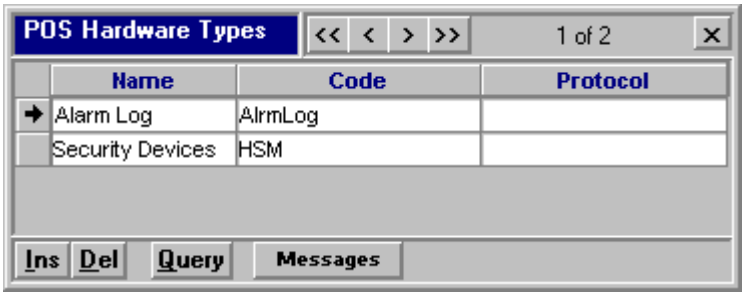
- *Protocol* – protocol name (see the section "POS Protocols dictionary").
- *Transaction Class* – financial transaction type.
- "Cash" – cash disbursement.
- "Retail" – retail transaction.
- "Unique" – casino transaction, etc.
- *Code* – operation code.
- *Name* – operation name.
- *Trans Type* – transaction type.
- *Request Cat* – request/advice category of the document generated according to the transaction message.
- "Request" – request to make a transaction.
- "Advice" – notification that a transaction has been made.
- "Reversal" – notification that a transaction has been reversed.
- "Part Reversal" – notification of a transaction's partial reversal.
- "Adjustment" – notification that the transaction amount has been adjusted.
- "Post Advice" – message that can be sent after the transaction has been made.
- *Automatic Tag* – this field is filled in for operations that are executed automatically.
- *Category* – financial/authorization message category.
- *Service Class* – transaction classification; the value of this parameter determines the way a document will be processed in the system; if this field is empty, it means the default value *Service Class* = "Transaction" is used.
- *Is Online* – specifies whether a request to the issuer is made when a transaction is executed.
- *Date* – method for determining the transaction date:

- "From Terminal" –transaction date and time is determined according to data received from the POS terminal.
- "From Host" – transaction date and time is determined according to the time of the server processing the request received from the terminal.
- *Is Checked* – drop-down list for specifying whether a service card check is required (the "Yes" value) when executing credit transactions; the "No" value or an empty value specifies that when executing this transaction, the cashier's service card does not need to be checked.
- *Trans Cond* – drop-down list for specifying transaction conditions (used for backward compatibility).
- *Special Parameters* – special parameters of the transaction.
- *Document Tag* – additional tags in a document generated as a result of executing the operation.

> ⚠ Note that users are not permitted to change the values in the fields of the "POS Operations" form.

1.2.3 POS Hardware Types dictionary

Each POS terminal contract in the system has hardware components required for executing operations on the POS terminal (see the section "POS Operations dictionary"). The list of POS hardware components contains "virtual" components.



POS Hardware Types dictionary

The POS Hardware dictionary contains the following fields:

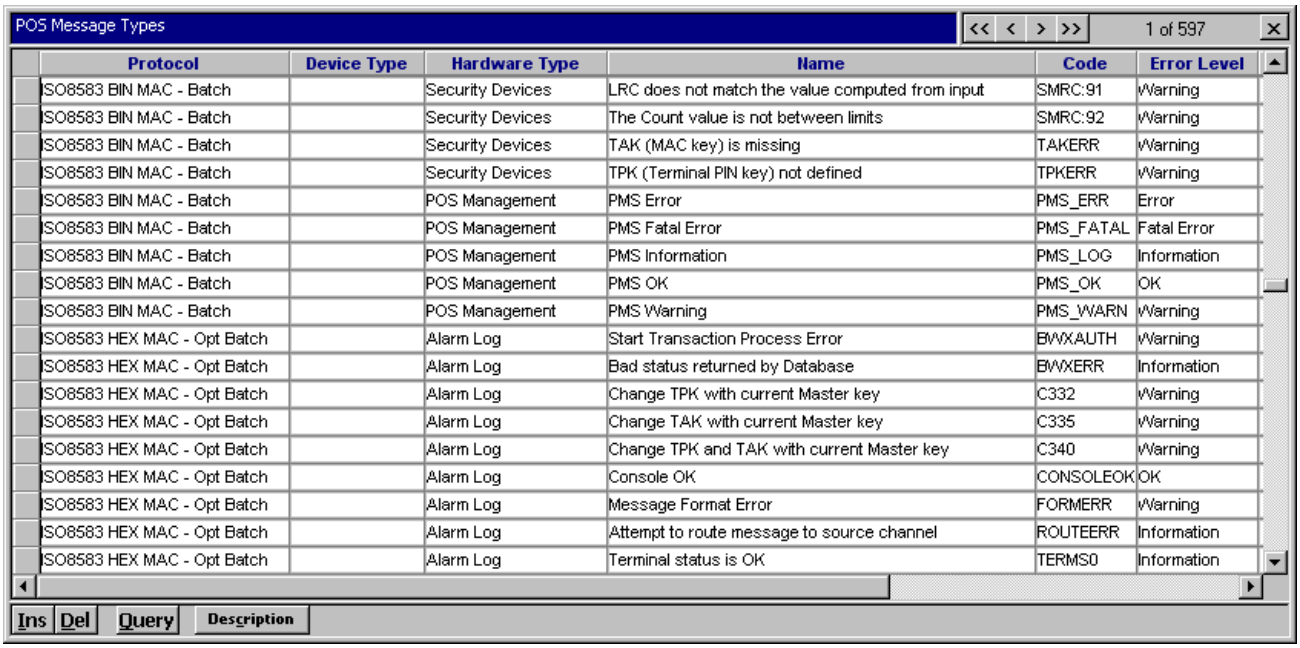
- *Name* – component name.
- *Code* – code of the component in the system.
- *Protocol* – the type of protocol for the component (this field is not filled in for components that are compatible with all registered protocol types).

> ⚠ Note that it is not permitted to change the values in the fields of this form.

The [Messages] button opens the "Messages for <component name>" form, containing a list of messages generated in the system when working with this component (see the section "POS Message Types dictionary").

1.2.4 POS Message Types dictionary

During operation of a POS terminal, certain messages can be generated in the system; each message corresponds to a specific POS terminal component.



POS Message Types — 1 of 597

Protocol	Device Type	Hardware Type	Name	Code	Error Level
ISO8583 BIN MAC - Batch		Security Devices	LRC does not match the value computed from input	SMRC:91	Warning
ISO8583 BIN MAC - Batch		Security Devices	The Count value is not between limits	SMRC:92	Warning
ISO8583 BIN MAC - Batch		Security Devices	TAK (MAC key) is missing	TAKERR	Warning
ISO8583 BIN MAC - Batch		Security Devices	TPK (Terminal PIN key) not defined	TPKERR	Warning
ISO8583 BIN MAC - Batch		POS Management	PMS Error	PMS_ERR	Error
ISO8583 BIN MAC - Batch		POS Management	PMS Fatal Error	PMS_FATAL	Fatal Error
ISO8583 BIN MAC - Batch		POS Management	PMS Information	PMS_LOG	Information
ISO8583 BIN MAC - Batch		POS Management	PMS OK	PMS_OK	OK
ISO8583 BIN MAC - Batch		POS Management	PMS Warning	PMS_WARN	Warning
ISO8583 HEX MAC - Opt Batch		Alarm Log	Start Transaction Process Error	BWXAUTH	Warning
ISO8583 HEX MAC - Opt Batch		Alarm Log	Bad status returned by Database	BWXERR	Information
ISO8583 HEX MAC - Opt Batch		Alarm Log	Change TPK with current Master key	C332	Warning
ISO8583 HEX MAC - Opt Batch		Alarm Log	Change TAK with current Master key	C335	Warning
ISO8583 HEX MAC - Opt Batch		Alarm Log	Change TPK and TAK with current Master key	C340	Warning
ISO8583 HEX MAC - Opt Batch		Alarm Log	Console OK	CONSOLEOK	OK
ISO8583 HEX MAC - Opt Batch		Alarm Log	Message Format Error	FORMERR	Warning
ISO8583 HEX MAC - Opt Batch		Alarm Log	Attempt to route message to source channel	ROUTEERR	Information
ISO8583 HEX MAC - Opt Batch		Alarm Log	Terminal status is OK	TERMS0	Information

Ins Del Query Description

Table of messages generated during POS terminal operation

The table of POS terminal messages contains the following fields:

- *Protocol* – name of the protocol (see the section "POS Protocols dictionary") for which this type of message can be generated. If the field is empty, the message can be generated for any protocol.
- *Device Type* – type of POS terminal registered in the system; this field is used to differentiate messages by device type; for example, when executing the same operation (with the same value in the *Code* field) on different types of POS terminals, messages with different values in the *Error Level* field may be generated.
- *Hardware Type* – name of the POS terminal component (see the section "POS Hardware Types dictionary") for which this message is generated during this component's operation.
- *Name* – message description.
- *Code* – message code.
- *Error Level* – error severity level specified in the message generated by the controller or the system during the corresponding procedures.
- *Group Code* – service field.
- *Security* – access level (number). Users in the group for which an access level number is specified that is equal to or more than the number in this field will have access to the operation.

> ⓘ User group access levels are specified in the Security Level field of the "Constants for <group name>" form opened by clicking the [Constants] button in the "User Groups and Users - View" form (Full → DB Administrator Utilities → Users & Grants → User Groups and Users – View).

- *Usage Operation* – service field.

Note that it is not permitted to change the values in the fields of this form.

The [Description] button opens the "Description for <message description>" form, containing additional information for a message.

2 POS description and configuration

Description of a POS terminal and its configuration includes registration of specific information in the Way4 DB about merchants and their terminals and about rules for processing transaction information by the Way4 acquiring module.

2.1 Configuring POS terminal contracts

The procedure for entering a new POS terminal contract is described in the section "Information about Device Contracts" of the document "Acquiring Module".

2.1.1 Configuring executable operations

Allowed operations for a POS terminal are set up in the "Operations for <POS terminal name>" form (see figure).

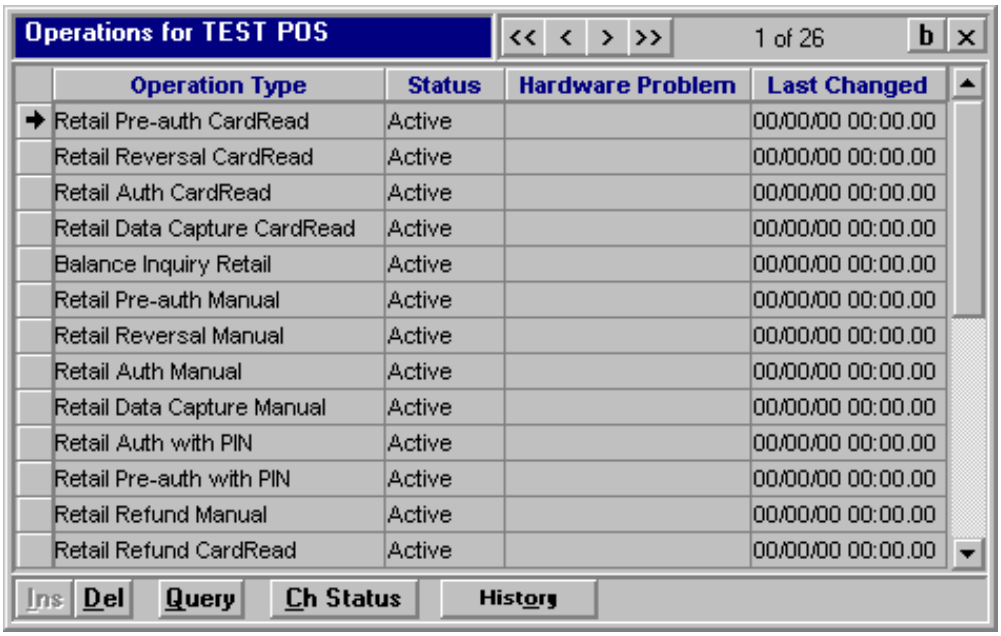
Setup of allowed operations for a POS terminal is an obsolete feature and is supported for backward compatibility.

It is recommended to limit the list of allowed operations for a POS terminal in the device's Service Package (see the document "Way4 Service Packages").

There are two ways to open this form:

- After selecting the user menu item "Acquiring → POS/Imprinter Controller → POS Management", in the "POS Management" form that opens, select the required POS terminal and click the [Operations] button.
- After selecting the user menu item "Acquiring → Acquiring Contracts → Acquiring Contracts", select the required account contract, click the [Devices] button in the account contract form, select the POS terminal and click the [POS] button in the device contract form. The "POS for <POS terminal name>" form will open. Click the [Operations] button in this form.

The "POS Management" form is the same as the "POS for <POS terminal name>" form described in the section "POS Terminals" of the document "Acquiring Module".



List of allowed operations for a POS terminal

To fill in the list of allowed operations for the first time, click the [Setup] button in the device configuration form ("POS Management" or "POS for <POS terminal name>") and choose the "Check and Fill" context menu. The list of operations is generated with consideration of the following:

- If the terminal type has "Yes" in the *All Ops* field of the "POS Types" form (see the section "POS Types dictionary"), the list is not filled in (all operations compatible with the protocol for this terminal type will be available for the POS terminal).
- If a value other than "Yes" is specified in *All Ops* field, the list will contain operations from the "POS Operations" dictionary (see the section "POS Operations dictionary") which are available for this terminal type, and all operations (except for the case described in the next item) will have the "Closed" (not allowed) status.
- If operations allowed by default are defined for the corresponding terminal type (in the "Dflt Oper for <POS terminal name>" form), after the list has been loaded, these operations will have the "Active" status.

To delete an operation from the list of allowed operations, select the required row in the table and click [Del].

An operation can also be allowed or prohibited by changing its status. To do so, click the [Ch Status] button. Clicking this button changes the status of the operation from "Active" to "Closed".

The *Last Changed* field contains the date and time the operation's status was last changed.

The [History] button in the "Operations for <POS terminal name>" form (see figure) opens a form with the operation's status change history.

The list of allowed operations can be restored after rows are deleted from the table in the device configuration form ("POS Management" or "POS for <POS terminal name>") by clicking the [Setup] button and selecting the context menu item "Check and Fill".

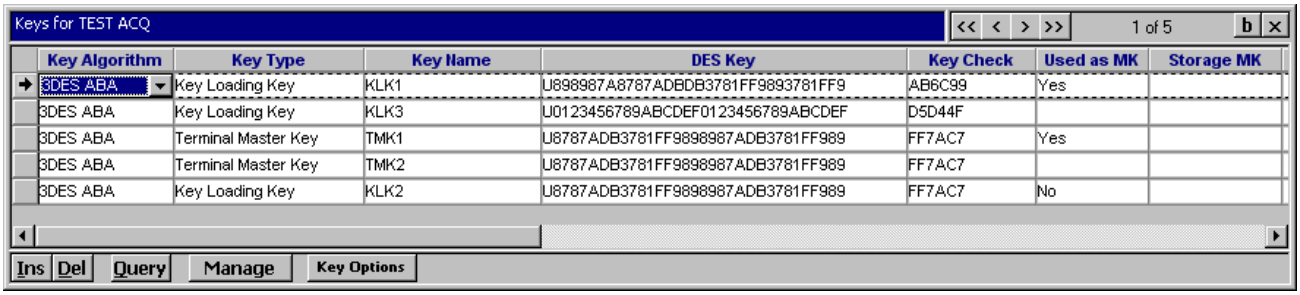
2.1.2 Specifying encryption keys

Encryption keys are created by the security officer using cryptographic hardware and include a specific number of digits.

Encryption keys are only stored in the system and in a PIN pad encrypted using another encryption key. A check value is used to verify an encryption key. This value is only determined by the encryption key value and does not depend on how it was encrypted.

To specify encryption keys, use the "Keys for <POS terminal name>" form, which is opened by clicking the [Keys] button in the device configuration form ("POS Management" or "POS for <POS terminal name>").

> The "POS Management" form is the same as the "POS for <POS terminal name>" form described in the section "POS Terminals" of the document "Acquiring Module".



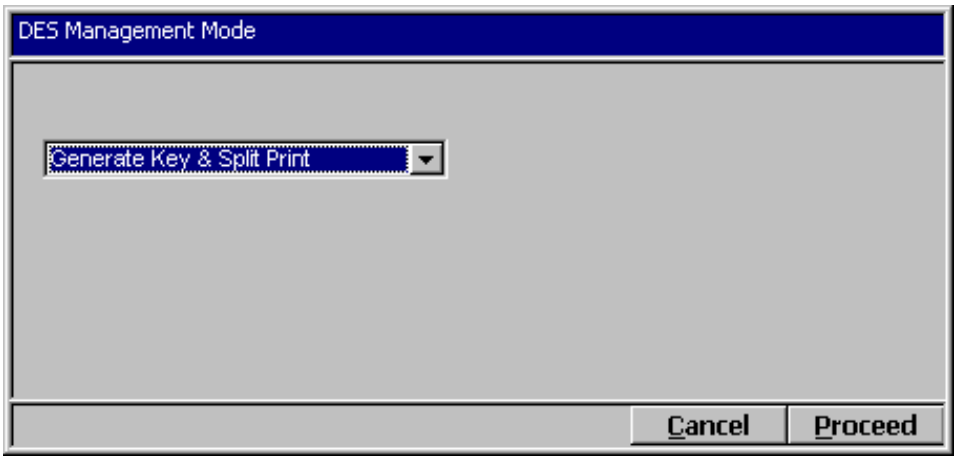
Form for specifying POS terminal encryption keys

This form contains the following fields:

- *Key Algorithm* – encryption algorithm for which this key will be used.
- *Key Type* – encryption key type selected from a list generated from the "PM Key Types" system dictionary.
- *Key Name* – encryption key name.
- *DES Key* – encryption key value.
- *Key Check* – encryption key check value.
- *Used As MK* – specifies whether the key will be used as the master key.
- *Storage MK* – specifies the master key used to encrypt this key when sending it to the terminal.
- *Serial Number* – key identifier distinguishing it among keys of the same type.
- *Is Active* – specifies (when the "Yes" value is set) that the encryption key can be used; an empty value in this field corresponds to the "No" value.
- *Date From* – the start date of the interval during which this key can be used.
- *Date To* – the end date of the interval during which this key can be used.
- *Max Usage* – a number specifying how many times this encryption key can be used.
- *Max Wrong Attempts* – number of attempts to incorrectly use the key before it is blocked.
- *Wrong Attempts Threshold* – when this value is exceeded, a signal about incorrect attempts to use the key will be made.
- *Current Usage* – the current value of this encryption key's usage counter.
- *Wrong Attempts* – counter of attempts to use the key incorrectly.

- *Storage Form* – the form in which the key is stored in the database.
- *Key Code* – the *Key Type* value shown in the form specified in the *Storage Form* field.
- *Parent Key* – parent key.
- *Add Data* – additional data.

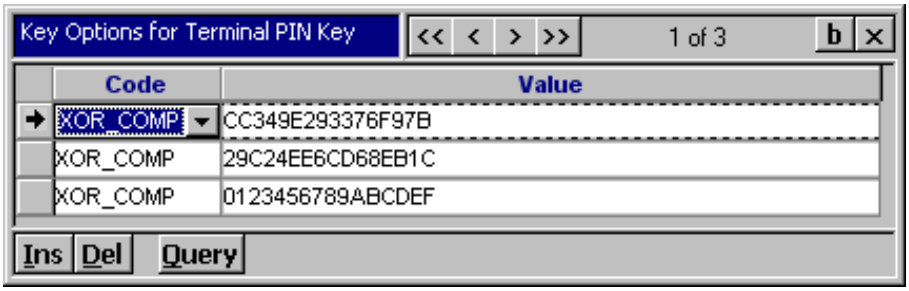
The [Manage] button in the "Keys for <POS terminal name>" form opens the "DES Management Mode" form used for manual generation of keys:



Form for manual generation of keys

To confirm changes, click the [Proceed] button, to cancel, click [Cancel].

The [Key Options] button in the "Keys for <POS terminal name>" form opens the "Key Options for Terminal PIN Key" form, used to store and enter key parameters.



Additional parameters of a key

This form contains the following fields:

- *Code* – key parameter code.
- *Value* – key value.

In this form, click the [Ins] button to add a record to this table; click [Del] to delete a record.

2.1.2.1 Enabling MAC mode

To enable MAC (Message Authentication Code) mode, set the "Mandatory" value in the *Mac Status* field of the device configuration form ("POS Management" or "POS for <POS terminal name>"). The mode is disabled if the "None" value is set in this field.

The "POS Management" form is the same as the "POS for <POS terminal name>" form, a description of which is given in the section "POS Terminals" of the document "Acquiring Module User Manual".

2.1.2.2 Mandatory PIN mode

To enable the mode for mandatory PIN entry when executing any operation on a POS terminal, set the "Mandatory" value in the *PBT Status* field of the device configuration form ("POS Management" or "POS for <POS terminal name>" form). If the "Optional" value is set in this field, a PIN is only required for operations for which PIN entry is mandatory. When the "None" value is set in this field, operations for which PIN entry is mandatory cannot be executed on this POS terminal.

The "POS Management" form is the same as the "POS for <POS terminal name>" form described in the section "POS Terminals" of the document "Acquiring Module".

The value in this field can be redefined depending on transaction conditions (*Transaction Condition*) using the DEV tag (Subfield YYYY, see the document "Terminal Device Attribute Setup") specified as the value of the override parameter for the corresponding device type (see the section "POS Types dictionary"). If even one of the bits:

- 4th bit – "Online PIN (default for simple PIN)"
- 5th bit – "(reserved) OffLine PIN clear"
- 6th bit – "(reserved) Offline PIN encrypted (default for offline PIN)"

is specified in "Subfield YYYY", this is interpreted as *PBT Status*="Optional". If none of these bits are specified in the override parameter, the "None" value is used. DEV tag values have a higher priority than the value of the *PBT Status* field.

2.2 Downloading software to POS terminals

The procedure for downloading software depends on the POS terminal type. For more information, see the administrator manual for the corresponding terminal type.

2.3 Configuring software for working with encryption keys

For PIN-based transactions (PBT), master keys and PIN block (a PIN block is a part of a message containing PIN data) encryption keys must be generated. These keys must be entered in the PIN pad, POS terminal and Way4 database. Zone PIN block encryption keys must be generated and placed in the

POS controller's configuration file (the zpk parameter of the pin_options section in the Transaction Switch service configuration).

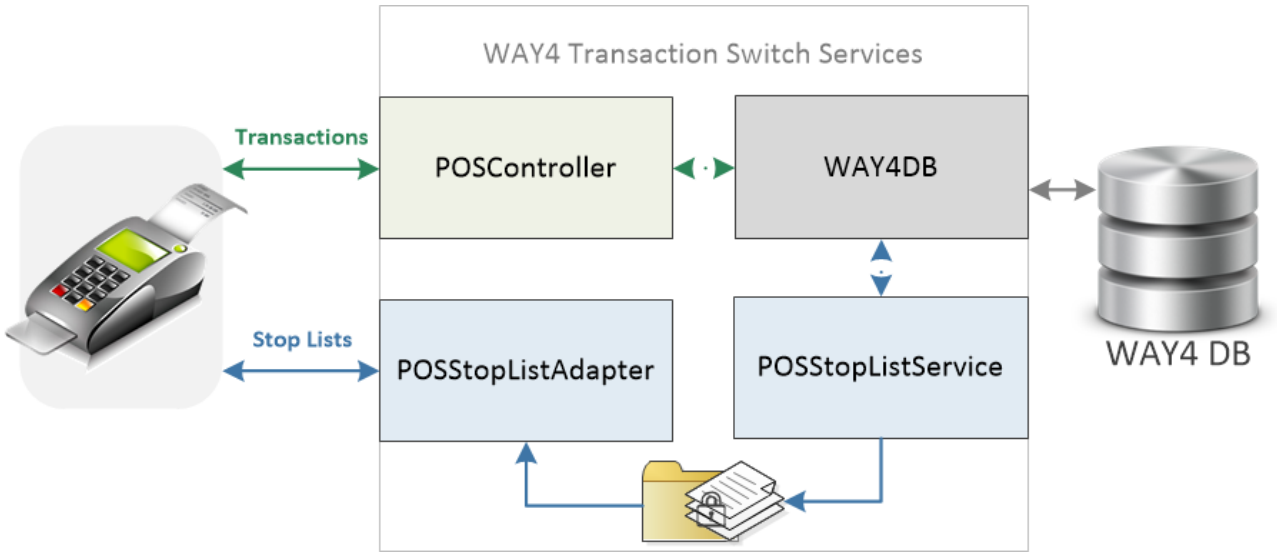
PIN block encryption keys (TPK – Terminal Pin Key) must be contained in POS terminals and the corresponding records in the Way4 database. TPK keys may be stored in the POS terminal's RAM only when encrypted under the master key contained in the PIN pad. Each POS terminal must have its own PIN block encryption key. All PIN pads must have different master keys. TPK keys in POS terminals must correspond to the keys in the database.

For more information about working with encryption keys, see the section "Working with Encryption Keys in OpenWay Software".

3 POS controller setup and operation

The POS controller is a software complex operating on the Way4 Transaction Switch platform and is responsible for interaction between a POS network and the processing center. The POS controller works through the following Way4 Transaction Switch services:

- POSController – service responsible for processing requests from POS terminals (see the section "Request types") using various protocols for communication with the processing center.
- POSStopListService/POSStopListAdapter – services responsible for generating and loading files to POS terminals (for example, card number stop lists, see the section "Generating and loading stop lists").



Services responsible for operation of the POS controller

3.1 Request processing service

The POSController service is responsible for interaction with POS terminals and for processing transaction requests from them.

3.1.1 Request types

The POSController service makes it possible to process the following requests from POS terminals:

3.1.1.1 Authorization

When this request is executed, an authorization code and response code are received from the bank that issued the card and the specified amount is blocked in the cardholder's account. A receipt with

the transaction results and corresponding amounts must be printed on the terminal. The cardholder does not have to sign the receipt, since this is not a financial transaction.

3.1.1.2 Retail/Cash

This is the basic POS terminal operation. When this request is executed, an authorization code and response code are received from the issuing bank and the corresponding amount is blocked in the cardholder's account. A receipt with the transaction results and amounts must be printed on the terminal. If the operation is signature-based (SBT), the receipt must be signed by the cardholder. The receipt is the main document if results are disputed. After this operation, the corresponding Transaction Switch service automatically generates a repayment request to the issuing bank.

3.1.1.3 Authorization confirmation

This request confirms an authorization that was made earlier. The corresponding Transaction Switch service generates a repayment request to the issuing bank. A receipt with the transaction results and amounts must be printed on the terminal. If the operation is signature-based (SBT), the receipt must be signed by the cardholder; moreover, the receipt is the main document if results are disputed.

3.1.1.4 Balance inquiry

This operation allows information about a cardholder's account balance to be received without generation of financial messages. For purposes of confidentiality, the results may only be displayed on the PIN pad screen, and the cardholder must be able to delete the information from the screen after viewing.

3.1.1.5 Ministatement

This operation makes it possible to get information about a cardholder's most recent transactions. The operation always requires PIN entry (PINBased). The cardholder can select the account type for which the most recent transactions will be checked

3.1.1.6 Credit

This operation makes it possible to credit a cardholder's account. The operation is always performed using a cashier's service card and requires the cashier to enter their card's PIN (PINBased), and a message must contain an authentication code (MAC).

In the fields of the second (or first) track of the magnetic stripe, the message for this operation must contain data from the cashier service card's magnetic stripe, and the PIN block must contain the cashier's PIN. The number of the bank card or data from the second track of the magnetic stripe of the bank card for the money recipient in a credit operation is sent to the acquirer as part of additional information about the operation.

The bank card is not authenticated during this operation.

3.1.1.7 Reconciliation

Reconciliation takes place on a POS terminal when closing a billing cycle at a merchant or cash dispensing point (for more information about support of terminal financial cycles in Way4, see the section "Working with POS cycles").

> For correct reconciliation, the terminal must be assigned the correct reconciliation type in device configuration forms ("POS Management" or "POS for <POS terminal name>"). For these terminal types, the *Batch Upl* field in the POS Types dictionary (see the section "POS Types dictionary") must contain "Yes".

> The "POS Management" form is the same as the "POS for <POS terminal name>" form described in the section "POS Terminals" of the document "Acquiring Module User Manual".

For the Openway Native protocol, reconciliation is performed as described below.

All operations (online and offline) that were made since the end of the last reconciliation operation are stored in the POS terminal's memory). In this case, offline operations are understood to be those made autonomously on the POS terminal without a connection with the POS controller. Offline operations also include those made on POS terminals operating on earlier versions of the protocol (in this case, online authorization was performed during transactions, but information about the financial operation was not transmitted online.

These offline operations can also be sent to the POS controller during a financial cycle in an automatic mode determined by the terminal's software.

Reconciliation for online and offline operations is executed separately as follows.

When closing a cycle, the POS terminal sends the POS controller a message with the totals for financial operations (message type "0500"). A message contains online and offline counter data (number of and total financial amounts) for the current cycle. If the totals transmitted by the terminal and totals stored in the Way4 database are reconciled, a message with response code "00" (totals matched) is returned to the terminal. Otherwise, response code "95" (totals do not match) is returned to the terminal.

If the totals were reconciled, reconciliation is finished.

If the totals were not reconciled, the POS terminal executes the Batch Upload operation (upload data for all transactions, message type "0320"). Based on data from the terminal, the values of counters for the current financial cycle are corrected in the Way4 DB.

After executing Batch Upload, the terminal sends the POS controller a message with the totals of all operations (message type "0520") for final reconciliation of POS terminal operation counter values and Way4 DB counters. In this case, a response message about reconciliation results is not sent to the POS terminal.

3.1.1.8 Refund

This operation is used to credit a cardholder account. It is used if the original transaction cannot be reversed, for example, because of a negative response to a reversal request. The message for this operation must contain a reference to the original transaction (RRN) (retail transaction, cash disbursement or authorization) in field 37. The refund amount can differ from the original transaction amount. This operation cannot be reversed.

3.1.1.9 Utility Payment

This operation is used to pay for services (for example, utilities) from a cardholder's account using a standing payment order created for the card contract. The payment recipient account is specified in the standing payment order.

3.1.1.10 Credit Voucher

This operation is used to credit a cardholder account that was debited as the result of a retail transaction performed earlier. This operation is used when information about the original transaction (RRN) is not available to perform a reversal. This operation can be reversed.

3.1.1.11 Universal Reversal

A message for this operation is sent when an operation that has already been executed must be reversed. The operation can be reversed manually by a cashier or automatically by the POS terminal to reverse the last operation executed, for example, in time-out cases when the POS terminal did not receive a response from the POS controller within a specified time period.

3.1.1.12 Universal Bill Payment

A message for this operation is sent if a payment was made to a billing system such as a mobile operator. Payments can be made by card or cash

3.1.1.13 Keys Change

A message for this operation is sent if terminal encryption keys must be changed.

This feature is optional and is supplied according to a separate agreement with OpenWay.

3.1.1.14 Request check

Any request coming from a POS terminal is checked for admissibility.

Parameters of the POS terminal's registration record in the database and device Service Package parameters are used for the check.

Checks according to POS terminal registration parameters:

- The admissibility of this operation on this POS terminal is checked according to the list of allowed operations (see the section "Configuring executable operations").

- Permission to execute this operation at this time is checked according to the values of the *Business Hours from*, *to* fields of the registration record form; if these fields are not filled in, operations on the POS terminal can be executed at any time.
- Protection of the request by a digital signature is checked if "Mandatory" or "Optional" is specified in the *MAC Status* field of the device configuration form ("POS Management" or "POS for <POS terminal name>") (see the section "Enabling MAC mode").

> If "None" is specified in the *MAC Status* field of the device configuration form ("POS Management" or "POS for <POS terminal name>") (see the section "Enabling MAC mode") a request containing a digital signature will be rejected.

- A check for the presence of PIN information in the request is made if "Mandatory" or "Optional" is specified in the *PBT Status* field of the device configuration form ("POS Management" or "POS for <POS terminal name>") (see the section "Mandatory PIN mode").

> If "None" is specified in the *PBT Status* field of the device configuration form ("POS Management" or "POS for <POS terminal name>") (see the section "Mandatory PIN mode"), a request containing PIN data will be rejected.

> The "POS Management" form is the same as the "POS for <POS terminal name>" form described in the section "POS Terminals" of the document "Acquiring Module".

The POS terminal's Service Package parameters are used to check whether the transaction currency is allowed.

If any of these checks are failed, the transaction will be declined with the corresponding response code.

Reversals, authorization confirmations and refunds require checks concerning operation history (presence of an original transaction, correspondence of amounts, etc.). If these checks are failed, a negative response will be sent for the transaction.

If all checks are passed, necessary POS terminal and merchant data is added to the request, after which it is sent to the corresponding Transaction Switch service for processing, for example to the ON-US service channel or payment system channel (Visa, Mastercard, and others).

3.1.2 Configuring the request processing service

The POSController serves online requests received from POS terminals and is also responsible for loading transaction data when closing POS terminal financial cycles and in reconciliation.

This service is set up in Way4 Transaction Switch configuration files with a name like POS[protocol_name].s.xml (where protocol_name is the name of the protocol for communication between the POS terminal and Way4). In particular, to set up the connection between POS terminals

and the POS controller, a free port for listening must be specified as the value of the transport/@port attribute. The corresponding port number must be specified in POS terminal settings as a socket attribute for the POS controller to which transaction messages will be sent.

3.2 Generating and loading stop lists

A stop list is a list of the numbers and ranges of numbers for cards that cannot be used for offline transactions. If a card number is in a stop list, the transaction must be made online. If this is not possible, the transaction must be declined. A POS terminal stores stop list data for all cards with valid card contracts. To do so, the numbers of all valid card contracts entered into a Way4 stop list are sent to the stop list stored in terminals.

Card numbers are added to and deleted from the stop list stored in terminals in accordance with commands contained in stop list files received from the Way4 system. This means that card numbers are added to and deleted from stop list in the Way4 system and then corresponding changes are replicated in the stop list stored in POS terminals.

A stop list is shared by all terminals. The method used for storing stop lists and information about loading them eliminates the ability to make unauthorized changes to the lists/information at any time. The algorithm for registering changes in POS stop lists is the same as the one used in Way4, assuring that records are not actually deleted from databases but, instead, their attributes are changed, while registering the dates and time of any changes and the names of those effecting them.

Stop lists are transmitted by Way4 Transaction Switch services: POSStopListService and POSStopListAdapter. The POSStopListService service independently generates stop list files and POSStopListAdapter provides them for loading to POS terminals. These services are set up in the PosStopListService.s.xml and PosStopListAdapter.s.xml configuration files, respectively.

3.2.1 Generating stop lists in Way4

Way4 periodically generates two types of stop list: cumulative and differentiated. Both lists are generated at the same time. A differentiated stop list contains changes that have occurred since the previous cumulative stop list was loaded. A cumulative stop list contains numbers for valid cards found in the Way4 stop list. After a card expires, it is removed from the stop list.

Both stop lists, cumulative and differentiated, are saved by the POSStopListService service to files located on the Way4 Transaction Switch server disk system. The files are placed in a common directory and are shared by all POS terminals.

The name structure of a stop list file is as follows: SL1F_YYYYMMDDNN.PSL where 1 is the version of the file, F is the type of the stop list (F stands for "full", that is, cumulative and U is for "update, that is, differentiated), YYYY, MM and DD are the year, month and day when the file was generated and NN is the ordinal number of the loaded stop list for the particular calendar day.

Stop list files are generated and transmitted to terminals in a special compressed format described further in the section "Compressed stop list format".

3.2.2 Generating stop list files and loading them to POS terminals

The POS controller POSStopListService service exports stop list files and an index file at least once a day. The frequency of this regular export is determined by the scheduledTime parameter of the PosStopListService.s.xml configuration file (see the section "Configuring the service generating stop list files"). If no changes were made to the stop list, new files are generated once a day, a differentiated file consisting of a header only.

During file export, stop list and index files are created with temporary names and after they have been created, POSStopListService renames with the correct names. This is done in order to avoid possible conflicts between file export by POSStopListService and simultaneous import of the same file to a POS terminal.

After stop list and index files have been exported, POSStopListService automatically deletes obsolete files with cumulative and differentiated stop lists and obsolete index files. These old files are deleted only after they have been loaded into the last terminal to which loading was started before the last exported pair of stop list files was renamed. A file is considered obsolete if its date of creation precedes the current system date by a certain number of days. This number of days is determined by the keepFiles parameter of the PosStopListService.s.xml configuration file (see the section "Configuring the service generating stop list files").

3.2.3 Loading and applying stop lists in a POS terminal

Each time transactions are offloaded to the POS controller at the end of a session, the terminal updates stop list information. If no stop list has been previously loaded into a terminal, it must receive a cumulative stop list from the POS controller.

The procedure for loading and applying stop lists in POS terminals is described below. The following notation is used in the text:

- keepFiles – number of days for which the most recently loaded stop list is considered effective.
- currDate – current date, date of current transaction.
- loadDate – date the stop list was loaded to the terminal.

3.2.3.1 Loading stop lists

1. The terminal checks if a stop list was loaded to it. If no such stop list exists, the terminal must get a request a cumulative stop list from the POS controller. The procedure for getting a cumulative stop list is described in the section "Receiving and processing a cumulative stop list file".
2. The terminal sends the POS controller (POSStopListAdapter service) a request for a listing of differentiated stop lists. To do so, a terminal uses the "DL" command with selection parameters. For instance, "DL:SL1U_*.PSL;". After this, the terminal sorts the received list of stop lists by filenames which include the file's date and ordinal number. Then the terminal begins receiving the latest stop lists according to the sort order starting from the first missing file.
3. Terminals use the "RF" command which includes the filename to request and receive the differentiated stop list. For instance, "RF:SL1U_2004113000.PSL;".

After receiving a differentiated stop list, from its header, the terminal extracts the date and ordinal number of the previous differentiated stop list and performs an analysis:

- If this stop list was previously loaded into the terminal, the stop list stored in the terminal is updated according to the newly received differentiated stop list. Then the terminal begins receiving the next differentiated stop list and the procedure of analysing the date and ordinal number of the previous stop list is repeated.
- If the stop list in question has never been loaded into the terminal, the terminal begins loading the cumulative stop list as described in the section "Receiving and processing a cumulative stop list file".

The procedure for loading stop lists is completed.

If the connection is broken while a differentiated stop list is being received, the terminal must connect to the POSStopListAdapter service and receive the remaining portion of the list. To do so, in the read command, the terminal indicates the offset in bytes from which it needs to load this file. For instance, "RF:SL1U_2004113000.PSL:1560;".

If all the differentiated stop lists have been received, the terminal completes the procedure.

3.2.3.2 Receiving and processing a cumulative stop list file

When receiving a file with a cumulative stop list, a POS terminal does as follows:

1. The terminal gets the name of the cumulative stop list from the POS controller (POSStopListAdapter service). To do so, the terminal uses the "DL" command with filtering parameters. For instance, "DL:SL1F_*.PSL;".
2. The terminal analyzes the free space in memory, taking into account the deletion of the previously loaded stop list. If free space is sufficient, the terminal deletes the previous stop list and begins receiving the new one.
3. The terminal resets the date and time of the last received differentiated stop list in its memory (TEF1).
4. The terminal uses the "RF" command with the name of the necessary cumulative stop list file to start receiving the file. For instance, "RF:SL1F_2004113002.PSL;". The terminal receives the cumulative stop list file and, as it is received, processes it. After receiving the header of the cumulative stop list, the terminal extracts the date and time of the current stop list from it.
5. Having processed each next record of the cumulative stop list, the terminal adds it to its own internal stop list.
6. Having successfully received the file for a cumulative stop list, the terminal saves (loadDate) the date and time of the current stop list and closes the connection with POSStopListAdapter. If the connection is broken while a cumulative stop list is being received, the terminal must reconnect to POSStopListAdapter and receive the remaining portion of the list. To do so, in the read command, the terminal indicates the offset in bytes from which it needs to load this file. For instance, "RF:SL1F_2004113002.PSL:3800;".
7. If necessary, the terminal may initiate the procedure for receiving the index file. If the connection is broken while the index file is being received, the terminal must reconnect to

POSStopListAdapter and receive the remaining portion of the file. To do so, in the read command, the terminal indicates the offset in bytes from which it needs to load this file.

3.2.3.3 Using stop lists in transactions

During a transaction, the terminal checks if the card number is in a stop list. If the card is in a stop list or no stop list was loaded into the terminal, the transaction must be processed online. If there is no way to process the transaction online, it must be declined.

If the card is not in a stop list, but the stop list has expired (more than keepFiles days: – 1<=currDate-loadDate<=keepFiles has passed since the stop list was updated), the transaction must be processed online. If there is no way to process the transaction online, it must be declined.

If all checks are successful, the terminal completes the transaction offline.

When printing a receipt, a terminal must print the date and number of the stop list according to which the offline was made.

3.2.4 Compressed stop list format (Delta2)

Stop lists intended for transmission to terminals are compressed so that a list contains only valid card numbers. As a rule, this allows cards to be grouped according their issuing banks (BIN) so that, within a group, card numbers are only different in their endings. The majority of cards also have a check digit at the end of their number, which, when necessary, obtained by computation. All this allows the effective compressing of card lists by preserving the mathematical difference between any two adjacent card numbers (delta code), disregarding the check digit. On average, when the number of cards is large, approximately 3 bytes are needed to code each one.

When developing the compressed data format, the modest computational capabilities of POS terminal models were also taken into consideration, so the decoding process was made as simple as possible, while maintaining sufficient efficiency. The decoding algorithm requires that POS terminals support work with 32-bit integers (long integers). This condition is met by the majority of terminals currently in use. When encoding, the ability to restore the check digit of a card number is verified. If the digit can be restored, it is removed. Then, the length of the resulting number is compared with the length of the number that precedes it in the list. If they do not match, a new card block is created with the current number as its base. If the lengths of the numbers match, the last 9 digits are taken from both numbers (numbers of this size may be represented as a long integer) and the difference between them is computed. That difference is stored as the delta code in the current card block. The card numbers are sorted in ascending order, depending on the type of the block.

A compressed stop list is a binary sequence that contains a header and a sequence of card blocks. Each card block contains information about the adjacent card numbers within a group. There are various types of card blocks. Cumulative stop list files may contain two kinds of card blocks: blocks of cards with removed check digits and those without check digits.

Besides separate cards, the Way4 system has a way of blocking card ranges. They are delimited by a pair of card numbers, the first and the last in the range. Information about ranges of cards is stored in special type blocks.

When looking for a card, a terminal's software must first look for it in a card range block. If the card is not found in any range, the terminal software must check the type of the card – with or without the check digit. This is done by a check-digit verification. After that, the card is searched for in blocks of the appropriate type.

The block type also contains a flag indicating the removal of a card or a card range from a list. This means that the block describes cards or ranges that must be deleted from the list. In files, such blocks are located before blocks for additions so that space may be saved in the local database. Usually, blocks are arranged in the following order:

1. Block of ranges of cards intended for removal from the list.
2. Blocks of cards (that had a check digit) intended for removal from the list.
3. Blocks of cards (that didn't have a check digit) intended for removal from the list.
4. A block of ranges of cards intended for addition to the list.
5. Blocks of cards (that had a check digit) for addition to the list.
6. Blocks of cards (that didn't have a check digit) for addition to the list.

In the case of a complete (cumulative) list, there are no type 1-3 blocks.

A compressed file is usually not well suited for directly searching for card numbers. This is why there are several possible methods to search for a card number in a stop list. A method is selected by the terminal software developer, depending on the computational and communication capabilities of a particular terminal.

1. Its resources allowing, a terminal must first load a compressed stop list and then uncompress it and transform it to an internal format that is effective for making searches.
2. If it is not possible to transform a compressed file into a search-efficient format, but the particular terminal has sufficient computing capabilities, the terminal may look through a compressed file and create an index for fast searches in the compressed file.
3. When there are no technical capabilities to either convert a compressed file or create an index table on a terminal itself, an appropriate index table may be loaded from the server. In this case, the ability to process differentiated files is lost because these index tables are available for cumulative stop lists only. In addition, this increases communication expenses. Index File Format

N	Name	Size	Comments
1	Signature	8 chars	"STOPLIST" string
2	Version	1 byte	"01" value
3	List Type	1 char	"F" is for a complete stop list and "U" is for a differentiated one.
4	File Date	4 bytes	File generation calendar date in YYYYMMDD format. BCD representation.

N	Name	Size	Comments
5	File Number	1 byte	Ordinal number of the file for the day. BCD representation: 00-99
6	Previous Update Date	4 bytes	Generation date of the previous file in YYYYMMDD format. BCD representation.
7	Previous Update Number	1 byte	Ordinal number of the previous file for the day. BCD representation: 00-99
8	Number of blocks	4 bytes	Number of blocks in a file. MSB representation (unsigned long int).
9	Number of cards	4 bytes MSB ULONG	The number of cards in a complete list. For differentiated files, this is the number that results from the processing of changes.
10	Number of ranges	4 bytes MSB ULONG	The number of card ranges in a complete list. For differentiated files, this is the number that results from the processing of changes.

A block of ranges includes a header and an array of card number pairs. In differentiated files, there are several types of range blocks. Format of blocks for card ranges in differentiated files

N	Name	Size	Comments
1	Block type	1 byte	Range block types (hex): 10 – add a range of card numbers 11 – remove a range of card numbers
2	Min card	N bytes	Relative number of the first card in a range. Special BCD representation.
3	Max card	M bytes	Relative number of the last card in a range. Special BCD representation.

Elements 2 and 3 are repeated the necessary number of times, depending on the number of ranges. The end of a block is indicated by the "Min Card" number equal to "FF", for which element 3 is missing.

A block of card numbers includes a header and an array of delta codes, the array is terminated with a zero-value code. There are several types of card number blocks.

N	Name	Size	Comments
1	Block type	1 byte	Card block type (Hex): 00 – add (the check digit has been removed) 80 – add (there is no check digit) 01 – remove (the check digit has been removed) 81 – remove (there is no check digit).
2	Base card	N bytes	Relative base card number. Special BCD representation.
3	Delta codes	M bytes	An array of delta codes. Terminated by an element with a zero-value code.

The base card number and the card numbers within a range are somewhat compressed (special BCD representation), which makes it possible to inherit a string prefix from the preceding card number. The structure of BCD bits: S[N..N]F

where:

- S – the size of the inherited card number prefix (hex digit: '0'-'F'). "0" means nothing is inherited. "F" means the first 15 digits are inherited.
- N - 0...Len is the BCD representation of the remainder of a card number.
- F – indicates the end of a card number. Its length may be half a byte or a whole byte, depending on the length of the remainder of a card number. "F" or "FF"), for example:

Current card number: 5111101234567890

Next card number: 5111109999999999

In this case, a coded card number will have the following BCD bits: 69'99'99'99'99'9F

Delta code structure:

N	Name	Size	Comments
1	Main code	1 byte	Delta code (8 bits): LLDDDDDD LL – the number of additional bytes in the code: 00 – the code has no additional bytes. The difference is 6 bits. 01 – 1 additional byte. The difference is 14 bits. 10 – 2 additional byte. The difference is 22 bits. 11 – 3 additional byte. The difference is 30 bits. D – difference bits.
2	Tail codes	0-3 byte	Contain difference bits.

The decoding algorithm for the delta code is as follows:

1. Read one byte from a stream.
2. Allocate the two most significant bits. These indicate the number of additional bytes in the code: 0 to 3 (code length being 1 to 4 bytes).
3. Read the indicated number of additional bytes.
4. Get a long integer difference relative to the previous card by extracting bits from the code bytes. The first byte contains the first 6 bits. The rest contain 8 bits each, in MSB order. The following are examples of delta codes:
   - 20 – the difference is 32
   - 41 F4 – the difference is 500
   - 81 D4 C0 – the difference is 120 000
   - FB 9A C9 FF – the difference is 999 999 999

Delta codes are read until a zero delta code, indicating the end of block, is encountered.

3.2.4.1 Example

The following is an example of a simple differentiated stop list. The following card numbers are added to the list:

- 4405010056780127
- 4405010058743289
- 6766990532480432453

The following card numbers are removed from the list:

- 4405010158539249

- 4405010159533241
- 6766990228439024893
- 6766990338439024894

The date of creation of the list is September 30, 2004. Its ordinal number is 0. The previous list was created on September 29, 2004. Its ordinal number is 2.

List dump:

0000	53 54 4F 50 4C 49 53 54 01 55 20 04 09 30 00 20
0010	04 09 29 02 00 00 00 05 00 00 00 0E 00 00 00 00
0020	01 04 40 50 10 15 85 39 24 FF 81 84 48 00 01 06
0030	76 69 90 22 84 39 02 48 9F 00 81 06 76 69 90 33
0040	84 39 02 48 94 FF 00 00 04 40 50 10 05 67 80 12
0050	FF 82 FE DC 00 00 06 76 69 90 53 24 80 43 24 5F
0060	00

The file header is shown in green, blue indicates the card block header, and black is for the card block delta code.

3.2.4.2 Index file

Index files are created in order to speed up the search in a compressed stop list loaded into terminals whose computing capabilities are limited.

The filename and header format are the same as those in stop lists but the file type index is "I" (for instance, SL1I_2004120101.PSL).

The file includes blocks that are arranged as follows:

N	Name	Size	Comments
1	Block type	1 byte	The type of the indexed block of card numbers (Hex): 10 – Card number ranges 00 – Card numbers where the check digit has been removed 80 – Card numbers with no check digit
2	Next block offset	4 bytes	The offset in the current file at which the next block is located. For the last block, the offset is 0.
3	Index card	N bytes	Relative number of the indexed card. Special BCD representation. Same as the format of the base card in a stop list.
4	Offset	1-4 bytes	The delta code of the offset (relative to the start of the file) in the corresponding cumulative stop list file, indicating the delta code of the card immediately following the current number. There is no such field where Index Card = FF.

Elements 3 and four are repeated the necessary number of times, depending on the indexing range determined in the PosStopListService.s.xml configuration file as the maximum number of card numbers between the adjacent index cards (see the section "Configuring the service generating stop list files"). The end of the block is indicated by a card number equal to "FF", for which there is no element 4. The last card number before the end-of-block card number is the highest-order number in a stop list of this type, that is, there are no cards with numbers exceeding this one and element 4 refers to the zero delta code at the end of the block of card numbers.

Because there is no need to create more than one block of a certain type in an index file, the file will contain one, two or three blocks of card numbers.

When this file type is used, the card search algorithm may be described in the following way:

1. Verify the check digit of the card that is being searched for and, depending on that, find the appropriate block of index cards.
2. Go sequentially through the card numbers of the index file until the card range where the card that is being searched for belongs is found. If the card number being searched for is that of an index card, the search is complete, because the card is definitely on the list.
3. If not, follow the offset in the stop list file from the index card with the smallest number.
4. Transform the last 9 digits of the number of the card that is being searched for into an unsigned long integer, and write the preceding digits as the prefix of the card that is being searched for.
5. Do the same with the number of the lowest-order index card and go through the array of delta codes and through the same type blocks that follow until the current prefix becomes equal to

the prefix that is searched for. After that, compare the postfixes: if the current one is less than the one that is searched for, the search must be continued. Otherwise, it is complete. If the current postfix is equal to the one that is searched for, the card is on the list. Otherwise, it is not there.

Alternative index files, that is, ones with differently structured indexes, like those optimized for binary search, can also be used simultaneously.

3.2.5 Configuring the service generating stop list files

PosStopListService.s.xml configuration file's main parameters:

- binRangeIndex – maximum number of indexed BINs in one data block.
- cardsIndex – maximum number of indexed card numbers in one data block.
- keepFiles – number of days since a stop list was loaded, during which this stop list is considered valid.
- scheduledTime – time of day (in HH:MM format) for exporting stop list data from the Way4 database. For repeated export during a day, the parameter value must be set as a list, for example:
  <scheduledTime>10:00;15:00;20:00</scheduledTime>
  It is possible to set periodic export during a specified interval, for example:
  <scheduledTime>19:00;08:00-18:00, 10 min</scheduledTime>
  In the last example, the export will be performed every 10 minutes from 08:00 to 18:00, as well as at 19:00. The period can only be specified in minutes.
- workDir – path to the directory relative to the Way4 Transaction Switch root directory to which stop list files will be saved.
- workKey – value of the TAK key for secure storage of stop list files.

3.2.6 Configuring the service for loading stop lists to terminals

PosStopListAdapter.s.xml configuration file main parameters:

- transport/@port - number of the port listened on to which POS terminal requests for loading stop lists will arrive.
- transport/filter – name and parameters of the protocol used for data exchange with a POS terminal.
- workDir – path to the directory relative to the Way4 Transaction Switch root directory in which stop list files are saved.
- workKey – value of the TAK key for decrypting stored stop list files.

4 Monitoring the POS network

The acquirer monitors the POS network in order to prevent malfunctions.

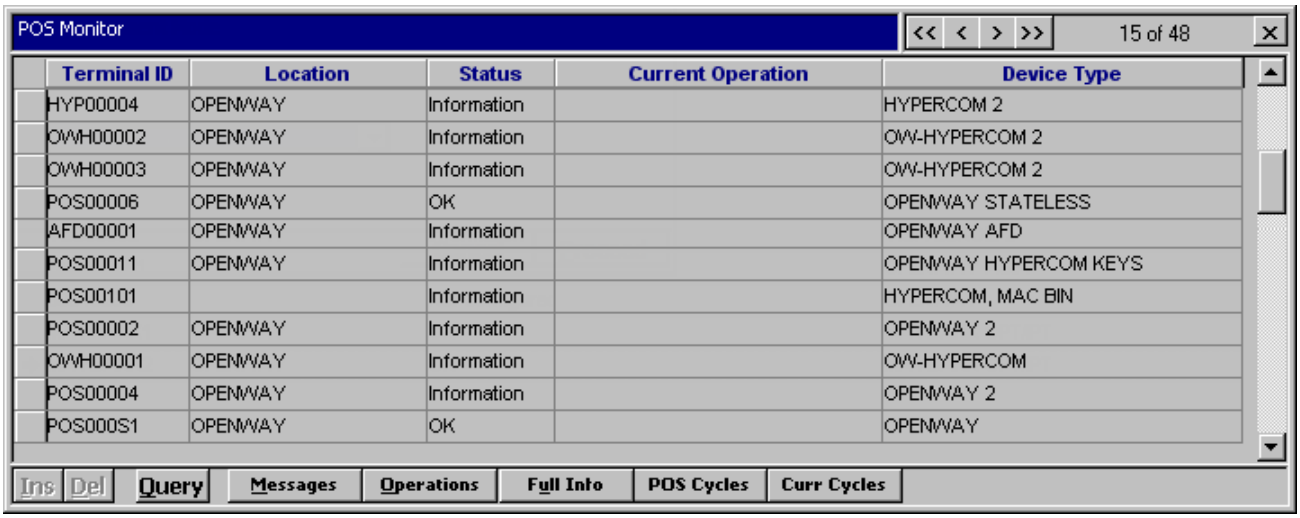
The monitoring procedure is executed using the user menu item "Acquiring → POS/Imprinter Controller → POS Monitor".

Before starting to monitor the POS network, ensure that the required financial institution is set in the status bar. If the user is granted privileges to work with several financial institutions, select "Acquiring → POS/Imprinter Controller → Set Financial Institution" from the user menu to select the required values.

4.1 POS state

To analyze the state of POS terminals, select the user menu item "Acquiring → POS/Imprinter Controller → POS Monitor".

The "POS Monitor" form will open.



Information about the state of POS terminals

This form contains the following columns:

- *Terminal ID* – unique identifier of the POS terminal in the system.
- *Location* – POS terminal location.
- *Status* – POS terminal status. The following values are possible:
  - OK – the POS terminal is operating correctly.
  - Information – the POS terminal is operating correctly, but the status of one or several operations changed.
  - Not configured – the POS terminal is not configured, operations are not possible.

- Warning – errors occurred during the POS terminal's operation. To see error messages, click the [Messages] button.
- Closed – the contract for this device is closed (see the section "Closing Contracts" of the document "Acquiring Module").

  To determine the reason for a change in a POS terminal's status, check the messages form or list of operations.

- *Current Operation* – current operation being executed by the POS terminal.
- *Device Type* – POS terminal type registered in the system and described in the "POS Types" dictionary ("Configuration Setup → Merchant Device Setup → POS Types").

For additional information about the state of POS terminals, and to change the status of a POS terminal, use the following control buttons:

- [Messages] – opens a form containing a list of messages starting from the time the POS terminal was registered in the system.
- [POS Cycles] – opens a form with information about the history of POS cycles (see the section "POS cycle history").
- [Curr Cycles] – opens a form with information about the current POS terminal cycle (see the section "POS terminal current cycle").
- [Operations] – opens the "Operations for <POS terminal name>" form, containing a list of operations currently available for this device, specifying the status of each operation (see the section "Operations with POS terminals").
- [Full Info] – opens the "Full Info for <POS terminal name>" form, containing information about device parameters (see the section "POS Terminals" of the document "Acquiring Module").

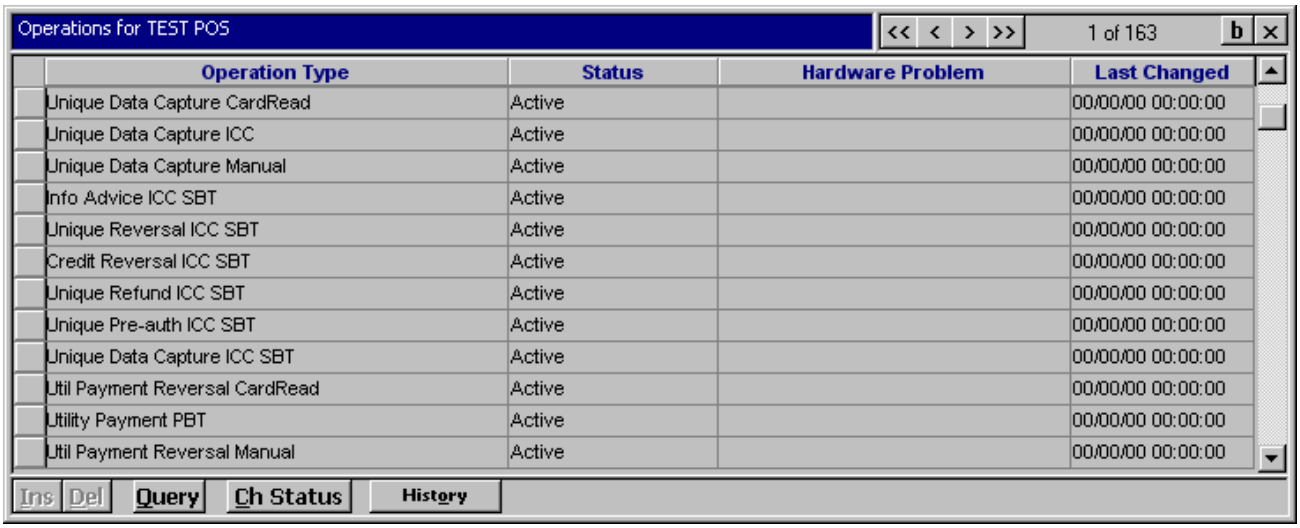
4.2 Operations with POS terminals

To view the list of operations with a POS terminal, select the required POS terminal from the list in the "POS Monitor" form (see figure in the section "POS state") and click the [Operations] button.

This command opens the "Operations for <POS terminal name>" form.

The ability to change the status of POS terminal operations is obsolete functionality which is supported for backward compatibility.

Work with these forms as described in the section "Configuring executable operations".



List of operations with a POS terminal

4.3 Working with POS cycles

Information about operations on a POS terminal are recorded in the Way4 database by keeping special counters within certain time intervals (cycles). Management of two types of cycle is supported in Way4.

- "Batch Upload" – counters are accumulated in POS cycles to record online and offline operations for subsequent reconciliation with terminal data. Only financial transactions ("Advice", "Reversal" or "Adjustment" categories) are recorded in a cycle. Management of this type of cycle is enabled by setting *Batch Upl* = "Yes" for the terminal type (see the section "POS Types dictionary").
- "All Documents" – information is recorded for all operations made at the POS terminal during a calendar day (regardless of the transaction category and statuses of documents generated in Way4). Transaction data from manually created documents or documents imported from external systems is also recorded in a cycle. Management of this type of cycle is enabled in one of the following ways:
- For all terminal types – the value of the global parameter ALLD_CYCLE_ON is set to "Y".
- For a specific terminal type – by setting the tag ALLD_CYCLE_ON=Y in the *Special Configuration* field of the corresponding record from the terminal type dictionary (see the section "POS Types dictionary").

A "Batch Upload" cycle is determined by the interval between two reconciliation operations (see the section "Reconciliation"). Each new cycle is created when the first operation is performed after reconciliation, regardless of its result.

An "All Documents"cycle is limited by the calendar date. Each new cycle is created when the first operation is performed on a new calendar date, relative to the date of the last operation.

In general a "Batch Upload" cycle is organized as follows:

- Immediately after opening, the cycle has the "Active" status (i.e. in the "POS Cycles for <POS terminal name>" form, see figure, the *Cycle Event* field contains the value "Active"). This status remains until reconciliation is executed.

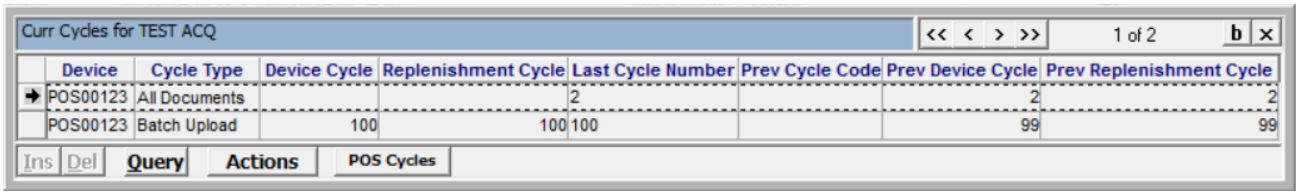
- On the POS terminal, the cycle is closed and online operations are reconciled (see the section "Reconciliation").
- If reconciliation was successful (i.e. counter values stored in the database correspond to counter values received from the POS terminal) the cycle gets the "Closed" status.
- If reconciliation was not successful:
- The cycle gets the "In Doubt" status.
- The POS terminal initiates the Batch Upload procedure (the POS terminal uploads data for online and offline operations) and the current cycle gets the "Uploading" status. During export of the POS terminal's data to the database, the values of cycle counters are corrected.
- After the Batch Upload procedure has been completed, the final reconciliation procedure is run.
- If the totals received from the Batch Upload procedure were reconciled, the cycle gets the "Closed" status; otherwise, it gets the "In Doubt" status.
- If after these operations, totals were still not reconciled, it is possible to close the cycle on the host's side by clicking the [Actions] button in the "POS Cycles for <POS terminal name>" form (see figure).

4.3.1 POS terminal current cycle

The current POS cycle:

- has the "Active" status (*Cycle Event* = "Active", see figure in the section "POS cycle history").
- is the "All Documents" type and has the "Closed" status as a result of manually closing the cycle before processing the next operation executed on the POS terminal.
- is the"Batch Upload" type and has the "Closed" or "In Doubt" status as a result of closing the cycle and reconciliation before processing the next transaction for an operation executed on the POS terminal.

For information about a POS terminal's current cycles, use the "Curr Cycles for <POS terminal name>" form. This form is opened in the parent form "POS Monitor" (see the section "POS state") by selecting a row corresponding to the required terminal and clicking the [Curr Cycles] button.



Current cycle for a POS terminal

This form contains the following fields:

- *Device* – POS terminal identifier.
- *Cycle Type* – cycle type ("Batch Upload" or "All Documents").
- *Device Cycle* – current cycle number (if the cycle is closed, this field will be empty).
- *Replenishment Cycle* – same value as in the *Device Cycle* field.
- *Last Cycle Number* – last number assigned to the cycle; the number of an active cycle will be used, if there is such a cycle.

- *Prev Cycle Code* – number assigned to the cycle as a result of reconciliation; usually the value in this field increases with each cycle closed. The value is filled in according to the cycle code received from the POS terminal.
- *Prev Device Cycle* – if this is an active cycle ("Active"), this field contains the number of the previous cycle; after reconciliation (in the "Closed" or "In Doubt" status) – the number of the current cycle.
- *Prev Replenishment Cycle* – corresponds with the value in the *Prev Device Cycle* field.

This form contains the following control buttons:

- The [Actions] button opens a context menu containing the following items:
  - "Replenishment" – close a cycle that has the "Active" status.

> ⚠ It is not recommended to use this button to close cycles that have statuses other than "Active".

  - "Reset Code" – reset the value of the cycle code (*Prev Cycle Code)*.
- [POS Cycles] – button for access to information about the POS cycle history (see the section "POS cycle history").

4.3.2 POS cycle history

The "POS Cycles for <POS terminal name>" form contains information about the history of POS terminal cycles. This form is opened by clicking the [POS Cycles] button in the "POS Monitor" form (see figure in the section "POS state") or in the "Curr Cycles for < POS terminal name>" form (see the section "POS terminal current cycle").

POS Cycles for OPENWAY — << < > >> 1 of 7

Cycle Number	Cycle Code	Cycle Event	Date From	Date To	Merchant Card Contract	Cycle Type
7		Active	27/04/12 13:55:01	00/00/00 00:00:00		Batch Upload
6	000006	Closed	27/04/12 13:39:34	27/04/12 13:40:13		Batch Upload
5	000005	Closed	27/04/12 13:30:32	27/04/12 13:33:04		Batch Upload
4	000004	Closed	27/04/12 11:50:21	27/04/12 12:01:11		Batch Upload
3	000003	In Doubt	19/04/12 16:57:59	19/04/12 18:03:31		Batch Upload
2	000002	Closed	19/04/12 16:40:35	19/04/12 16:40:56		Batch Upload
1	000001	Closed	30/12/05 18:29:02	19/04/12 16:31:17		Batch Upload

Ins Del Query Actions Counters Messages

POS cycle history

Rows in this table correspond to POS terminal cycles, and columns contain the following information:

- *Cycle Number* – POS terminal cycle ordinal number, assigned by Way4.
- *Cycle Code:*
- for "Batch Upload" – number assigned to the cycle as the result of reconciliation, based on data from the POS terminal; usually the value in this field increases each time a cycle is closed.

- for "All Documents" – date (in YYYYMMDD format) of operations that were made in the cycle.
- *Cycle Event* – POS cycle status. This field may have the following values:
- "Active" – the cycle is active.
- "In Doubt" – discrepancies were found during reconciliation.
- "Uploading" – uploading in process (Batch Upload procedure is being executed).
- "Replenishment" – the cycle was closed in the "Active" status (see the section "Closing a cycle").
- "Closed" – the cycle is closed (see the section "Closing a cycle").
- *Date From* – start date and time of cycle.
- *Date To* – for "Batch Upload" cycles, the date and time of reconciliation (with subsequent transfer of the cycle to the corresponding status); for "All Documents" cycles, the cycle closing date and time; for a current cycle, this field contains null values.
- *Merchant Card Contract* – cashier service card number.
- *Cycle Type* – cycle type.

The [Counters] button opens the "Counters for <POS terminal name>" form (see figure) with information on the state of cycle counters.

4.3.2.1 "Batch Upload" cycle counters

"Batch Upload" cycle counter values are used during reconciliation (see the section "Reconciliation").

For the OpenWay Native protocol, each counter accumulates information about the number and total financial amount of operations grouped by three attributes:

- "Direction" – direction of funds activity (Debit/Credit).
- "Request Category" – (Advice/Reversal).
- "Currency" – operation currency.

Rules for recording different operation types in counters are specified by the mode for calculating totals (see the section "Totals calculation modes").

For reconciliation to be successful, counter values stored in the database must match those received from the POS terminal.

Counters for POS00002-OPENWAY << < > >> 1 of 2

Key Value	Direction	Request Category	Currency	Cycle N Docs	Cycle Balance	Device N Docs	Device Balance	Device Cycle
DANR810	Debit	Reversal	RUR	6	-466,66	6	-466,66	114
DANP810	Debit	Advice	RUR	13	1 150,00	13	1 150,00	114

Ins Del Query Dispense

State of "Batch Upload" cycle counters

For "Batch Upload" cycles, the "Counters for <POS terminal name>" contains the following information:

- *Key Value* – this value is generated automatically based on the values of other fields.
- *Direction* – transaction direction:
  - "Credit" – the cardholder's account is credited.
  - "Debit" – the cardholder's account is debited.
- *Request Category* – request category:

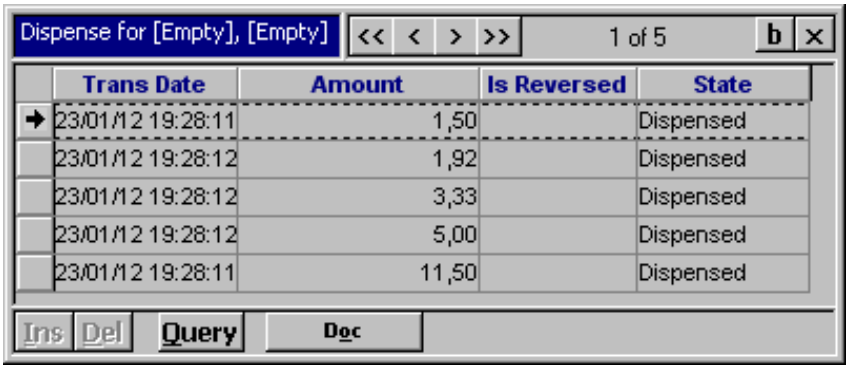
  - "Advice" – execution of an operation.
  - "Reversal" – reversal (adjustment) of an operation. For protocols with *Is Adjusting Totals* = "Yes", reversals are recorded in the same counters as original operations.
- *Currency* – operation currency.
- *Cycle N Docs* – number of operations recorded by the corresponding Way4 counter (both in the process of registering operations in a financial cycle and in the Batch Upload process when closing a cycle).
- *Cycle Balance* – total financial amount of operations recorded by the corresponding Way4 counter.
- *Device N Docs* – number of operations recorded by the corresponding POS terminal counter (obtained during reconciliation).
- *Device Balance* – total financial amount of operations recorded by the corresponding POS terminal counter (obtained during reconciliation).

> If for this terminal type (see the section "POS Types dictionary") "standard" mode for checking counters is set (*Strong Counters* = "No"), the values of the *Cycle Balance* and *Device Balance* fields will be compared during the check. If for this terminal type, "strong" mode for checking counters is set (*Strong Counters* = "Yes"), the values of the *Cycle N Docs* and *Device N Docs* fields will also be compared during the check.

- Device Cycle – current cycle number.

The [Dispense] button in the "Counters for <POS terminal name>" form opens the "Dispense for ..." form containing detailed information about operations.

This form is used to obtain information about the operations from which the *Cycle N Docs* and *Cycle N Balance* counter values were taken, for example, in analyzing a situation when counter values did not correspond in reconciliation.



Detailed information about operations

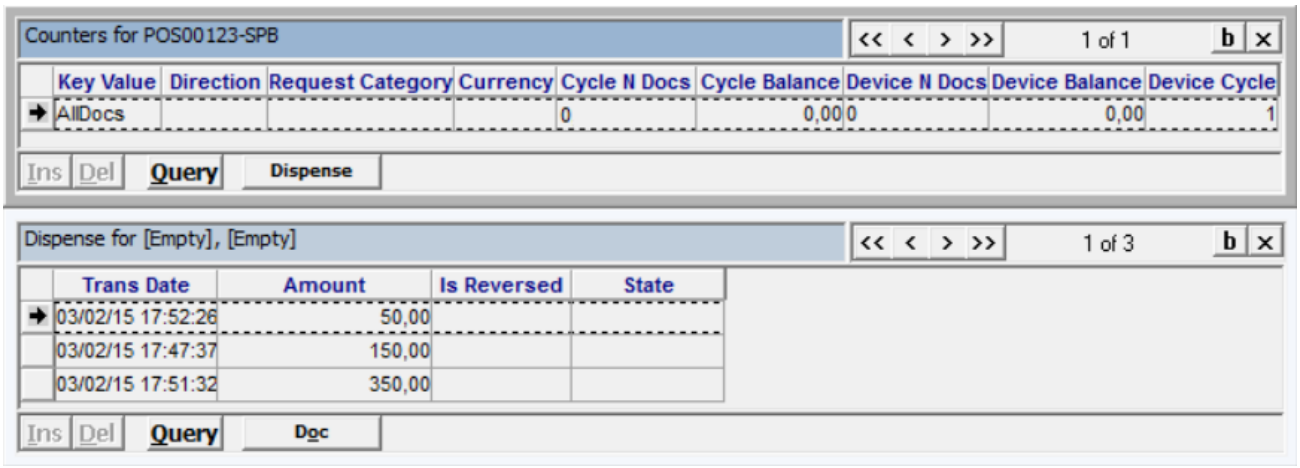
The "Dispense for..." form contains the following fields:

- *Trans Date* – transaction date and time.
- *Amount* – transaction amount.
- *Is Reversed* – indicates a reversal (adjustment) operation. Possible values:

- "Reversing" – the operation reverses an operation that has not been confirmed by the Batch Upload procedure. The "Reversed" value is specified for an unconfirmed operation in the State field. A similar value is set for an adjustment operation if a protocol with Is Adjusting Totals = "Yes" is used (in this case, adjustments are recorded in the same counter as original operations).
- "Adjusting" – the operation adjusts an earlier operation. The value is set if the adjustment is recorded in the same counter as the original operation (a protocol with Is Adjusting Totals = "Yes" is used).
- *State* – operation state. This field can have the following values:
- "Dispensed" – the operation was performed during a financial cycle.
- "Marked" – an operation that was not confirmed during initial reconciliation is awaiting confirmation during Batch Upload (the operation remained in the "Dispensed" state until upload was started). If the POS terminal confirms this operation by uploading the corresponding data, the state will change to "Matched"
- "Matched" – an operation that was uploaded by the Batch Upload procedure.
- "Reversed" – the operation was reversed, since final reconciliation (after Batch Upload) did not confirm it.
- "Closed" – the operation was confirmed as the result of initial reconciliation or final reconciliation after Batch Upload.
- The [Doc] button makes it possible to get information about a document created in the system for an operation selected from the list (opens the "Doc for Dispense for..." form).

4.3.2.2 "All Documents" Cycle Counters

Unlike "Batch Upload" cycles, in an "All Documents" cycle, a single counter is used that accumulates information for all operations made on the POS terminal during a calendar day.



Counter and list of corresponding "All Documents" cycle operations

For "All Documents" cycles, the "Counters for <POS terminal name>" form contains the following information:

- *Key Value* – the "AllDocs" value.
- *Device Cycle* – current cycle number.

The remaining fields are not filled in for the "All Documents" counter.

The [Dispense] button in the "Counters for <POS terminal name>" form opens the "Dispense for ..." form containing information about operations.

- *Trans Date* – transaction date and time.
- *Amount* – transaction amount.

The remaining fields are not filled in for the "AllDocs" counter.

The [Doc] button makes it possible to get information about a document created in the system for an operation selected from the list (opens the "Doc for Dispense for..." form).

4.3.3 Closing a cycle

A POS terminal cycle is closed in Way4 as follows:

- Automatically:
  - For "Batch Upload" cycles – if reconciliation is successful (initial reconciliation of operations or final reconciliation when the Batch Upload procedure is completed), the cycle will get the "Closed" status.
  - For "All Documents" cycles – when the first operation is made in a new calendar day, a new cycle opens and the current one will get the "Closed" status
- Manually:
  - If an active cycle (*Cycle Event* = "Active") must be closed, first its status must be changed to "Replenishment". To do this, in the "Curr Cycles for <POS terminal name>" form, click the [Actions] button and select "Replenishment" from the context menu. A cycle with *Cycle Event* = "Replenishment" is changed to the "Closed" status by clicking the [Actions] button in the "POS Cycles for <POS terminal name>" form.
  - If a cycle that has the "In Doubt" status must be closed (there was a discrepancy in counter values after initial reconciliation of executed operations or after Batch Upload), use the [Actions] button in the "POS Cycles for <POS terminal name> form".

4.3.4 Generating reimbursement

In general, a merchant is reimbursed as follows: When processing contracts (for example, when closing the banking day) documents for POS terminal operations are processed, confirmed by reconciliation in closing the financial cycle, and if they are processed successfully, get the "Posted" status. According to due normalization settings, a funds entry is made between "Merchant Receivable" and "Merchant Current" accounts. Funds are transferred to the merchant's accounts when standing payment orders configured for "Merchant Current" accounts are processed.

If the global parameter WAIT_BATCH_UPLOAD=Y (see the document "Way4 Global Parameters"), documents for operations waiting for confirmation by the "Batch Upload" procedure are not included in processing; therefore, it is possible that the corresponding amounts will not be included in the current normalization. If documents are confirmed by the "Batch Upload" procedure and the value of the global parameter USE_CUT_OFF_TIME is "B", the value of the *Cut-Off Time* parameter will be considered when processing documents (see the section "POS Terminals" of the document "Acquiring Module").

If turnover must be reflected in a "Merchant Receivable" account within a billing cycle, the "ENTRY_GROUPING" tag is used. For this, in the appropriate Account Scheme (menu item "Full → Configuration Setup → Products → Acquiring Products → Acquiring Account Schemes") specify the value "ENTRY_GROUPING=BY_BATCH;" in the *Template Details* field for the "Merchant Receivable" account.

Reimbursement of a merchant can also be initiated when a final message is received with data about online operations (message type "0500") that were performed in the financial cycle. If the value of the global parameter SETTLE_MERCHANT_BY_POS_CYCLES is "Y", regardless of the results of the cycle's reconciliation, a job will be generated to pay the merchant and this job will be processed in the order of the existing queue. The parameter SETTLE_MERCHANT_BY_POS_CYCLES can also be defined (in ascending order of priority) by a tag with the same name for a specific financial institution (the *Special Parms* field of a financial institution's form) or contract (the *Add Info* field of a contract's form) (see the document "Way4 Global Parameters").

To run the reimbursement procedure, use the menu item "Acquiring → POS / Imprinter Controller → Acq Cycle Settlement". The procedure to process the queue of reimbursement jobs can be scheduled (see the document "Scheduler").

The procedure for processing the job queue must not overlap with the standard procedure for processing documents.

The merchant reimbursement procedure includes the following:

- Processing documents that were generated in financial cycles (according to the number of the cycle and contract specified in the job).

Cycle numbers in documents must not be registered in ways that differ from standard mechanisms for numbering cycles.

  If for some reason a cycle document was not processed (it got the "Decline" status), it is assumed that after errors have been fixed, the document will be processed by the standard procedure; for example, closing the banking day, and that reimbursements for the document will be generated according to normalization settings in the "Merchant Receivable" account type.

  Similarly, documents for operations waiting for "Batch Upload" to be performed will be processed by the next standard procedure only after the cycle has been closed, and reimbursements will be generated according to "Merchant Receivable" normalization settings.

- Entry between "Merchant Receivable" and "Merchant Current" accounts.
- Processing standing payment orders with the "BY_BATCH;" tag (in the *Posting Details* field, see the document "Standing Payment Orders") that are configured for "Merchant Current" accounts.

To support functionality for unscheduled reimbursement, set the tag "ENTRY_GROUPING=BY_BATCH;" for the "Merchant Receivable" account type (as described earlier) and configure the corresponding payment orders with the "BY_BATCH;" tag for "Merchant Current" accounts.

5 Working with encryption keys in OpenWay software

Encryption keys are generated using an HSM (see the document "Host Security Module RG7000 Operation and Installation Manual").

5.1 Generating keys

The key generation procedure is described in the document "Terminal Key Management".

> The system supports a procedure for automatic key change. This functionality is provided according to an additional agreement with OpenWay.

5.2 Entering the master key in the PIN pad

For information on entering the master key in the PIN pad, see the system administrator manual for the appropriate terminal type.

5.3 Entering TPK in the terminal database

To process PIN-based transactions (PBT), the terminal's encrypted TPK key and its check value must be entered in the corresponding Way4 database record (see the section "Specifying encryption keys"). To do so, the encrypted TPK value received on the HSM and recorded in the log must be entered in the *Des Key* field of the terminal command record. The *Check Value* field is filled in with the corresponding TPK check value. Check the correspondence of keys in the database and in terminal PIN pads. For information about the *PBT Status* parameter, see the section "Mandatory PIN mode".

5.4 Entering TPK and check values in terminals

For information about entering TPK and check values in terminals, see the administrator manual for the appropriate terminal type.

5.5 Entering TAK in the terminal database

To process transactions requiring MAC signatures, the terminal's encrypted TAK key and its check value must be entered in the corresponding Way4 database record (see the section "Specifying encryption keys"). The *Check Value* field of the TAK key is filled in with the corresponding TAK check value. Check the correspondence of keys in the database and in terminal PIN pads. For information about the *MAC Status* parameter, see the section "Enabling MAC mode".

5.6 Entering TAK and check values in terminals

For information about entering TAK and check values in terminals, see the administrator manual for the appropriate terminal type.

6 Request transmission scenarios

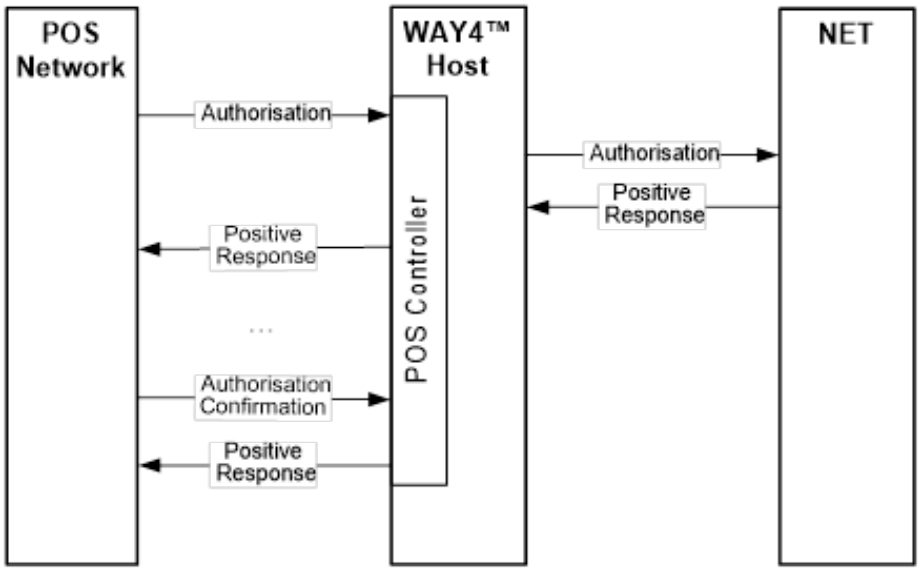
An online request from a POS network is received for processing by the POS controller (Way4 Host). In most cases, the request is sent to a payment system network (NET) or Host- to-Host channel. On-us transactions are processed in Way4.

Typical request transmission scenarios can be grouped as follows:

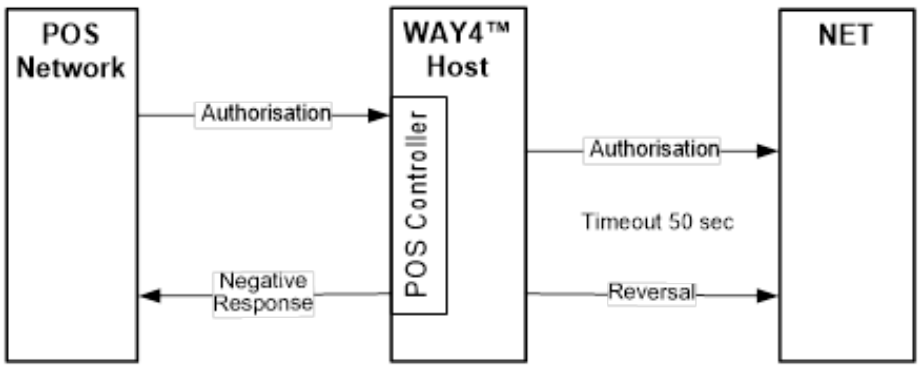
- Deferred confirmation authorization.
- Retail/cash.
- Balance inquiry.

6.1 Deferred confirmation authorization

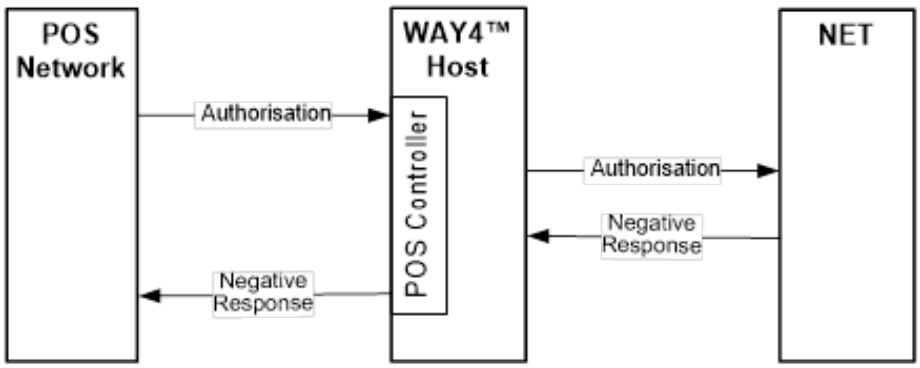
Request transmission scenarios for deferred confirmation authorization are shown in the figures:



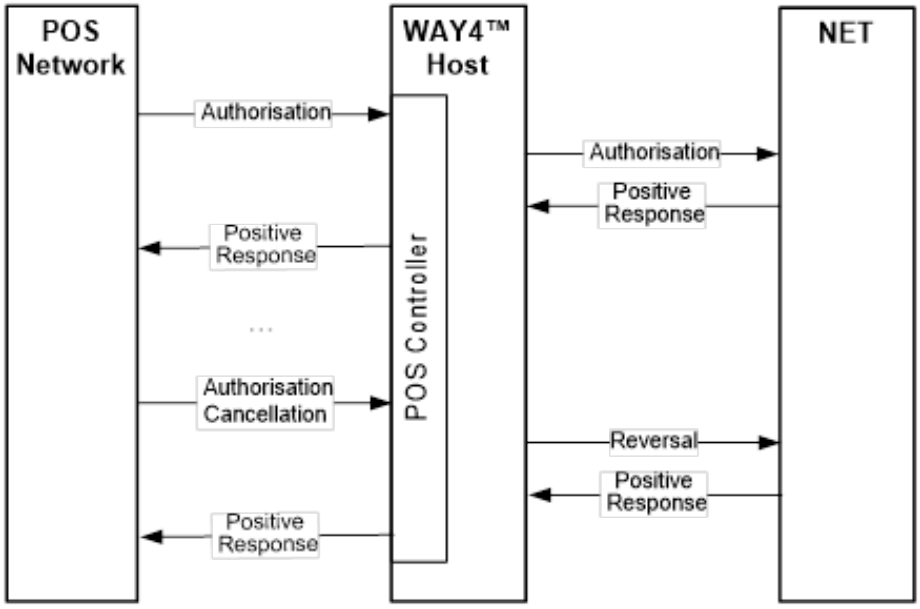
Successful authorization in an external network with deferred advice



No response during a specified period



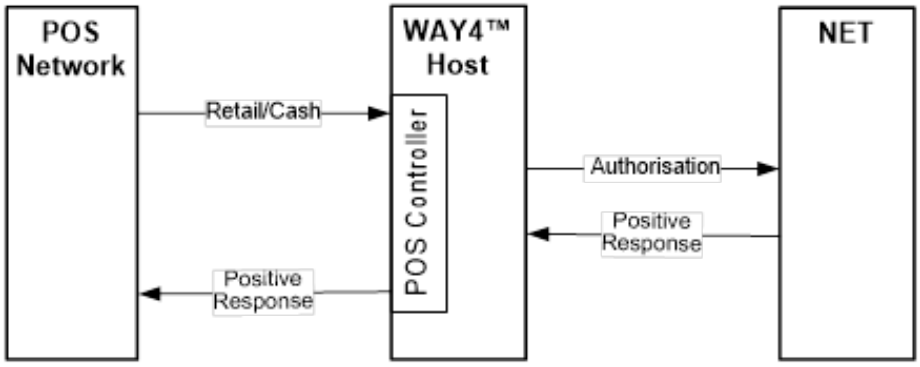
Negative authorization response from an external network



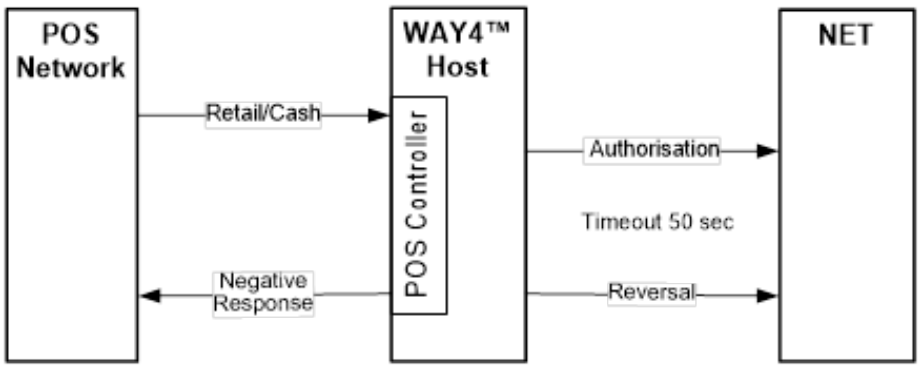
Reversal of a previous authorization in an external network

6.2 Retail/cash

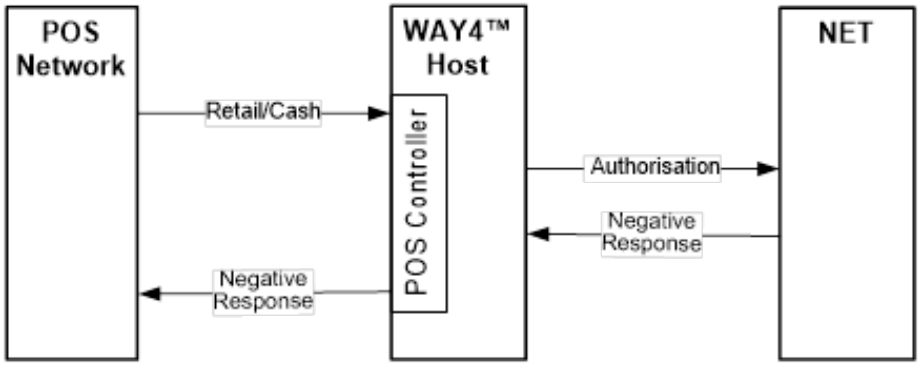
Request transmission scenarios for retail/cash operations are shown in the figures.



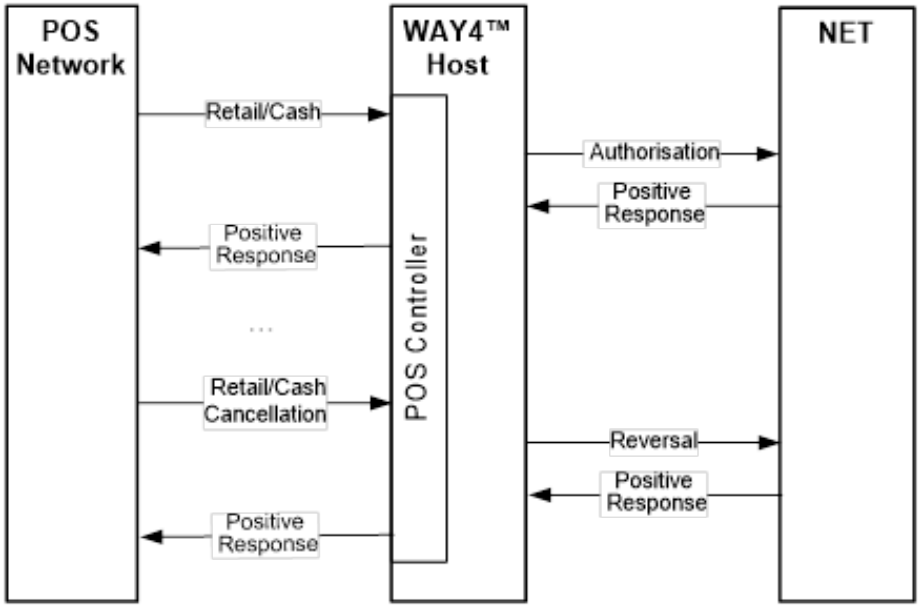
Successful purchase (additional financial request from the POS network is not required)



No response during a specified period



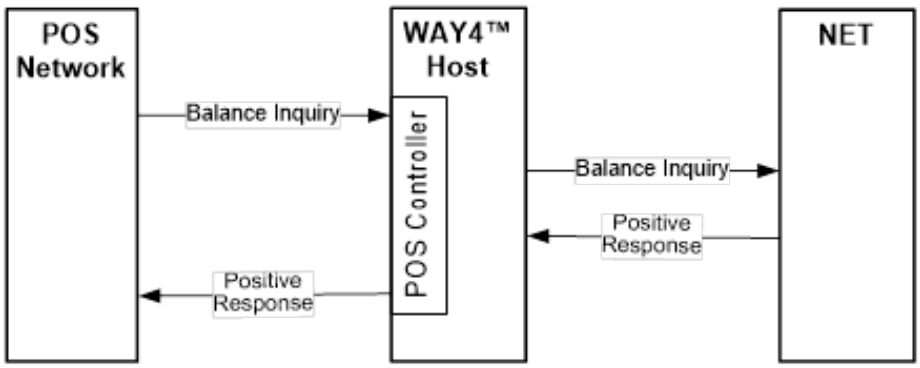
Negative authorization response from an external network: purchase or cash dispense is not allowed



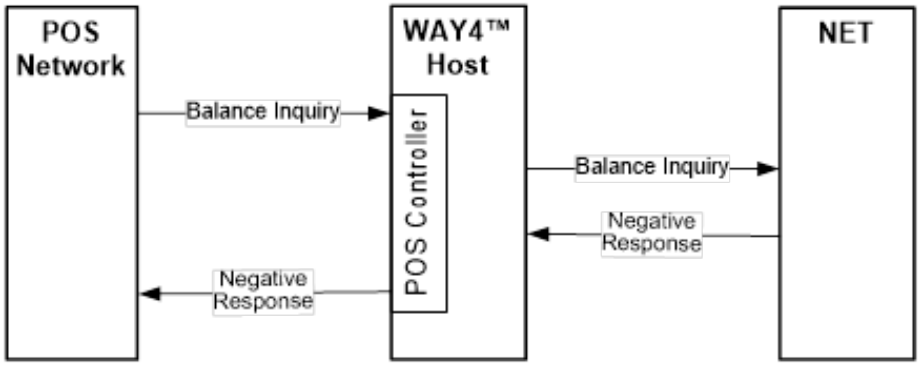
Successful reversal of the previous successful retail/cash operation

6.3 Balance inquiry

Request transmission scenarios for balance inquiries are shown in the figures:



Successful balance inquiry in an external network



Negative response to a balance inquiry in an external network

7 Totals calculation modes

For each available currency type in a POS terminal in Way4, the following operation counter types are maintained: Advice Debit, Reversal Debit, Advice Credit, Reversal Credit. Information about counter values is provided in the "Counters for... " form (see the section "POS cycle history"). Totals calculation modes determine the correspondence between operation types and the types of counters in which they are recorded.

There are two totals calculation modes; each of which has its own table for comparing the operation type and the name of the counter used to record this operation.

- Correspondence between operation type and counter name for calculation mode "1"

Counter Type	Operation Type
Advice Debit	Purchase/Cash Authorisation Confirmation Purchase with Cash Back Universal Bill Payment Advice (card and cash)
Reversal Debit	Universal Reversal on Purchase/Cash Universal Reversal Advice on Purchase/Cash Universal Reversal on Authorisation Refund
Advice Credit	Credit Credit Voucher
Reversal Credit	Universal Reversal on Credit

Pre-Authorization and Utility Payment operations are non-financial operations and are not considered during comparison. Original operations that were automatically reversed by the terminal and their reversals (Automatic Reversal) are considered in counters.

- Correspondence between operation type and counter name for calculation mode "2"

Counter Type	Operation Type

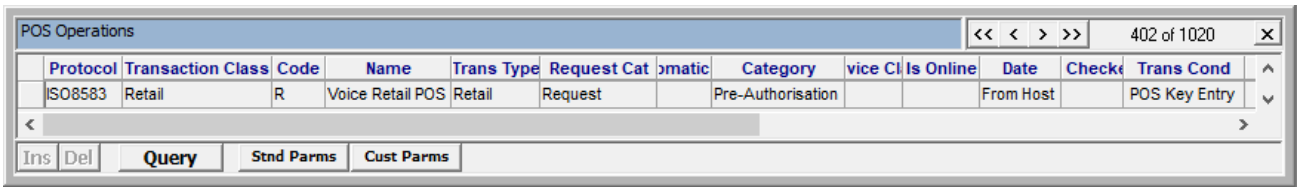
Advice Debit	Purchase/Cash Authorisation Confirmation Purchase with Cash Back Universal Bill Payment Advice (card and cash) Pre-paid purchase AFD Completion
Reversal Debit	Universal Reversal on Purchase/Cash Universal Reversal on Authorisation Confirmation Universal Reversal on Purchase with Cash Back Universal Reversal on Universal Bill Payment Advice (card and cash) Universal Reversal on Pre-paid purchase Universal Reversal on AFD Completion Refund
Advice Credit	Credit Credit Voucher
Reversal Credit	Universal Reversal on Credit Universal Reversal on Credit Voucher

Pre-Authorization and Utility Payment operations are non-financial operations and are not considered during comparison. Neither original operations that were automatically reversed by the terminal nor their reversals (Automatic Reversal) are considered in counters.

8 Configuring voice authorization

The Way4 acquiring module provides the ability to conduct voice authorization if execution of the corresponding operation on the POS terminal is for some reason impossible (without using an imprinter). In the acquirer's system such an operation is registered as a preauthorization document for the corresponding POS terminal. This is done in the voice authorization window ("Acquiring → POS / Imprinter Controller → Voice Authorization Screen")

When this feature is used, an operation with the following parameters must be registered in the "POS Operations" dictionary (see the section "Fixed dictionaries"):



POS terminal operation parameters for voice authorization

In the *Protocol* field of the "POS Operations" form, it is necessary to specify the protocol set for the terminal of the used type according to the "POS Types" dictionary (see the section "Custom dictionaries").

This operation is added to the list of operations available for POS terminals in the settings of contracts for the corresponding devices, in the "POS for <device name>" form ("Acquiring → Acquiring Contracts → Acquiring Contracts → [Devices] → [POS]"). To update the list of available operations, click the [Setup] button and select the menu item"Check and fill".

When registering new POS terminals of the corresponding type, additional settings are not required and voice authorization will be available by default.

The aforementioned settings make it possible to register preauthorization documents through the voice authorization window ("Acquiring → POS / Imprinter Controller → Voice Authorization Screen") by specifying the identifier of the corresponding POS terminal.

Financial documents related to voice authorization that was made are registered in the Way4 database as the result of batch upload of the merchant's transaction information. For their correct processing, uploaded UFX files must contain the following data about transaction conditions (<TransCondition> element):

```
<Doc>
...
    <TransType>
        <TransCode>
            <MsgCode>DpP--00-</MsgCode>
        </TransCode>
    <TransCondition> ,IMPRINTER,NO_TERM,AUTHENTICATED,AUTH_MERCH,TRANS_AUTH,SBT,SBT_
MAN,CARD,CARDHOLDER,MERCH,KEY_ENTRY,</TransCondition>
    </TransType>
...
</Doc>
```

The feature described in this section makes it possible to use the voice authorization window, including to solve various kinds of problem situations when servicing POS terminal operations.