L-STAT

L-STAT[™] Room Operator Panel

User Manual

LOYTEC electronics GmbH



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Abbreviations

ASCII	American Standard Code for Information Interchange
IR	Infrared
LCD	Liquid Crystal Display
NDEF	NFC Data Exchange Format
NFC	Near Field Communication
RGB	Red, Green, Blue
URI	Uniform Resource Identifier
URL	Uniform Resource Locator

1 Introduction

1.1 Overview

The L-STAT is a room control device with a modern look that fits any interior design. It is directly connected to a LOYTEC controller with a Modbus interface such as LIOB-AIR, L-ROC or L-INX.

Up to 16 L-STAT devices can be connected to one controller to offer control at different locations for the largest rooms. The L-STAT is equipped with a segmented LCD display featuring an RGB backlight with adjustable color, offering a neat way to make the L-STAT match the interior color concept of an office building. Eight capacitive touch buttons are used to cycle through sensor values, display parameters, and adjust setpoints. Up to four external buttons can be accessed and processed by the controller.

The L-STAT's internal sensors measure temperature, humidity, dew point, occupancy and CO_2 level. Sensor values can be displayed in SI or US units. Additionally, the date and time as well as the current level of eco-friendliness are also displayed on the LCD display. Parameters controlled by the controller's logic can be overridden on the L-STAT, such as for occupancy, air conditioning, and ventilation. A direct access mode is available to quickly adjust the most important setpoints e.g. for temperature and ventilation control.

A buzzer provides acoustic feedback for the touch buttons and can also be used to indicate alarms and error states. To prevent unauthorized modifications, two access levels (end user, system integrator) are used, which are secured via 4-digit pin codes. Device replacement, firmware upgrade, and L-STAT configuration are performed with very little effort through the controller. The L-STAT device is represented in the controller by a simple data point interface, which can be directly connected to the IEC 61131 or IEC 61499 logic application and offers all common functions for data points such as alarming, scheduling, trending, historic filters, math functions, etc.

Using an NFC tag, the L-STAT transmits the URL of an L-WEB project to mobile devices for more extensive control and administrative tasks. Last but not least, the L-STAT comes with a built-in infrared receiver for comfortable remote control.

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1.2 Key Features

Features	LSTAT-800-Gx-Lx	LSTAT-801-Gx-Lx	LSTAT-802-Gx-Lx
Modbus RTU Slave	\checkmark	\checkmark	\checkmark
NFC Tag	\checkmark	\checkmark	\checkmark
Buzzer	\checkmark	\checkmark	\checkmark
Internal Temperature Sensor	\checkmark	\checkmark	\checkmark
Internal Relative Humidity Sensor	\checkmark	\checkmark	\checkmark
3 x Digital Inputs 1 x Analog Input	\checkmark	\checkmark	\checkmark
Infrared Receiver	\checkmark	\checkmark	\checkmark
Occupancy Sensor	-	\checkmark	\checkmark
CO ₂ Sensor	-	-	\checkmark

The different L-STAT models and their features are documented in Table 1.

Table 1: Key Features

Not only the model type but also the enclosure color as well as the touch button layout is defined with the order code. See Table 2 for possible order codes.



Table 2: Possible Order Codes

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1.3 LCD Segments

The following Figure 1 shows the LCD of the L-STAT with all possible segments.



Figure 1: LCD Segments available on L-STAT

The following Table gives an overview of all available segments of the L-STAT LCD with its defined names. The Table also shows which symbols are directly accessible via Modbus registers (see Table 12 on Page 26).

Segment	Name	Description	Direct Access
<u> </u>	heat	Heating symbol	\checkmark
\bigcap	alarm_bell	Alarm bell symbol	\checkmark
۵	drop	Drop symbol	\checkmark
<u>`</u> ۵	drop_not	Cross out for drop symbol	\checkmark
Ŵ	alarm	Alarm symbol	\checkmark
Ŷ	light	Light bulb symbol	\checkmark
	blinds	Sun blinds symbol	\checkmark

Segment	Name	Description	Direct Access
(-1)	clock	Clock symbol	\checkmark
*	sun_left	Left half of sun symbol	\checkmark
*	sun_right	Right half of sun symbol	\checkmark
	moon	Moon symbol	\checkmark
3.6	colon	Colon of the secondary display It will only be accessible if the secondary_display_direct_access_enabled flag at the config_flags register at address 192 (Table 22 at Page 33) is set.	~
<u>88</u> 88	secondary_display	The secondary display is used to show time, date and/or a short text depending on the semantic meaning of a display value or set point. It can also be directly accessed via the Modbus register: sec_display_direct_access_string (see Table 23 on Page 34).	~
am pm	am_pm_symbols	These symbols are not directly accessible but are shown along with the time when 12h time format has been selected.	-
*	cool	Cooling symbol	\checkmark
•	man_out	Man outside the house (no occupancy)	\checkmark
+	man_in	Man inside the house (occupancy)	\checkmark
*	arrow	Arrow symbol (to represent a set point)	\checkmark
	temp_in	Temperature inside	\checkmark
	temp_out	Tempareture outside	\checkmark
\bigcirc	house	House symbol	\checkmark
ADDR CAL RGB OFFLINE	text_symbols	The text symbols are not accessible via Modbus but are shown at certain modes or events.	-
Р Ц	key	The key symbol is primarily used to show that a set point is pincode protected but it can also be accessed via the symbol direct access registers.	\checkmark

Segment	Name	Description	Direct Access
N	wind	Wind alarm symbol	\checkmark
	rain	Rain alarm symbol	\checkmark
	window	Window open alarm symbol	\checkmark
55	fan	Fan symbol	\checkmark
M	valve	Valve symbol	\checkmark
Ĺ	logo	Loytec logo symbol	\checkmark
R.	green_leaf_3		\checkmark
P	green_leaf_2	The green leaf symbols can be used to	\checkmark
Ń	green_leaf_1	to visualize environmental conditions.	\checkmark
	green_leaf_0		\checkmark
	bar_left_2		\checkmark
	bar_left_1		\checkmark
Ţ	bar_left_0	The left bar graph symbols can be used to display a heating or cooling stage in automatic or manual mode.	\checkmark
MAN AUTO	manual_left		\checkmark
MAN AUTO	auto_left		\checkmark
	bar_right_2		\checkmark
	bar_right_1		\checkmark
	bar_right_0	The right bar graph symbols can be used to display a fan stage or valve position in automatic or manual mode.	\checkmark
MAN	manual_right		\checkmark
MAN AUTO	auto_right		\checkmark

Segment	Name	Description	Direct Access
8888	main_display	The main display is primarily used to show certain values. It is not accessible directly.	-
°F	unit_F		-
°C	unit_C		-
cfm	unit_cfm		-
l/s	unit_l/s		-
m³/h	unit_m³/h	All unit symbols are not directly accessible but are displayed along with a display value or set point if the unit is set	-
Pa	unit_Pa	in the corresponding configuration register. See Table 28 on Page 39 for display value	-
inWC	unit_inWC	configuration and Table 29 on Page 41 for set point configuration	-
V	unit_V		-
%	unit_%		-
%RH	unit_%RH		-
ppm	unit_ppm		-

Table 3: LCD Segments Overview

2 Quick-Start Guide

2.1 Hardware Installation

Please refer to the L-STAT installation sheet for further information on dimensions, mounting and wiring.

Figure 2 shows the back view of the device with the connection terminals for Modbus, 24 V DC-Supply and external buttons. The four external buttons share a common GND connection which is internally connected to the negative 24 V input terminal.



Figure 2: Back View LSTAT-80x-Gx-Lx

2.2 User Interface

2.2.1 General Description

The user interface consists of the LCD for displaying any desired value and up to eight touch buttons which are used to adjust set points and change settings. Additionally up to four external push-buttons can be connected to the device.



Figure 3: Front View LSTAT-80x-Gx-Lx

Each button can individually be configured via a Modbus register for its function (see Table 24 on Page 35). The following listing gives you an overview which functionality can be associated with the buttons.



change set point or device setting in EDIT-mode directly access a set point in DISPLAY-mode



no specific function, the button state can be requested to control lighting



no specific function, the button state can be requested to set occupancy state



short press <3s: cycle through display values, set points or device settings

long press ~3s: switch between DISPLAY-mode and EDIT-mode long press >6s: switch to cleaning mode

2.2.2 Operating Modes

In Figure 4 the operating modes of L-STAT are depicted. Each operating mode gives access to certain Modbus registers that can either be viewed or edited depending on the mode. The following data is available on L-STAT:

- display values: Are used to visualize data provided by the Modbus master or values of internal sensors. It is viewed in DISPLAY-mode. For the display value registers see Table 11 on Page 25 and Table 28 on Page 39 for the corresponding display value configuration.
- set points: Are used to visualize data that is provided by the Modbus master and that can be edited by the user. It is shown in DISPLAY-mode and it can be edited in EDIT-mode. For the set point registers see Table 32 on Page 44 and Table 29 on Page 41 for set point configuration. The range in which a set point can be altered is defined by minimum and maximum values that have to be written by the Modbus master. Please refer to Table 33 on Page 45 and Table 34 on Page 46.
- device settings: These values define some basic settings of the device itself. Please refer to Table 5 on Page 17 for a listing of all device settings and to Table 18, Table 19 and Table 20 on Page 30 f. for the corresponding Modbus registers. Device Settings can only be edited by the system administrator in EDIT-mode.
- offset values: Are used to add a certain offset to a display value. This functionality can be used to calibrate sensor values. Offset values can be edited by the system administrator in CALIBRATION-mode directly at the device or over Modbus. Please see Table 35 on Page 47 for the offset value register.



Figure 4: Operating Modes of L-STAT

When the device powers up, it enters DISPLAY-mode and it will display the first display value. When pressing the MENU-button the next value will be shown. First all active display values and then all active set points are displayed. After the last set point, the display will show the first display value again.

EDIT-mode is entered by pressing the MENU-button for more than 3 seconds. To enter EDIT-mode as system administrator two additionally defined buttons (TB0 and TB4) need to be pressed along with the MENU-button for more than 3 seconds. Also in EDIT-Mode a short press on the MENU-button is used to go to the next value. Any other button that has no specific function can be used in EDIT-mode to cycle the values in the opposite direction. EDIT-mode is left when pressing the MENU-button for more than 3 second.

The system administrator will also be able to view and edit the device settings.

CALIBRATION-mode will be entered for any display value when pressing one UP- and one DOWN-button simultaneously for more than 3 seconds to adjust the offset. This mode

is secured by the system administrator password. CALIBRATION-mode is left when pressing the MENU-button for more than 3 second or after a timeout of 1 minute.

An overview of all possible operating modes is given in Table 4 below. The operating mode can also be defined by the Modbus master by writing the user interface direct access register (see Table 13 on Page 26).

Or	der of L-STAT Operating Modes	Description
0	DISPLAY-mode / display values	Display values are shown.
1	DISPLAY-mode / set points	Set points are shown.
2	EDIT-mode / set points	Set points can be edited.
3	EDIT-mode / device settings	Device settings can be edited
4	CALIBRATION-mode / offset values	Offset values can be edited
5	PINCODE-ENTRY / end user	The pincode for the end user has to be entered to show and/or edit the requested value.
6	PINCODE-ENTRY / system administrator	The pincode for the system administator has to be entered to show and/or edit the requested value.
7	DIRECT_ACCESS-mode / set points	A defined set point can be accessed and edited without entering EDIT-mode. It can be entered by pressing a defined button (see Table 24 on Page 35).

Table 4: Operating Modes

2.2.3 Access Levels

The L-STAT has two access levels (end user & system administrator) with configurable rights to display and edit values. Each access level is secured by a four digit pincode that will be requested when EDIT-mode or DIRECT_ACCESS-mode is entered if the desired value is pincode protected.

Per default the pincode for end user and system administrator access level is disabled (0000).

2.2.4 Device Settings

The following Table gives an overview of the device settings accessible through the button interface as well as via Modbus. For the corresponding Modbus registers please refere to Table 18, Table 19 and Table 20 on Page 30 and following.

Device Setting	Possible Values	Default	Your Setting
Modbus Parity	Odd / Even / None	None	
Modbus Baudrate	1.2kB / 2.4kB / 4.8kB / 9.6kB / 19.2kB / 38.4kB / 57.6kB / 115.2kB	57,6kB	
Modbus Address	1 - 247	1	
Pincode System Administrator	0000 – 9999 (if 0000 the pincode is disabled)	0000	
Pincode End User	0000 – 9999 (if 0000 the pincode is disabled)	0000	
Color Setting LCD Backlight Red	0% - 100%	100%	
Color Setting LCD Backlight Green	0% - 100%	100%	
Color Setting LCD Backlight Blue	0% - 100%	100%	
Brightness LCD Backlight	0% - 100%	100%	
LCD Contrast	0% - 100%	100%	
LCD Color Scheme	0 – user (as defined above) 1 – white 2 – red 3 – green 4 – blue 5 – orange 6 – magenta 7 – cyan	0	
Time Format	24h / 12h	24h	
Show Date	on / off	off	
Show Time	on / off	off	
Acoustic Feedback (for Touch Buttons)	on / off	on	
Goto First Display Value (the first display value will be displayed after 1 minute with no inter- action)	on / off	on	
Display Auto Dim (lcd brightness will be dimmed after 2 minutes with no interaction)	off / 50% / 10% / 0% / OCC* * built-in occupancy sensor activates display	off	
Unit System	SI / US	SI	
Device Restart	off – if a DOWN-button is pressed the device will restart	-	

Table 5: Device Settings

2.2.5 Factory Default

The factory default configuration for display values and set points depends on the specific L-STAT model. The following Table shows the factory default values for each model. See Table 28 on Page 39 for display value configuration and Table 29 on Page 41 for set point configuration.

	LSTAT-800-Gx-Lx	LSTAT-801-Gx-Lx	LSTAT-802-Gx-Lx
display_value_0	Internal Temperature	Internal Temperature	Internal Temperature
display_value_1	Relative Humidity	Relative Humidity	Relative Humidity
display_value_2	Dew Point	Dew Point	Dew Point
display_value_3	-	-	CO ₂ Level
display_value_4	Modbus Voltage	Modbus Voltage	Modbus Voltage
display_value_5	External Temperature	External Temperature	External Temperature
display_value_6 to display_value_15	-	-	-
set_point_0	Internal Temperature Set Point	Internal Temperature Set Point	Internal Temperature Set Point
set_point_1	Fan Stage	Fan Stage	Fan Stage
set_point_2 to set_point_15	-	-	-

Table 6: Factory Default for L-STAT Models

2.3 Getting Started with the Configurator

A Modbus Template for the L-INX configurator with all available datapoints can be downloaded from the Libraries/Templates Download section on the LOYTEC website: https://www.loytec.com/support/download

For further information on using the L-INX configurator for Modbus devices please refer to the L-INX/L-GATE user manual [1].

Please refer to Chapter 3 for a listing of all available Modbus Registers.

3 Modbus

3.1 Introduction

The L-STAT operates as a Modbus slave in Modbus RTU mode. The default baudrate is set to 57600, the default parity is set to 'none' and the default address is set to 1. The communication with a Modbus master device will work with Modbus function code 0x03 (Read Holding Registers) and Modbus function code 0x06 (Preset Single Register). Section 3.4 shows all available Modbus registers.

3.2 Modbus Network

Figure 5 illustrates a typical Modbus network setup with a linear bus topology used to connect several slave devices to a master device. The transmission line has to be terminated at both ends. At the master device this can be done by connecting an L-Term (LT-04) device. Each L-STAT slave device is equipped with a built-in 120Ω termination resistor. Set the termination switch to OFF except on the last device on the bus where the termination switch must be turned ON. Per default each device has the Modbus address set to 1. Because each address can only be used once it has to be configured at the device settings in EDIT-mode. For further information please see Section 2.2.



Figure 5: Modbus Network

3.3 Modbus Register Usage for Value Display

The following Figure 6 shows, which Modbus registers have influence on a displayed value, unit, text on the secondary display or symbols. Depending on settings in configuration registers different combinations are possible to achieve the desired result.



Figure 6: Modbus Register Usage for Value Display

3.4 Modbus Register Description

In the following sections the L-STAT Modbus registers are described. Abbrevations are explained at the end of each table. 'R' indicates that this value is not used by now and that it is reserved for future use. Square brackets '[]' indicate that this is the initial value. Numbers with the prefix '0x' are hexadecimal values. Values with no prefix indicate decimal values.

3.4.1 Data Registers

These registers contain data that is changing frequently. This data is not stored persistent in the L-STAT device and will be lost after a reboot.

Register Name	Register							F	Bit Po	ositio	n						
	Address	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
present_state	0 0x0000	R [0]	R [0]	R [0]	Occu [0]	[[]	[[[[[[[[[
short_pressed	1 0x0001	IRC [0]	NFC [0]	R [0]	Occu [0]	EB3 [0	EB2 [0	EB1 [0	EB0 [0	TB7 [0	TB6 [0	TB5 [0	TB4 [0	TB3 [0	TB2 [0	TB1 [0	TB0 [0
long_pressed	2 0x0002	FD [1]	ERR [0]	DOC [0]	SPC [0]												
	The press	ent_st y sens	ate r or.	regist	er alv	vays	repr	esents	s the	actu	ial st	ate o	of the	e but	tons	and	the
	The short Modbus r is cleared	_press naster autor	sed and the sed an	nd loi vritin ally a	ng_pr g a lo fter th	essec gical le occ	l state '1' te cupan	es wil o the cy_ti	l rem speci meou	ain se fic fl it has	et unt ag, ez expi	il the ccept red.	flags the c	s are o occup	cleare ancy	ed by flag (the that
	Bits 0-11)-11 indicate the states of the buttons (TBx -touch button, EBx -external button) i: occupancy flag, defines if occupancy is detected by built-in occupancy sensor (applies to LSTAT 801 Gy Ly and LSTAT 802 Gy Ly)															
	Occu: oc (ap	coccupancy flag, defines if occupancy is detected by built-in occupancy sensor (applies to LSTAT-801-Gx-Lx and LSTAT-802-Gx-Lx) NFC flag, is set if an NFC field was detected. This gives the information that a															or
	NFC: NI uso mo	(applies to LSTAT-801-Gx-Lx and LSTAT-802-Gx-Lx)C: NFC flag, is set if an NFC field was detected. This gives the information that a user is reading the NFC tag memory with an NFC enabled mobile device. For more information see Chapter 4.															a or
	IRC: inf rec reg	rared eived gister	remo l. The at reg	ote co e rec gister	ontrol eived addre	flag code ss 32	;, is s e can 2 (see	et wi be i Tabl	hen a read e 9 o	n int via t n Pag	frared he ir <u></u> ge 24)	l rem _rem	ote c ote_c	contro	ol coo ol_coi	de wa nmar	as 1d
	SPC: Se Ea Pa	t poir ch set ge 23	nt cha t poin).	angec it has	l flag an in	, is s divid	set wi lual c	hen a hange	i set e flag	point ; at re	t was egiste	chai r add	nged ress 3	on tł 3 (see	ne L- e Tab	STA' le 8 d	Г. on
	DOC: de va reg	vice s lue wa gisters	etting as cha at ac	g or c angec ldress	offset l on tl s 4 an	value he L- d 5 (s	e cha STA see T	nged F. Th able 8	flag, e spe 8 on l	is se cific Page	t whe chan 23).	n a d ge fla	levice 1gs ca	e setti an be	ing oi read	r offs via tl	et ne
	ERR: err	or fla	g, is s	set wl	hen ar	1 inte	rnal e	error	has o	ccurr	ed.						
	FD: fac de	ctory of fault s	lefau setting	lt (un gs.	config	gurec	l) flag	g, is s	et wh	en th	e dev	vice h	as bo	oted	with	facto	ry
	 Button 1 - pr 0 - re 	state essed leasec	s and , set 1, clea	flags ared	can ł	nave	the fo	ollowi	ng bi	nary	value	es:					
	① The pr (For a)	esent <u></u> list o	_state f pos	regis sible	ster is mode	only s see	upda Tabl	ited in e 4 oi	n DIS n Pag	SPLA e 16)	Y-mo	ode!					

Table 7: Button States and Flags

Register Name	Register							I	Bit Po	ositio	n						
C	Address	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
change_flags_	3	SP15	SP14	SP13	SP12	SP11	SP10	SP9	SP8	SP7	SP6	SP5	SP4	SP3	SP2	SP1	SP0
set_points	0x0003	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
change_flags_	4	R	R	R	R	R	R	R	R	DS7	DS6	DS5	DS4	DS3	DS2	DS1	DS0
device_settings	0x0004	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
change_flags_	5 0x0005	OV15 [0]	OV14 [0]	OV13 [0]	OV12 [0]	OV11 [0]	OV10 [0]	OV9 [0]	OV8 [0]	OV7 [0]	OV6 [0]	OV5 [0]	OV4 [0]	OV3 [0]	OV2 [0]	OV1 [0]	OV0 [0]
	The chang master by	ge flag writii	g regi ng a l	ister ogica	states al '1'	will to the	rema spec	in tru ific f	ie un lag.	til the	e flag	s are	clea	red by	y the	Mod	bus
	SP0 to S	SP15	cha	inge i	flags	for se	et_poi	nt_0	to set	t_poi	nt_15	i (see	Tabl	e 32	on Pa	nge 44	4)
		DS0	: cha 18	inge on Pa	flag f age 3	for m 0)	odbus	s_par	amete	er on	regis	ter a	ddres	s 176	ő (see	a Tab	le
	DS1: change flag for pincode_system_administrator on register address 177 (see Table 19 on Page 30)DS2: change flag for pincode_end_user on register address 178 (see Table															7	
	DS2: change flag for pincode_end_user on register address 178 (see Table 19 on Page 30)															le	
	19 on Page 30)DS3: change flag for lcd_color_red on register address 179 (see Table 20 or Page 31)															on	
		DS4	cha cha	inge Page	flag f 31)	or le	d_col	or_gr	een o	on reg	gister	addr	ess 1	80 (s	ee Ta	able 2	20
		DS5	cha cha	inge Page	flag f 31)	for le	d_col	or_b	lue o	n reg	ister	addre	ess 1	81 (se	ee Ta	ible 2	20
		DS6	cha: Tal	ange ble 20	flag : 0 on I	for lo Page	cd_br 31)	ightn	ess_c	ontra	st on	regi	ster a	addre	ss 18	32 (se	ee
		DS7	cha: Tal	inge ble 20	flag) on I	for u Page	iser_ii 31)	nterfa	ace_s	etting	s on	regi	ster a	addre	ss 18	83 (se	ee
	OV0 to C)V15	cha: Pag	inge ge 47	flags)	for o	offset	_valu	e_0 1	to of	fset_v	alue <u></u>	_15 (see]	Fable	35 o	on
	 Change 1 – tru 0 – fal 	e flags ie se	s can	have	the f	ollow	ving b	inary	valu	es:							
	If a set flag wi	t poir 11 be	nt, de set ar	vice nd it l	settin has to	g or be c	offset leared	t valu 1 by t	ie is d he M	chang odbu	ged by s mas	y the ster.	user	the c	corres	spond	ling

Table 8: Change Flags

Register Name	Register							I	Bit Po	ositio	n						
U U	Address	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
ir_remote_control_	32	button_code remote_id															
command	0x0020	[0x00] [0x00]															
	This register provides the button_code and remote_id of a valid command received via the infrared receiver. See Chapter 5 for detailed information.														the		
	Whene update on Pag	ever d and e 22)	a co l the l	mma IRC f	nd w flag c	vas ro of the	eceiv shor	ed th _pres	ne ir ssed	_rem regist	ote_c er at	onti add	ol_co ress 1	mman is set	id re t (see	giste Tab	r is le 7

Table 9: IR Remote Control Command

The following Table gives an overview of the internal sensor values. These registers can be read over Modbus and can be used as source for a display value if configured. As described in Section 2.2.2 on Page 15 there are up to 16 display values used to visualize data. Each display value has two 16 bit configuration registers to specify the values displayed. Display values (register address 64 to 79) are read- and writable over Modbus.

Register Name	Register	Bit Position														
	Address	15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0														
sensor_value_0	48 0x0030	internal temperature														
sensor_value_1	49 0x0031	external temperature														
sensor_value_2	50 0x0032	relative humidity														
sensor_value_3	51 0x0033	dew point														
sensor_value_4	52 0x0034	reserved														
sensor_value_5	53 0x0035	amount CO ₂ (applies only to LSTAT-802-Gx-Lx)														
sensor_value_6	54 0x0036	L-STAT supply voltage														
sensor_value_7	55 0x0037	L-STAT CPU temperature														
sensor_value_8	56 0x0038	L-STAT CPU voltage														
	A sense bit as v address is set th meanin on this	or value can be used as source for a display value. Therefor the DSSA or DSEU well as the semantic meaning at the corresponding display value configuration at s 256 to 286 has to be set (see Table 28 on Page 39). If the DSSA or DSEU bit his specifies that a sensor value is used instead of a display value. The semantic g specifies which sensor value is used as source for displaying. For an overview topic please see Figure 6 on Page 21.														

③ Sensor_value_0, sensor_value_1 and sensor_value_3 are 16 Bit signed values. All other sensor values are defined as 16 Bit unsigned since there are no negative values to expect. The values are scaled as described in Table 39 at Page 52.

Table 10: Sensor Values

Register Name	Register	Bit Position
. 6	Address	15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0
display_value_0	64 0x0040	[0x0000]
display_value_1	65 0x0041	[0x0000]
display_value_2	66 0x0042	[0x0000]
display_value_3	67 0x0043	[0x0000]
display_value_4	68 0x0044	[0x0000]
display_value_5	69 0x0045	[0x0000]
display_value_6	70 0x0046	[0x0000]
display_value_7	71 0x0047	[0x0000]
display_value_8	72 0x0048	[0x0000]
display_value_9	73 0x0049	[0x0000]
display_value_10	74 0x004A	[0x0000]
display_value_11	75 0x004B	[0x0000]
display_value_12	76 0x004C	[0x0000]
display_value_13	77 0x004D	[0x0000]
display_value_14	78 0x004E	[0x0000]
display_value_15	79 0x004F	[0x0000]
	 The Day 256 to Table 2 value i display see Fig All media 	SSA or DSEU bit at the corresponding display value configuration at address 286 has to be cleared to display the content of a display value register (see 28 on Page 39). If the DSSA or DSEU bit is cleared this specifies that a display s used instead of a sensor value. The semantic meaning specifies which text is red along with the specific display value. For an overview on this topic please gure 6 on Page 21.

① All registers are 16 Bit signed values. Depending on the modbus_unit specified with the corresponding display value configuration register at address 256 to 287 (Table 28 at Page 39) the value needs to be scaled as described in Table 39 at Page 52 to achieve the desired result.

Table 11: Display Values

Register Name	Register				Bit Po	osition			
6	Address	15 14	13 12	11 10	9 8	7 6	5 4	3 2	1 0
symbol_direct_ access_0	96 0x0060	Ĺ	•		n [N	\triangle
symbol_direct_ access_1	97 0x0061	(-1)		*	*	R.	1	Z	
symbol_direct_ access_2	98 0x0062	7.0		\bigcirc	4	<u>ک</u>	\bigcap	<u> </u>	**
symbol_direct_ access_3	99 0x0063			Ţ				X	5
symbol_direct_ access_4	100 0x0064	/ MAN AUTO	MAN AUTO	MAN AUTO	MAN AUTO	Ĵ		+	+
	Symbols o LCD segm 2 bits are r	of the LCD ments pleas reserved pe) can be di e see Tabl er symbol	irectly set e 3 on Pag indicating	by writing e 12. the state tl	these reg	isters. For ve the follo	an overvie owing valu	ew of all es:
	00 – disab	led, symbo	ol is not vi	sible					
	01 – enabl	led, symbo	ol is visible	•					
	10 – blink	ing slow (1Hz)						
	11 – blink	ing fast (2	Hz)						

(i) For the house symbol the initial value is set to '01' per default.

Table 12: Symbol Direct Access

Register Name	Register						I	Bit Po	ositio	n							
-	Address	15 14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
user_interface_ direct_access	101 0x0065	EU/ SA [0]		ui_ [(_mod 0x00	le]						ui_ii [0x	ndex 00]				
	This regis also be wr	ster can be read to get information of which value is currently displayed. It or ritten to determine the displayed value.															
	EU/SA:	defines	the cu	rrent	acces	ss lev	el (0	– en	d use	r, 1 –	syste	em ad	minis	strato	r)		
	ui_mode	defines	defines the current access level (0 – end user, 1 – system administrator) defines the user interface mode the device is currently operating in														
	ui_index	defines	defines the index of the value currently displayed														
	Please se	e the foll	owing	exam	ples:												
	0x0001 -	- This m for the	eans th end us	nat dis er.	splay	v_valu	ue_1	is cu	rrent	ly dis	splaye	ed in	DISF	PLAY	-mo	de	
	0x8200 -	- This m in EDI	eans th Γ-mode	nat sei e.	t_poi	nt_0	is cu	irrent	ly ed	ited l	by the	e syst	em a	dmin	istrat	or	
	 For a li 	sting of a	II L-ST	ΓAT α	opera	ting	mode	s see	Tabl	e 4 o	n Paş	ge 16.					
				Tał	ble 13	B: Use	r Inte	rface	Direc	t Acce	ess						

Register Name	Register							I	Bit Po	osition						
	Address	15	14	13	12	11	10	9	8	7 6 5 4 3 2 1 0						
buzzer_direct_	102	BE	R	R	R	R	R	R	R	buzzer_duration						
access_0	0x0066	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0x00]						
buzzer_direct_	103			b	uzzer	_mod	le			buzzer_tone						
access_1	0x0067				[0x	[00]				[0x00]						
	These regi acoustic fe	sters edba	are u ck fo	sed to	o pro couch	vide o butto	lirect ons.	acce	ss of	the piezo buzzer primarily used to give						
		BE: buzzer enable bit (1 – enabled, 0 – disabled) iration: 0x00 infinite, 0x01 - 0xFF duration in seconds														
	buzzer_du	Iration: 0x00 infinite, 0x01 - 0xFF duration in seconds mode: defines specific alarm sound patterns														
	buzzer	mode: description:														
		r_mode: defines specific alarm sound patterns mode: description:														
		mode:description: \leftarrow 1s pattern \Rightarrow 0continuous $ \frac{1}{10000000000000000000000000000000000$														
					1	a	larm	1		₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩						
					2	a	larm	2		₩₩₩₩₩₩₩₩₩₩₩₩						
				, -	3	a	larm	3								
				4	4	a	larm	4								
				:	5	a	larm	5								
					5	a	larm	6								
				,	7	a	larm	7								
				:	8	a	larm	8								
	buzzer_t	one:	()x00 ·	- 100	Hz, ()xFF	- 137	5 Hz	z (step-width = 5 Hz)						

Table 14: Buzzer Direct Access

Register Name	Register							I	Bit Po	ositio	n						
U U	Address	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
direct_value	104 0x0068								[0x0	0000]							
direct_value_config	105 0x0069	EN [0]	R [0]	R [0]	R [0]	R [0]	R [0]	R [0]	R [0]	R [0]	R [0]		u [0	nit x0]		e: [(хр)0]
	These reg set_points. Page 21.	These registers are used to display specific values instead of display_values of et_points. For an overview on how to setup the configuration please refer to Figure 6 of Page 21. direct_value: 16 bit signed integer to be displayed															or on
	direct_value: 16 bit signed integer to be displayed EN: direct value enable bit $(1 - \text{enabled}, 0 - \text{disabled})$																
	EN: direct value enable bit $(1 - \text{enabled}, 0 - \text{disabled})$																
	EN: direct value enable bit (1 – enabled, 0 – disabled) unit: defines a unit symbol to be displayed, following values are possible:																
	unit: defines a unit symbol to be displayed, following values are possible: 0x0 0x1 0x2 0x3 0x4 0x5 0x6 0x7 0x8 0x9 0xA 0xB ^{no} unit °C °F cfm l/s m ³ /h Pa inWC V % %RH ppm exp: exponent, defines the number of decimal places:																
			00) – no	o deci	imal p	point						_				
			01	L – or	ne deo	cimal	place	e					_				
			16	9 – tw	o deo	cimal	place	es	-				_				
			11	L – th	ree d	eciml	plac	es					_				
	If disauser_in	abled nterfa	, the ce_di	last rect_	viev acces	wed ss reg	value sister	wil at ado	l be derss	visit 101 (ole a Tabl	gain e 13	as on P	define age 2	ed w 6).	ith tl	he

Table 15: Direct Value

Register Name	Register	Bit Position												
	Address	15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0												
	112	system_time_0												
	0x0070	[0x0000]												
system_time	113	system_time_1												
	0x0071	[0x0000]												
	system_tin has to be i so it wou incremente intervals to register.	me represent a 32 bit timestamp in seconds since JAN-01-1970. The timestamp nitially set by the Modbus master because the device has no back-up battery and ald start at 0 (00:00:00 JAN-01-1970) after a reboot. The timestamp is ed by the L-STAT device but anyway it has to be set by the master at defined p prevent time offsets. The timestamp is compatible with the L-INX system time												

Table 16: System Time

Register Name	Register]	Bit Po	ositic	n							
	Address	15 1	4 13	1	12	11	10	9	8	7	6	5	4	3	2	1		0
	128	•		•			m	odbu	s_tin	ne_cl	eared	_0						
modbus_time_	0x0080								[0x0	0000]								
cleared	129						m	odbu	s_tin	ne_cl	eared	_1						
	0x0081								[0x0	0000]								
	130						n	nodb	us_rx	_pac	kets_	0						
modbus ry poskats	0x0082								[0x0	0000]								
moubus_1x_packets	131						n	nodb	us_rx	_pac	kets_	1						
	0x0083								[0x0	0000]								
	132							mod	bus_1	x_by	tes_0)						
modbus ry bytas	0x0084								[0x0	0000]								
moubus_tx_bytes	133	modbus_rx_bytes_1 [0x0000]																
	0x0085	modbus_rx_bytes_1 [0x0000]																
	134						n	nodb	us_tx	_pac	kets_	0						
modbus ty packats	0x0086								[0x0	0000]								
moubus_tx_packets	135						n	nodb	us_tx	_pac	kets_	1						
	0x0087								[0x0	0000]								
	136							mod	bus_t	x_by	tes_0)						
modbus ty bytes	0x0088								[0x0	0000]								
modous_tx_bytes	137							mod	bus_1	x_by	tes_1							
	0x0089								[0x0	0000]								
	138						mo	dbus	_tim	eout_	error	s_0						
modbus_timeout_	0x008A								[0x(0000]								
errors	139						mo	dbus	_tim	eout_	error	s_1						
	0x008B								[0x(0000]								
	140						mod	bus_	chec	ksum	_erro	ors_0						
modbus_checksum_	0x008C								[0x(0000]								
errors	141						mod	bus_	chec	ksum	_erro	rs_1						
	0x008D								[0x(0000]								
	modbus_t seconds si cleared by	ime_cle nce JAN the mas	eared_ N-01-1 ster de	<u>0</u> a 970 vice	and r that that	nod l t is s	bus_ et by	time the	_clea L-ST	red_ AT c	1 rep levice	e after	nt a 3 r the s	2 bit statis	time tics h	stai ave	mp be	in en
	All other v not permai	values a nently s	re 32 tored a	bit c at th	coun le L-	ters STA	incre T an	men d wil	ted b ll be l	y the lost a	L-ST fter a	rebo	device ot.	e. Th	ese v	alu	es a	ıre
	① The standard addres	atistics s 192 (s	can b ee Tal	e cl ble 2	leare 22 oi	d by n Pa	y sett ge 33	ing 1 5).	the N	1SC	bit at	t the	confi	g_fla	igs re	egis	ter	at

Table 17: Modbus Statistics

3.4.2 Device Settings

The device settings contain data to configure the device and the user interface. This registers are also accessible through the button interface in EDIT-mode for the system administrator. The data is stored persistently and will be preserved during power loss.

Register Name	Register							I	Bit Po	ositio	n						
C C	Address	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
modbus parameter	176	R	R	PA	١R	m	odbu	s_baı	ıd			C	levice	e_add	lr		
modous_parameter	0x00B0	[0]	[0]	[0x	(2]		[03	(6					[0x	01]			
	This regist	ter co	ntain	s the	confi	gurat	ion fo	or the	Mod	lbus j	port o	of the	LST.	AT d	evice	•	
		PAR	def:	ines t	he pa	arity ł	oit us	ed for	r Moo	dbus	comr	nunic	ation	. Val	id are	:	
		 0x0 - odd (odd parity bit, 1 stop bit) 0x1 - even (even parity bit, 1 stop bit) 0x2 - none (no parity bit, 2 stop bits) baud: defines the Modbus baudrate, following values are valid: 0x0 - 1200 															
	modbus_l																
			0x1	1 - 24	-00												
			0x2	2 - 48	600												
			0x3	3 – 96	600												
			0x4	4 – 19	200												
			0x5	5 – 38	400												
			0x6	5 – 57	600												
			0x7	7 – 11	5200)											
	device_	addr	def	ines t	he M	[odbu	s slav	ve ad	dress								
			Va	lid ad	dress	ses ar	e 1(0	x01)	to 24	7 (0x	F7).						
	Compa	re Ta	ble 5	on Pa	age 1	7 for	devi	ce set	tings	edita	ıble v	ia the	e user	inter	face.		

Table 18: Modbus Parameter

Register Name	Register							I	Bit Po	ositio	n						
0	Address	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
pincode_system_ administrator	177 0x00B1	R [0]	R R [0x0000] R R [0x0000]														
pincode_end_user	178 0x00B2	R [0]	[0] [0] [0x0000] R R [0x0000] [0] [0] [0x0000]														
	pincode_s 0000 the p pincode e	ysten incod	n_ad le is c iser (minis lisabl define	s trat o ed. P es the	or det ossib e pin	fines le val code	the pl ues a for t	incoc are 0(he en	le for)00 ((nd us	the s 0x000	ysten)0) to E set	n adm 9999 to 00	ninisti Ə (Ox2)00 tl	rator. 270F) ne pir	If set).	t to e is
	disabled. F	Possit	ole va	lues a	are 00	000 (0x00(00) to) 999	9 (0x	270F).		intor	face		
	U Compa	ie la	ule 3	OII Pa	age I	/ 101	uevi	e set	ungs	eulta	une v	ia the	e user	mter	race.		

Table 19: Pincodes

Register Name	Register		Bit Position 5 14 13 12 11 10 9 8 7 6 5 4 3 2 1 reserved $[0x00]$ $[0x64]$ $[0x64]$ reserved $[0x00]$ $[0x64]$ $[0x64]$ reserved color_brightness $[0x00]$ $[0x64]$ $[0x64]$ Icd_contrast Icd_brightness $[0x64]$ $[0x64]$ $[0x64]$ DAD GFV AF Time Date TF R R Icd_color_scheme $[0x0]$ [11] [11] [0] [11] [0] [0] $[0x0]$ ers are used to configure basic features of the display and the button interfs https://dots.colspan="2">Values for $0x00 - 0\%$ to $0x64 - 100\%$ are valid. https://dots.colspan="2">Values for $0x00 - 0\%$ to $0x64 - 100\%$ are valid. https://dots.colspan="2">Values for $0x00 - 0\%$ to $0x64 - 100\%$ are valid. httesets a predefined color setting, possible va													
Register Name	Address	15 14	13 12	11 1	0 9	8	7	6	5	4	3 2		1 0			
led color red	179		rese	rved					col	or_br	ightness					
	0x00B3		[0x	00]						[0x	.64]					
lcd_color_green	180 0x00P4		rese	rved					col	or_br	ightness					
	181		Tese	ooj rved					col	$\frac{10x}{0r}$ br	.04] ightness					
lcd_color_blue	0x00B5		[0x	00]					001	01_01 [0x	64]	•				
lcd_brightness_	182		lcd_co	ontrast					lc	d_brig	ghtness					
contrast	0x00B6		[0x	64]		1			1	[0x	64]					
user_interface_ settings	183 0x00B7	DAD [0x0]	O GFV] [1]	AF Ti [1] [me Date	TF [1]	R [0]	R [0]		lcd_	color_s [0x0]	cher	ne			
	These regi	sters are u	sed to cont	figure b	asic fea	tures	of th	e disp	olay a	nd the	e button	inte	erface.			
	color_br	ightness:	defines th $0x00 - 0$ %	e brigh 6 to 0x6	tness (64 – 10	ofas 0%ar	pecif e vali	ic bao id.	ckligl	nt col	lor. Val	ues	from			
	lcd_br	ightness:	defines th $0x00 - 0$ %	e overa 6 to 0x6	ll brig 4 – 10	htness 0% ar	s of t e vali	he LO id.	CD b	acklig	ght. Val	ues	from			
	lcd_o	contrast:	defines th 0x64 - 10	e contra 0% are	ist setti valid.	ng of	the I	LCD.	Valu	es fro	om 0x00	- 0)% to			
	lcd_color_	_scheme:	sets a prec	lefined	color s	etting	, poss	sible v	value	s are:						
			0x0 - uset 0x1 - whi 0x2 - red 0x3 - gree 0x4 - blue 0x5 - orat 0x6 - mag 0x7 - cya	r (as def te en e nge genta n	ined w	ith the	e abo	ve val	lues)							
		TF:	time form	at (0 – 1	12h, 1	- 24h))									
		Date:	show date	in seco	ndary	lispla	y (0 -	– off,	1 – o	n)						
		Time:	show time	in seco	ndary	displa	y (0 -	– off,	1 – c	on)						
		AF:	acoustic f	eedback	for to	ich bi	uttons	s (0 –	off, 2	1 – or	ı)					
		GFV:	goto first	value af	ter a de	efined	time	out of	f 1 m	inute	(0 – off	, 1 -	- on)			
		DAD:	display au defined va	to dim, dues:	dim di	splay	brigl	ntness	afte	r 2 mi	inutes to	o fol	lowing			
			0x0 - off 0x1 - 509 0x2 - 109 0x3 - 0% 0x4 - 0%	(disable 6 lcd_bi 6 lcd_bi 1cd_bri 1cd_bri 1cd_bri	d) rightne rightne ghtness ghtness	ss ss s (dep	endin	ng on o	occuj	pancy	sensor	*)				
0x4 – 0% lcd_brightness (depending on occupancy sensor *) * As long as occupancy is detected the LCD brightness will stay at 100%. After 2 minute it will be dimmed to 0%.													ninutes			
	① Comparing	re Table 5	on Page 1	7 for de	vice se	ttings	edita	able v	ia the	e user	interfac	e.				

Table 20: User Interface Settings

Register Name	Register							I	Bit Po	ositio	n						
U U	Address	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
occupancy_sensor_	184	EN	R	R	R	R	R	R	R			occu	ipanc	y_tin	neout		
config	0x00B8	[1]	[0]	[0]	[0]	[0]	[0]	[0]	[0]				[0x	0A]			
	With this r	registø y_ tin	 ster the function of occupancy sensor is enabled and controlled. imeout: defines a timeout in seconds when the state of the occupancy flag of the present state and short pressed register at address 0 and 1 will be cleared again after motion was detected. Please see Figure 7 for further information on operation. 														
	 Applies 	sonly	EN	the the Ta	cupan pres ble 7 Γ-801	ent se on Pa	ensor tate a age 2 Lx ar	enab and s 2 will nd LS	led, o hort l be s	only i press et.	f ena ed re -Gx-I	bled egiste	the c er at	occup addre	ancy ess 0	flag and	of 1,

Table 21: Occupancy Sensor Configuration

As depicted in Figure 7 the occupancy flag is set when motion is detected and will be cleared again after the occupancy_timeout has exceeded as defined at the occupancy_sensor_configuration register.



Figure 7: Occupancy Sensor Operation

3.4.3 Configuration Registers

The configuration registers contain data for configuring fundamental functions of the device as well as configurations for display values and set points. The data is stored persistent and will be preserved after reboot.

Register Name	Register							E	Bit Po	ositio	n						
	Address	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
config_flags	192 0x00C0	R [0]	R [0]	MSC [0]	IRCP [0]	D [0x	U (1]	М [02	U (1]	VIE [0]	VOL [1]	AIE [0]	AOL [0]	PESA [1]	PEEU [1]	SDE [0]	RST [0]
	RST:	reset <u></u>	_dev	ice fla	ıg, set	: to '1	' the	devid	ce wi	ll reb	oot						
	SDE:	the c 200 (ndary ontei (see]	-disp nt of Fable	lay_d the se 23 or	lirect <u></u> cond Page	_acce ary_o e 34)	ess_ei displa	nable iy_di	d flag rect_a	g, set acces	to ' s_str	1' the ing re	e dev egiste	ice d r at a	isplay ddres	7S SS
	PEEU:	pinco can b	ode_e oe edi	enable	ed_for y the	c_end end u	_use	r flag	, if s	et to	'1' th	ne pir	ncode	e for t	he er	nd use	er
	PESA:	pinco the e admi	ode_e end u nistra	enable user a ator	ed_for and t	:_syst he sy	tem_a ystem	admiı 1 adn	nistra ninist	tor fl rator	ag, if can	f set be	to ' 1 edited	the d by	pinco the	ode fo syster	or m
	AOL:	acou while	stic_a e the	alarm <u></u> devic	_when e is of	n_off ffline	line f	lag, i	f set	to '1 '	' a bu	zzer	tone	will t	e ger	ierate	ed
	AIE:	acou: gener	stic_a rated	alarm if an	_on_i interr	ntern nal er	al_er ror o	ror f	lag, d	if se	t to	'1' a	buz	zer to	one v	vill t	be
	VOL:	visual_alarm_when_offline flag, if set to '1' the offline text symbol (OFFLINE) will be displayed while the device is offline visual_alarm_on_internal_error flag, if set to '1' the alarm symbol (A) will be															ol
	VIE:	(OFFLINE) will be displayed while the device is offline visual_alarm_on_internal_error flag, if set to '1' the alarm symbol (\triangle) will be displayed if an internal error occured															be
	MU:	modł follo 0x0 - 0x1 - 0x2 -	ous_u wing - K - °C (- °F (unit, c value (SI) (US)	lefine es are	s whi possi	ich u ble:	nit sy	/stem	ı is u	sed fo	or va	lues	on M	lodbu	s. Tł	ie
	DU:	displ The f	ay_u follov	nit, de wing v	efines values	whic are p	ch un possi	it sys ble:	tem i	s use	d to c	lispla	ay va	lues c	on the	L-ST	ΓAT.
		0x0 - 0x1 - 0x2 -	- acc - °C (- °F (ess pr (SI) (US)	ohibi	ted vi	ia the	user	inter	face							
	IRCP:	ir_re	mote	_cont	rol_p	airing	g flag										
	MSC:	modł	ous_s	statisti	ics_cl	ear fl	ag										
	The dissetting setting	splay s (see via t	unit e Tał he us	syster ole 5 er int	m (D) an Pa erface	U) ca ige 17 e is pi	n als 7). If rohib	o be the v ited.	chang value	ged v is se	t to '	e use: 00' ti	r inte he ac	erface cess	in th of thi	e dev s dev	vice
	A cha registe to mat configu	nge i rs for ch th uratic	n the disp e sele	e disp blay v ected d Tab	olay u alues unit le 29	anit of at ad system on Pa	or se dress m. Pl age 4	nsor 256 ease 1 for	unit to 28 see 7 set p	syste 39 an Fable oint c	m wi d set 28 c config	ill ch poin on Pa gurati	ts at a lige 39	the addre 9 for	confi ss 32 displa	gurat 0 to 3 ay va	ion 351 lue

Table 22: Configuration Flags

Register Name	Register							E	Bit Po	ositio	n							
	Address	15	14	13	12	11	10	9	8	7	6	5		4	3	2	1	0
secondary display	200 0x00C8																	
direct_access_string	- 207 0x00CF		sec_display_direct_access_string															
	The string secondary	will be displayed with the $4x16$ segment digits of the display.																
	The string config_flag	; will gs reg	be gister	updat at ad	ed if	the 192	secor (Tabl	dary e 22	_disp at Pa	olay_o ge 33	direc 3) is :	t_ac set.	ce	ss_e	nable	d fla	g at	the
	Up to 1 termina second	6 AS ator ary d	SCII (0x00 ispla	chara)) ca y will	cter (n be worl	limite disp c as a	ed to layed ticke	chara . If r.	a st	fron ring	n Ox2 is lo	0 to	r 1	x5F than) incl 4 c	uding harac	a str ters	ing the

Table 23: Secondary Display Direct Access String

Register Name	Register							I	Bit Po	osition				
8	Address	15	14	13	12	11	10	9	8	7 6 5 4 3 2 1 0				
config_touch_	208	DA	ED	EU	DAD	DAU	MF	R	EN	set_point_index				
button_0	0x00D0	[1]	[0]	[1]	[0]	[1]	[0]	[0]	[1]	[0x00]				
config_touch_	209	DA	ED	EU	DAD	DAU	MF	R	EN	set_point_index				
button_1	0x00D1	[1]	[0]	[1]	[0]	[1]	[0]	[0]	[1]	[0x01]				
config_touch_	210	DA	ED	EU	DAD	DAU	MF	R	EN	set_point_index				
button_2	0x00D2	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[1]	[0x00]				
config_touch_	211	DA	ED	EU	DAD	DAU	MF	R	EN	set_point_index				
button_3	0x00D3	[0]	[0]	[0]	[0]	[0]	[1]	[0]	[1]	[0x00]				
config_touch_	212	DA	ED	EU	DAD	DAU	MF	R	EN	set_point_index				
button_4	0x00D4	[1]	[1]	[0]	[1]	[0]	[0]	[0]	[1]	[0x00]				
config_touch_	213	DA	ED	EU	DAD	DAU	MF	R	EN	set_point_index				
button_5	0x00D5	[1]	[1]	[0]	[1]	[0]	[0]	[0]	[1]	[0x01]				
config_touch_	set_point_index													
button_6	0x00D6	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[1]	[0x00]				
config_touch_	215	DA	ED	EU	DAD	DAU	MF	R	EN	set_point_index				
button_7	0x00D7	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[1]	[0x00]				
button_7 $0x00D7$ $[0]$ $[1]$ $[0x00]$ With these registers the functionality of the touch buttons is defined.														
	set_point	_inde	ex: d n	efine 10de	s a se if the	et poi DA l	nt reg oit is	gister set	that	can be edited in DIRECT_ACCESS-				
		E	N: if	set t	io '1'	the d	lefine	d but	ton is	s enabled and its state will be updated				
			11 0	n ne n Pag	prese ge 22	nt sta	ite, sr	iort p	resse	a and long pressed register at Table /				
		Μ	F: if	set t	o '1'	the b	utton	is de	fined	as MENU-button				
		DA	U: if ir	set t DIF	o '1' RECT	the b	utton CESS	is de	fined le	as UP-button				
		DA	D: if	set t	o '1'	the b	utton	is de	fined	as DOWN-button in				
			D	IRE	CT_A	CCE	SS-n	node						
		E	U: if	set t	o '1'	the b	utton	is de	fined	as UP-button in EDIT-mode				
		E	D: if	set t	o '1'	the b	utton	is de	fined	as DOWN-button in EDIT-mode				
		D.	A: if se	set et_po	to '1 ' oint_i	' and ndex	the will b	butto be dis	n get playe	s pressed a set point defined by the ed in DIRECT_ACCESS-mode				
	See Tat	ole 26	6 on F	Page	37 foi	r exai	nple	confi	gurat	ions.				

Table 24: Touch Button Configuration

Register Name	Register							I	Bit Po	ition						
U	Address	15	14	13	12	11	10	9	8	7 6 5	4	3	2	1		0
config_external_	224	DA	ED	EU	DAD	DAU	MF	R	EN	S	et_poi	nt_in	dex			
0	0x00E0	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[1]		[02	x00]				
config_external_	225	DA	ED	EU	DAD	DAU	MF	R	EN	S	et_poi	nt_in	dex			
button_1	0x00E1	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[1]		[02	x00]				
config_external_	226	DA	ED	EU	DAD	DAU	MF	R	EN	S	et_poi	nt_in	dex			
button_2	0x00E2	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[1]		[02	x00]				
config_external_	227	DA	ED	EU	DAD	DAU	MF	R	EN	S	et_poi	nt_in	dex			
button_3	0x00E3	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[1]		[02	x00]				
	With these	regis	sters (he fu	inctio	nality	v of th	ne ext	ternal	outtons is de	fined.					
	set_point	t_point_index: defines a set point register that can be edited in DIRECT_ACCESS mode if the DA bit is setEN: if set to '1' the defined button is enabled and its state will be update														
		 Endex. defines a set point register that can be edited in DIRECT_ACCESS mode if the DA bit is set EN: if set to '1' the defined button is enabled and its state will be update in the present state, short pressed and long pressed register at Table on Page 22 														
		Μ	F: if	set t	o '1'	the bu	utton	is de	fined	s MENU-bu	tton					
		DA	U: if ir	set t DIF	o '1' RECT	the bi _AC	utton CESS	is de -moc	fined le	s UP-button						
		DA	D: if D	set t SIRE	o '1' CT_A	the bu	utton SS-m	is dei 10de	fined	s DOWN-bı	tton i	1				
		E	U: if	set t	o '1'	the bu	utton	is de	fined	s UP-button	in ED	IT-n	ıode			
		E	D: if	set t	o '1'	the bu	utton	is de	fined	s DOWN-bu	tton i	n ED	IT-n	ıode		
		D.	A: if	set set_po	to '1 ' oint_ii	and	the will b	outto e dis	n get playe	pressed a s	et poi _ACC	nt de ESS	fine -moc	d by le	the	;
	See Tat	ole 26	5 on F	Page	37 foi	r exar	nple	confi	gurat	ons.						

Table 25: External Button Configuration

Description							I	Bit Po	ositio	n						
L	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
no special function	0	0	0	0	0	0	0	1				(C			
the button point index	n is e x has	enable no in	ed bu Ifluen	t has ce in	no s this o	specia case.	ıl fur	nction	ı (e.g	. OC	CUP.	ANC	Y-bu	tton).	The	e set
MENU-button 0 0 0 0 1 0 M This combination can be used to determine the MENU-button. The set point index has no																
MENU-button 0 0 0 0 1 0 1 0 This combination can be used to determine the MENU-button. The set point index has no influence in this case. IIIIn this case. IIIIIn this case. IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII																
UP-button	0	0	1	0	1	0	0	1				(0			
$\mathfrak{P}_{pressed. T}$	on wi he se	ill in t poir	crem nt ind	ent a ex ha	s set	poin influe	t in ince i	EDI' n this	Г- or s case	DIF	RECT	_AC	CESS	S-mo	le w	hen
DOWN-button with direct access	1	1	0	1	0	0	0	1				(C			
This buttor pressed. A pressed an	on wi Additi d can	ill de ionall i be e	ecrem y a dited	ent a setpo in D	a set oint c IREC	poin lefine T_A	t in d wi CCES	EDI th th SS-m	Γ- or ne se ode.	DIF t_poi	RECT nt_in	'_AC dex i	CESS is dis	S-mo splaye	ie w ed w	/hen /hen

Table 26: Button Example Configuration

Register Name	Register							ł	Bit Po	ositio	n						
Ũ	Address	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
config_bar_	240	R	R	R	R	R	R	R	EN			set	_poir	nt_inc	lex		
graph_left	0x00F0	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]				[0x	[00]			
config_bar_	241	R	R	R	R	R	R	R	EN			set	_poir	nt_inc	lex		
graph_right	0x00F1	[0] [0] [0] [0] [0] [1] [0x01]															
	graph_right0x00F1[0][0][0][0][0][0][1][0x01]These registers are used to associate a set point as source for the bar graph on the left and on the right side of the LCD. If enabled the bar graph is updated corresponding to the value of the set point defined with the set_point_index. The bar graph segments can also be set manually by writing the symbol_direct_access registers at address 99 and 100 (Table 12 on Page 26).																
	set_point_	_inde	x: d	efine	s a se	t poiı	nt reg	ister	that i	s use	d as s	ource	e for t	he ba	ır gra	ph	
		E	N: if tł	f set t ne val	to '1' lue of	the c a set	corres poin	pond t witł	ing b	ar-gr defin	aph v ed se	will b t_poi	e upo nt_in	lated dex	to vi	sualiz	ze

Table 27: Bar Graph Configuration

Register Name	Register	15 14 13 1 unit_modbus [0x1]					В	it Po	sition								
8	Address	15 14 13 unit_modbus [0x1] VSA VEU DSSA			12	11	10	9	8	7	6	5	4	3	2	1	0
config_display_	256 0x0100	τ	init_n [02	10dbus x1]	5		unit_ [03	_lstat (1]		CAL [1]		S	emant [tic_m 0x01	eanir]	ıg	
value_0	257 0x0101	VSA [1]	VEU [1]	DSSA [1]	DSEU [1]		[0]		<u>کر</u> 101	6 [0]	N	33	<u>∭</u> [0]	₩ [0]] [0]	1	•• ■•
	258	ι	init_n	nodbus	5	1.1	unit_	lstat		CAL		S	emant	tic_m	eanir	ıg	
config_display_	0x0102		[0x	A]	1	0	[0x	[A]	• ^	[1]			[0x04]	0.	*
value_1	259 0x0103	VSA [1]	VEU [1]	DSSA [1]	DSEU [1]				<u>О</u>		M	5	<u> </u>		[0]	••	I+
	260		init_n	nodbus	5	[0]	unit_	lstat	[0]	CAL	[0]	[0] St	emant	tic_m	eanir	Ig	[0]
config_display_	0x0104		[02	x1]	T		[02	(1]		[1]			[0x05]		
value_2	261 0x0105	VSA [1]	VEU [1]	DSSA [1]	DSEU [1]		[0]	¥ [0]	<u>کر</u> 101		M	55 [0]	<u> </u>	口 [0]] [0]	1	⊪+ [0]
	262	υ	init_n	nodbus	5		unit_	lstat		CAL		S	emant	tic_m	eanir	ıg	
config_display_	0x0106		[03	KB]	1	0	[0x	B]		[1]			[0x07]		
value_3 *	263 0x0107	VSA [1]	VEU [1]	DSSA [1]	DSEU [1]				Ю [0]	0	F01	55	<u> </u>	тол ГОЛ	[0]	* •	[0]
	264	ι	init_n	nodbus		[0]	unit_	lstat	[v]	CAL	[0]	[0] Se	emant	tic_m	eanir	lg	[0]
config_display_	0x0108		[02	x8]			[02	(8]		[1]			[0x0E]	<u> </u>	
value_4	265	VSA	VEU	DSSA	DSEU	\bigcap		Ŷ	Ó.	۵	H	5	<u> </u>	*			 +
	0x0109 266	[1]	nit n	nodbus	[1]	[0]	[0] unit	[0] İstat	[0]		[0]	[0]	[[0] •mant	[0] tic m	[0] eanir	[0] 10	[0]
config_display_	0x010A	[0x1] VSA VEU DSSA D [1] [1] [1]					[02	<u>(13</u>		[1]		5]	0x03]	5	
value_5	267	VSA	DSEU	\square		\bigcirc	Ó.	۵	I	5	<u> </u>	*		-	#+		
	0x010B	VSA VEU DSSA DS [1] [1] [1] [1] [unit_modbus [0x0]				[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[1]	[0]	[0]
config display	268 0x010C	ι	5		unit_	$\frac{1}{2}$ Istat		CAL [0]		S	emant	10 m	eanır 1	ıg			
value_6	269	[1] [1] [1] [1] unit_modbus [0x0] VSA VEU DSSA DSE [0] [0] [0] [0]				Ω		Ω	$\mathbf{\mathcal{V}}$	4	H	S		*	\mathbb{N}		₩ + <u>)</u>
	0x010D	Unit_induction [0x0] VSA VEU DSSA DSSA [0] [0] [0] [0] [0]				[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	т [0]	[0]	[0]	[0]
c. 1. 1	270	υ	init_n	nodbus	5		unit_	lstat		CAL		S	emant	tic_m	eanir	ıg	
config_display_	0x010E 271	VSA			DCEU	\cap		$\left[\begin{array}{c} 0 \end{array} \right]$	\mathbf{N}		1	(A)	(((0x00	10		in-0
value_/	0x010F	[0]	[0]	[0]	[0]	[0]	[0]	¥ [0]	0, [0]	[0]	[0]	(0]	<u>m</u> [0]	*** [0]	[0]	[0]	[0]
	272	υ	init_n	nodbus	5		unit_	lstat		CAL		S	emant	tic_m	eanir	ıg	
config_display_	0x0110		[02	x0]		\cap	[0]	(0)	•	[0]		4.	[0x00		01	
value_8	273 0x0111	VSA [0]	VEU [0]	DSSA [0]	DSEU [0]		[0]	.¥ [0]	ГОТ	() [0]	M	35	<u>)))</u> [0]	私 [0]	ĕ [0]	* 8 [0]	[0]
	274		init_n	nodbus	5	[0]	unit_	lstat	[0]	CAL	[0]	[0] Se	emant	tic_m	eanir	Ig	[0]
config_display_	0x0112		[02	x0]			[02	(0]	4	[0]			[0x00]	-	
value_9	275	VSA [0]	VEU [0]	DSSA [0]	DSEU [0]	$\prod_{i=1}^{n}$		↓ ↓	٦Ó.		•	5	<u> </u>	**			+
	276	ι• <u>ι</u> ι	init n	nodbus	[0]	[0]	unit	lstat	[0]		[0]	[0] Se	emant	tic m	eanir	[0] 19	[0]
config_display_	0x0114	-	[02	x0]			[02	k0]		[0]			[0x00]	0	
value_10	277 0::0115	VSA	VEU	DSSA	DSEU	$\bigcap_{i=1}^{n}$			Ś.		I	5	<u> </u>	1 1 1			-
	278	[0]	init n	nodbus	[0]	[0]	unit	[0] İstat	[0]		[0]	[0] Sf	[[0] emant	tic m	[0] eanir	[0] 19	[0]
config_display_	0x0116	unit_modbus [0x0]					[03	<u>(0</u>		[0]		5]	0x00]	5	
value_11	279	VSA VEU DSSA D			DSEU	\bigcap		Ţ	Ś,	4	I	55	<u> </u>	₩		-	 +
	0x0117	[0] [0] [0] [0] [0]			[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
config display	280 0x0118		uut_n [0]	10abus x01	,		unit_ [0y	_istat x01		[0]		S	inani I	0×00^{-10}	eamr]	ıg	
value_12	281	VSA	VEU	DSSA	DSEU	\bigcap			۵.	۵	H	5		*			1 -1
	0x0119	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
contig_display_ value_13	282 0x011A	τ	init_n [0]	10dbus x01	5		unit_	_Istat		CAL [0]		S	emant I	10^{10}m	eanir 1	ıg	

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Register Name	Register Address							B	it Po	sition							
	283 0x011B	VSA [0]	VEU [0]	DSSA [0]	DSEU [0]		[0]		<u>کر</u>	6	F01	5	<u>∭</u> [0]	‡‡ [0]	[0]		**
	284	u	nit n	nodbus	3	[U]	unit	lstat	[0]	CAL	[0]	se	man	tic m	eanir	ng	[0]
config_display_	0x011C		[0:	x0]	-		[02	x0]		[0]]	0x00]	-0	
value_14	285 0x011D	VSA [0]	VEU [0]	DSSA [0]	DSEU [0]				<u>کر</u>			\$	<u>(((</u>	₩			**
	286	u	nit n	nodbus	3	[U]	unit	lstat	[U]	CAL	[U]	se	man	tic m	eanir	ig	[0]
config_display_	0x011E		[0:	x0]			[0]	- (0]		[0]			[0x00]	U	
value_15	287	VSA	VEU	DSSA	DSEU	\square		\bigcirc	Ò.	۵	M	5	<u> </u>	\$‡		-	*
	0x011F	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
	These regis	sters h	old th	ne conf	figura	tion	of the	16 d	ispla	y valu	ies.						
	semantic_1	meani	ng: i	is used source Page 4	l to p of th 2.	rović ie val	le inf lue. F	orma or fu	tion a rther	about infor	the s matic	eman on ple	itic n ase s	neanii see Ta	ng an able 3	d the 30 on	
		CA	AL: i	if set CALII '1')	to " BRAT	1' th FION	e con -mod	rrespo e (on	ondin ly ca	ng off apable	e if D	value SEU	can or E	be e DSSA	editec is se	l in et to	
	u	nit_ls	tat:	defines on the	s a ur LCD	nit wi	th wł	nich t	he co	orresp	ondir	ng dis	play	value	e app	ears	
	unit_	on the LCD nit_modbus: defines a unit that the corresponding display value register appeare on Modbus both, unit_lstat and unit_modbus the following values are possible: 0x1 0x2 0x3 0x4 0x5 0x6 0x7 0x8 0x9 0xA 0xB															
	① For both	, unit <u></u>	it_lstat and unit_modbus the following values are possible: 0x2 0x3 0x4 0x5 0x6 0x7 0x8 0x9 0xA 0xB														
	0x0 0x1	0x2	it_lstat and unit_modbus the following values are possible: 0x2 0x3 0x4 0x5 0x6 0x7 0x8 0x9 0xA 0xB														
	no °C unit	°F	cf	m l	/s r	n³/h	Pa	inW	VC	V	%	%RI	H pp	m			
	Bits 0-11 d displayed a	of the long v	highe with ti	er addi he cori	ress o respo	of eac nding	ch co g disp	nfigu lay va	ratioı alue.	n regi	ster i	ndica	te th	e syn	nbols	that	are
		DSI	EU: (display	y soui	ce fo	or end	user									
		DS	SA:	diplay	sourc	ce for	syste	em ad	mini	strato	r						
	These two 64 to 79 (s Table 10 or	bits d ee Ta n Page	efine ble 1 e 24).	if the 1 on P The fe	value age 2 ollow	disp 25) or ing s	layed r fron tates	is tal 1 a se are va	ken f nsor <u></u> alid:	rom a value	ı disp e regi	lay_v ister a	value at ado	regis lress	ter at 48 to	addr 56 (ess see
	0 – defin modb	es tha	at the	value	is ta	ıken	from	a dis	splay	_value	e reg	ister	that	has to	o be	set v	ia
	1 – defin auton	es tha	at the lly up	value dated	is ta with t	aken the cu	from irrent	a sei sens	nsor_ or va	_value lue	e (+ 0	offset	_valı	ue) re	giste	r tha	t is
		v	VEU:	visib	le for	end	user										
			VSA:	visib	le for	syste	em ad	minis	strate	or							
	These two administrat	bits de or. If	efine i set to	if the c '1' the	lispla e valu	y val ie wil	ue is 1 be v	visibl visible	le for e.	the e	nd us	er an	d/or	the sy	stem		
	See Tab	le 31	on Pa	ige 43	for e	xamp	le co	nfiguı	ratior	ns of c	lispla	ıy val	ues o	r set	point	s.	
	* Please n for LST this regis	ote th AT-80 ster are	nat co)2-Gx e set t	nfig_d -Lx de to '0' .	lispla evice	y_val s for	lue_3 displ	regis aying	ster i the	s only actual	/ con 1 CO	figure 2 leve	ed as el. Ot	abov herw	ve per ise al	r defa Il bits	ult of

Table 28: Display Value Configuration

Register Name	Register	15 14 13 1 unit_modbus					E	Bit Po	ositior	1							
Register Ivanie	Address	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
	320	u	nit_m	odbu	S		unit_	_lstat		PIN		S	eman	tic_m	eanin	g	
config_set_	0x0140		[0x	1]	1	\cap	[0]	x1]	• ^	[0]			[0x01		0.	* 0
point_0	321 0x0141	VSA [1]	VEU [1]	ESA [1]	EEU [1]				Ю. [0]	()	F01		<u>}))</u> [0]	私 [0]	[4	•• •	<u> +8</u> [1]
	322	u	nit m	odbu	s	[0]	unit	lstat	[0]	PIN	[0]	S	eman	tic m	eanin	g	[1]
config_set_	0x0142		[0x	0]			[0]	x0]		[0]			[0x0B]	0	
point _1	323	VSA	VEU	ESA	EEU	\square		\bigcirc	0	۵	M	55	<u> </u>	\$‡		-	#+ 8
	0x0143	[1]	[1]	[1]	[1]	[0]	[0]	[0]	[0]	[0]	[0]	[1]	[0]	[0]	[0]	[0]	[0]
config set	324 0x0144	u	nit_m 0x	oabu: 01	S		unit_	_Istat		PIN [0]		Se	eman I	10 m	eanin 1	g	
point 2	325	VSA	VEU	ESA	EEU	Ω		\bigcirc	\mathbf{N}		M	50	۱ ۱	tt	\mathbb{N}	- I	∳ + <u>)</u>
r * -	0x0145	[0]	[0]	[0]	[0]	[0]	[0]	₽ [0]	[0]	[0]	[0]	[0]	[0]	٦ <u>×</u> ٦ [0]	[0]	[0]	[0]
	326	u	nit_m	odbu	s		unit_	lstat		PIN		se	eman	tic_m	eanin	g	
config_set_	0x0146		[0x	0]		0	[0]	x0]	. ^	[0]			[0x00]		
point _3	327	VSA [0]	VEU [0]	ESA 101	EEU 101	<u> </u>		¥	Ň,			5	<u> </u>	*		*	**
	328	10]	nit m	odbu	[U]	[0]	unit	[0] İstat	[0]	[0] DIN	[0]	[0] Sf	[0] emani	tic m	[0] eanin	[0] σ	[0]
config set	0x0148	u	<u>[</u> 0x	0100 0]	5		[0]	_13tat		[0]]	$0 \times 00^{\circ}$]	5	
point _4	329	VSA	VEU	ESA	EEU	\square		Ŷ	٦.	۵	M	5		*			1 +
	0x0149	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
C	330	u	nit_m	odbu:	S		unit	_lstat		PIN		S	eman	tic_m	eanin	g	
config_set_	0X014A 331	VCA			EEU	\cap			\mathbf{N}			(•)		0X00	Ì ∩ I		in0
point _5	0x014B	[0]	[0]	ESA [0]	[0]	101	[0]	¥ [0]	0, [0]	• [0]	[0]	••• [0]	<u>)))</u> [0]	* * * [0]	● [0]	-• [0]	[0]
	332	u	nit_m	odbu	s	[~]	unit_	lstat	[~]	PIN	r	S	eman	tic_m	eanin	g	<u> </u>
config_set_	0x014C		[0x	0]	T		[0]	x0]		[0]		_	[0x00]		
point _6	333 0x014D	VSA [0]	VEU [0]	ESA [0]	EEU [0]	$\prod_{i=1}^{n}$		¥ [0]	٦Ó.			5	<u> </u>	₩ 101		F01	**
	334	10]	nit m	odbu	S I I	[0]	unit	lstat	[0]	[0] PIN	[0]	[U] St	emant	tic m	eanin	[0] σ	[0]
config_set_	0x014E		[0x	0]			[0]	x0]		[0]]	0x00]	8	
point _7	335	VSA	VEU	ESA	EEU	\square		\bigcirc	Ó.	۵	ľ	5	<u> </u>			-	#+ 8
	0x014F	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
config sot	336 0x0150	u	nıt_m	odbu:	S		unit	_lstat		PIN [0]		S	eman	t_{0}	eanın 1	g	
point 8	337	VSA	VELL	U] ESA	FEU	\cap		Ω	\mathbf{N}		ы	5	<u>ا</u>	0X00		.	m.
Pome To	0x0151	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	∿ [0]	[0]	•	[0]
	338	u	nit_m	odbu	s		unit	lstat		PIN		S	eman	tic_m	eanin	g	
config_set_	0x0152		[0x	0]	1	0	[0]	x0]	Å	[0]		•-	[0x00]		
point _9	339 0::01 5 2	VSA [0]	VEU [0]	ESA [0]	EEU	$\prod_{i=1}^{n}$		¥	Ň.			5	<u> </u>	*		-	**
	340	10]	nit m	odbu	[U]	[0]	unit	[0] İstat	[0]	[0] DIN	[0]	[0] Sf	[0] emani	tic m	[0] eanin	[0] σ	[0]
config set	0x0154	u	m_m [0x	01 01	3		[0]	_1stat x0]		[0]		30	[]]	$0 \times 00^{\circ}$]	5	
point _10	341	VSA	VEU	ESA	EEU	\square		\square	۵.	۵	M	5		*			#+
	0x0155	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]
con Cine de	342	[0] [0] [0] [0] unit_modbus					unit	_lstat		PIN		S	eman	tic_m	eanin	g	
config_set_	0x0156	VCA			PPU	\cap			\mathbf{v}			•		0x00	<u>Pn</u>	01	a n
point _11	0x0157	VSA [0]	[0]	ESA [0]	EEU [0]	ليل [0]	[0]	¥ [0]	О, [0]	() [0]	[0]	U	<u>)))</u> [0]	¥ہ¥ 101	ĕ [0]	° 8 [0]	[0]
	344	u	nit_m	odbu	S	[0]	unit	lstat	[0]	PIN	[0]	<u> </u>	eman	tic_m	eanin	g	[0]
config_set_	0x0158		[0x	0]			[0]	x0]		[0]			[0x00]	-	
point _12	345	VSA	VEU	ESA	EEU	\bigcap		\bigcirc	Ó.	٥	H	55	<u> </u>	\$‡		-	#+8
	0x0159	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]	[0]

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Register Name	Register Address		Bit Position														
config at	346	u	nit_m	odbu	s		unit_	lstat		PIN		se	eman	tic_m	eanir	ıg	
point _13	347 0x015B	VSA [0]	UXU [0]	<u>J]</u> ESA [0]	EEU [0]				<u>کر</u> [0]		► 1	SS [0]	<u> </u>			I 01	*- [0]
config_set_	348 0x015C	u	nit_mo [0x(odbu: D]	s	[•]	unit_ [02	_lstat (0]	[•]	PIN [0]	[•]	se	eman	tic_m [0x00	eanir	ng	1.01
point _14	349 0x015D	VSA [0]	VEU [0]	ESA [0]	EEU [0]	(0)	[0]	[0]	کر [0]	(0]	► [0]	\$ [0]	<u>∭</u> [0]	\‡ [0]	[0]	[0]	••• [0]
config_set_	350 0x015E	u	nit_mo [0x0]	odbu: D]	S		unit_ [02	_lstat x0]		PIN [0]		se	eman 	tic_m [0x00	eanir]	ıg	
point _15	351 0x015F	VSA [0]	VEU [0]	ESA [0]	EEU [0]	 [0]	[0]	₽ [0]	کر [0]	(0]	► [0]	\$ [0]	<u>()</u> [0]	‡‡ [0]	[0]	[0]	••• [0]
	These regis	ters h	old the	e con	figur	ation	for th	ne 16	set p	oint.							
semantic_meaning: is used to provide information about the semantic meaning of the set point. For further information please see Table 30 on Page 42.																	
PIN: if set to '1' the the corresponding set point is pincode protected and can only be changed in EDIT-mode if the correct pincode has been entered before.																	
unit_lstat: defines a unit with which the corresponding set point appears on the LCD																	
	unit_	modb	ous: d N	efine Iodb	es a i us	unit tl	hat th	ne co	rresp	ondin	g set	poin	t reg	ister	appea	ars of	1
	 For both 	, unit_	_lstat a	and u	nit_r	nodbı	is the	follo	wing	value	es are	possi	ible:				
	0x0 0x1 ^{no} °C unit	0x2 °F	2 0x cfr	3 0 n 1)x4 l/s	0x5 m³/h	0x6 Pa	07 inV	k7 VC	0x8 V	0x9 %	0xA %Rl	х 02 Н рр	xB om			
	Bits 0-11 c displayed a	of the long v	highe vith th	r add e cor	lress resp	of ea	ch cơ g disj	onfigu play v	uratio value.	n reg	ister	indica	ate th	ne syr	nbols	that	are
		EI	EU: e	ditab	le fo	r end	user										
		E	SA: e	ditab	le fo	r syste	em ac	lmini	strato	or							
	These two administrate	bits or. Th	define e follo	if wing	the s g stat	set po es are	oint valio	is ed 1:	itable	e for	the	end u	user	and/c	or the	e sys	tem
	0 – define	es that	the se	et poi	int is	<u>not</u> e	ditab	le									
	1 – define	es that	the se	et poi	int is	edita	ble										
		1	VEU:	visil	ble fo	or end	user										
			VSA:	visil	ble fo	or sys	tem a	dmin	istrat	or							
	These two l If set to '1'	oits de the se	efine if t poin	f the t will	set p l be v	oint is visible	s visil	ole fo	r the	end u	iser a	nd/or	the s	ystem	ı adm	inistr	ator.
	See Tab.	le 31 o	on Pag	ge 43	for e	examp	ole co	nfigu	ratio	ns of	displa	ay val	ues o	or set	point	s.	

Table 29: Set Point Configuration

Table 30 below shows possible values for the semantic meaning used in the configuration for display values (Table 28 on Page 39) and set points (Table 29 on Page 41). Primarily the semantic meaning field defines a text that is displayed along with a display value or a set point. Additionally for display values it defines the internal sensor_value that is displayed when the DSEU or DSSA bit is set. For examples on how to use the semantic meaning field in the configuration registers please see Table 31 at Page 43 for example configurations.

Semantic Meaning Value	Description	Secondary Display Text
0x00	None (unconfigured)	
0x01	Internal Temperature abs.	R D D M
0x02	Internal Temperature rel.	ΔSPT
0x03	External Temperature	DUT
0x04	Relative Humidity	HUM
0x05	Dew Point	D E W
0x06	Luminance (lx)	LUX
0x07	Amount CO ₂	C O 2
0x08	Differential Pressure	P R E S
0x09	Flow	FLOW
0x0A	Valve Position	VALV
0x0B	Fan Stage	FAN
0x0C	Heat/Cool Stage	H&C
0x0D	Brightness (%)	B R %
0x0E	Supply Voltage	2 4 V
0x0F	CPU voltage	СРИ
0x10	CPU temperature	СРИ
0x11	Room ID	ROOM
0x12	Damper Position (%)	D A M P
0x13	Reheat (%)	HEAT
0x14	Discharge Temperature	DIS

Table 30: Semantic Meaning

Description							E	Bit Po	ositio	n						
L	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
config_display_value_x		0x	1			0x	1		1				0x01			
(from built in sensor)	1	1	1	1	0	0	0	0	0	0	0	0	0	0	1	0
	The temp adm	value peratu inistra	of three synthesis of the off the second sec	he bu ymbo See t	ilt in l in he fo	temp °C. 1 llowin	eratu t wil ng ex	ire se ll be ampl	nsor visil e for	will b ble fo how	be distor the d	playe e enc isplay	ed wit 1 use y wou	th the r and ild lo	inter systok ok lik	mal tem te:
Ψ,																
config_display_value_x		0x/	A			0x	А		0				0x04			
(value supplied over Modbus)	1	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Ę	and disp syste look	DSS lay_va em ad t like:	SA alue_ mini		is is ster w or. Se J. 4	set f vill be ee the HUN % RF	disp foll	0' t ilayec owin	he l. It v g exa	conte vill b ample	nt o e visi e for	of the form	he cor the cor the cor	end end lispla	pond user : y wo	ling and uld
config_set_point_x		0x	1			0x	:1		1				0x02			
relative temperature	1	1	1	1	0	0	0	0	0	0	0	0	0	0	1	1
μ	This temp set p follo	s is an peratur point i powing	n exa re sy is pin exar	amplo moode nple	e of l as v e pro for ho	a relativell a tected ow the $\Delta = F$	ative s the also e disp	temp arro the play v	veratu w sy key s would	ure so mbol symbo l look	et po will ol wi t like:	int ir be di ll be	n °C. isplay displ	The ved. S ayed.	inter ince See	nal the the

Table 31: Display Value and Set Point Example Configuration

Register Name	Register	Bit Position
8	Address	15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0
set_point_0	384 0x0180	[0x00DC]
set_point_1	385 0x0181	[0x0000]
set_point_2	386 0x0182	[0x0000]
set_point_3	387 0x0183	[0x0000]
set_point_4	388 0x0184	[0x0000]
set_point_5	389 0x0185	[0x0000]
set_point_6	390 0x0186	[0x0000]
set_point_7	391 0x0187	[0x0000]
set_point_8	392 0x0188	[0x0000]
set_point_9	393 0x0189	[0x0000]
set_point_10	394 0x018A	[0x0000]
set_point_11	395 0x018B	[0x0000]
set_point_12	396 0x018C	[0x0000]
set_point_13	397 0x018D	[0x0000]
set_point_14	398 0x018E	[0x0000]
set_point_15	399 0x018F	[0x0000]
	These regi	sters contain the values of up to 16 set points.

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All registers are 16 Bit signed values. Depending on the modbus_unit specified with the corresponding set point configuration register at address 320 to 351 (Table 29 at Page 41) the value needs to be scaled as described in Table 39 at Page 52 to achieve the desired result.

Table 32: Set Points

Register Name	Register	Bit Position
	Address	15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0
set point max 0	416	[0x012C]
	0x01A0	
set point max 1	417	[0x0003]
	0x01A1	[· · · · ·]
set point max 2	418	[0x0000]
	0x01A2	
set_point_max_3	419	[0x0000]
	0X01A5	
set_point_max_4	420	[0x0000]
	421	
set_point_max_5	421 0x01A5	[0x0000]
	422	
set_point_max_6	0x01A6	[0x0000]
	423	
set_point_max_7	0x01A7	[0x0000]
	424	[0,000]
set_point_max_8	0x01A8	[UXUUUU]
sat point may 0	425	[0v0000]
set_point_max_9	0x01A9	[0x0000]
set point may 10	426	[00000]
set_point_max_10	0x01AA	
set point max 11	427	[0x0000]
set_point_inttx_iii	0x01AB	[0,0000]
set point max 12	428	[0x0000]
~F ~	0x01AC	[]
set point max 13	429	[0x0000]
	0x01AD	
set_point_max_14	430 0::01 A E	[0x0000]
_	121	
set_point_max_15	431 0x01AF	[0x0000]
	UXUIAI	
	These reg	gisters are used to allow set point changes for the end user or system
	administra	tor only within limits defined with a set_point_max value of this Table and a
	set_point_	min value of Table 34.
	All register	are are 16 Pit signed values. Depending on the modeus unit exception with the
	correspond	ding set point configuration register at address 320 to 351 (Table 20 at Page 41)
	conceptin	and set point configuration register at address 520 to 551 (14010 29 at 1 age 41)

Table 33: Set Point max. Values

the value needs to be scaled as described in Table 39 at Page 52 to achieve the desired

result.

Register Name	Register	Bit Position
Register Hume	Address	15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0
set_point_min_0	448 0x01C0	[0x0096]
set_point_min_1	449 0x01C1	[0x0000]
set_point_min_2	450 0x01C2	[0x0000]
set_point_min_3	451 0x01C3	[0x0000]
set_point_min_4	452 0x01C4	[0x0000]
set_point_min_5	453 0x01C5	[0x0000]
set_point_min_6	454 0x01C6	[0x0000]
set_point_min_7	455 0x01C7	[0x0000]
set_point_min_8	456 0x01C8	[0x0000]
set_point_min_9	457 0x01C9	[0x0000]
set_point_min_10	458 0x01CA	[0x0000]
set_point_min_11	459 0x01CB	[0x0000]
set_point_min_12	460 0x01CC	[0x0000]
set_point_min_13	461 0x01CD	[0x0000]
set_point_min_14	462 0x01CE	[0x0000]
set_point_min_15	463 0x01CF	[0x0000]
	701	

These registers are used to allow set point changes for the end user or system administrator only within limits defined with a set_point_max value of Table 33 and a set_point_min value of this Table.

All registers are 16 Bit signed values. Depending on the modbus_unit specified with the corresponding set point configuration register at address 320 to 351 (Table 29 at Page 41) the value needs to be scaled as described in Table 39 at Page 52 to achieve the desired result.

Table 34: Set Point min. Values

Register Name	Register	Bit Position
8	Address	15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0
offset_value_0	480 0x01E0	[0x0000]
offset_value_1	481 0x01E1	[0x0000]
offset_value_2	482 0x01E2	[0x0000]
offset_value_3	483 0x01E3	[0x0000]
offset_value_4	484 0x01E4	[0x0000]
offset_value_5	485 0x01E5	[0x0000]
offset_value_6	486 0x01E6	[0x0000]
offset_value_7	487 0x01E7	[0x0000]
offset_value_8	488 0x01E8	[0x0000]
offset_value_9	489 0x01E9	[0x0000]
offset_value_10	490 0x01EA	[0x0000]
offset_value_11	491 0x01EB	[0x0000]
offset_value_12	492 0x01EC	[0x0000]
offset_value_13	493 0x01ED	[0x0000]
offset_value_14	494 0x01EE	[0x0000]
offset_value_15	495 0x01EF	[0x0000]
	These regi a built in CALIBRA	isters are used to define offsets for display values when displaying a value from sensor. These registers can either be written via Modbus or can be edited in ATION-mode by the system administrator.
	All register correspond Page 39) described	ers are 16 Bit signed values. Depending on the modbus_unit specified with the ding display value configuration register at address 256 to 287 (Table 28 at the value needs to be scaled the same as the corresponding display value as in Table 39 at Page 52.

Table 35: Offset Values

3.4.4 Model Information Registers (read only)

These registers are set at production time and contain specific information about the specific model and the default button print layout.

Register Name	Register Address	Buttonlayout LSTAT-80x-Gx	Default Value
		L1	[0x0004]
		L2	[0x0004]
default_print_	528	L3	[0x0004]
touch_button_0	0x0210	L4	[0x0004]
		L5	[0x0004]
		L6	[0x0004]
		L1	[0x0000]
		L2	[0x0006]
default_print_	529	L3	[0x0006]
touch_button_1	0x0211	L4	[0x000A]
		L5	[0x0006]
		L6	[0x0006]
		L1	[0x0000]
		L2	[0x0000]
default_print_	530	L3	[0x0008]
touch_button_2	0x0212	L4	[0x0008]
		L5	[0x000A]
		L6	[0x000A]
		L1	[0x0001]
		L2	[0x0001]
default print	531	L3	[0x0001]
touch_button_3	0x0213	L4	[0x0001]
		L5	[0x0001]
		L6	[0x0001]
_		L1	[0x0005]
		L2	[0x0005]
default print	532	L3	[0x0005]
touch_button_4	0x0214	L4	[0x0005]
		L5	[0x0005]
		L6	[0x0005]
_		L1	[0x0000]
		L2	[0x0007]
default print	533	L3	[0x0007]
touch button 5	0x0215	L4	[0x000B]
		L5	[0x0007]
		L6	[0x0007]
-		L1	[0x0000]
	•	L2	[0x0000]
default print	534	L3	[0x0009]
touch button 6	0x0216	L4	[0x0009]
	•	L5	[0x000B]
		L6	[0x000B]
		LI	[0x0002]
		L2	[0x0002]
default print	535	 L3	[0x0002]
touch button 7	0x0217	<u> </u>	[0x0002]
//////////////////////////////////////		L5	[0x0002]
		L6	[0x0008]

Register Name	Register Address	Buttonlayout LSTAT-80x-Gx	Default Value
default_print_ external_button_0	536 0x0218	applies to all types	[0x0000]
default_print_ external_button_1	537 0x0219	applies to all types	[0x0000]
default_print_ external_button_2	538 0x021A	applies to all types	[0x0000]
default_print_ external_button_3	539 0x021B	applies to all types	[0x0000]
	Button Pr	int Layout – describes which symbols a external buttons by default.	re printed on the front panel and on the The following symbols are defined:
		0x0000 – none	0x0006 – fan_up
		0x0001 – menu	0x0007 – fan_down
		0x0002 – occupancy	$0x0008 - light_on$
		0x0003 – reserved	0x0009-light_off
		0x0004 - temp_up	0x000A – blinds_up
		0x0005 - temp_down	0x000B - blinds_down

Table 36: Model Information Registers

3.4.5 Device Information Registers (read only)

The registers shown in Table 37 are set at production and contain specific information about the device.

Description	Register								Bit P	os	sitio	n							
1	Address	15	14	13	12	11	10	9	8		7	6	5	4	3	2	1	1 	0
product_code_string	560 0x0230 - 569 0x0239							prod	uct_o	co	de_s	string	5						
serial_number_ string	576 0x0240 - 585 0x0249							seria	l_nuı	mł	oer_	string	5						
firmware_version_ string	592 0x0250 - 595 0x0253						fii	rmwa	ure_v	ver	sior	1_stri	ng						
firmware date	596 0x0254							firı	nwai	re_	_dat	e_0							
IIIIIware_date	597 0x0255							firı	nwai	re_	_dat	e_1							
bootloader_version_ string	608 0x0260 - 611 0x0263						bo	otloa	der_	ve	ersio	n_str	ing						
bootloader date	612 0x0264							boo	tload	ler	r_da	te_0							
	613 0x0265							boo	tload	ler	r_da	te_1							
① firmware_date_0 and firmware_date_1 as well as bootloader_date_0 and bootloader_date_1 represent a 32 bit timestamp in seconds since JAN-01-1970 indicating the build time.												nd 70							

Table 37: Device Information Registers

3.4.6 NFC Registers

These registers provide an URL that can be accessed by NFC enabled devices such as smart phones to get additional information and control of the room automation.

Description	Register							E	Bit Po	ositio	n						
	Address	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
	1024																
	0x0400																
url_string	-	[http://www.loytec.com]															
	1148																
	0x047C																
	Up to 2 will be inform	48 A conv ation	SCII verteo on th	chara d to a ie NF	acter a ND C int	inclu EF U erfac	ding a JRI r e see	a strii ecord Chap	ng ter that ter 4	rmina is sa	tor ((aved	0x00) on th	can ne NF	be us FC tag	ed. T g. Fo	he sti r fur	ring her

Table 38: NFC Registers

3.4.7 Value Scaling and Stepwidth

The following table gives an overview of he	w raw Modbus	register valu	es are scaled an	d
which stepwidth is defined for set points.				

Physical Value	Unit	Modbus Scaling A*10^B*(raw + C)			Set Point Stepwidth	Example			
	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$					raw value	Display value		
No Unit	-	1	0	0	1	100	100.0		
	(K)	1	-1	-2740	0,5	2975	023.5 °C		
Temperature	°C	1	-1	0	0,5	235	023.5 °C		
	°F	1	-1	0	1,0	743	□ 74 . □ ^{°F}		
	m³/h	1	0	0	1	150	150.0 ^{m³/h}		
Flow	1/s	1	-1	0	0,1	417	[]41.7 ^{/s}		
	cfm	1	0	0	1	88	88.0 ^{cfm}		
David	Pa	1	0	0	1	200	200.0 ^{Pa}		
Pressure	inWC	1	-3	0	0,01	803	0.803 ^{inWC}		
Voltage	V	1	-1	0	0,1	240	24.0 ^v		
Percentage	%	5	-3	0	1	9000	045.0 [%]		
Humidity	%RH 5 -3 0 1		1	9000	045.0 ^{%RH}				
Amount CO ₂	ppm	1	0	0	1	550	550.0 ^{ppm}		
	Note the	at thou	gh a di	splay va	lue or a set point wo	uld accept values	from 0 to 65535 if		

Note that though a display value or a set point would accept values from 0 to 65535 if unsigned or -32768 to 32767 if signed the value that is displayed is limited to a range from -999 to 9999 because of the 4 digit display.

(1) When a fixed-point number reaches a certain limit where an overflow occurs the decimal point is shifted rightwards (e.g. $999.9 \rightarrow 1000$).

(1) Whole number values are preferably displayed with the bigger digits. If an overflow occurs the number is shifted rightwards (e.g. $999 \rightarrow 1000$).

Table 39: Value Scaling and Stepwidth

4 NFC

4.1 General Description

The NFC interface of the L-STAT device can be used to get additional information and configuration options for room automation. The L-STAT will behave like an NFC tag that can be read by an NFC enabled device. The antenna is located behind the LCD and best performance is achieved by putting the NFC enabled device right on the front panel glass. Depending on where the antenna of the mobile device is located the optimal position will be found by moving the device slowly over the front panel. Best performance can be achieved by positioning the device in a more or less horizontal position covering the LCD as shown in Figure 8.



Figure 8: NFC Device Positioning

If the connection is established the NFC field detection bit at the short_pressed Modbus register at address 1 (Table 7 at Page 22) will be set. In the meantime the NFC enabled device will read the memory of the tag and will perform an appropriate action. Since a NDEF URI record is saved at the tags memory (Table 38 at Page 51) the device will ask to open the defined URL in the browser of the NFC enabled device.

4.2 Copy the L-WEB Project URL to the NFC Tag Memory

To show an L-WEB project on your mobile device by NFC, simply copy and paste the URL of the L-Web project to the url_string of Table 38. Note that the mobile device needs network or internet access to open the URL. Please follow the instructions below.

To Copy a L-WEB Project URL to the NFC Tag Memory

- 1. Open the web interface of your device
- 2. Select **Project List** from the **L-WEB** menu.
- 3. Open the desired project in the web browser as shown in Figure 9.

LOYTEC		L-WEB Project List							
LIOB-AIR1 Logged in as admin 2015-10-21 15:07:09	trol	Install the LOYTEC LWEB-803 Visualization software on your PC or use the LWEB-802 brow	wser-based visualization	1					
	u u	Available L-WEB projects							
Device Info	Ŭ	Name	Last modified	Size (Bytes)					
Data	er								
Commission	pu	Istudio/System.VAVsystem_VAV01_AW_VAV01.VAVmanagerStatusArea.lweb2	09.10.2015 09:50:30	1201856					
Config	Б	lstudio/System.VAVsystem_VAV01_AW_VAV01.VAVstatus.lweb2	09.10.2015 09:50:38	2607877					
Statistics	rks	Istudio/System_VAVsystem_VAV01_AW_VAV01.VAVmobile.lweb2	09.10.2015 09:50:32	523488	國 				
L-WEB	NO	lstudio/System.VAVsystem VAV01 AW VAV01.VAVmanagerStatusBuilding.lweb2	09.10.2015 09:50:31	1207042	Open project in web browser (LWEB-802)				
 Project List LWEB-802 Config ACL Configuration 	netv	Istudio/System.VAVsystem_VAV01_AW_VAV01.VAVmobileCalibration.lweb2	09.10.2015 09:50:33	281473					
L-IOB	1	lstudio/System.VAVsystem_VAV01_AW_VAV01.VAVsimulation.lweb2	09.10.2015 09:50:33	593128	(a) ⊕				
Documentation	1	Isturlin/System VAVeystem VAV/01 AW VAV/01 VAVmanage/StatusFlags Lunk?	09 10 2015 00 50 24	1202364					
Reset	1	Notice of Section And Section Test and the Section Sec	33.10.2010 00.00.31	1202301					
Contact	1	Istudio/System.VAVsystem_VAV01_AW_VAV01.VAVsimulationCO2.lweb2	09.10.2015 09:50:33	236230					
1	•								

Figure 9: L-WEB Project List

- 4. Simply copy the URL of the desired project from the browsers address bar and go to the **Modbus Datapoints** of the L-STAT device.
- 5. Open the **nfc_string** datapoint in the web interface of your device and paste the L-WEB project URL at the **Value** field as shown in Figure 10.
- 6. Click on the **Set** button to save the string.

COOT (ROOT OBJECT) Favorites System Registers	< 🎘 🌳	ROOT \rangle \rangle Datapoints \rangle L-STAT_80x-Lx-Gx_V18_1 \rangle nfc_string							
	Data Point Details	8							
EC61131 Variables	Path	/Modbus Port RS485/Datapoints/L-STAT 80x-Lx-Gx V18 1/nfc string							
Cheduler Scheduler	Name	nfc string							
Alarm	Description	NFC URL							
CEA709 Port	Direction	value							
BACnet Port	Туре	string							
Modbus Port R5485	Value	http://www.loytec.com//web802/?pj Set Enter * * for invalid value							
	Raw value	68 74 74 70 3A 2F 2F 77 77 72 2E 6C 6F 79 74 65 63 2E 6C 2F 6C 77 74 65 63 2E 6D 2F 6C 77 76 73 74 75 64 69 6F 2F 55 73 79 73 74 65 60 2E 56 41 56 30 31 5F 56 41 56 30 31 5F 56 41 56 30 31 5F 56 41 56 30 31 2F 56 56 41 56 30 31 2F 56 56 41 56 30 31 2F 56 52 26 61 64 64 72 65 73 73 30 31 33 33 33 33 33 33 33 33 33 33 33 33 33							

Figure 10: L-STAT NFC String

5 IR-Remote Control Operation

5.1 General Description

The IR receiver is located behind the front panel glass above the LCD. The L-STAT device implements the NEC IR protocol compatible with the Apple remote control as displayed in Figure 11.



Figure 11: Apple Remote Control

Whenever a command gets received the IRC bit at the short_pressed Modbus register at address 1 (Table 7 at Page 22) is set. The received button code as well as the remote ID can be read from the ir_remote_control_command register at address 32 (Table 9 at Page 24).

Button Number	Description	Button Code
1	Center	46
2	Up	5
3	Left	4
4	Right	3
5	Down	6
6	Menu	1
7	Play/Pause	47

 Table 40: Apple Remote Button Codes

5.2 Remote Control Pairing

Each remote control has an ID that is transmitted along with the button code. This ID can be used to pair a certain remote control with a certain L-STAT device. The ID of the Apple remote control can be changed by pressing Menu and Center button for at least 6s. This will increment the ID by one.

The ID of your remote control can be checked by pressing any button and watching the ir_remote_control_command register in the Web interface as shown in Figure 12 below. This example shows that the Menu button was pressed on a remote control with the ID 14.

COT (ROOT OBJECT)	ROOT Modbus Port RS485	Datapoir	nts		
Favorites System Registers User Registers EC61131 Variables Scheduler Alarm Trend CEA709 Port BACnet Port Modbus Port RS485 Datapoints	E Name Present_state short_pressed long_pressed change_flags_set_points change_flags_device_settings	Dir. input value value input input	Type user user user user user	State normal normal normal normal	Value 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
LIOB-FT LIOB-IP	Change Tlags Offset Values Firremote_control_command	input input input input input	user analog analog analog analog	normal normal normal normal normal	1 14 1 14 24.7°C -10.9°C

Figure 12: IR Remote Control Command Register

If an L-STAT device gets paired with a certain remote control it will only update the ir_remote_control_command register and the IRC bit at the short_pressed register when receiving a command from this remote control.

Pairing can be achieved by pressing Menu and Right button at the remote control for at least 6s while pointing towards the L-STAT device. If pairing worked the secondary display will shortly show 'IRP' (IR pairing). The remote ID will be saved internally and the IRCP flag of the config_flags register at address 192 (Table 22 at Page 33) will be set.

The pairing can be canceled by either clearing the IRCP flag or by pressing Menu and Left button for at least 6s. If the secondary display shows 'IRUP' (IR unpairing) shortly the pairing is suspended.

6 Firmware Update

6.1 Firmware Update via the Web Interface

The current firmware can be downloaded from the Software Download section on the LOYTEC website: <u>https://www.loytec.com/support/download</u>

For the firmware update go to the web interface of the L-INX, L-ROC, L-IOB device.

To Update the Firmware via the Web Interface

- 1. Select Modbus under the Commission menu.
- 2. A listing of available devices will be displayed. Select the devices for the firmware update by clicking the check box on the right.
- 3. Select **Update firmware...** from the drop-down menu as shown in Figure 13.

LOYTEC	Modbus Commissioning	
LINX-150 Logged in as admin 2015-10-21 14:13:34	R5485 P Devices in configuration	
Device Info Data Commission = BACnet = okey = M-Bus = M-Bus = OPC XML-DA Client Config Statistics	Reload Reset UID Device Status 160F L-STAT_80x-Lx-Gx_1 OK	Action on selected ▼ Action on selected Decommission Enable Disable Update firmware

Figure 13: Web Interface – Modbus Commission

- 4. Select the firmware file and click **Open**.
- 5. The selected devices will then receive the firmware updated.

7 Troubleshooting

7.1 Technical Support

LOYTEC offers free telephone and e-mail support for the L-STAT product series. If none of the above descriptions solves your specific problem please contact us at the following address:

LOYTEC electronics GmbH Blumengasse 35 A-1170 Vienna Austria / Europe

e-mail :	support@loytec.com
Web :	http://www.loytec.com
tel :	+43/1/4020805-100
fax :	+43/1/4020805-99

or

LOYTEC Americas Inc. N27 W23957 Paul Road Suite 103 Pewaukee, WI 53072 USA

 e-mail:
 support@loytec-americas.com

 Web:
 http://www.loytec-americas.com

 tel:
 +1 (512) 402 5319

 fax:
 +1 (262) 408 5238

or

LOYTEC Asia Corporation Ltd. 16F.-3, No. 155, Zhongyang Rd Xindian District New Taipei City 23150 Taiwan

e-mail:	support-asia@loytec.com
tel:	+886 (2) 8913 7838
fax:	+886 (2) 8913 7830

8 Specifications

8.1 Physical Specifications

Operating Voltage	24 VDC ±10 %
Power Consumption	see Table 41
In rush current	up to 4A @ 24 VDC
Operating Temperature (ambient)	$0^{\circ}C$ to $+50^{\circ}C$
Storage Temperature	-10°C to +60°C
Humidity (non condensing) operating	10 to 90 % RH @ 50°C
Humidity (non condensing) storage	10 to 90 % RH @ 50°C
LCD Backlight Lifetime	50,000 hours
Enclosure	94.5 x 110 x 19.5 (W x H x D)
Environmental Protection	IP 30 (enclosure)
Installation	Europe: switch box Ø 60mm US: switch box 4" x 2"

LCD brightness	LSTAT-800-Gx-Lx & LSTAT-801-Gx-Lx	LSTAT-802-Gx-Lx
100%	0.8W	0.93W avg., 1.8W max.
0%	0.09W	0.22W avg., 1.1W max.

Table 41: Power Consumption

Following Table 42 should provide support for dimensioning of an installation and the power supply. For each device type there is a listing for up to 16 devices of the maximum possible cable length and the resulting power loss on the cable for different supply voltage levels. Together with the power consumption of the devices one can calculate the required power of the power supply.

Conditions of the Installation		Number of Devices																	
	Conditions of the instantation			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	con	maximum power sumption of devic	es [W]	0,8	1,6	2,4	3,2	4,0	4,8	5,6	6,4	7,2	8,0	8,8	9,6	10,4	11,2	12,0	12,8
1		max. cable	for 0,5mm ²	1.620	810	540	400	320	270	230	200	180	160	140	130	120	110	100	100
0/80	VDC	length [m]	for 1,0mm ²	3.250	1.620	1.080	810	650	540	460	400	360	320	290	270	250	230	210	200
AT 80	24'	max. power loss on cable	; [W]	0,2	0,4	0,6	0,9	1,1	1,3	1,5	1,7	1,9	2,1	2,3	2,6	2,8	3,0	3,2	3,4
L-ST	r \	max. cable	for 0,5mm ²	1.260	630	420	310	250	210	180	150	140	120	110	100	90	90	80	70
Ι	VDC	length [m]	for 1,0mm ²	2.530	1.260	840	630	500	420	360	310	280	250	230	210	190	180	160	150
	20'	max. power loss on cable	6 [W]	0,3	0,5	0,8	1,0	1,3	1,6	1,8	2,0	2,3	2,6	2,9	3,1	3,3	3,6	3,7	3,8
	con	maximum power sumption of devic	es [W]	1,8	3,6	5,4	7,2	9,0	10,8	12,6	14,4	16,2	18,0	19,8	21,6	23,4	25,2	27,0	28,8
	•	max. cable	for 0,5mm ²	720	360	240	180	140	120	100	90	80	70	60	60	50	50	40	40
02	VDC	length [m]	for 1,0mm ²	1.440	720	480	360	280	240	200	180	160	140	130	120	110	100	90	90
TAT 8	24'	max. power loss on cable	; [W]	0,5	1,0	1,5	1,9	2,3	2,9	3,3	3,9	4,4	4,7	5,3	5,8	6,3	6,5	6,6	7,8
L-S		max. cable	for $0,5mm^2$	560	280	180	140	110	90	80	70	60	50	50	40	40	40	30	30
	VDC	length [m]	for 1,0mm ²	1.120	560	370	280	220	180	160	140	120	110	100	90	80	80	70	70
	20	max. power loss on cable	[W]	0,6	1,2	1,7	2,3	2,8	3,3	4,1	4,7	5,0	5,7	6,3	6,6	6,7	8,2	7,9	9,4

Table 42: Cable Length and Power Loss on Cable

8.2 Sensor Specifications

Ambient Temperature Sensor	type: CMOS range: $-40 - 125 \ ^{\circ}C$ resolution: $0.1 \ ^{\circ}C$ accuracy: $\pm 0.5 \ ^{\circ}C (5 - 60 \ ^{\circ}C)$
Relative Humidity Sensor	type: capacitive range: 0 – 100 %R.H. resolution: 0.1 %R.H. accuracy: ±2 %R.H. @ 25 °C, 20 – 80 %R.H. ±3 %R.H. @ 25 °C, 0 – 20 %R.H. & 80 – 100 %R.H.
CO ₂ Sensor	type: NDIR range: $0 - 2000$ ppm resolution: 1 ppm accuracy: ± 30 ppm or ± 3 % of reading warm up time: < 2 min (operational), 10 min (max. accuracy) self calibration: The sensor will perform a self calibration routine within the first 24 hours of continuous operation. After calibration has finished the sensor will operate at the defined accuracy. The sensor also remembers the lowest CO ₂ levels of the last 14 days to compensate gradual sensor drift. Therefor it has to be guaranteed that CO ₂ concentration regularly drops to outside background levels. Usually this takes place when a building is unoccupied for 4 to 8 hours a day.
Occupancy Sensor	max. range: 5 m detection zones: 64 opening angle: 94° H, 82° V (see Figure 14) temperature difference to background: 4°C



Figure 14: Occupancy Sensor Opening Angle

Infrared Receiver

protocol: NEC carrier: 38 kHz @ 950 nm Apple remote control compatible

9 References

[1] L-INX/L-GATE User Manual, LOYTEC electronics GmbH

10 Revision History

Date	Version	Author	Description
2015-12-09	1.0	HG	Initial Manual Version
2016-02-25	1.1	HG	Added comment for cleaning mode at MENU-Button description, revised description of 2.2.2 Operating Modes, extended description at 3.1 Introduction, revised Figure 5, changed size of Figure 6, changed layout of Table 36, added Table 42 and description for cable length and power supply dimensioning, extended description of CO_2 sensor self calibration algorythmus, correction of typing errors