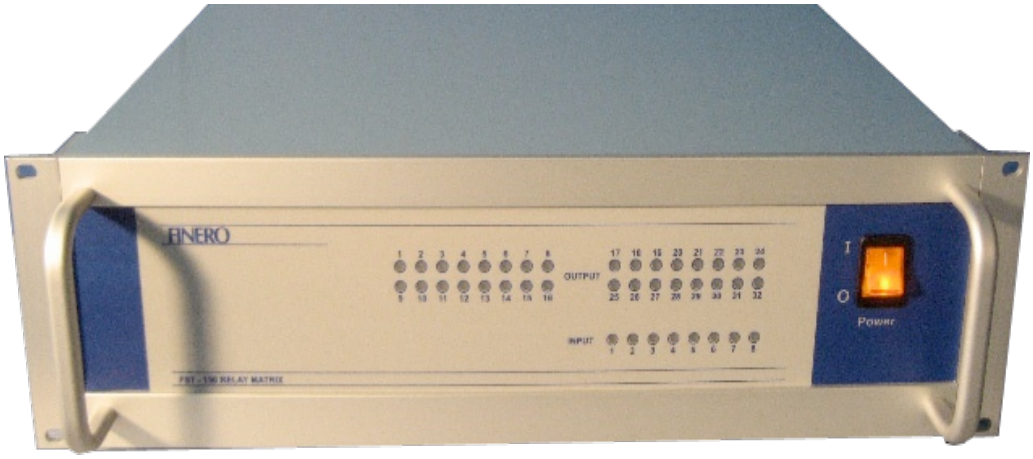
FINERO *The Quality Control Company*

User Manual



FST-150 Relay Matrix

Finero Oy
Haltonintie 5, FIN-47400 Kausala, Finland
Tel. + 358 (0) 5 752 2200
Fax. + 358 (0) 5 363 8326
e-mail: sales@qacontrol.com
www.qacontrol.com

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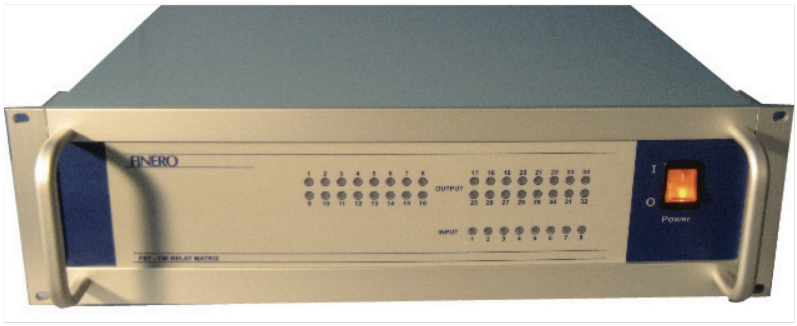
ANNEX A - FST-150 RELAY MATRIX - COMMAND LIST



Dear Customer,

Thank you for purchasing Finero's test and measurement equipment. Finero is obliged to provide you with the best on the market available test and measurement equipment. The 30 years of Finero experience in most demanding production applications is made available to you in this piece of equipment.

We are confident that this equipment will support your endeavors to keep up the good quality of your production.

If you have any comments about Finero products, software or services I would like to hear of them.

Yours truly,

Risto Vuolle
Chief Executive Officer

Finero Inc.
Kausala, Finland

All information is subject to changes without prior notice.

Finero Oy – The Quality Control Company
Haltonintie 5, FIN-47400 KAUSALA, FINLAND
www.qacontrol.com
Tel. +358-5-7522 200
Fax +358-5-3638 326
sales@qacontrol.com

DELIVERY SCOPE LIST

Although Finero packages the equipment with utmost care you should check the package regarding any delivery damages. If the equipment is damaged you should contact your insurance company directly and inform Finero as well about the matter. Please include photos if possible.

The package should include in minimum following documents and materials:

FST-150	1pc
Mains cable	1pc
User Manual	1pc

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Haltonintie 5, FIN-47400 KAUSALA, FINLAND
www.qacontrol.com
Tel. +358-5-7522 200
Fax +358-5-3638 326
sales@qacontrol.com

1 TECHNICAL INFORMATION

Type:	FST-150 Relay Matrix
Serial number:	See the back of the device
Physical Size:	483x148x410 (width, height, depth) Designed to 19”-eurorack, height 3U 133mm, without legs
Weight:	7-20kg, depends configuration
Operating voltage:	230VAC (±10%) 50Hz 1~phase
Nominal power:	about 60VA, depends on configuration
Connection:	Cable plug, equipment earth
Main fuse:	1A slow 5x20mm glass fuses inside the power connector, depends on the configuration
Ambient temperature:	+5 °C...+35 °C
Ambient conditions:	Dry and clean
Outputs:	Totally 32pcs NPN type outputs Each 8 outputs 24Vdc supply with max 500mA
Digital inputs:	8pcs inputs 24Vdc, common - potential Internal resistance 120kΩ Current rate about 0,2mA
Analog inputs:	8 inputs 0…10Vdc, common - potential Internal resistance 110kΩ Current rate about 0,1mA
Computer connection (option):	LAN, USB (B), GPIB or RS-232 connector in the back panel
RS485 Interface	To be used for device to device communication between FST-line equipments

2 GENERAL

2.1 FST-150

The FST-150 Relay Matrix can be used to build functional test systems combined with electrical safety testing features. The FST-150 can be configured individually for different applications.

ANY UNAUTHORIZED OPEING OF THE EQUIPMENT WILL VOID THE WARRANTY.

2.2 FST-150 control modes

The FST-150 is PC controlled, usually with the SafeTest 100B software. However, FST-150 is a LABView compatible so drivers can be downloaded from Internet and the application software can be made by the customer itself.

It is possible connect several (up to 10) relay matrices together into one system. Address can be set inside the FST-150 manually or by software command (switch must be position 0).

2.3 Product development

Owing to constant product development, the manufacturer reserves the right to make changes without separate notification. Due to customer-specific or other changes, operation can, in some respects, differ from the provided description.

2.4 Accessories

Separate testing tools, systems and calibration devices are available for the equipment. We will be delighted to provide you with more information on their use and connection to other pieces of equipment.

3 SAFETY PRECAUTIONS

3.1 General

Before testing can be started, the user should become sufficiently familiar with the instructions of use and the operation of the tester. In addition, read carefully the emergency first aid instructions and the testing procedure of the relevant product.

3.2 High Voltage and High Current

The high voltage connectors in rear panel have a dangerous high voltage during the test.

The current supplied by the FST-150 maybe high enough to cause convulsion and potentially to get trapped to the parts under high voltage. The FST-150 measures the current in the circuit and shall switch the voltage off if the current exceeds the set current limit, THIS FEATURE CANNOT BE USED AS A SAFETY MEASURE!

NEVER TOUCH THE HIGH VOLTAGE CONNECTORS OR TEST LEADS IF THE FST-150 IS SWITCHED ON!

The rear panel test connectors have low voltage during the test but due to high current there may occur some sparking in the test connectors. Also care must be taken of heating of the test leads caused by high currents. Therefore use sufficient cable cross-section size for test leads. They can be ordered also as an option from Finero.

NEVER TOUCH THE CONNECTORS OR TEST LEADS IF THE FST-150 IS SWITCHED ON!

4 INSTALLATION

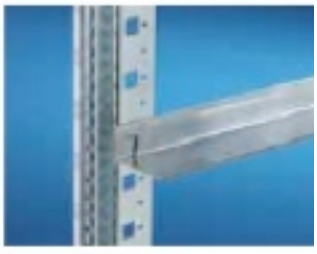
4.1 General

The device is designed for desktop use, or it can be installed on a standard 19" wide rack or housing. Installation height is 3U (133mm). Depth is approx. 370mm; furthermore, approx. 150mm will be needed for the connectors. The handles on the housing come approximately 40mm out of the front panel. When relocating the device, do not carry it by the front handles but the ones on the sides. On dry and dust-free premises the device can be used in its own housing, but care must be taken to ensure that nothing can enter into the device through the ventilation openings, which must not be covered.

4.2 Mounting into 19” Module –Rack or Case

As the unit is heavy, when installing in an instrument cabinet or similar, mounting rails must be used. Mounting holes in the front panel are for mounting only; they are not designed to carry the whole weight of the apparatus. Before installing in a cabinet, remove the footpads that may have been installed underneath. The footpads are removed by turning the unit carefully on either side. The relevant screws are under the skid-stop rubber pads. Ensure that the instrument cabinet is well ventilated so that the internal temperature will not rise above +35°C.

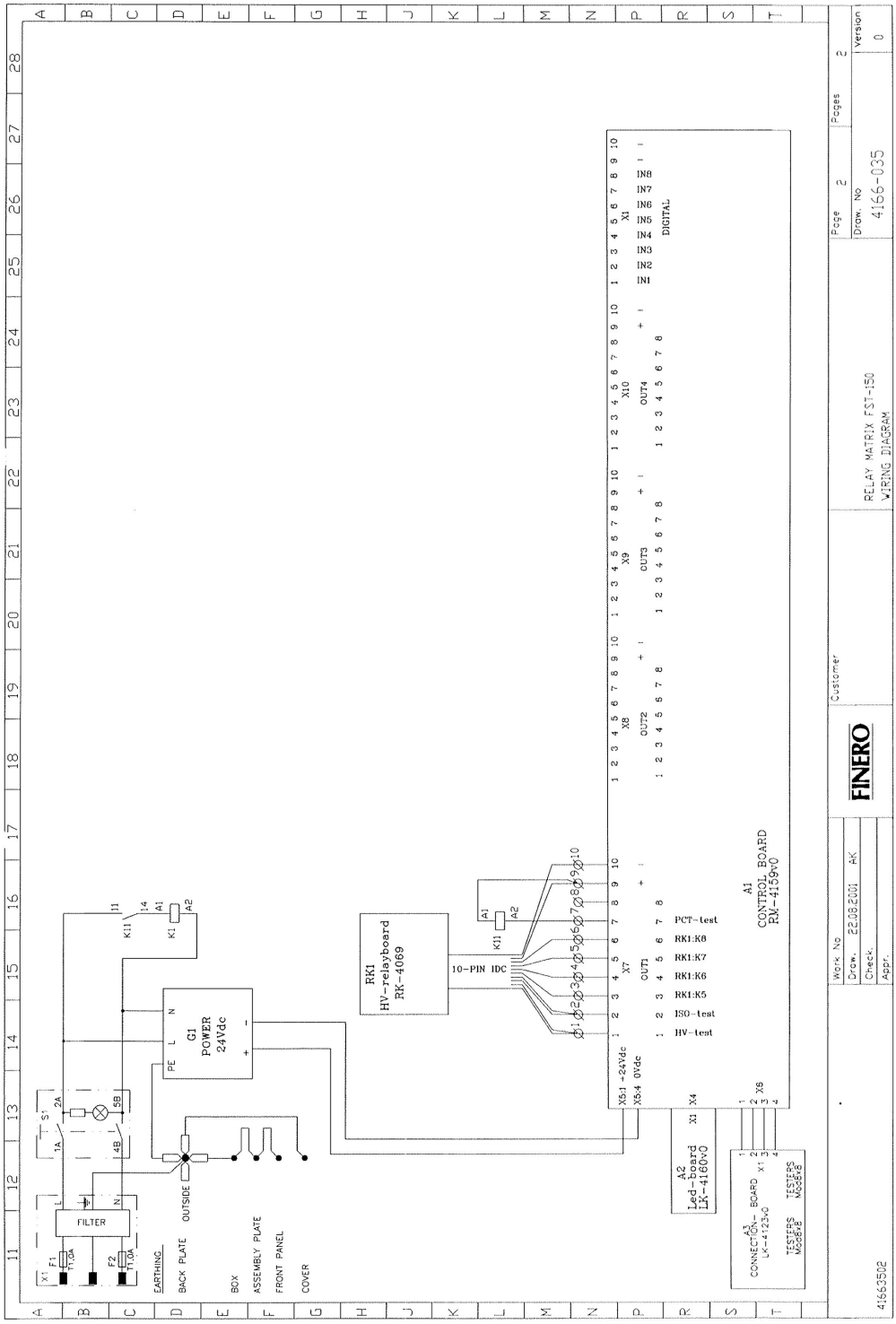
Here are some example pictures of how to build the support for rack installation.



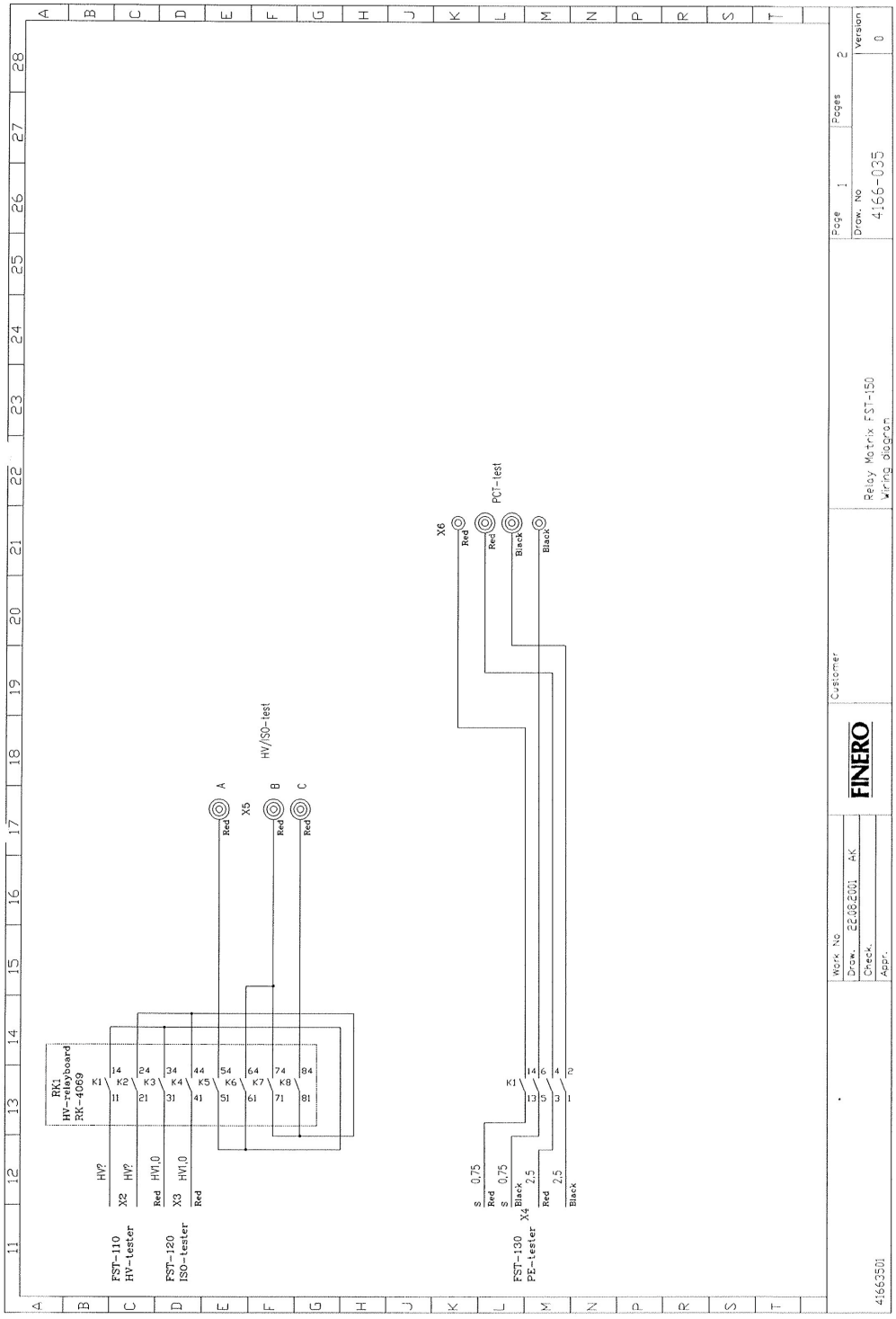
4.3 Connecting to the D.U.T.

The connection of the FST-150 Relay Matrix depends on the configuration of FST-150 as well as on the D.U.T. So no generally applicable instruction can be given. Please consult your Finero representative or Finero service directly.

A basic main circuit diagram is according to the following picture.



Example Application Diagram



4.4 Mains supply and Switching On the FST-150

Connect the FST-150 to the mains supply in following order:

- Check that the position of the front panel POWER switch is 0.
- Connect the control and high voltage cables to the FST-150.
- Plug the mains cord to the FST-150.
- Plug the mains cord to a mains outlet
- Switch ON the FST-150

5 OPERATION

5.1 General

Relay matrix can only be used as computer controlled. There are LED indicator lights in the front panel for 32 outputs and 8 inputs.

5.2 Start-up

Power is switched on by the “Power” –switch. After that the FST-150 Relay matrix is ready to received commands from computer. See SafeTest 100B user’s manual for easy programming.

5.3 Operation

Before FST-150 Relay matrix operation check the delivered wiring diagrams for configuration specific use. All uses in different applications will void warranty.

6 LIMITED WARRANTY

All of our products and test systems are covered by a standard 12-month warranty period. The warranty period starts on the original shipment date of the product or test system. Our product and test system warranties guarantee that our products will be free from defects in material and workmanship and we will repair or replace any such Finero product or test system we find to be defective.

All new Finero products and test systems are calibrated prior to shipment. Finero products and test systems require annual calibration, if Finero has not given any other written instruction, and Finero accepts only calibrations made by an approved Finero partner or by Finero factory. If your product during the 12-month warranty period fails to perform as Finero has specified please return the product to the below address or to one of our approved partners. Warranty work includes parts and labor at Finero's cost, but excludes shipping costs. Labor outside Finero facilities is charged extra.

Finero products returned for warranty repair and found to be in proper working order may be subject to a shipping and handling fee.

Any non-authorized modification, repair, tampering or physical damage or if the product has been subject to gross misuse will void this warranty. Elimination of any connections in the earth grounding system or bypassing any safety systems will void this warranty. Parts subject to wear, such as test probes and leads, are not covered by this product warranty, except where they are deemed to have a manufacturing defect within 60 days of the original shipment of the Finero product. Except as provided herein, Finero makes no warranties to the purchaser of Finero products and test systems and all other warranties, expressed or implied (including, without limitation, merchantability or fitness for a particular purpose) are hereby excluded, disclaimed and waived.

FINERO SHALL NOT BE LIABLE FOR ANY SPECIAL, INDIRECT CONSEQUENTIAL, INCIDENTAL OR OTHER SIMILAR DAMAGES SUFFERED BY THE PURCHASER OR ANY THIRD PARTY, INCLUDING WITHOUT LIMITATION, DAMAGES FOR LOSS OF PROFITS OR BUSINESS OR DAMAGES RESULTING FROM USE OR PERFORMANCE OF THE PRODUCT OR TEST SYSTEM, WHETHER IN CONTRACT OR IN TORT, EVEN IF FINERO OR ITS AUTHORIZED REPRESENTATIVE HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES, AND FINERO SHALL NOT BE LIABLE FOR ANY EXPENSES, CLAIMS, OR SUITS ARISING OUT OF OR RELATING TO ANY OF THE FOREGOING.

Return address: Finero Oy, Service and Calibration, Haltonintie 5, FIN-47400 Kausala, FINLAND

ANNEX A

FST-150 RELAY MATRIX

COMMAND LIST

NOTICE!

IF YOU HAVE ORDERED A COMPUTER INTERFACE WITH YOUR FST-EQUIPMENT THIS ANNEX IS RELEVANT FOR THE PROGRAMMING

Summary of Tester Commands

Tester Command	Description
RELm	Commands are use for FST-150 relay matrix m (m=1…10)
OUTX 255	Outputs X (X=1…8) ON
OUTX 0	Outputs X (X=1…8) OFF
OUTX:ON	Output X (X=1…32) ON
OUTX:OFF	Output X (X=1…32) OFF
IDN ” ”	Tester identify code, maximum 20 characters
ADDR 2	Relay matrix address change to 2
RES?1	Request for Analog input channel results: Voltage Status1 Status2 0
STAT?	Request for Tester status
OUT?	Request for Outputs 1…32 status
IN?	Request for Input 1…8 status
CAL?	Request for Calibration date
VER?	Request for Tester version
IDN?	Request for Tester identify code
CaLP	Calibration mode

Tester commands and Examples how to use them

RELm
m=1…10

Send commands to relay matrix 1…10

Examples:

REL1;OUT1:ON	relay matrix 1 and that its output 1 is ON
REL10;OUT1:ON	relay matrix 10 and that its output 1 is ON

OUTX mmm
X= 1…4
mmm=0…255

Set outputs 1…8 in groups 1 to 4 on or off, also individual outputs

Examples:

OUT1 1 (binary= 0000001)	Output group 1 output 1 is ON, outputs 2…8 OFF are in the same group
OUT1 3 (binary= 0000011)	Outputs 1 and 2 ON, outputs 3…8 OFF
OUT1 255 (binary= 1111111)	Outputs 1…8 ON
OUT4 0	Outputs 1…8 OFF in group 4

OUTm:n
m=1…32
n=ON or OFF

Sets output m ON or OFF. Individual output settings.

Examples:

OUT1:ON	Output 1 ON, no status change in other outputs
OUT32:ON	Output 32 ON, no status change in other outputs
OUT32:OFF	Output 32 OFF, no status change in other outputs

IDN ” ”

Set the Tester identify code (free setting), maximum 20 characters (not ”-marks). Usually there the tester type and serial number is used.

Example: IDN ”FST-150 s:no 123456”

ADDRm
m=1…10

Relay matrix address change. Address is factory set to 1, but if several relay matrices are used in a test system, every device must have a different address. First relay matrix must be switched to calibration mode with CaLP command (command must be send twice). Relay matrix returns to normal operation mode automatically after ADDR-command.

Examples:

REL1: CaLP 1	Send command to relay matrix 1, relay matrix waits for CaLP 1next command. Switches to the calibration mode.
REL1: ADDR 2	Relay matrix 1 address change to 2

RES?m
m=1…10

Request for analog input voltage and status bytes, returns 4 numbers aaaaa bb cc 0. m=analog input channel

aaaaa	Voltage in analog input 0…10000 (=0-10,0V)
bb	Status byte 1 (see STAT?)
cc	Status byte 2 (see STAT?)
d	0

Examples:

REL1;RES?2	Query to relay matrix 1, analog channel 2

STAT?

Returns output involving 2 status bytes at the same time. Resets some related bits: mmm, nnn

mmm Status byte 1

Bit	Value	Meaning	Resetting
0	1		
1	2		
2	4		
3	8		
4	16	Communication error	STAT?

nnn Status byte 2

Bit	Value	Meaning	Resetting
0	1		
1	2		
2	4		
3	8		
4	16	Calibration data error	
5	32	Communication error, time out	STAT?
6	64	Communication error, check sum	STAT?

Examples:

Statusbyte 2 bit 5 Communication error, time out error

-Communication module (RS-232 or GPIB) cannot take communication to relay matrix. Maybe power is off or control line is broken.
-Communication module (RS-232 or GPIB) or software error. Relay matrix waits data or command, but it is missing (time out).

Statusbyte 2 bit 6 Communication error, check sum error

-Communication module (RS-232 or GPIB) error or line error. Relay matrix found data error with check sum.

OUT? Outputs status. The provided data will be four figures: aaa bbb ccc ddd

aaa	Outputs 1..8 status (0…255)
bbb	Outputs 9…16 status (0…255)
ccc	Outputs 17…24 status (0…255)
ddd	Outputs 25…32 status (0…255)

IN? Query of input status. Return answer: aaa

aaa	Input status (0…255)

CAL? Tester adjustment date query. Output will be the following string dd.mm.yyyy

For example: 29.08.2001

VER? Queries the tester build version data, provides a string listing the tester's interface cards' version numbers/software version numbers.

Provided data example: RS-4122v1/v1.1 RM-4159v0/v1.3

IDN? Querying the tester-specific identifier. The provided data will be the specified free-form identifier stored in the tester, maximum 20 characters. Identifier specified by Finero includes the tester type and the serial number.

Example: FST-150 sno: 123456