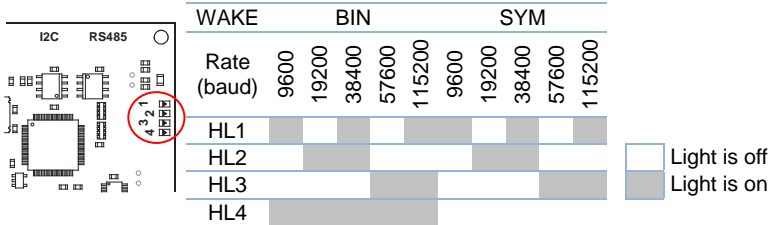


## Table of Commands V3.7

Mnemonics	Code	Parameters	Description	Inf Frame
<b>System commands</b>				
CMD_ECHO	0x02	s	// send echo	s
CMD_INFO	0x03		// send device identifier	hhh
CMD_GetVer	0x04		// send device firmware version	s
CMD_GetInfo	0x05		// send device information	s
CMD_SetInfo	0x06	s	// write device information	
CMD_SetAdr	0x07	uc	// set network address	uc
CMD_StTel	0x40	uc hh hh	// set telemetry status	hh hh
CMD_get_PRM	0x41		// send parameters stored in FLASH (backup)	
CMD_set_PRM	0x42		// receive parameters stored in FLASH (recovery from backup)	
CMD_I2C	0x44	uc hh hhhh hh	// operations with bus I2C 1 #I2C HHHH Num - Read dev #I2C with address HHHH number Num bytes 0 #I2C HHHH Num - Writ dev #I2C with address HHHH of one byte equal Num	hh hh hh hh hh hh hh hh
CMD_Prog_T	0x45	0- W Pg Ln 1- R Pg Ln 2- Wst Pg St 3- Rst Pg St	// Managing of programs of change in time At the end the program line: Pg-number of program 0-15 Ln-number of line 0-49 St-program status 0=yes elsewise-no  Temp Time hh Ln Mode / Pg 0 Interdiction of regulation 2 T-regulation 3 Temperature maintenance (PID) 4 Constant voltage	uc uc uc f ud hh uc uc uc uc f2 ud hh uc
CMD_get_Tel	0x46		// send telemetry line	
CMD_Krt_OK	0x49	№ uc uc f	// criterion of signal of settling	
CMD_St_HW	0x4a		// status of devices in system	hh hh hh
CMD_Infs_Wk	0x4b	uc uc uc	// set status to interface 0-232 0-BIN 0...4 9600-19200-38400-57600-115200	
CMD_Dig_Out	0x4d	uc	// enable of digital output	uc
CMD_Dig_In	0x4e	uc hh	// control of digital input	uc hh
<b>Commands of Work with ADC</b>				
CMD_ClbrADC	0x10	№ uc	// hardware calibration of ADC	hh hh
CMD_ClbrK_ADC	0x11	№ f	// calibration of ADC (calculation of calibrating ADC coefficients)	
CMD_Wr_K_ADC	0x12	№ e	// writing calibrating ADC coefficients	
CMD_Kfiltr	0x13	№ uc	// writing ADC filter coefficient	
CMD_AskKADC	0x14	№	// sending ADC conversion coefficient, filter coefficient and PGA	hh e6 uc hh
CMD_AskOfst	0x15	№	// sending ADC register of offset	hh hh hh hh
CMD_StartADC	0x16	№	// starting measurement in ADC channel	hh hhhhhhh e6 e6
CMD_Only_1	0x17	№ 1/0	// measurements of one ADC channel (fast measurement)	hh
CMD_Sever	0x18	hh	// mask on ADC channels	hh
CMD_PGA	0x19	№ uc	// PGA of ADC thermistor channel	
CMD_Polinom	0x1a	№ uc	// writing thermistor polynomial order	
	0x1a	№ uc f	// writing thermistor polynomial coefficients	
CMD_ask_Pol	0x1b	№ uc	// sending thermistor polynomial coefficient	hh uc uc e6
CMD_saveTerm	0x1c	uc	// Save the Current Settings of Thermistor Input	
CMD_loadTerm	0x1d	uc uc	// Restore Thermistor Input Settings	hh
CMD_get_TBL	0x1e		// Save Table of Thermistor Settings (backup)	
CMD_set_TBL	0x1f		// Restore Table of Thermistor Settings (Backup)	
<b>Commands of work with DAC</b>				
CMD_set_DAC	0x21	№ f	// setting DACs in Volts	hh ud
CMD_seth_DAC	0x22	№ ud	// setting DACs directly (no control of limitations)	hh ud
CMD_Wr_K_DAC	0x23	№ f f	// writing DAC calibrating coefficients	
CMD_AskKDAC	0x24	№	// sending conversion coefficient and DAC max values	hh e6 e6 f2
CMD_DAC_max	0x25	№ f	// writing max voltage	
CMD_U_Treg	0x26	№ f	// voltage of T-regulation	hh f2
<b>Commands of work with PID controller</b>				
CMD_Pol_TEC	0x30	№ uc	// setting of TEC polarity Off-0 Hot-1 Cool-2	
CMD_set_PID	0x31	№ f f f	// writing parameters of PID controller Kp Ki Kd	
CMD_ask_PID	0x32	№	// sending parameters of PID controller Kp Ki Kd	hh f6 f6 f6
CMD_setCurrT	0x33	№ uc	// current thermistor 0-10uA 1-93uA	hh uc
CMD_askT_PID	0x34	№ [ f ]	// sending/set setpoints of PID controller	hh f2 f2 uc uc
CMD_strt_PID	0x35	№ uc f	// starting control mode 0 Idle (Regulation stop) 1 Regulation according to program 2 T-regulation 3 Temperature maintenance – PID 4 Constant voltage	
CMD_tun_PID	0x36	№ hex	// output parameters of PID controller (bits)	hh hh
CMD_Zmetr	0x37	№ uc uc	// starting Z-meter (number of channel; time of measurement; 1-only R)	s
CMD_Zprmtr	0x38		// storage of Z-metering parameters (as reference)	
CMD_Z_I	0x39		// sending Z-meter current	e6
CMD_Z_I	0x39	f	// storage of Z-meter current (f-resistance on canal 0)	
CMD_Boot	0x3b	№ uc f ud	// start of regulation after restarting mode; (PRG, U, T); time	hh hh f2 ud

Mnemonics	Code	Parameters	Description	Inf Frame
CMD_set_LimT	0x3c №	min max time	// writing limiting temperatures	
CMD_get_LimT	0x3d №		// sending limiting temperatures	hh f2 f2 uc
CMD_ResZmtr	0x3e		// sending Z-metering results	hh f2 e2 f2
CMD_TecZmtr	0x3f №		// sending Z-metering parameters	hh f2 e2 f2
CMD_PID_tun	0x51 №		// auto tuning PID	s
CMD_REST	0x53		// reset controller	
CMD_EKR	0x54	[#screen]	// control of indication board	



HL3	Continuous	The device is waiting for the reception of commands (WAKE protocol) via the interface RS-485
	Pulsed	The device is waiting for the reception of commands (WAKE protocol) via the interface RS-232
	Off	The unprocessed data has arrived in the device via the interfaces RS-232 or RS-485 and there was an overflow of the buffer intended for their storage

For the description of commands the command code and its parameters are specified. The following designations are used:  
№ - number of ADC or number of TEC channel (of PID regulator) or number of DAC can be «0» or «1».

The following abbreviations are used for the of parameters depending on their:

ADC numbers	measured parame
0	Supply voltage
1	TEC1 voltage
2	TEC2 voltage
3	TEC1 current
4	TEC2 current
5	TEC1 temperature
6	TEC2 temperature

	description	types
uc	unsigned char	integer decimal number
ud	unsigned int	integer decimal number
ul	unsigned long	integer decimal number
e	float	floating point number
f	float	floating point number
s	string	line of symbols
h	hex	hexadecimal number (0...9, A...F)

For the symbol mode these abbreviations determine a type and form of parameters. For the binary mode they only do a type of parameters. The figure after "e" and "f" indicates a number of digits after the point (comma).

The MSB status byte value	
0x01	TEC1 temperature is beyond the limitations
0x02	TEC2 temperature is beyond the limitations
0x04	TEC1 temperature is within the setting
0x08	TEC2 temperature is within the setting
0x10	Command performance is interrupted

The LSB status byte value:	
0x01	error EEPROM
0x02	unknown command
0x04	no ready data for telemetry (response)
0x08	TEC voltage at Z-metering does not drop for too long
0x10	error in parameters or command format
0x20	reception RS-232 buffer overfilling
0x40	reception RS-485 buffer overfilling
0x80	voltage supply error

**Attention!!!** The error of supply voltage (0x0080) is accompanied by switching-off of voltage converters. The error remains even after voltage returning to allowable limits 12±10%.

### Telemetry Status (40 time MSB LSB)

BIT	Mask	LSB Function or parameter in telemetry block
0	01	Supply voltage measured (f2)
1	02	TEC1 voltage measured (f2)
2	04	TEC2 voltage measured (f2)
3	08	TEC1 current measured (f1)
4	10	TEC2 current measured (f1)
5	20	TEC1 temperature measured (f3)
6	40	TEC2 temperature measured (f3)
7	80	Reserved
BIT	Mask	MSB Function or parameter in telemetry block
0	01	TEC1 channel status (hh) (for bit values - see command 4A)
1	02	TEC2 channel status (hh) (for bit values - see command 4A)
2	04	Device status (hhhh – two bytes at the end of the information frame) bits values
3	08	Enable anything besides the telemetry be out into a non-command interface
4	10	TEC1 temperature setpoint (f2)
5	20	TEC2 temperature setpoint (f2)
6	40	Permission of telemetry output into the command interface.
7	80	Permission of telemetry output into a non-command interface