

Arduino

1.0

Generated by Doxygen 1.8.14



# Contents

<b>1</b>	<b>Class Index</b>	<b>1</b>
1.1	Class List . . . . .	1
<b>2</b>	<b>File Index</b>	<b>3</b>
2.1	File List . . . . .	3
<b>3</b>	<b>Class Documentation</b>	<b>5</b>
3.1	CpuLoad Class Reference . . . . .	5
3.1.1	Detailed Description . . . . .	5
3.1.2	Constructor & Destructor Documentation . . . . .	6
3.1.2.1	CpuLoad() . . . . .	6
3.1.3	Member Function Documentation . . . . .	6
3.1.3.1	ComputeCPULoad() . . . . .	6
3.1.3.2	getAverageCPULoad() . . . . .	7
3.1.3.3	getCurrentCPULoad() . . . . .	7
3.1.3.4	getMaxCPULoad() . . . . .	8
3.1.4	Member Data Documentation . . . . .	8
3.1.4.1	avg_load . . . . .	8
3.1.4.2	current_load . . . . .	8
3.1.4.3	last_sum_value . . . . .	9
3.1.4.4	max_load . . . . .	9
3.1.4.5	sample_cnt . . . . .	9
3.1.4.6	sample_idx . . . . .	9
3.1.4.7	sample_mem . . . . .	9

3.2	dht22 Class Reference . . . . .	10
3.2.1	Detailed Description . . . . .	10
3.2.2	Constructor & Destructor Documentation . . . . .	10
3.2.2.1	<code>dht22()</code> . . . . .	10
3.2.3	Member Function Documentation . . . . .	11
3.2.3.1	<code>initializeCommunication()</code> . . . . .	11
3.2.3.2	<code>read()</code> . . . . .	11
3.3	dio Class Reference . . . . .	12
3.3.1	Detailed Description . . . . .	13
3.3.2	Constructor & Destructor Documentation . . . . .	13
3.3.2.1	<code>dio()</code> . . . . .	14
3.3.3	Member Function Documentation . . . . .	14
3.3.3.1	<code>dio_changePortPinCnf()</code> . . . . .	14
3.3.3.2	<code>dio_getPort()</code> . . . . .	15
3.3.3.3	<code>dio_getPort_fast()</code> . . . . .	16
3.3.3.4	<code>dio_invertPort()</code> . . . . .	16
3.3.3.5	<code>dio_memorizePINaddress()</code> . . . . .	17
3.3.3.6	<code>dio_setPort()</code> . . . . .	18
3.3.3.7	<code>getDDRxAddress()</code> . . . . .	19
3.3.3.8	<code>getPINxAddress()</code> . . . . .	20
3.3.3.9	<code>getPORTxAddress()</code> . . . . .	20
3.3.3.10	<code>ports_init()</code> . . . . .	21
3.3.4	Member Data Documentation . . . . .	21
3.3.4.1	<code>PINx_addr_mem</code> . . . . .	21
3.3.4.2	<code>PINx_idx_mem</code> . . . . .	22
3.4	DisplayInterface Class Reference . . . . .	22
3.4.1	Detailed Description . . . . .	23
3.4.2	Constructor & Destructor Documentation . . . . .	23
3.4.2.1	<code>DisplayInterface()</code> . . . . .	23
3.4.3	Member Function Documentation . . . . .	24

---

3.4.3.1	ClearLine()	24
3.4.3.2	DisplayFullLine()	25
3.4.3.3	FindFirstCharAddr()	26
3.4.3.4	getLLShiftDataPtr()	26
3.4.3.5	IsLineEmpty()	27
3.4.3.6	LLElementCompare()	27
3.4.3.7	shiftLine_task()	28
3.4.4	Member Data Documentation	29
3.4.4.1	dummy	29
3.4.4.2	lineEmptyTab	29
3.4.4.3	LL_shift_data_ptr	29
3.4.4.4	p_lcd	29
3.5	DisplayManagement Class Reference	30
3.5.1	Detailed Description	31
3.5.2	Constructor & Destructor Documentation	31
3.5.2.1	DisplayManagement()	31
3.5.3	Member Function Documentation	31
3.5.3.1	DisplaySensorData_Task()	32
3.5.3.2	GetIftPointer()	33
3.5.3.3	GetTempSensorPtr()	33
3.5.4	Member Data Documentation	34
3.5.4.1	p_display_ift	34
3.5.4.2	p_tempSensor	34
3.6	I2C Class Reference	34
3.6.1	Detailed Description	35
3.6.2	Constructor & Destructor Documentation	35
3.6.2.1	I2C()	35
3.6.3	Member Function Documentation	36
3.6.3.1	initializeBus()	36
3.6.3.2	setBitRate()	36

3.6.3.3	setTxAddress()	37
3.6.3.4	writeByte()	37
3.6.4	Member Data Documentation	38
3.6.4.1	bitrate	38
3.6.4.2	tx_address	38
3.7	keepAliveLed Class Reference	38
3.7.1	Detailed Description	39
3.7.2	Constructor & Destructor Documentation	39
3.7.2.1	keepAliveLed()	39
3.7.3	Member Function Documentation	39
3.7.3.1	blinkLed_task()	40
3.8	LCD Class Reference	40
3.8.1	Detailed Description	42
3.8.2	Constructor & Destructor Documentation	42
3.8.2.1	LCD()	42
3.8.3	Member Function Documentation	43
3.8.3.1	command()	43
3.8.3.2	ConfigureBacklight()	43
3.8.3.3	ConfigureCursorBlink()	44
3.8.3.4	ConfigureCursorOnOff()	45
3.8.3.5	ConfigureDisplayOnOff()	46
3.8.3.6	ConfigureEntryModeDir()	46
3.8.3.7	ConfigureEntryModeShift()	47
3.8.3.8	ConfigureFontType()	47
3.8.3.9	ConfigureI2CAddr()	48
3.8.3.10	ConfigureLineNumber()	49
3.8.3.11	GetDDRAMAddress()	50
3.8.3.12	GetLineNumberCnf()	50
3.8.3.13	InitializeScreen()	51
3.8.3.14	SetDDRAMAddress()	51

3.8.3.15	write()	52
3.8.3.16	write4bits()	53
3.8.3.17	WriteInRam()	54
3.8.4	Member Data Documentation	55
3.8.4.1	backlight_enable	55
3.8.4.2	cnfCursorBlink	55
3.8.4.3	cnfCursorOnOff	55
3.8.4.4	cnfDisplayOnOff	56
3.8.4.5	cnfEntryModeDir	56
3.8.4.6	cnfEntryModeShift	56
3.8.4.7	cnfFontType	56
3.8.4.8	cnfI2C_addr	56
3.8.4.9	cnfLineNumber	57
3.8.4.10	ddram_addr	57
3.9	LinkedList Class Reference	57
3.9.1	Detailed Description	58
3.9.2	Member Typedef Documentation	58
3.9.2.1	T_LL_element	58
3.9.3	Constructor & Destructor Documentation	59
3.9.3.1	LinkedList()	59
3.9.4	Member Function Documentation	59
3.9.4.1	AttachNewElement()	59
3.9.4.2	getCurrentElement()	60
3.9.4.3	IsLLEmpty()	60
3.9.4.4	MoveToNextElement()	61
3.9.4.5	RemoveElement()	61
3.9.4.6	ResetElementPtr()	62
3.9.5	Member Data Documentation	62
3.9.5.1	curElement_ptr	63
3.9.5.2	firstElement	63

3.10 scheduler Class Reference . . . . .	63
3.10.1 Detailed Description . . . . .	64
3.10.2 Member Typedef Documentation . . . . .	64
3.10.2.1 Task_t . . . . .	65
3.10.3 Constructor & Destructor Documentation . . . . .	65
3.10.3.1 scheduler() . . . . .	65
3.10.4 Member Function Documentation . . . . .	65
3.10.4.1 addPeriodicTask() . . . . .	65
3.10.4.2 getPitNumber() . . . . .	66
3.10.4.3 launchPeriodicTasks() . . . . .	67
3.10.4.4 LLElementCompare() . . . . .	68
3.10.4.5 removePeriodicTask() . . . . .	68
3.10.4.6 startScheduling() . . . . .	69
3.10.5 Member Data Documentation . . . . .	70
3.10.5.1 pit_number . . . . .	70
3.10.5.2 TasksLL_ptr . . . . .	70
3.11 String Class Reference . . . . .	70
3.11.1 Detailed Description . . . . .	71
3.11.2 Constructor & Destructor Documentation . . . . .	71
3.11.2.1 String() [1/2] . . . . .	71
3.11.2.2 String() [2/2] . . . . .	72
3.11.2.3 ~String() . . . . .	73
3.11.3 Member Function Documentation . . . . .	73
3.11.3.1 appendBool() . . . . .	73
3.11.3.2 appendInteger() . . . . .	74
3.11.3.3 appendString() . . . . .	75
3.11.3.4 Clear() . . . . .	76
3.11.3.5 ComputeStringSize() . . . . .	76
3.11.3.6 getSize() . . . . .	77
3.11.3.7 getString() . . . . .	78

3.11.4 Member Data Documentation . . . . .	78
3.11.4.1 size . . . . .	78
3.11.4.2 string . . . . .	78
3.12 T_ASW_cnf_struct Struct Reference . . . . .	79
3.12.1 Detailed Description . . . . .	79
3.12.2 Member Data Documentation . . . . .	79
3.12.2.1 p_DisplayInterface . . . . .	80
3.12.2.2 p_DisplayManagement . . . . .	80
3.12.2.3 p_keepAliveLed . . . . .	80
3.12.2.4 p_TempSensor . . . . .	80
3.12.2.5 p_usartDebug . . . . .	80
3.13 T_BSW_cnf_struct Struct Reference . . . . .	81
3.13.1 Detailed Description . . . . .	81
3.13.2 Member Data Documentation . . . . .	81
3.13.2.1 p_cpupload . . . . .	81
3.13.2.2 p_dht22 . . . . .	82
3.13.2.3 p_dio . . . . .	82
3.13.2.4 p_i2c . . . . .	82
3.13.2.5 p_lcd . . . . .	82
3.13.2.6 p_timer . . . . .	82
3.13.2.7 p_usart . . . . .	83
3.14 T_Display_shift_data Struct Reference . . . . .	83
3.14.1 Detailed Description . . . . .	83
3.14.2 Member Data Documentation . . . . .	83
3.14.2.1 line . . . . .	83
3.14.2.2 size . . . . .	84
3.14.2.3 str_cur_ptr . . . . .	84
3.14.2.4 str_start_ptr . . . . .	84
3.14.2.5 temporization . . . . .	84
3.15 T_LCD_conf_struct Struct Reference . . . . .	84

---

3.15.1	Detailed Description	85
3.15.2	Member Data Documentation	85
3.15.2.1	backlight_en	85
3.15.2.2	cursor_en	85
3.15.2.3	cursorBlink_en	85
3.15.2.4	display_en	85
3.15.2.5	entryModeDir	85
3.15.2.6	entryModeShift	86
3.15.2.7	fontType_cnf	86
3.15.2.8	i2c_addr	86
3.15.2.9	lineNumber_cnf	86
3.16	LinkedList::T_LL_element Struct Reference	86
3.16.1	Detailed Description	87
3.16.2	Member Data Documentation	87
3.16.2.1	data_ptr	87
3.16.2.2	nextElement	87
3.17	scheduler::Task_t Struct Reference	87
3.17.1	Detailed Description	88
3.17.2	Member Data Documentation	88
3.17.2.1	period	88
3.17.2.2	TaskPtr	88
3.18	TempSensor Class Reference	88
3.18.1	Detailed Description	89
3.18.2	Constructor & Destructor Documentation	90
3.18.2.1	TempSensor()	90
3.18.3	Member Function Documentation	90
3.18.3.1	GetHumDecimal()	90
3.18.3.2	getHumidity()	91
3.18.3.3	GetHumInteger()	91
3.18.3.4	getHumPtr()	92

3.18.3.5	getTemp()	92
3.18.3.6	GetTempDecimal()	92
3.18.3.7	GetTempInteger()	93
3.18.3.8	getTempPtr()	94
3.18.3.9	GetValidity()	94
3.18.3.10	readTempSensor_task()	95
3.18.3.11	setValidity()	95
3.18.3.12	updateLastValidValues()	96
3.18.4	Member Data Documentation	96
3.18.4.1	read_humidity	97
3.18.4.2	read_temperature	97
3.18.4.3	valid_hum	97
3.18.4.4	valid_pit	97
3.18.4.5	valid_temp	97
3.18.4.6	validity	98
3.18.4.7	validity_last_read	98
3.19	timer Class Reference	98
3.19.1	Detailed Description	99
3.19.2	Constructor & Destructor Documentation	99
3.19.2.1	timer()	99
3.19.3	Member Function Documentation	99
3.19.3.1	configureTimer1()	99
3.19.3.2	getTimer1Value()	100
3.19.3.3	startTimer1()	101
3.19.3.4	stopTimer1()	101
3.19.4	Member Data Documentation	101
3.19.4.1	prescaler	101
3.20	uart Class Reference	102
3.20.1	Detailed Description	102
3.20.2	Constructor & Destructor Documentation	102

3.20.2.1 <code>usart()</code>	102
3.20.3 Member Function Documentation	103
3.20.3.1 <code>setBaudRate()</code>	103
3.20.3.2 <code>usart_init()</code>	104
3.20.3.3 <code>usart_read()</code>	104
3.20.3.4 <code>usart_sendString()</code>	105
3.20.3.5 <code>usart_transmit()</code>	106
3.20.4 Member Data Documentation	107
3.20.4.1 <code>BaudRate</code>	107
3.21 UsartDebug Class Reference	107
3.21.1 Detailed Description	108
3.21.2 Constructor & Destructor Documentation	108
3.21.2.1 <code>UsartDebug()</code>	109
3.21.3 Member Function Documentation	109
3.21.3.1 <code>activateDebugMode()</code>	109
3.21.3.2 <code>DebugModeManagement()</code>	110
3.21.3.3 <code>DisplayCPULoad_task()</code>	111
3.21.3.4 <code>DisplaySensors_task()</code>	112
3.21.3.5 <code>isDebugModeActive()</code>	112
3.21.3.6 <code>sendBool()</code>	113
3.21.3.7 <code>sendInteger()</code>	114
3.21.3.8 <code>sendString() [1/2]</code>	114
3.21.3.9 <code>sendString() [2/2]</code>	115
3.21.4 Member Data Documentation	116
3.21.4.1 <code>debug_state</code>	116
3.21.4.2 <code>debugModeActive_F</code>	116

---

<b>4 File Documentation</b>	<b>117</b>
4.1 asw.cpp File Reference . . . . .	117
4.1.1 Detailed Description . . . . .	118
4.1.2 Function Documentation . . . . .	118
4.1.2.1 asw_init() . . . . .	118
4.1.3 Variable Documentation . . . . .	118
4.1.3.1 ASW_cnf_struct . . . . .	119
4.2 asw.h File Reference . . . . .	119
4.2.1 Detailed Description . . . . .	119
4.2.2 Function Documentation . . . . .	120
4.2.2.1 asw_init() . . . . .	120
4.2.3 Variable Documentation . . . . .	120
4.2.3.1 ASW_cnf_struct . . . . .	120
4.3 bsw.cpp File Reference . . . . .	121
4.3.1 Detailed Description . . . . .	121
4.3.2 Function Documentation . . . . .	121
4.3.2.1 bsw_init() . . . . .	122
4.3.3 Variable Documentation . . . . .	122
4.3.3.1 BSW_cnf_struct . . . . .	122
4.4 bsw.h File Reference . . . . .	122
4.4.1 Detailed Description . . . . .	123
4.4.2 Macro Definition Documentation . . . . .	123
4.4.2.1 I2C_BITRATE . . . . .	123
4.4.2.2 USART_BAUDRATE . . . . .	124
4.4.3 Function Documentation . . . . .	124
4.4.3.1 bsw_init() . . . . .	124
4.4.4 Variable Documentation . . . . .	124
4.4.4.1 BSW_cnf_struct . . . . .	124
4.5 CpuLoad.cpp File Reference . . . . .	125
4.5.1 Detailed Description . . . . .	125

4.6 CpuLoad.h File Reference . . . . .	125
4.6.1 Detailed Description . . . . .	126
4.6.2 Macro Definition Documentation . . . . .	126
4.6.2.1 NB_OF_SAMPLES . . . . .	126
4.7 debug.cpp File Reference . . . . .	126
4.7.1 Detailed Description . . . . .	127
4.7.2 Variable Documentation . . . . .	127
4.7.2.1 str_debug_main_menu . . . . .	127
4.8 debug.h File Reference . . . . .	128
4.8.1 Detailed Description . . . . .	128
4.8.2 Macro Definition Documentation . . . . .	128
4.8.2.1 PERIOD_MS_TASK_DISPLAY_CPU_LOAD . . . . .	129
4.8.2.2 PERIOD_MS_TASK_DISPLAY_SENSORS . . . . .	129
4.8.3 Enumeration Type Documentation . . . . .	129
4.8.3.1 debug_state_t . . . . .	129
4.9 dht22.cpp File Reference . . . . .	129
4.9.1 Detailed Description . . . . .	130
4.9.2 Macro Definition Documentation . . . . .	130
4.9.2.1 MAX_WAIT_TIME_US . . . . .	130
4.10 dht22.h File Reference . . . . .	131
4.10.1 Detailed Description . . . . .	131
4.10.2 Macro Definition Documentation . . . . .	131
4.10.2.1 DHT22_PORT . . . . .	131
4.11 dio.cpp File Reference . . . . .	132
4.11.1 Detailed Description . . . . .	132
4.12 dio.h File Reference . . . . .	132
4.12.1 Detailed Description . . . . .	133
4.12.2 Macro Definition Documentation . . . . .	133
4.12.2.1 DECODE_PIN . . . . .	133
4.12.2.2 DECODE_PORT . . . . .	134

---

4.12.2.3 ENCODE_PORT . . . . .	134
4.12.2.4 PORT_A . . . . .	134
4.12.2.5 PORT_B . . . . .	134
4.12.2.6 PORT_C . . . . .	134
4.12.2.7 PORT_CNF_IN . . . . .	135
4.12.2.8 PORT_CNF_OUT . . . . .	135
4.12.2.9 PORT_D . . . . .	135
4.13 dio_port_cnf.h File Reference . . . . .	135
4.13.1 Detailed Description . . . . .	135
4.13.2 Macro Definition Documentation . . . . .	136
4.13.2.1 PORTB_CNF_DDRB . . . . .	136
4.13.2.2 PORTB_CNF_PORTB . . . . .	136
4.14 dio_reg_atm2560.h File Reference . . . . .	136
4.14.1 Macro Definition Documentation . . . . .	137
4.14.1.1 DDRA_PTR . . . . .	137
4.14.1.2 DDRB_PTR . . . . .	137
4.14.1.3 DDRC_PTR . . . . .	137
4.14.1.4 DDRD_PTR . . . . .	137
4.14.1.5 PINA_PTR . . . . .	137
4.14.1.6 PINB_PTR . . . . .	138
4.14.1.7 PINC_PTR . . . . .	138
4.14.1.8 PIND_PTR . . . . .	138
4.14.1.9 PORTA_PTR . . . . .	138
4.14.1.10 PORTB_PTR . . . . .	138
4.14.1.11 PORTC_PTR . . . . .	139
4.14.1.12 PORTD_PTR . . . . .	139
4.15 DisplayInterface.cpp File Reference . . . . .	139
4.15.1 Detailed Description . . . . .	140
4.16 DisplayInterface.h File Reference . . . . .	140
4.16.1 Detailed Description . . . . .	141

---

4.16.2 Macro Definition Documentation . . . . .	141
4.16.2.1 DISPLAY_LINE_SHIFT_PERIOD_MS . . . . .	141
4.16.2.2 DISPLAY_LINE_SHIFT_TEMPO_TIME . . . . .	141
4.16.3 Enumeration Type Documentation . . . . .	141
4.16.3.1 T_DisplayInterface_LineDisplayMode . . . . .	141
4.17 DisplayManagement.cpp File Reference . . . . .	142
4.17.1 Detailed Description . . . . .	142
4.18 DisplayManagement.h File Reference . . . . .	143
4.18.1 Detailed Description . . . . .	143
4.18.2 Macro Definition Documentation . . . . .	144
4.18.2.1 DISPLAY_MGT_LCD_I2C_ADDR . . . . .	144
4.18.2.2 DISPLAY_MGT_LINE_HUM . . . . .	144
4.18.2.3 DISPLAY_MGT_LINE_TEMP . . . . .	144
4.18.2.4 DISPLAY_MGT_PERIOD_TASK_SENSOR . . . . .	144
4.18.3 Variable Documentation . . . . .	144
4.18.3.1 humidityDisplayString . . . . .	145
4.18.3.2 LCD_init_cnf . . . . .	145
4.18.3.3 tempDisplayString . . . . .	145
4.19 I2C.cpp File Reference . . . . .	145
4.19.1 Detailed Description . . . . .	146
4.20 I2C.h File Reference . . . . .	146
4.20.1 Detailed Description . . . . .	146
4.20.2 Macro Definition Documentation . . . . .	147
4.20.2.1 DATA_ACK . . . . .	147
4.20.2.2 SLA_ACK . . . . .	147
4.20.2.3 START . . . . .	147
4.21 keepAliveLed.cpp File Reference . . . . .	147
4.21.1 Detailed Description . . . . .	148
4.22 keepAliveLed.h File Reference . . . . .	148
4.22.1 Detailed Description . . . . .	148

---

4.22.2 Macro Definition Documentation . . . . .	149
4.22.2.1 LED_PORT . . . . .	149
4.22.2.2 PERIOD_MS_TASK_LED . . . . .	149
4.23 LCD.cpp File Reference . . . . .	149
4.23.1 Detailed Description . . . . .	150
4.24 LCD.h File Reference . . . . .	150
4.24.1 Detailed Description . . . . .	151
4.24.2 Macro Definition Documentation . . . . .	152
4.24.2.1 BACKLIGHT_PIN . . . . .	152
4.24.2.2 EN_PIN . . . . .	152
4.24.2.3 LCD_CNF_BACKLIGHT_OFF . . . . .	152
4.24.2.4 LCD_CNF_BACKLIGHT_ON . . . . .	152
4.24.2.5 LCD_CNF_CURSOR_BLINK_OFF . . . . .	152
4.24.2.6 LCD_CNF_CURSOR_BLINK_ON . . . . .	153
4.24.2.7 LCD_CNF_CURSOR_OFF . . . . .	153
4.24.2.8 LCD_CNF_CURSOR_ON . . . . .	153
4.24.2.9 LCD_CNF_DISPLAY_OFF . . . . .	153
4.24.2.10 LCD_CNF_DISPLAY_ON . . . . .	153
4.24.2.11 LCD_CNF_ENTRY_MODE_DIRECTION_LEFT . . . . .	154
4.24.2.12 LCD_CNF_ENTRY_MODE_DIRECTION_RIGHT . . . . .	154
4.24.2.13 LCD_CNF_ENTRY_MODE_DISPLAY_SHIFT_OFF . . . . .	154
4.24.2.14 LCD_CNF_ENTRY_MODE_DISPLAY_SHIFT_ON . . . . .	154
4.24.2.15 LCD_CNF_FONT_5_11 . . . . .	154
4.24.2.16 LCD_CNF_FONT_5_8 . . . . .	155
4.24.2.17 LCD_CNF_ONE_LINE . . . . .	155
4.24.2.18 LCD_CNF_SHIFT_ID . . . . .	155
4.24.2.19 LCD_CNF_SHIFT_SH . . . . .	155
4.24.2.20 LCD_CNF_TWO_LINE . . . . .	155
4.24.2.21 LCD_DISPLAY_CTRL_FIELD_B . . . . .	156
4.24.2.22 LCD_DISPLAY_CTRL_FIELD_C . . . . .	156

4.24.2.23 LCD_DISPLAY_CTRL_FIELD_D . . . . .	156
4.24.2.24 LCD_FCT_SET_FIELD_DL . . . . .	156
4.24.2.25 LCD_FCT_SET_FIELD_F . . . . .	156
4.24.2.26 LCD_FCT_SET_FIELD_N . . . . .	157
4.24.2.27 LCD_INST_CLR_DISPLAY_BIT . . . . .	157
4.24.2.28 LCD_INST_DISPLAY_CTRL . . . . .	157
4.24.2.29 LCD_INST_ENTRY_MODE_SET . . . . .	157
4.24.2.30 LCD_INST_FUNCTION_SET . . . . .	157
4.24.2.31 LCD_INST_SET_DDRAM_ADDR . . . . .	158
4.24.2.32 LCD_RAM_1_LINE_MAX . . . . .	158
4.24.2.33 LCD_RAM_1_LINE_MIN . . . . .	158
4.24.2.34 LCD_RAM_2_LINES_MAX_1 . . . . .	158
4.24.2.35 LCD_RAM_2_LINES_MAX_2 . . . . .	158
4.24.2.36 LCD_RAM_2_LINES_MIN_1 . . . . .	159
4.24.2.37 LCD_RAM_2_LINES_MIN_2 . . . . .	159
4.24.2.38 LCD_SIZE_NB_CHAR_PER_LINE . . . . .	159
4.24.2.39 LCD_SIZE_NB_LINES . . . . .	159
4.24.2.40 LCD_WAIT_CLR_RETURN . . . . .	159
4.24.2.41 LCD_WAIT_OTHER_MODES . . . . .	160
4.24.2.42 RS_PIN . . . . .	160
4.24.2.43 RW_PIN . . . . .	160
4.24.3 Enumeration Type Documentation . . . . .	160
4.24.3.1 T_LCD_command . . . . .	160
4.24.3.2 T_LCD_config_mode . . . . .	161
4.24.3.3 T_LCD_ram_area . . . . .	161
4.25 LinkedList.cpp File Reference . . . . .	161
4.26 LinkedList.h File Reference . . . . .	162
4.26.1 Detailed Description . . . . .	162
4.26.2 Typedef Documentation . . . . .	163
4.26.2.1 CompareFctPtr_t . . . . .	163

4.27 main.cpp File Reference . . . . .	163
4.27.1 Detailed Description . . . . .	163
4.27.2 Function Documentation . . . . .	164
4.27.2.1 ISR() [1/2] . . . . .	164
4.27.2.2 ISR() [2/2] . . . . .	164
4.27.2.3 main() . . . . .	165
4.28 main.h File Reference . . . . .	166
4.28.1 Detailed Description . . . . .	166
4.29 operators.cpp File Reference . . . . .	166
4.29.1 Detailed Description . . . . .	167
4.29.2 Function Documentation . . . . .	167
4.29.2.1 operator delete() . . . . .	167
4.29.2.2 operator new() . . . . .	167
4.30 operators.h File Reference . . . . .	169
4.30.1 Detailed Description . . . . .	169
4.30.2 Function Documentation . . . . .	170
4.30.2.1 operator delete() . . . . .	170
4.30.2.2 operator new() . . . . .	170
4.31 scheduler.cpp File Reference . . . . .	170
4.31.1 Detailed Description . . . . .	171
4.31.2 Variable Documentation . . . . .	171
4.31.2.1 p_scheduler . . . . .	171
4.32 scheduler.h File Reference . . . . .	172
4.32.1 Detailed Description . . . . .	172
4.32.2 Macro Definition Documentation . . . . .	173
4.32.2.1 PRESCALER_PERIODIC_TIMER . . . . .	173
4.32.2.2 SW_PERIOD_MS . . . . .	173
4.32.2.3 TIMER_CTC_VALUE . . . . .	173
4.32.3 Typedef Documentation . . . . .	173
4.32.3.1 TaskPtr_t . . . . .	173

4.32.4 Variable Documentation . . . . .	173
4.32.4.1 p_scheduler . . . . .	174
4.33 String.cpp File Reference . . . . .	174
4.33.1 Detailed Description . . . . .	174
4.34 String.h File Reference . . . . .	174
4.34.1 Detailed Description . . . . .	175
4.35 TempSensor.cpp File Reference . . . . .	175
4.35.1 Detailed Description . . . . .	175
4.35.2 Macro Definition Documentation . . . . .	176
4.35.2.1 PIT_BEFORE_INVALID . . . . .	176
4.36 TempSensor.h File Reference . . . . .	176
4.36.1 Detailed Description . . . . .	176
4.36.2 Macro Definition Documentation . . . . .	177
4.36.2.1 PERIOD_MS_TASK_TEMP_SENSOR . . . . .	177
4.37 timer.cpp File Reference . . . . .	177
4.37.1 Detailed Description . . . . .	177
4.38 timer.h File Reference . . . . .	178
4.38.1 Detailed Description . . . . .	178
4.39 usart.cpp File Reference . . . . .	178
4.39.1 Detailed Description . . . . .	179
4.40 usart.h File Reference . . . . .	179
4.40.1 Detailed Description . . . . .	179
Index . . . . .	181

# Chapter 1

## Class Index

### 1.1 Class List

Here are the classes, structs, unions and interfaces with brief descriptions:

<a href="#">CpuLoad</a>	Class defining CPU load libraries . . . . .	5
<a href="#">dht22</a>	DHT 22 driver class . . . . .	10
<a href="#">dio</a>	DIO class . . . . .	12
<a href="#">DisplayInterface</a>	Display interface services class . . . . .	22
<a href="#">DisplayManagement</a>	Display management class . . . . .	30
<a href="#">I2C</a>	Two-wire serial interface ( <a href="#">I2C</a> ) class definition . . . . .	34
<a href="#">keepAliveLed</a>	Class for keep-alive LED blinking . . . . .	38
<a href="#">LCD</a>	Class for <a href="#">LCD</a> S2004A display driver . . . . .	40
<a href="#">LinkedList</a>	Linked list class . . . . .	57
<a href="#">scheduler</a>	Scheduler class . . . . .	63
<a href="#">String</a>	<a href="#">String</a> management class . . . . .	70
<a href="#">T_ASW_cnf_struct</a>	ASW configuration structure . . . . .	79
<a href="#">T_BSW_cnf_struct</a>	BSW configuration structure . . . . .	81
<a href="#">T_Display_shift_data</a>	Structure containing shift data . . . . .	83
<a href="#">T_LCD_conf_struct</a>	. . . . .	84
<a href="#">LinkedList::T_LL_element</a>	Type defining a linked list element . . . . .	86
<a href="#">scheduler::Task_t</a>	Type defining a task structure . . . . .	87
<a href="#">TempSensor</a>	Class for temperature sensor . . . . .	88

<a href="#">timer</a>	
Class defining a timer . . . . .	98
<a href="#">usart</a>	
USART serial bus class . . . . .	102
<a href="#">UsartDebug</a>	
Class used for debugging on usart link . . . . .	107

# Chapter 2

## File Index

### 2.1 File List

Here is a list of all files with brief descriptions:

<a href="#">asw.cpp</a>	ASW main file . . . . .	117
<a href="#">asw.h</a>	ASW main header file . . . . .	119
<a href="#">bsw.cpp</a>	BSW main file . . . . .	121
<a href="#">bsw.h</a>	BSW main header file . . . . .	122
<a href="#">CpuLoad.cpp</a>	Defines functions of class <a href="#">CpuLoad</a> . . . . .	125
<a href="#">CpuLoad.h</a>	<a href="#">CpuLoad</a> class header file . . . . .	125
<a href="#">debug.cpp</a>	This file defines classes for log and debug data transmission on USART link . . . . .	126
<a href="#">debug.h</a>	Header file for debug and logging functions . . . . .	128
<a href="#">dht22.cpp</a>	This file defines classes for DHT22 driver . . . . .	129
<a href="#">dht22.h</a>	DHT22 driver header file . . . . .	131
<a href="#">dio.cpp</a>	DIO library . . . . .	132
<a href="#">dio.h</a>	DIO library header file . . . . .	132
<a href="#">dio_port_cnf.h</a>	Digital ports configuration file . . . . .	135
<a href="#">dio_reg_atm2560.h</a>		136
<a href="#">DisplayInterface.cpp</a>	Source code file for display services . . . . .	139
<a href="#">DisplayInterface.h</a>	<a href="#">DisplayInterface</a> class header file . . . . .	140
<a href="#">DisplayManagement.cpp</a>	Display management source file . . . . .	142
<a href="#">DisplayManagement.h</a>	Display management class header file . . . . .	143

I2C.cpp	Two-wire interface ( <a href="#">I2C</a> ) source file . . . . .	145
I2C.h	<a href="#">I2C</a> class header file . . . . .	146
keepAliveLed.cpp	Definition of function for class <a href="#">keepAliveLed</a> . . . . .	147
keepAliveLed.h	Class <a href="#">keepAliveLed</a> header file . . . . .	148
LCD.cpp	<a href="#">LCD</a> class source file . . . . .	149
LCD.h	<a href="#">LCD</a> class header file . . . . .	150
LinkedList.cpp		161
LinkedList.h	Linked List library header file . . . . .	162
main.cpp	Background task file . . . . .	163
main.h	Background task header file . . . . .	166
operators.cpp	C++ operators definitions . . . . .	166
operators.h	C++ operators definitions header file . . . . .	169
scheduler.cpp	Defines scheduler class . . . . .	170
scheduler.h	Scheduler class header file . . . . .	172
String.cpp	<a href="#">String</a> class source file . . . . .	174
String.h	<a href="#">String</a> class header file . . . . .	174
TempSensor.cpp	Defines function of class <a href="#">TempSensor</a> . . . . .	175
TempSensor.h	Class <a href="#">TempSensor</a> header file . . . . .	176
timer.cpp	Defines function for class timer . . . . .	177
timer.h	Timer class header file . . . . .	178
uart.cpp	BSW library for USART . . . . .	178
uart.h	Header file for USART library . . . . .	179

# Chapter 3

## Class Documentation

### 3.1 CpuLoad Class Reference

Class defining CPU load libraries.

```
#include <CpuLoad.h>
```

#### Public Member Functions

- [CpuLoad \(\)](#)  
*CpuLoad class constructor.*
- [void ComputeCPULoad \(\)](#)  
*Computes current CPU load.*
- [uint8\\_t getCurrentCPULoad \(\)](#)  
*Get current CPU load value.*
- [uint8\\_t getAverageCPULoad \(\)](#)  
*Get average CPU load value.*
- [uint8\\_t getMaxCPULoad \(\)](#)  
*Get maximum CPU load value.*

#### Private Attributes

- [uint8\\_t current\\_load](#)
- [uint8\\_t avg\\_load](#)
- [uint8\\_t max\\_load](#)
- [uint8\\_t sample\\_cnt](#)
- [uint8\\_t sample\\_mem \[NB\\_OF\\_SAMPLES\]](#)
- [uint8\\_t sample\\_idx](#)
- [uint16\\_t last\\_sum\\_value](#)

#### 3.1.1 Detailed Description

Class defining CPU load libraries.

This class defines tools to compute and monitor CPU load.

Definition at line 19 of file CpuLoad.h.

### 3.1.2 Constructor & Destructor Documentation

#### 3.1.2.1 CpuLoad()

`CpuLoad::CpuLoad ( )`

`CpuLoad` class constructor.

This function initializes class `CpuLoad`

Returns

Nothing

Definition at line 13 of file `CpuLoad.cpp`.

### 3.1.3 Member Function Documentation

#### 3.1.3.1 ComputeCPULoad()

`void CpuLoad::ComputeCPULoad ( )`

Computes current CPU load.

This function computes the current CPU load using value of the timer used by the scheduler at the end of the periodic cycle. This value is divided by the PIT period to obtain CPU load;

Returns

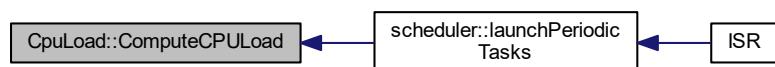
Nothing

Definition at line 27 of file `CpuLoad.cpp`.

Here is the call graph for this function:



Here is the caller graph for this function:



### 3.1.3.2 getAverageCPULoad()

```
uint8_t CpuLoad::getAverageCPULoad ( ) [inline]
```

Get average CPU load value.

This function returns the average CPU load value

#### Returns

Average CPU load value

Definition at line 56 of file CpuLoad.h.

Here is the caller graph for this function:



### 3.1.3.3 getCurrentCPULoad()

```
uint8_t CpuLoad::getCurrentCPULoad ( ) [inline]
```

Get current CPU load value.

This function returns the current CPU load value

#### Returns

Current CPU load value

Definition at line 45 of file CpuLoad.h.

Here is the caller graph for this function:



### 3.1.3.4 getMaxCPUload()

```
uint8_t CpuLoad::getMaxCPUload ( ) [inline]
```

Get maximum CPU load value.

This function returns the maximum CPU load value

#### Returns

Maximum CPU load value

Definition at line 67 of file CpuLoad.h.

Here is the caller graph for this function:



## 3.1.4 Member Data Documentation

### 3.1.4.1 avg\_load

```
uint8_t CpuLoad::avg_load [private]
```

Average CPU load based on the last 50 cycles

Definition at line 74 of file CpuLoad.h.

### 3.1.4.2 current\_load

```
uint8_t CpuLoad::current_load [private]
```

Current CPU load (load of last cycle)

Definition at line 73 of file CpuLoad.h.

#### 3.1.4.3 last\_sum\_value

```
uint16_t CpuLoad::last_sum_value [private]
```

Value of the last computed sum (it will reduce the number of samples to sum and speed up execution time)

Definition at line 79 of file CpuLoad.h.

#### 3.1.4.4 max\_load

```
uint8_t CpuLoad::max_load [private]
```

Maximum CPU load since power on

Definition at line 75 of file CpuLoad.h.

#### 3.1.4.5 sample\_cnt

```
uint8_t CpuLoad::sample_cnt [private]
```

Number of samples used to compute average load

Definition at line 76 of file CpuLoad.h.

#### 3.1.4.6 sample\_idx

```
uint8_t CpuLoad::sample_idx [private]
```

Current measurement index (used to memorize the current measure at the correct location in table)

Definition at line 78 of file CpuLoad.h.

#### 3.1.4.7 sample\_mem

```
uint8_t CpuLoad::sample_mem[NB_OF_SAMPLES] [private]
```

Memorization of the last NB\_OF\_SAMPLES measures

Definition at line 77 of file CpuLoad.h.

The documentation for this class was generated from the following files:

- [CpuLoad.h](#)
- [CpuLoad.cpp](#)

## 3.2 dht22 Class Reference

DHT 22 driver class.

```
#include <dht22.h>
```

### Public Member Functions

- [dht22 \(\)](#)  
*dht22 class constructor*
- bool [read \(uint16\\_t \\*raw\\_humidity, uint16\\_t \\*raw\\_temperature\)](#)  
*Reads the data from DHT22.*

### Private Member Functions

- void [initializeCommunication \(\)](#)  
*Initializes the communication.*

#### 3.2.1 Detailed Description

DHT 22 driver class.

This class defines all useful functions for DHT22 temperature and humidity sensor

Definition at line 22 of file dht22.h.

#### 3.2.2 Constructor & Destructor Documentation

##### 3.2.2.1 dht22()

```
dht22::dht22 ( )
```

[dht22](#) class constructor

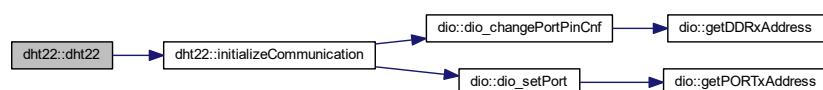
Initializes the class [dht22](#)

Returns

Nothing

Definition at line 22 of file dht22.cpp.

Here is the call graph for this function:



### 3.2.3 Member Function Documentation

#### 3.2.3.1 initializeCommunication()

```
void dht22::initializeCommunication ( ) [private]
```

Initializes the communication.

This function initializes the communication with DHT22 using 1-wire protocol

##### Returns

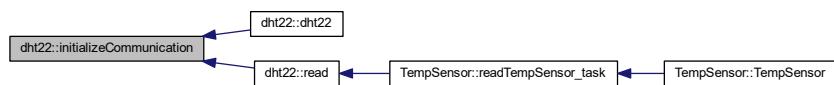
Nothing

Definition at line 198 of file dht22.cpp.

Here is the call graph for this function:



Here is the caller graph for this function:



#### 3.2.3.2 read()

```
bool dht22::read (
    uint16_t * raw_humidity,
    uint16_t * raw_temperature )
```

Reads the data from DHT22.

This function communicates with DHT22 using 1-wire protocol to read raw values of temperature and humidity. A checksum check is done when communication is finished to validate the received data

**Parameters**

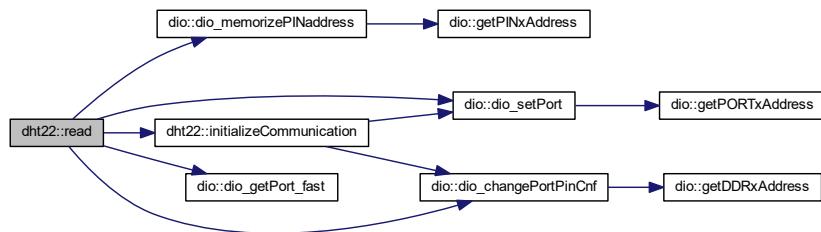
<code>out</code>	<code>raw_humidity</code>	Raw humidity value received from sensor
<code>out</code>	<code>raw_temperature</code>	Raw temperature value received from sensor

**Returns**

Validity of the read value

Definition at line 27 of file dht22.cpp.

Here is the call graph for this function:



Here is the caller graph for this function:



The documentation for this class was generated from the following files:

- [dht22.h](#)
- [dht22.cpp](#)

### 3.3 dio Class Reference

DIO class.

```
#include <dio.h>
```

## Public Member Functions

- `dio ()`  
*dio class constructor*
- `void dio_setPort (uint8_t portcode, bool state)`  
*Port setting function.*
- `void dio_invertPort (uint8_t portcode)`  
*Inverts the state of output port.*
- `bool dio_getPort (uint8_t portcode)`  
*Gets the logical state of selected pin.*
- `bool dio_getPort_fast (void)`  
*Gets the logical state of the memorized pin.*
- `void dio_changePortPinCnf (uint8_t portcode, uint8_t cnf)`  
*Changes the IO configuration of the selected pin.*
- `void dio_memorizePINaddress (uint8_t portcode)`  
*Memorizes PINx register address and pin index.*

## Private Member Functions

- `void ports_init ()`  
*Digital ports hardware initialization function.*
- `uint8_t * getPORTxAddress (uint8_t portcode)`  
*Gets the physical address of the requested register PORTx.*
- `uint8_t * getPINxAddress (uint8_t portcode)`  
*Gets the physical address of the requested register PINx.*
- `uint8_t * getDDRxAddress (uint8_t portcode)`  
*Gets the physical address of the requested register DDRx.*

## Private Attributes

- `uint8_t * PINx_addr_mem`
- `uint8_t PINx_idx_mem`

### 3.3.1 Detailed Description

DIO class.

This class defines all useful functions for digital input/output ports

Definition at line 31 of file dio.h.

### 3.3.2 Constructor & Destructor Documentation

### 3.3.2.1 dio()

```
dio::dio ( )
```

dio class constructor

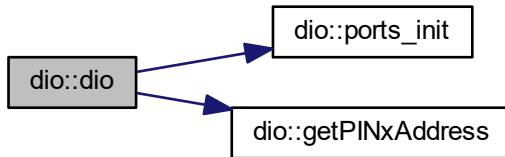
Initializes class dio and calls DIO hardware initialization function

Returns

Nothing

Definition at line 112 of file dio.cpp.

Here is the call graph for this function:



### 3.3.3 Member Function Documentation

#### 3.3.3.1 dio\_changePortPinCnf()

```
void dio::dio_changePortPinCnf (
    uint8_t portcode,
    uint8_t cnf )
```

Changes the IO configuration of the selected pin.

This function configures the selected pin as input or output according to parameter cnf. The corresponding port and pin index is extracted from parameter portcode.

Parameters

in	<i>portcode</i>	Encoded pin and register index
in	<i>cnf</i>	Requested configuration for the selected pin PORT_CNF_OUT (1) : pin configured as output PORT_CNF_IN (0) : pin configured as input

**Returns**

Nothing

Definition at line 149 of file dio.cpp.

Here is the call graph for this function:



Here is the caller graph for this function:

**3.3.3.2 dio\_getPort()**

```
bool dio::dio_getPort (
    uint8_t portcode )
```

Gets the logical state of selected pin.

This function gets the logical value of the selected pin. The corresponding port and pin index is extracted from parameter portcode.

**Parameters**

in	<i>portcode</i>	Encoded pin and register index
----	-----------------	--------------------------------

**Returns**

Logical state of selected pin

Definition at line 139 of file dio.cpp.

Here is the call graph for this function:



### 3.3.3.3 dio\_getPort\_fast()

```
bool dio::dio_getPort_fast (
    void )
```

Gets the logical state of the memorized pin.

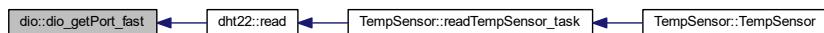
This function gets the logical value of the memorized pin. The corresponding port and pin index are stored in class members PINx\_addr\_mem and PINx\_idx\_mem. This mechanism is used to speed up reading time as this function no longer needs to extract register address and pin index from portcode.

#### Returns

Logical state of selected pin

Definition at line 171 of file dio.cpp.

Here is the caller graph for this function:



### 3.3.3.4 dio\_invertPort()

```
void dio::dio_invertPort (
    uint8_t portcode )
```

Inverts the state of output port.

This function inverts the state of the chosen pin. The corresponding port and pin index is extracted from parameter portcode.

**Parameters**

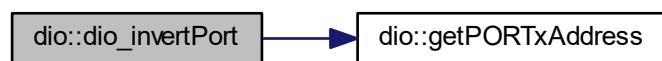
in	<i>portcode</i>	Encoded pin and register index
----	-----------------	--------------------------------

**Returns**

Nothing

Definition at line 131 of file dio.cpp.

Here is the call graph for this function:



Here is the caller graph for this function:

**3.3.3.5 dio\_memorizePINaddress()**

```
void dio::dio_memorizePINaddress (
    uint8_t portcode )
```

Memorizes PINx register address and pin index.

This function is used to speed up reading of register PINx. Register address and pin index are decoded from portcode parameter and stored for later use by function dio\_getPort\_fast.

**Parameters**

in	<i>portcode</i>	Encoded pin and register index
----	-----------------	--------------------------------

**Returns**

Nothing

Definition at line 165 of file dio.cpp.

Here is the call graph for this function:



Here is the caller graph for this function:



### 3.3.3.6 dio\_setPort()

```
void dio::dio_setPort (
    uint8_t portcode,
    bool state )
```

Port setting function.

This function sets the requested digital output to the requested state. The corresponding port and pin index is extracted from parameter portcode.

**Parameters**

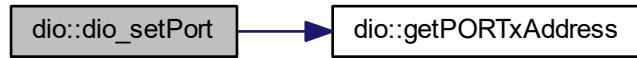
in	<i>portcode</i>	Encoded pin and register index
in	<i>state</i>	Requested state to set pin

**Returns**

Nothing

Definition at line 121 of file dio.cpp.

Here is the call graph for this function:



Here is the caller graph for this function:



### 3.3.3.7 getDDRxAddress()

```
uint8_t * dio::getDDRxAddress (
    uint8_t portcode ) [private]
```

Gets the physical address of the requested register DDRx.

This function retrieves the address of the register DDRx where x is encoded into the parameter portcode.

#### Parameters

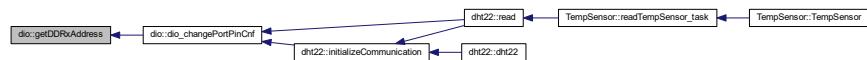
in	<i>portcode</i>	Encoded port code
----	-----------------	-------------------

#### Returns

Pointer to the DDRx register

Definition at line 83 of file dio.cpp.

Here is the caller graph for this function:



### 3.3.3.8 getPINxAddress()

```
uint8_t * dio::getPINxAddress (
    uint8_t portcode ) [private]
```

Gets the physical address of the requested register PINx.

This function retrieves the address of the register PINx where x is encoded into the parameter portcode.

#### Parameters

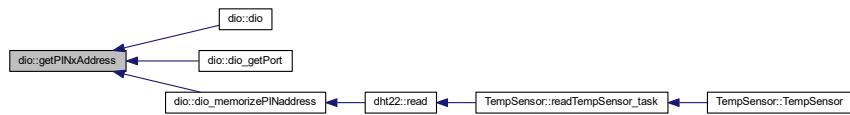
in	<i>portcode</i>	Encoded port code
----	-----------------	-------------------

#### Returns

Pointer to the PINx register

Definition at line 54 of file dio.cpp.

Here is the caller graph for this function:



### 3.3.3.9 getPORTxAddress()

```
uint8_t * dio::getPORTxAddress (
    uint8_t portcode ) [private]
```

Gets the physical address of the requested register PORTx.

This function retrieves the address of the register PORTx where x is encoded into the parameter portcode.

#### Parameters

in	<i>portcode</i>	Encoded port code
----	-----------------	-------------------

#### Returns

Pointer to the PORTx register

Definition at line 25 of file dio.cpp.

Here is the caller graph for this function:



### 3.3.3.10 ports\_init()

```
void dio::ports_init ( ) [private]
```

Digital ports hardware initialization function.

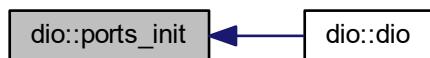
This function initializes digital ports as input or output and sets their initial values

**Returns**

Nothing

Definition at line 16 of file dio.cpp.

Here is the caller graph for this function:



### 3.3.4 Member Data Documentation

#### 3.3.4.1 PINx\_addr\_mem

```
uint8_t* dio::PINx_addr_mem [private]
```

Memorizes physical address of register PINx in order to speed up register reading time in function dio\_getPort\_fast

Definition at line 146 of file dio.h.

### 3.3.4.2 PINx\_idx\_mem

```
uint8_t dio::PINx_idx_mem [private]
```

Memorizes pin index of register PINx in order to speed up register reading time in function dio\_getPort\_fast

Definition at line 147 of file dio.h.

The documentation for this class was generated from the following files:

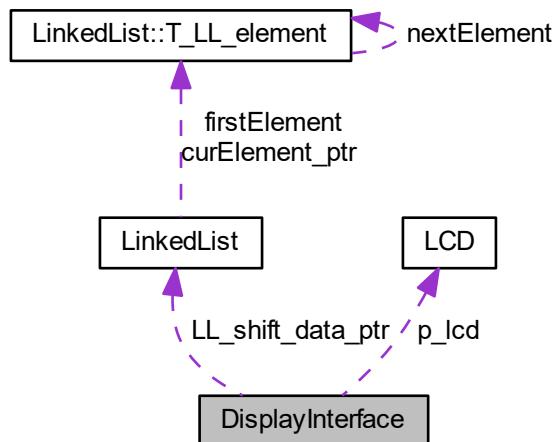
- [dio.h](#)
- [dio.cpp](#)

## 3.4 DisplayInterface Class Reference

Display interface services class.

```
#include <DisplayInterface.h>
```

Collaboration diagram for DisplayInterface:



### Public Member Functions

- `DisplayInterface (const T_LCD_conf_struct *LCD_init_cnf)`  
*Class constructor.*
- `bool DisplayFullLine (uint8_t *str, uint8_t size, uint8_t line, T_DisplayInterface_LineDisplayMode mode)`  
*Line display function.*
- `bool ClearLine (uint8_t line)`  
*Line clearing function.*
- `bool IsLineEmpty (uint8_t line)`  
*Empty line get function.*
- `LinkedList * getLLShiftDataPtr ()`  
*Linked list shift data get function.*

## Static Public Member Functions

- static bool [LLElementCompare](#) (void \*LLElement, void \*CompareElement)  
*Linked list comparison function.*
- static void [shiftLine\\_task](#) ()  
*Line shifting periodic task.*

## Private Member Functions

- uint8\_t [FindFirstCharAddr](#) (uint8\_t line)  
*Finds start address of a line.*

## Private Attributes

- [LCD \\* p\\_lcd](#)
- uint32\_t [dummy](#)
- bool [lineEmptyTab \[LCD\\_SIZE\\_NB\\_LINES\]](#)
- [LinkedList \\* LL\\_shift\\_data\\_ptr](#)

### 3.4.1 Detailed Description

Display interface services class.

This class defines the services used for interfacing display management services and [LCD](#) screen driver

Definition at line 51 of file [DisplayInterface.h](#).

### 3.4.2 Constructor & Destructor Documentation

#### 3.4.2.1 [DisplayInterface\(\)](#)

```
DisplayInterface::DisplayInterface (
    const T\_LCD\_conf\_struct * LCD_init_cnf )
```

Class constructor.

This function initializes all class variables and instantiates the [LCD](#) driver according to the given configuration.

#### Parameters

in	<a href="#">LCD_init_cnf</a>	Initial configuration of the screen
----	------------------------------	-------------------------------------

**Returns**

Nothing

Definition at line 39 of file DisplayInterface.cpp.

### 3.4.3 Member Function Documentation

#### 3.4.3.1 ClearLine()

```
bool DisplayInterface::ClearLine (
    uint8_t line )
```

Line clearing function.

This function clears the requested line. It sets the corresponding DDRAM addresses to the ASCII value of space character

**Parameters**

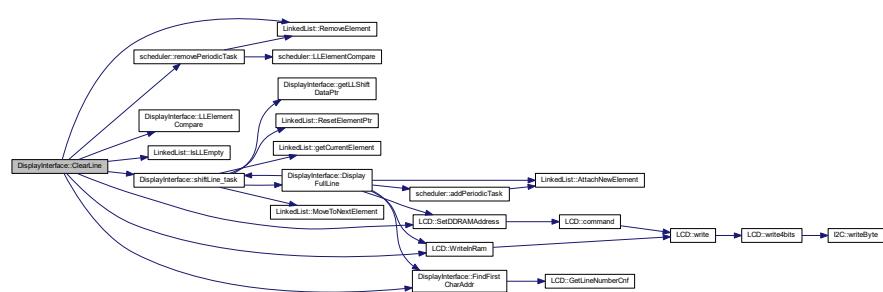
in	<i>line</i>	Line to clear
----	-------------	---------------

**Returns**

True if the line has been cleared, false otherwise

Definition at line 169 of file DisplayInterface.cpp.

Here is the call graph for this function:



### 3.4.3.2 DisplayFullLine()

```
bool DisplayInterface::DisplayFullLine (
    uint8_t * str,
    uint8_t size,
    uint8_t line,
    T_DisplayInterface_LineDisplayMode mode )
```

Line display function.

This function displays the given string on the requested line. If the string is too long to be displayed entirely, the behavior is defined by the selected mode.

#### Parameters

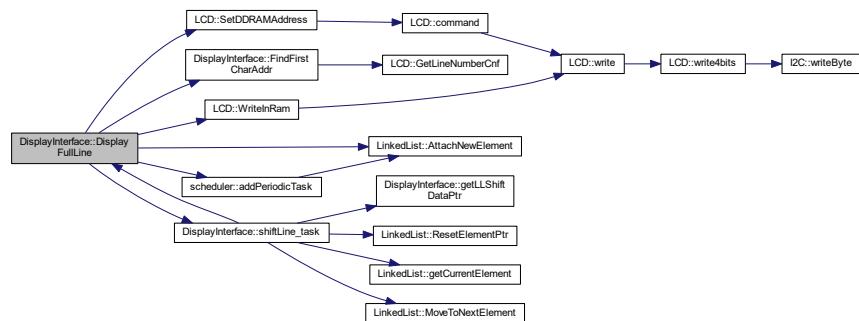
in	<i>str</i>	Pointer to the string to display
in	<i>size</i>	Size of the string to display
in	<i>line</i>	Index of the line where the string shall be displayed
in	<i>mode</i>	Display mode

#### Returns

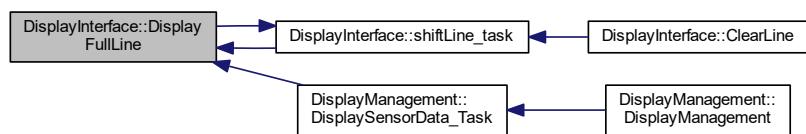
True if the line has been correctly displayed, false otherwise

Definition at line 61 of file DisplayInterface.cpp.

Here is the call graph for this function:



Here is the caller graph for this function:



### 3.4.3.3 FindFirstCharAddr()

```
uint8_t DisplayInterface::FindFirstCharAddr (
    uint8_t line ) [private]
```

Finds start address of a line.

This function finds the address in DDRAM of the first character of a line.

#### Parameters

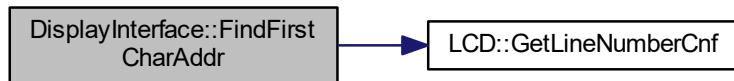
<code>in</code>	<code>line</code>	Line which address shall be found
-----------------	-------------------	-----------------------------------

#### Returns

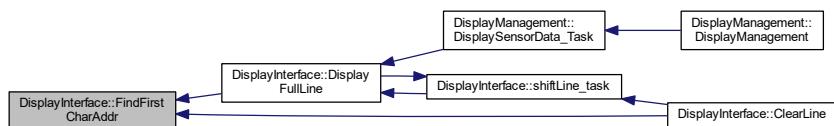
Address in DDRAM of the first character of the line

Definition at line 130 of file DisplayInterface.cpp.

Here is the call graph for this function:



Here is the caller graph for this function:



### 3.4.3.4 getLLShiftDataPtr()

```
LinkedList* DisplayInterface::getLLShiftDataPtr ( ) [inline]
```

Linked list shift data get function.

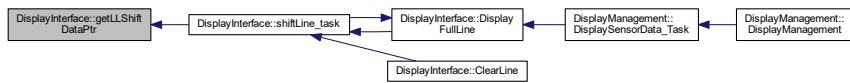
This function returns the pointer to the shift data linked list.

**Returns**

Pointer to linked list

Definition at line 119 of file DisplayInterface.h.

Here is the caller graph for this function:

**3.4.3.5 IsLineEmpty()**

```
bool DisplayInterface::IsLineEmpty (
    uint8_t line )
```

Empty line get function.

This function answers if the line given in parameter is empty or not, according to the table isLineEmpty[]

**Parameters**

in	<i>line</i>	Requested line
----	-------------	----------------

**Returns**

True if the line is empty, false otherwise

Definition at line 200 of file DisplayInterface.cpp.

**3.4.3.6 LLElementCompare()**

```
bool DisplayInterface::LLElementCompare (
    void * LLElement,
    void * CompareElement ) [static]
```

Linked list comparison function.

This function is called by the linked list class to compare one element of the list to a given element. In the class [DisplayInterface](#), the LLElement is a shift data pointer (containing a line number inside it), and the compareElement a line number. The comparison will be done between the two function pointer.

### Parameters

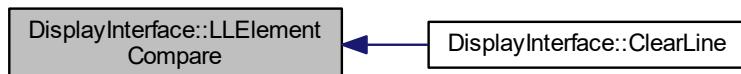
in	<i>LLElement</i>	Pointer to the linked list element
in	<i>CompareElement</i>	Pointer to the element to the compare

### Returns

True if both elements are identical, false otherwise

Definition at line 209 of file DisplayInterface.cpp.

Here is the caller graph for this function:



### 3.4.3.7 shiftLine\_task()

```
void DisplayInterface::shiftLine_task ( ) [static]
```

Line shifting periodic task.

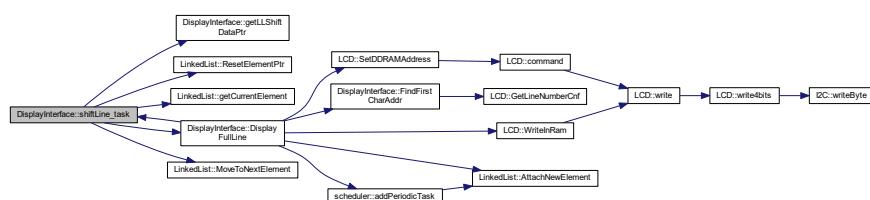
This function is called periodically by the scheduler. It shifts all the lines in line shifting mode and updates the data structures.

### Returns

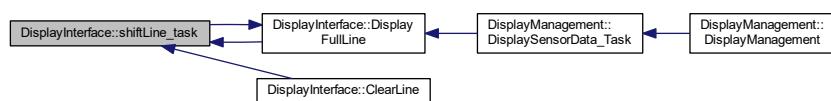
Nothing

Definition at line 220 of file DisplayInterface.cpp.

Here is the call graph for this function:



Here is the caller graph for this function:



### 3.4.4 Member Data Documentation

#### 3.4.4.1 dummy

```
uint32_t DisplayInterface::dummy [private]
```

Needed for data alignment

Definition at line 127 of file DisplayInterface.h.

#### 3.4.4.2 lineEmptyTab

```
bool DisplayInterface::lineEmptyTab[LCD_SIZE_NB_LINES] [private]
```

Table indicating whether a line is empty or not (true = line empty, false = line not empty)

Definition at line 128 of file DisplayInterface.h.

#### 3.4.4.3 LL\_shift\_data\_ptr

```
LinkedList* DisplayInterface::LL_shift_data_ptr [private]
```

Linked list containing data for line shifting, each element of the list corresponds to a line of the screen

Definition at line 129 of file DisplayInterface.h.

#### 3.4.4.4 p\_lcd

```
LCD* DisplayInterface::p_lcd [private]
```

Pointer to the attached LCD driver object

Definition at line 126 of file DisplayInterface.h.

The documentation for this class was generated from the following files:

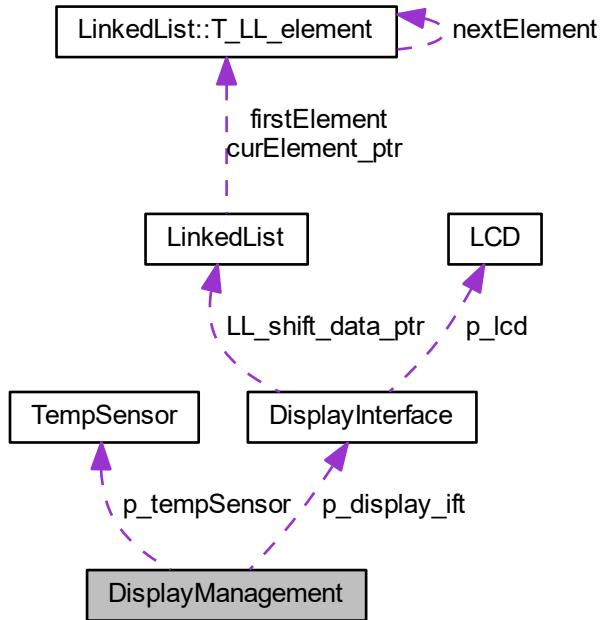
- [DisplayInterface.h](#)
- [DisplayInterface.cpp](#)

### 3.5 DisplayManagement Class Reference

Display management class.

```
#include <DisplayManagement.h>
```

Collaboration diagram for DisplayManagement:



#### Public Member Functions

- `DisplayManagement ()`  
*Class constructor.*
- `DisplayInterface * GetIfpPointer ()`  
*Interface pointer get function.*
- `TempSensor * GetTempSensorPtr ()`  
*Sensor pointer get function.*

#### Static Public Member Functions

- `static void DisplaySensorData_Task ()`  
*Periodic task for displaying sensor data.*

#### Private Attributes

- `DisplayInterface * p_display_ift`
- `TempSensor * p_tempSensor`

### 3.5.1 Detailed Description

Display management class.

This class manages all displays. It is a top-level class. It retrieves the data computed by other ASW classes and displays them. It is interfaced with [DisplayInterface](#) class to display data on screens. One interface class is used for each screen.

Definition at line 45 of file `DisplayManagement.h`.

### 3.5.2 Constructor & Destructor Documentation

#### 3.5.2.1 `DisplayManagement()`

```
DisplayManagement::DisplayManagement( )
```

Class constructor.

This class initializes display management.

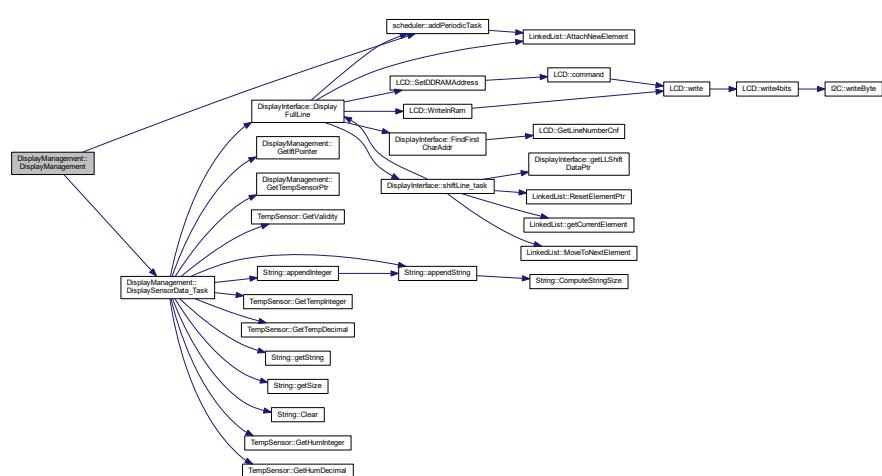
It creates a display interface object and initializes all class variables.

**Returns**

Nothing

Definition at line 30 of file `DisplayManagement.cpp`.

Here is the call graph for this function:



### 3.5.3 Member Function Documentation

### 3.5.3.1 DisplaySensorData\_Task()

```
void DisplayManagement::DisplaySensorData_Task ( ) [static]
```

Periodic task for displaying sensor data.

This function displays the sensors data on the screen. Currently temperature and humidity data coming from `dht22` sensor are displayed.

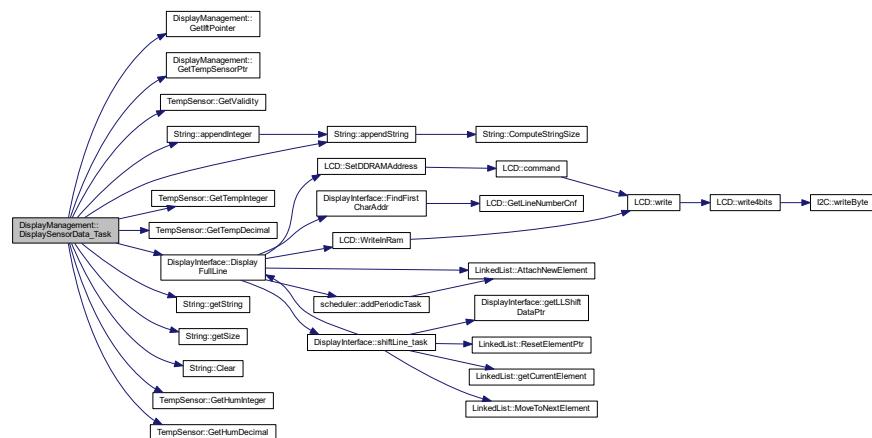
It is called periodically by scheduler.

#### Returns

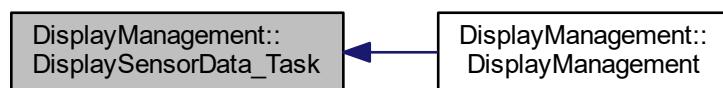
Nothing

Definition at line 44 of file `DisplayManagement.cpp`.

Here is the call graph for this function:



Here is the caller graph for this function:



### 3.5.3.2 GetIfPointer()

```
DisplayInterface* DisplayManagement::GetIfPointer ( ) [inline]
```

Interface pointer get function.

This function returns the pointer to the display interface object

#### Returns

Pointer to display interface object

Definition at line 74 of file DisplayManagement.h.

Here is the caller graph for this function:



### 3.5.3.3 GetTempSensorPtr()

```
TempSensor* DisplayManagement::GetTempSensorPtr ( ) [inline]
```

Sensor pointer get function.

This function returns the pointer to the temperature sensor object

#### Returns

Pointer to sensor object

Definition at line 85 of file DisplayManagement.h.

Here is the caller graph for this function:



### 3.5.4 Member Data Documentation

#### 3.5.4.1 p\_display\_ift

`DisplayInterface* DisplayManagement::p_display_ift [private]`

Pointer to the display interface object

Definition at line 92 of file `DisplayManagement.h`.

#### 3.5.4.2 p\_tempSensor

`TempSensor* DisplayManagement::p_tempSensor [private]`

Pointer to the temperature sensor object

Definition at line 93 of file `DisplayManagement.h`.

The documentation for this class was generated from the following files:

- [DisplayManagement.h](#)
- [DisplayManagement.cpp](#)

## 3.6 I2C Class Reference

Two-wire serial interface ([I2C](#)) class definition.

```
#include <I2C.h>
```

### Public Member Functions

- [`I2C \(uint32\_t l\_bitrate\)`](#)  
*I2C class constructor.*
- [`bool writeByte \(uint8\_t \*data\)`](#)  
*Byte sending function.*
- [`void setTxAddress \(uint8\_t address\)`](#)  
*Setting function for Tx I2C address.*
- [`void setBitRate \(uint32\_t l\_bitrate\)`](#)  
*Variable bitrate setting function.*

### Private Member Functions

- [`void initializeBus \(\)`](#)  
*I2C bus initialization.*

## Private Attributes

- `uint8_t tx_address`
- `uint32_t bitrate`

### 3.6.1 Detailed Description

Two-wire serial interface ([I2C](#)) class definition.

This class manages [I2C](#) driver.

Definition at line 23 of file I2C.h.

### 3.6.2 Constructor & Destructor Documentation

#### 3.6.2.1 I2C()

```
I2C::I2C (   
           uint32_t l_bitrate )
```

[I2C](#) class constructor.

This function initializes the [I2C](#) class and calls bus initialization function

#### Parameters

<code>in</code>	<code>l_bitrate</code>	Requested bitrate for <a href="#">I2C</a> bus (in Hz)
-----------------	------------------------	---

#### Returns

Nothing

Definition at line 15 of file I2C.cpp.

Here is the call graph for this function:



### 3.6.3 Member Function Documentation

#### 3.6.3.1 initializeBus()

```
void I2C::initializeBus ( ) [private]
```

I2C bus initialization.

This function initializes the I2C bus, it resets the bus and configure the bitrate as requested. Bitrate is configured according to formula in the ATMEGA2560 datasheet :  $SCL\ freq = F\_CPU / (16 + 2*TWBR*(4^{TWPS}))$ . Prescaler value is fixed to 1 (TWPS1 = 0 and TWPS0 = 0), then only TWBR value shall be computed.

##### Returns

Nothing

Definition at line 76 of file I2C.cpp.

Here is the caller graph for this function:



#### 3.6.3.2 setBitRate()

```
void I2C::setBitRate (
    uint32_t l_bitrate )
```

Variable bitrate setting function.

This function sets the class variable bitrate as requested in parameter.

##### Parameters

in	<i>l_bitrate</i>	Requested bitrate (in Hz)
----	------------------	---------------------------

##### Returns

Nothing

Definition at line 71 of file I2C.cpp.

### 3.6.3.3 setTxAddress()

```
void I2C::setTxAddress (  
    uint8_t address )
```

Setting function for Tx I2C address.

This function sets the given Tx I2C address in the internal class variable.

#### Parameters

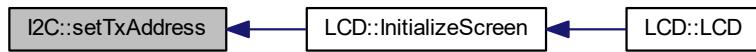
in	address	Requested Tx address
----	---------	----------------------

#### Returns

Nothing

Definition at line 66 of file I2C.cpp.

Here is the caller graph for this function:



### 3.6.3.4 writeByte()

```
bool I2C::writeByte (   
    uint8_t * data )
```

Byte sending function.

This function sends one byte on I2C bus

#### Parameters

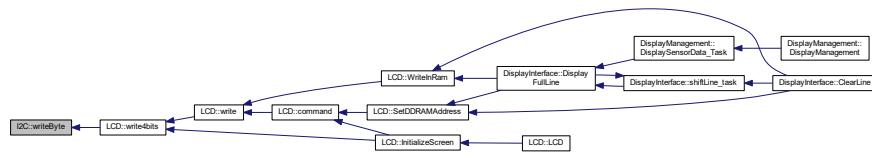
in	data	Pointer to the data to send
----	------	-----------------------------

**Returns**

True if transmission is completed, False if an error has occurred

Definition at line 23 of file I2C.cpp.

Here is the caller graph for this function:



### 3.6.4 Member Data Documentation

#### 3.6.4.1 bitrate

```
uint32_t I2C::bitrate [private]
```

Definition at line 63 of file I2C.h.

#### 3.6.4.2 tx\_address

```
uint8_t I2C::tx_address [private]
```

Definition at line 62 of file I2C.h.

The documentation for this class was generated from the following files:

- [I2C.h](#)
- [I2C.cpp](#)

## 3.7 keepAliveLed Class Reference

Class for keep-alive LED blinking.

```
#include <keepAliveLed.h>
```

### Public Member Functions

- [keepAliveLed \(\)](#)

*Class constructor.*

## Static Public Member Functions

- static void [blinkLed\\_task \(\)](#)

*Task for LED blinking.*

### 3.7.1 Detailed Description

Class for keep-alive LED blinking.

This class defines all functions to make keep-alive LED blink

Definition at line 22 of file `keepAliveLed.h`.

### 3.7.2 Constructor & Destructor Documentation

#### 3.7.2.1 `keepAliveLed()`

```
keepAliveLed::keepAliveLed ( )
```

Class constructor.

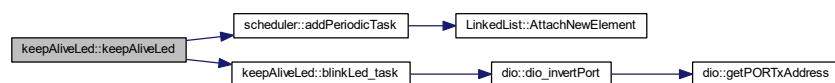
This function initializes the class `keepAliveLed`

##### Returns

Nothing

Definition at line 15 of file `keepAliveLed.cpp`.

Here is the call graph for this function:



### 3.7.3 Member Function Documentation

### 3.7.3.1 blinkLed\_task()

```
void keepAliveLed::blinkLed_task ( ) [static]
```

Task for LED blinking.

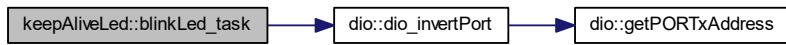
This function is inserted into the scheduler. It changes the state of the LED output to make it blink

#### Returns

Nothing

Definition at line 21 of file `keepAliveLed.cpp`.

Here is the call graph for this function:



Here is the caller graph for this function:



The documentation for this class was generated from the following files:

- [keepAliveLed.h](#)
- [keepAliveLed.cpp](#)

## 3.8 LCD Class Reference

Class for [LCD](#) S2004A display driver.

```
#include <LCD.h>
```

## Public Member Functions

- `LCD (const T_LCD_conf_struct *init_conf)`  
*LCD class constructor.*
- `void command (T_LCD_command cmd)`  
*LCD command management function.*
- `void ConfigureBacklight (bool enable)`  
*Backlight configuration function.*
- `void ConfigureLineNumber (bool param)`  
*Line type configuration function.*
- `void ConfigureFontType (bool param)`  
*Font configuration function.*
- `void ConfigureDisplayOnOff (bool param)`  
*Display configuration function.*
- `void ConfigureCursorOnOff (bool param)`  
*Cursor configuration function.*
- `void ConfigureCursorBlink (bool param)`  
*Cursor blinking configuration function.*
- `void ConfigureEntryModeDir (bool param)`  
*Entry mode direction configuration function.*
- `void ConfigureEntryModeShift (bool param)`  
*Entry mode shift configuration function.*
- `void ConfigureI2CAddr (uint8_t param)`  
*I2C address configuration function.*
- `void SetDDRAMAddress (uint8_t addr)`  
*DDRAM address setting function.*
- `uint8_t GetDDRAMAddress ()`  
*DDRAM address get function.*
- `void WriteInRam (uint8_t a_char, T_LCD_ram_area area)`  
*Screen RAM write function.*
- `bool GetLineNumberCnf ()`  
*Number of line get function.*

## Private Member Functions

- `void write4bits (uint8_t data)`  
*I2C write function for 4-bits mode.*
- `void write (uint8_t data, T_LCD_config_mode mode)`  
*I2C write function.*
- `void InitializeScreen ()`  
*Screen configuration function.*

## Private Attributes

- `bool backlight_enable`
- `bool cnfLineNumber`
- `bool cnfFontType`
- `bool cnfDisplayOnOff`
- `bool cnfCursorOnOff`
- `bool cnfCursorBlink`
- `bool cnfEntryModeDir`
- `bool cnfEntryModeShift`
- `uint8_t cnfI2C_addr`
- `uint8_t ddrum_addr`

### 3.8.1 Detailed Description

Class for [LCD](#) S2004A display driver.

This class handles functions managing [LCD](#) display S2004a on [I2C](#) bus

Definition at line 143 of file LCD.h.

### 3.8.2 Constructor & Destructor Documentation

#### 3.8.2.1 LCD()

```
LCD::LCD (
    const T_LCD_conf_struct * init_conf )
```

[LCD](#) class constructor.

This constructor function initializes the class [LCD](#) and calls screen configuration function.

#### Parameters

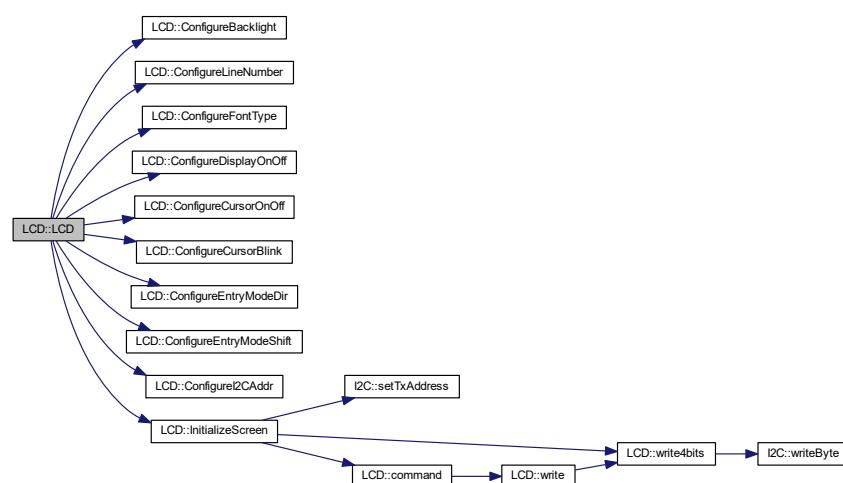
in	<i>init_conf</i>	Initial configuration structure
----	------------------	---------------------------------

#### Returns

Nothing

Definition at line 27 of file LCD.cpp.

Here is the call graph for this function:



### 3.8.3 Member Function Documentation

#### 3.8.3.1 command()

```
void LCD::command (
    T_LCD_Command cmd )
```

LCD command management function.

This function sends the requested command to the LCD screen. It builds the 8-bit command word and sends it on I2C bus.

##### Parameters

in	cmd	Requested command
----	-----	-------------------

##### Returns

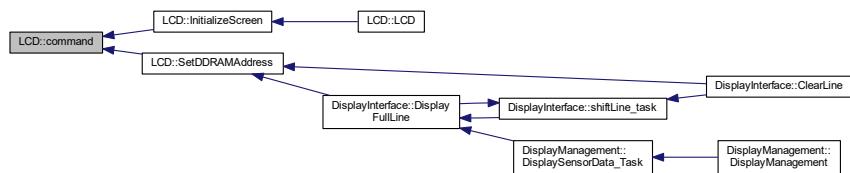
Nothing

Definition at line 128 of file LCD.cpp.

Here is the call graph for this function:



Here is the caller graph for this function:



#### 3.8.3.2 ConfigureBacklight()

```
void LCD::ConfigureBacklight (
    bool enable ) [inline]
```

Backlight configuration function.

This function configures the screen backlight (enable or disable) according to the parameter enable.

**Parameters**

in	<i>enable</i>	True if backlight shall be on, False otherwise
----	---------------	--

**Returns**

Nothing

Definition at line 173 of file LCD.h.

Here is the caller graph for this function:



### 3.8.3.3 ConfigureCursorBlink()

```
void LCD::ConfigureCursorBlink ( bool param ) [inline]
```

Cursor blinking configuration function.

This function configures the cursor blinking (on or off mode) according to the parameter.

**Parameters**

in	<i>param</i>	Configuration value
----	--------------	---------------------

**Returns**

Nothing

Definition at line 233 of file LCD.h.

Here is the caller graph for this function:



### 3.8.3.4 ConfigureCursorOnOff()

```
void LCD::ConfigureCursorOnOff ( bool param ) [inline]
```

Cursor configuration function.

This function configures the cursor (on or off mode) according to the parameter.

**Parameters**

in	param	Configuration value
----	-------	---------------------

**Returns**

Nothing

Definition at line 221 of file LCD.h.

Here is the caller graph for this function:



### 3.8.3.5 ConfigureDisplayOnOff()

```
void LCD::ConfigureDisplayOnOff (
    bool param ) [inline]
```

Display configuration function.

This function configures the display (on or off mode) according to the parameter.

#### Parameters

in	param	Configuration value
----	-------	---------------------

#### Returns

Nothing

Definition at line 209 of file LCD.h.

Here is the caller graph for this function:



### 3.8.3.6 ConfigureEntryModeDir()

```
void LCD::ConfigureEntryModeDir (
    bool param ) [inline]
```

Entry mode direction configuration function.

This function configures the direction of entry mode (right or left) according to the parameter.

#### Parameters

in	param	Configuration value
----	-------	---------------------

#### Returns

Nothing

Definition at line 245 of file LCD.h.

Here is the caller graph for this function:



### 3.8.3.7 ConfigureEntryModeShift()

```
void LCD::ConfigureEntryModeShift (
    bool param ) [inline]
```

Entry mode shift configuration function.

This function configures the display shift of entry mode (enable or disable) according to the parameter.

#### Parameters

in	<i>param</i>	Configuration value
----	--------------	---------------------

#### Returns

Nothing

Definition at line 257 of file LCD.h.

Here is the caller graph for this function:



### 3.8.3.8 ConfigureFontType()

```
void LCD::ConfigureFontType (
    bool param ) [inline]
```

Font configuration function.

This function configures the font type of the screen (5\*8 or 5\*11 dots) according to the parameter.

**Parameters**

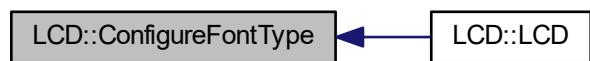
in	<i>param</i>	Configuration value
----	--------------	---------------------

**Returns**

Nothing

Definition at line 197 of file LCD.h.

Here is the caller graph for this function:



### 3.8.3.9 ConfigureI2CAddr()

```
void LCD::ConfigureI2CAddr (
    uint8_t param ) [inline]
```

I2C address configuration function.

This function configures the I2V address of the [LCD](#) screen according to the parameter.

**Parameters**

in	<i>param</i>	I2C address
----	--------------	-------------

**Returns**

Nothing

Definition at line 269 of file LCD.h.

Here is the caller graph for this function:



### 3.8.3.10 ConfigureLineNumber()

```
void LCD::ConfigureLineNumber (
    bool param ) [inline]
```

Line type configuration function.

This function configures the line number configuration of the screen (1 or 2 lines mode) according to the parameter.

**Parameters**

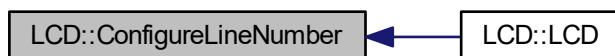
in	param	Configuration value
----	-------	---------------------

**Returns**

Nothing

Definition at line 185 of file LCD.h.

Here is the caller graph for this function:



### 3.8.3.11 GetDDRAMAddress()

```
uint8_t LCD::GetDDRAMAddress ( ) [inline]
```

DDRAM address get function.

This function return the value of the current DDRAM address stored in internal variable `ddram_addr`.

#### Returns

Current DDRAM address

Definition at line 289 of file LCD.h.

### 3.8.3.12 GetLineNumberCnf()

```
bool LCD::GetLineNumberCnf ( ) [inline]
```

Number of line get function.

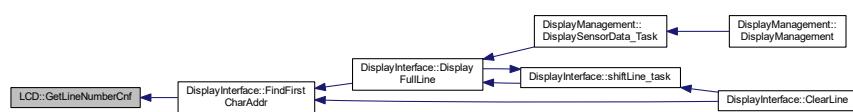
This function returns the line number configuration of the screen : 1 or 2 lines mode.

#### Returns

Line number configuration

Definition at line 311 of file LCD.h.

Here is the caller graph for this function:



## 3.8.3.13 InitializeScreen()

```
void LCD::InitializeScreen ( ) [private]
```

Screen configuration function.

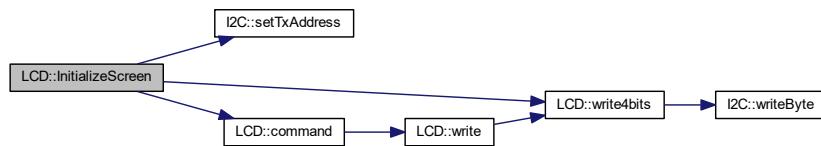
This function configures the [LCD](#) screen. It's must be called during initialization phase, or the screen won't be usable. The configuration process is described in [LCD](#) datasheet J2004A-GFDN-DYNC

#### Returns

Nothing

Definition at line 76 of file LCD.cpp.

Here is the call graph for this function:



Here is the caller graph for this function:



## 3.8.3.14 SetDDRAMAddress()

```
void LCD::SetDDRAMAddress (
    uint8_t addr )
```

DDRAM address setting function.

This function updates the DDRAM address according to the given parameter. The parameter is checked against limits to be sure the address stays always coherent. It also calls the command function to update screen accordingly.

**Parameters**

in	<i>addr</i>	New DDRAM address
----	-------------	-------------------

**Returns**

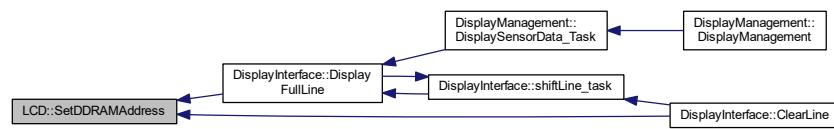
Nothing

Definition at line 171 of file LCD.cpp.

Here is the call graph for this function:



Here is the caller graph for this function:

**3.8.3.15 write()**

```

void LCD::write (
    uint8_t data,
    T_LCD_config_mode mode ) [private]
  
```

I2C write function.

This function writes the requested data on I2C bus. It's assumed we only perform write operation so the R/W bit is forced LOW. It's also assumed we work in 4-bit mode, then two calls of write4bits are performed, first with bits 4-7 of data, second with bits 0-3.

**Parameters**

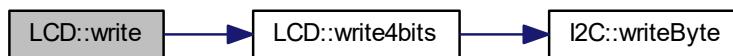
in	<i>data</i>	8-bit data for D0-7 pins of screen
in	<i>mode</i>	Requested mode for LCD communication

**Returns**

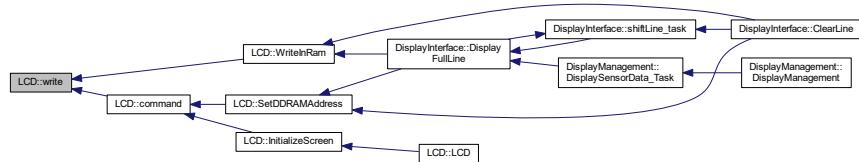
Nothing

Definition at line 65 of file LCD.cpp.

Here is the call graph for this function:



Here is the caller graph for this function:

**3.8.3.16 write4bits()**

```
void LCD::write4bits (
    uint8_t data ) [private]
```

[I2C](#) write function for 4-bits mode.

This function sends the requested 8-bits data on the [I2C](#) bus. The backlight pin is also set/clear according to the configuration. The function sends the data a first time with EN pin set, then a second time with EN bit clear.

**Parameters**

in	data	8-bit data to send
----	------	--------------------

**Returns**

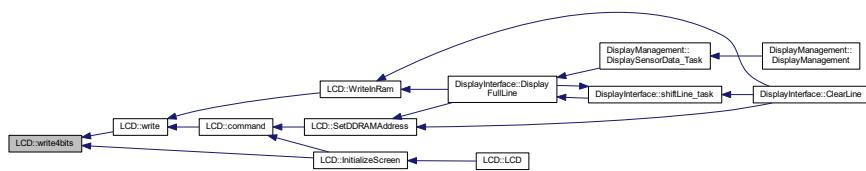
Nothing

Definition at line 48 of file LCD.cpp.

Here is the call graph for this function:



Here is the caller graph for this function:



### 3.8.3.17 WriteInRam()

```
void LCD::WriteInRam (
    uint8_t a_char,
    T_LCD_ram_area area )
```

Screen RAM write function.

This function writes in the memorized RAM address the character given as parameter. After a write the screen automatically increment/decrement the RAM address, so we do the same in the function to stay coherent. Currently only DDRAM write is implemented.

#### Parameters

in	<i>a_char</i>	Data byte to write in RAM
in	<i>area</i>	Area in RAM where the data will be written : DDRAM or CGRAM

#### Returns

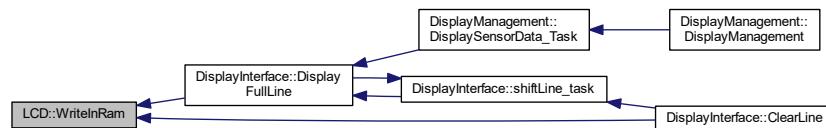
Nothing

Definition at line 193 of file LCD.cpp.

Here is the call graph for this function:



Here is the caller graph for this function:



### 3.8.4 Member Data Documentation

#### 3.8.4.1 `backlight_enable`

```
bool LCD::backlight_enable [private]
```

Backlight enable flag

Definition at line 319 of file LCD.h.

#### 3.8.4.2 `cnfCursorBlink`

```
bool LCD::cnfCursorBlink [private]
```

Cursor blinking configuration : 1 = cursor blink is on, 0 = cursor blink is off

Definition at line 324 of file LCD.h.

#### 3.8.4.3 `cnfCursorOnOff`

```
bool LCD::cnfCursorOnOff [private]
```

Cursor configuration : 1 = cursor on, 0 = cursor off

Definition at line 323 of file LCD.h.

### 3.8.4.4 cnfDisplayOnOff

```
bool LCD::cnfDisplayOnOff [private]
```

Display configuration : 1 = display on, 0 = display off

Definition at line 322 of file LCD.h.

### 3.8.4.5 cnfEntryModeDir

```
bool LCD::cnfEntryModeDir [private]
```

Entry mode direction configuration : 1 = cursor moves to right when DDRAM address is incremented, 0 = cursor moves to left when DDRAM address is incremented

Definition at line 325 of file LCD.h.

### 3.8.4.6 cnfEntryModeShift

```
bool LCD::cnfEntryModeShift [private]
```

Entry mode configuration : 0 = no display shift is performed after a DDRAM read, 1 = a shift is performed

Definition at line 326 of file LCD.h.

### 3.8.4.7 cnfFontType

```
bool LCD::cnfFontType [private]
```

Font type configuration, 0 = 5\*8 dots, 1 = 5\*11 dots

Definition at line 321 of file LCD.h.

### 3.8.4.8 cnfI2C\_addr

```
uint8_t LCD::cnfI2C_addr [private]
```

I2C address of the [LCD](#) screen

Definition at line 327 of file LCD.h.

#### 3.8.4.9 cnfLineNumber

```
bool LCD::cnfLineNumber [private]
```

Display line number configuration, 0 = 1-line mode, 1 = 2-line mode

Definition at line 320 of file LCD.h.

#### 3.8.4.10 ddram\_addr

```
uint8_t LCD::ddram_addr [private]
```

Screen DDRAM address

Definition at line 329 of file LCD.h.

The documentation for this class was generated from the following files:

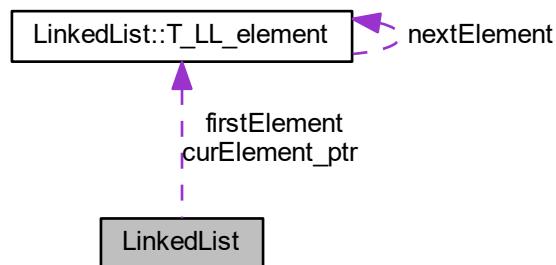
- [LCD.h](#)
- [LCD.cpp](#)

## 3.9 LinkedList Class Reference

Linked list class.

```
#include <LinkedList.h>
```

Collaboration diagram for LinkedList:



## Classes

- struct [T\\_LL\\_element](#)  
*Type defining a linked list element.*

## Public Member Functions

- [LinkedList \(\)](#)  
*Class constructor.*
- [void AttachNewElement \(void \\*data\\_ptr\)](#)  
*Add an new element to the list.*
- [bool RemoveElement \(CompareFctPtr\\_t comparisonFct\\_ptr, void \\*reference\\_ptr\)](#)  
*Removes an element from the chain.*
- [void \\* getCurrentElement \(\)](#)  
*Current element get function.*
- [bool MoveToNextElement \(\)](#)  
*Move to next element function.*
- [void ResetElementPtr \(\)](#)  
*Resets element pointer.*
- [bool IsLLEmpty \(\)](#)  
*Empty linked list.*

## Private Types

- [typedef struct LinkedList::T\\_LL\\_element T\\_LL\\_element](#)  
*Type defining a linked list element.*

## Private Attributes

- [T\\_LL\\_element \\* firstElement](#)
- [T\\_LL\\_element \\* curElement\\_ptr](#)

### 3.9.1 Detailed Description

Linked list class.

This class defines a linked list and the associated services.

All classes using a linked list with this interface shall implement a comparison function used to find the list element to remove. This function shall have the following prototype : static bool LLElementCompare(void\* LLElement, void\* CompareElement);

Definition at line 22 of file `LinkedList.h`.

### 3.9.2 Member Typedef Documentation

#### 3.9.2.1 T\_LL\_element

```
typedef struct LinkedList::T_LL_element LinkedList::T_LL_element [private]
```

Type defining a linked list element.

This structure defines a linked list element. An element is defined by a pointer to the attached data and a pointer to the next element.

### 3.9.3 Constructor & Destructor Documentation

#### 3.9.3.1 LinkedList()

```
LinkedList::LinkedList ( )
```

Class constructor.

This constructor initializes a linked list

##### Returns

Nothing

Definition at line 12 of file LinkedList.cpp.

### 3.9.4 Member Function Documentation

#### 3.9.4.1 AttachNewElement()

```
void LinkedList::AttachNewElement (  
    void * data_ptr )
```

Add an new element to the list.

This function adds a new element at the end of the list. The data pointer to attach to the element is given in parameter

##### Parameters

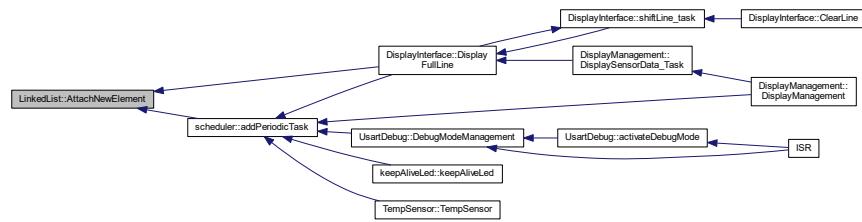
in	<i>data_ptr</i>	Pointer to the data element
----	-----------------	-----------------------------

##### Returns

Nothing

Definition at line 18 of file LinkedList.cpp.

Here is the caller graph for this function:



### 3.9.4.2 getCurrentElement()

```
void* LinkedList::getCurrentElement ( ) [inline]
```

Current element get function.

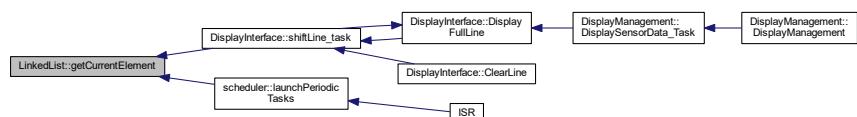
This function returns a pointer to the current pointed data in the chain.

#### Returns

Pointer to the current data

Definition at line 59 of file LinkedList.h.

Here is the caller graph for this function:



### 3.9.4.3 IsLLEmpty()

```
bool LinkedList::IsLLEmpty ( )
```

Empty linked list.

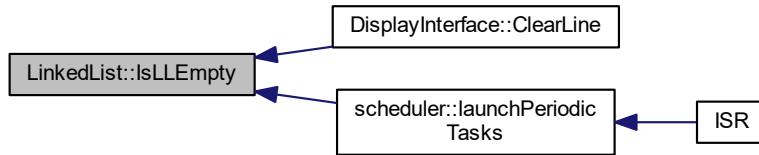
This function checks whether the linked list is empty or not (pointer to first element is equal to 0 or not).

**Returns**

True if the list is empty, false otherwise

Definition at line 84 of file LinkedList.cpp.

Here is the caller graph for this function:

**3.9.4.4 MoveToNextElement()**

```
bool LinkedList::MoveToNextElement ( )
```

Move to next element function.

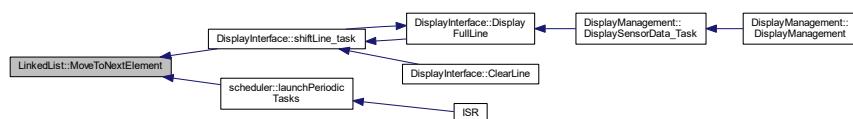
This function moves the element pointer to the next element of the chain.

**Returns**

True if the next element exists, false if there is no next element

Definition at line 70 of file LinkedList.cpp.

Here is the caller graph for this function:

**3.9.4.5 RemoveElement()**

```
bool LinkedList::RemoveElement (
    CompareFctPtr_t comparisonFct_ptr,
    void * reference_ptr )
```

Removes an element from the chain.

This function removes an element from the chain. To know which element shall be removed, we use the comparison function given in parameter. This function is called with two parameters : the data pointer from the chain and the reference pointer given as parameter.

**Parameters**

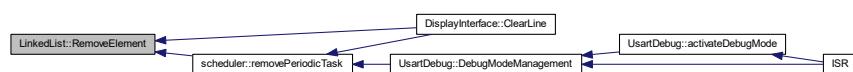
in	<i>comparisonFct_ptr</i>	Pointer to the comparison function to use
in	<i>reference_ptr</i>	Pointer to the reference data used for comparison

**Returns**

True if the element has been correctly removed from the chain, false otherwise

Definition at line 43 of file LinkedList.cpp.

Here is the caller graph for this function:

**3.9.4.6 ResetElementPtr()**

```
void LinkedList::ResetElementPtr ( ) [inline]
```

Resets element pointer.

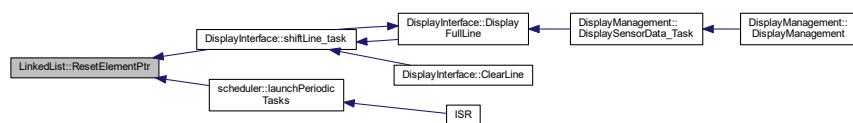
This function sets the element pointer to the first element of the chain.

**Returns**

Nothing

Definition at line 78 of file LinkedList.h.

Here is the caller graph for this function:

**3.9.5 Member Data Documentation**

### 3.9.5.1 curElement\_ptr

```
T_LL_element* LinkedList::curElement_ptr [private]
```

Definition at line 105 of file LinkedList.h.

### 3.9.5.2 firstElement

```
T_LL_element* LinkedList::firstElement [private]
```

Definition at line 104 of file LinkedList.h.

The documentation for this class was generated from the following files:

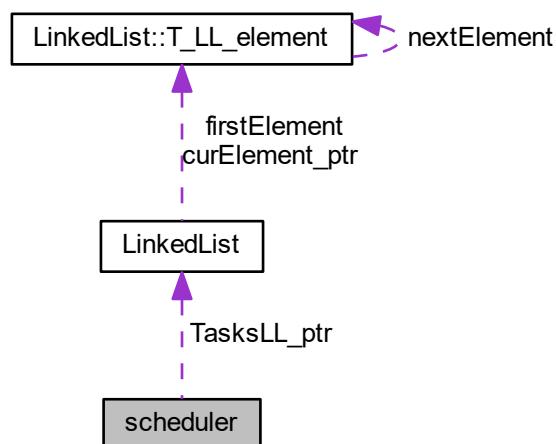
- [LinkedList.h](#)
- [LinkedList.cpp](#)

## 3.10 scheduler Class Reference

Scheduler class.

```
#include <scheduler.h>
```

Collaboration diagram for scheduler:



## Classes

- struct [Task\\_t](#)

*Type defining a task structure.*

## Public Member Functions

- [scheduler \(\)](#)  
*scheduler class constructor*
- [void launchPeriodicTasks \(\)](#)  
*Main scheduler function.*
- [void startScheduling \(\)](#)  
*Starts the tasks scheduling.*
- [void addPeriodicTask \(TaskPtr\\_t task\\_ptr, uint16\\_t a\\_period\)](#)  
*Add a task into the scheduler.*
- [bool removePeriodicTask \(TaskPtr\\_t task\\_ptr\)](#)  
*Remove a task from the scheduler.*
- [uint32\\_t getPitNumber \(\)](#)  
*Get function for PIT number.*

## Static Public Member Functions

- [static bool LLElementCompare \(void \\*LLElement, void \\*CompareElement\)](#)  
*Linked list comparison function.*

## Private Types

- [typedef struct scheduler::Task\\_t Task\\_t](#)  
*Type defining a task structure.*

## Private Attributes

- [LinkedList \\* TasksLL\\_ptr](#)
- [uint32\\_t pit\\_number](#)

### 3.10.1 Detailed Description

Scheduler class.

This class defines the scheduler of the system.

It is called by the main interrupt and calls successively all applicative functions according to their recurrence time.  
All tasks called by the scheduler shall have the following prototype : static void task();

Definition at line 30 of file scheduler.h.

### 3.10.2 Member Typedef Documentation

### 3.10.2.1 Task\_t

```
typedef struct scheduler::Task_t scheduler::Task_t [private]
```

Type defining a task structure.

This structure defines a task. A task is defined by a function to call (defined by its pointer) and a period.

## 3.10.3 Constructor & Destructor Documentation

### 3.10.3.1 scheduler()

```
scheduler::scheduler ()
```

scheduler class constructor

This function initializes the class scheduler

Returns

Nothing

Definition at line 31 of file scheduler.cpp.

Here is the call graph for this function:



## 3.10.4 Member Function Documentation

### 3.10.4.1 addPeriodicTask()

```
void scheduler::addPeriodicTask (
    TaskPtr_t task_ptr,
    uint16_t a_period )
```

Add a task into the scheduler.

This function create a new task in the scheduler linked to the function task\_ptr with a period a\_period and an ID a\_task\_id

**Parameters**

in	<i>task_ptr</i>	Pointer to the task which will be added
in	<i>a_period</i>	Period of the new task

**Returns**

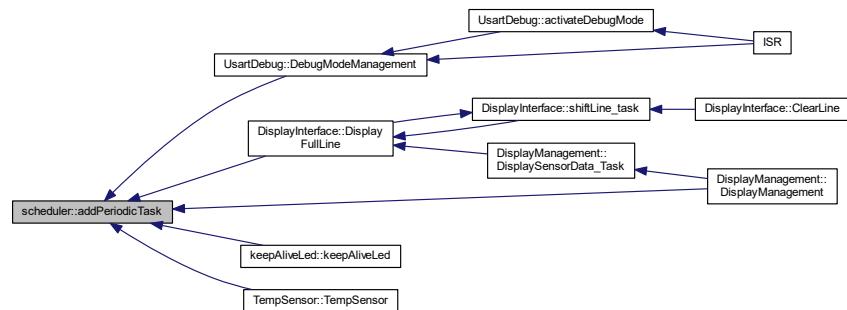
Nothing

Definition at line 84 of file scheduler.cpp.

Here is the call graph for this function:



Here is the caller graph for this function:

**3.10.4.2 getPitNumber()**

```
uint32_t scheduler::getPitNumber( )
```

Get function for PIT number.

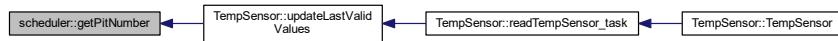
This function returns the PIT number

**Returns**

PIT number

Definition at line 96 of file scheduler.cpp.

Here is the caller graph for this function:

**3.10.4.3 launchPeriodicTasks()**

```
void scheduler::launchPeriodicTasks ( )
```

Main scheduler function.

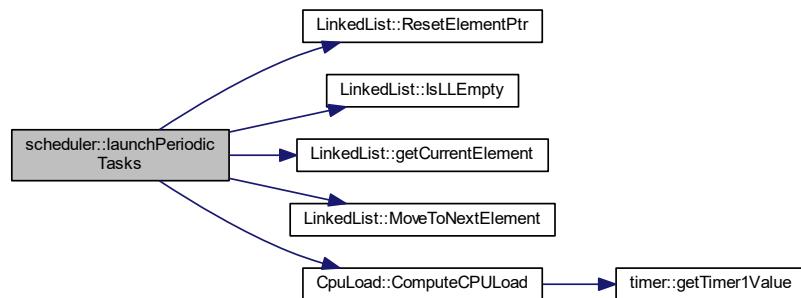
This function launches the scheduled tasks according to current software time and task configuration

**Returns**

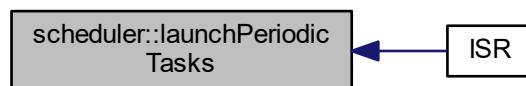
Nothing

Definition at line 43 of file scheduler.cpp.

Here is the call graph for this function:



Here is the caller graph for this function:



### 3.10.4.4 LLElementCompare()

```
bool scheduler::LLElementCompare (
    void * LLElement,
    void * CompareElement ) [static]
```

Linked list comparison function.

This function is called by the linked list class to compare one element of the list to a given element. In the class scheduler, the LLElement is a task pointer (containing a function pointer and a period), and the compareElement a function pointer. The comparison will be done between the two function pointer.

#### Parameters

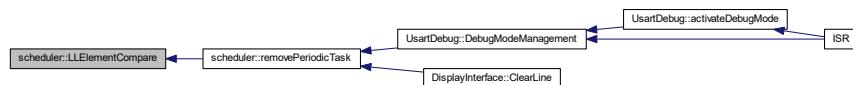
in	<i>LLElement</i>	Pointer to the linked list element
in	<i>CompareElement</i>	Pointer to the element to the compare

#### Returns

True if both elements are identical, false otherwise

Definition at line 107 of file scheduler.cpp.

Here is the caller graph for this function:



### 3.10.4.5 removePeriodicTask()

```
bool scheduler::removePeriodicTask (
    TaskPtr_t task_ptr )
```

Remove a task from the scheduler.

This function finds the task defined by `task_ptr` in the scheduler and removes it.

#### Parameters

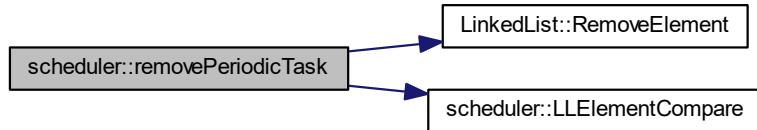
in	<i>task_ptr</i>	address of the task to remove from scheduler
----	-----------------	--

#### Returns

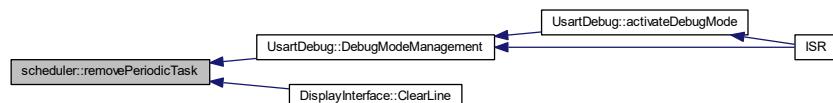
TRUE if the task has been removed, FALSE if the task does not exist in the scheduler

Definition at line 102 of file scheduler.cpp.

Here is the call graph for this function:



Here is the caller graph for this function:



#### 3.10.4.6 startScheduling()

```
void scheduler::startScheduling ( )
```

Starts the tasks scheduling.

This function starts the timer which will trigger an interrupt every software period. When the interrupt is raised the scheduler will launch applications

**Returns**

Nothing

Definition at line 78 of file scheduler.cpp.

Here is the call graph for this function:



Here is the caller graph for this function:



### 3.10.5 Member Data Documentation

#### 3.10.5.1 pit\_number

```
uint32_t scheduler::pit_number [private]
```

Counter of periodic interrupts

Definition at line 116 of file scheduler.h.

#### 3.10.5.2 TasksLL\_ptr

```
LinkedList* scheduler::TasksLL_ptr [private]
```

Pointer to the linked list object containing the tasks

Definition at line 114 of file scheduler.h.

The documentation for this class was generated from the following files:

- [scheduler.h](#)
- [scheduler.cpp](#)

## 3.11 String Class Reference

[String](#) management class.

```
#include <String.h>
```

## Public Member Functions

- `String (const uint8_t *str)`  
*Class constructor.*
- `String ()`  
*Class constructor.*
- `~String ()`  
*Class destructor.*
- `uint8_t * getString ()`  
*String pointer get function.*
- `uint8_t getSize ()`  
*Size get function.*
- `void appendString (uint8_t *str)`  
*String adding function.*
- `void appendInteger (uint16_t value, uint8_t base)`  
*Integer adding function.*
- `void appendBool (bool data, bool isText)`  
*Boolean adding function.*
- `void Clear ()`  
*String clear function.*

## Private Member Functions

- `uint8_t ComputeStringSize (uint8_t *str)`  
*String size computation function.*

## Private Attributes

- `uint8_t * string`
- `uint8_t size`

### 3.11.1 Detailed Description

`String` management class.

This class defines string object. It implements some functions to manage chains of characters. The string is limited to 255 characters. It must finish by the character '\0'.

Definition at line 20 of file String.h.

### 3.11.2 Constructor & Destructor Documentation

#### 3.11.2.1 `String()` [1/2]

```
String::String (
    const uint8_t * str )
```

Class constructor.

This function initializes the class. The string is initialized with the data given in parameter.

**Parameters**

in	str	Pointer to initialization string
----	-----	----------------------------------

**Returns**

Nothing

Definition at line 15 of file String.cpp.

Here is the call graph for this function:



### 3.11.2.2 String() [2/2]

`String::String ( )`

Class constructor.

This function initializes the class with an empty string. The size is set to 0.

**Returns**

Nothing

Definition at line 33 of file String.cpp.

### 3.11.2.3 ~String()

```
String::~String ( )
```

Class destructor.

This function frees the memory used to contain the string when the object is deleted

#### Returns

Nothing

Definition at line 39 of file String.cpp.

Here is the call graph for this function:



### 3.11.3 Member Function Documentation

#### 3.11.3.1 appendBool()

```
void String::appendBool (
    bool data,
    bool isText )
```

Boolean adding function.

This functions adds the given boolean data at the end of the main string. The string size is updated accordingly. According to the input parameter isText, the boolean parameter is converted into a string (true/false) or an integer (0/1).

#### Parameters

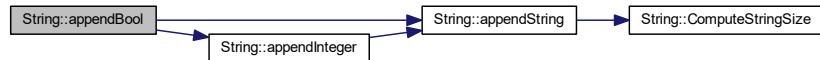
in	<i>data</i>	Boolean data to add
in	<i>isText</i>	Defines the conversion mode : text or integer

#### Returns

Nothing

Definition at line 121 of file String.cpp.

Here is the call graph for this function:



Here is the caller graph for this function:



### 3.11.3.2 appendInteger()

```
void String::appendInteger (
    uint16_t value,
    uint8_t base )
```

Integer adding function.

This functions adds the given integer at the end of the main string. The string size is updated accordingly. The integer parameter is first converted into a chain of character according to the base and then added to the string.

#### Parameters

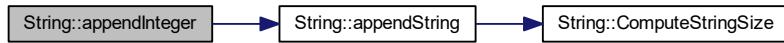
in	<b>value</b>	Integer to add
in	<b>base</b>	Base of computation of the integer (between 2 and 36)

#### Returns

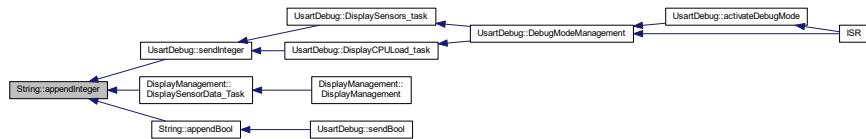
Nothing

Definition at line 95 of file String.cpp.

Here is the call graph for this function:



Here is the caller graph for this function:



### 3.11.3.3 appendString()

```
void String::appendString (
    uint8_t * str )
```

[String](#) adding function.

This functions adds the given string at the end of the main string. The string size is updated accordingly.

#### Parameters

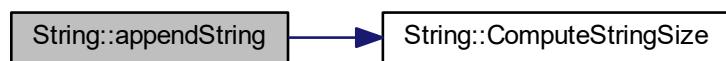
in	str	New string to add
----	-----	-------------------

#### Returns

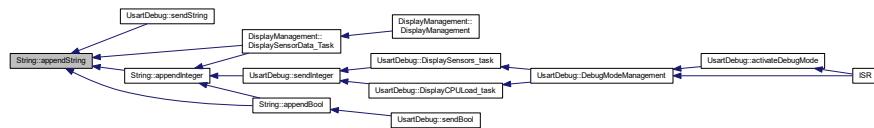
Nothing

Definition at line 57 of file String.cpp.

Here is the call graph for this function:



Here is the caller graph for this function:



### 3.11.3.4 Clear()

```
void String::Clear ()
```

**String** clear function.

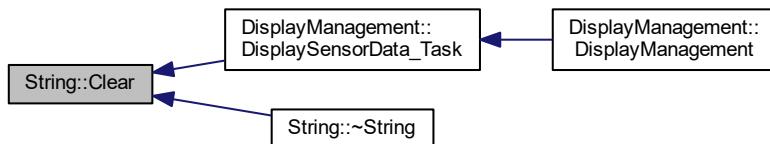
This function clears the string. Size is set to 0 and the memory is freed.

Returns

Nothing

Definition at line 113 of file String.cpp.

Here is the caller graph for this function:



### 3.11.3.5 ComputeStringSize()

```
uint8_t String::ComputeStringSize (
    uint8_t * str ) [private]
```

**String** size computation function.

This function computes the sizes of the given string. It counts the number of character between the start of the string given in parameter and the next \0 character.

**Parameters**

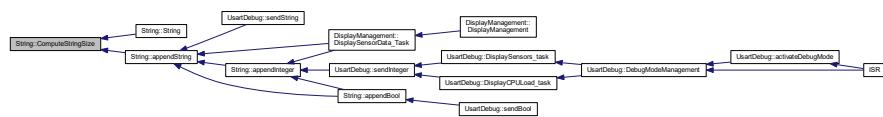
<code>in</code>	<code>str</code>	Pointer to the beginning of the string
-----------------	------------------	--

**Returns**

Number of character of the string (the \0 is excluded)

Definition at line 44 of file String.cpp.

Here is the caller graph for this function:

**3.11.3.6 getSize()**

```
uint8_t String::getSize () [inline]
```

Size get function.

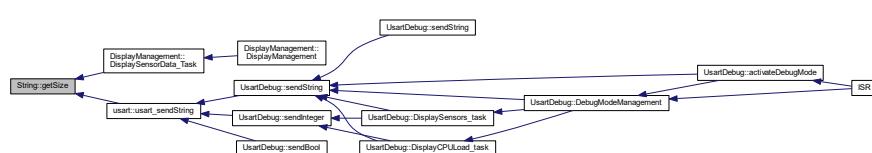
This function returns the size of the string.

**Returns**

Size of the string

Definition at line 66 of file String.h.

Here is the caller graph for this function:



### 3.11.3.7 `getString()`

```
uint8_t* String::getString ( ) [inline]
```

`String` pointer get function.

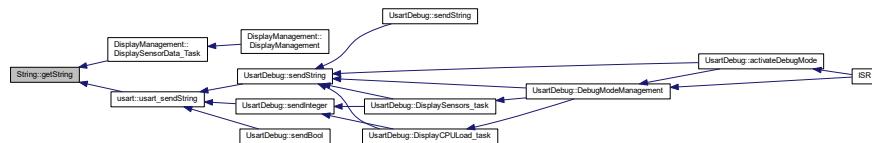
This function returns the pointer to the beginning of the string.

#### Returns

`String` pointer

Definition at line 55 of file `String.h`.

Here is the caller graph for this function:



### 3.11.4 Member Data Documentation

#### 3.11.4.1 `size`

```
uint8_t String::size [private]
```

Size of the string (the '\0' at the end of the string is not taken into account)

Definition at line 114 of file `String.h`.

#### 3.11.4.2 `string`

```
uint8_t* String::string [private]
```

Pointer to the start of the string

Definition at line 113 of file `String.h`.

The documentation for this class was generated from the following files:

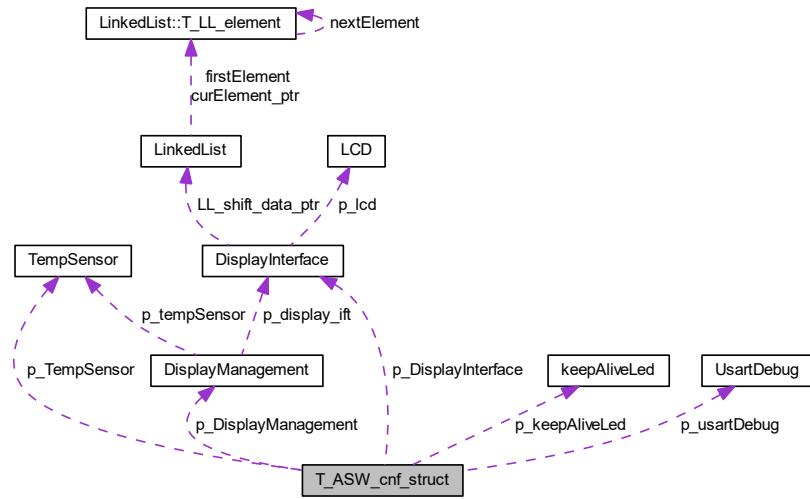
- [String.h](#)
- [String.cpp](#)

## 3.12 T\_ASW\_cnf\_struct Struct Reference

ASW configuration structure.

```
#include <asw.h>
```

Collaboration diagram for T\_ASW\_cnf\_struct:



### Public Attributes

- `UsartDebug * p_usartDebug`
- `keepAliveLed * p_keepAliveLed`
- `TempSensor * p_TempSensor`
- `DisplayInterface * p_DisplayInterface`
- `DisplayManagement * p_DisplayManagement`

#### 3.12.1 Detailed Description

ASW configuration structure.

This structure contains all pointers to instanced applicative objects

Definition at line 18 of file asw.h.

#### 3.12.2 Member Data Documentation

### 3.12.2.1 p\_DisplayInterface

`DisplayInterface* T_ASW_cnf_struct::p_DisplayInterface`

Pointer to [DisplayInterface](#) object

Definition at line 23 of file asw.h.

### 3.12.2.2 p\_DisplayManagement

`DisplayManagement* T_ASW_cnf_struct::p_DisplayManagement`

Pointer to [DisplayManagement](#) object

Definition at line 24 of file asw.h.

### 3.12.2.3 p\_keepAliveLed

`keepAliveLed* T_ASW_cnf_struct::p_keepAliveLed`

Pointer to [keepAliveLed](#) object

Definition at line 21 of file asw.h.

### 3.12.2.4 p\_TempSensor

`TempSensor* T_ASW_cnf_struct::p_TempSensor`

Pointer to [TempSensor](#) object

Definition at line 22 of file asw.h.

### 3.12.2.5 p\_usartDebug

`UsartDebug* T_ASW_cnf_struct::p_usartDebug`

Pointer to USART debug object

Definition at line 20 of file asw.h.

The documentation for this struct was generated from the following file:

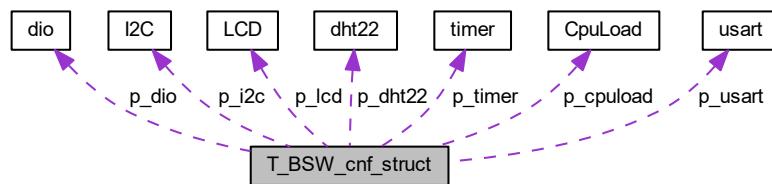
- [asw.h](#)

## 3.13 T\_BSW\_cnf\_struct Struct Reference

BSW configuration structure.

```
#include <bsw.h>
```

Collaboration diagram for T\_BSW\_cnf\_struct:



### Public Attributes

- `uart * p_usart`
- `dio * p_dio`
- `timer * p_timer`
- `dht22 * p_dht22`
- `CpuLoad * p_cpuload`
- `I2C * p_i2c`
- `LCD * p_lcd`

#### 3.13.1 Detailed Description

BSW configuration structure.

This structure contains all pointers to instanced drivers objects

Definition at line 24 of file bsw.h.

#### 3.13.2 Member Data Documentation

##### 3.13.2.1 p\_cpuload

```
CpuLoad* T_BSW_cnf_struct::p_cpuload
```

Pointer to cpu load library object

Definition at line 30 of file bsw.h.

### 3.13.2.2 p\_dht22

`dht22* T_BSW_cnf_struct::p_dht22`

Pointer to [dht22](#) driver object

Definition at line 29 of file bsw.h.

### 3.13.2.3 p\_dio

`dio* T_BSW_cnf_struct::p_dio`

Pointer to dio driver object

Definition at line 27 of file bsw.h.

### 3.13.2.4 p\_i2c

`I2C* T_BSW_cnf_struct::p_i2c`

Pointer to [I2C](#) driver object

Definition at line 31 of file bsw.h.

### 3.13.2.5 p\_lcd

`LCD* T_BSW_cnf_struct::p_lcd`

Pointer to [LCD](#) driver object

Definition at line 32 of file bsw.h.

### 3.13.2.6 p\_timer

`timer* T_BSW_cnf_struct::p_timer`

Pointer to timer driver object

Definition at line 28 of file bsw.h.

### 3.13.2.7 p\_usart

```
usart* T_BSW_cnf_struct::p_usart
```

Pointer to usart driver object

Definition at line 26 of file bsw.h.

The documentation for this struct was generated from the following file:

- [bsw.h](#)

## 3.14 T\_Display\_shift\_data Struct Reference

Structure containing shift data.

```
#include <DisplayInterface.h>
```

### Public Attributes

- `uint8_t * str_start_ptr`
- `uint8_t * str_cur_ptr`
- `uint8_t size`
- `uint8_t line`
- `uint8_t temporization`

### 3.14.1 Detailed Description

Structure containing shift data.

This structure contains all useful data for line shifting. These data need to be kept between each call of the periodic function.

Definition at line 33 of file DisplayInterface.h.

### 3.14.2 Member Data Documentation

#### 3.14.2.1 line

```
uint8_t T_Display_shift_data::line
```

Definition at line 38 of file DisplayInterface.h.

### 3.14.2.2 size

```
uint8_t T_Display_shift_data::size
```

Definition at line 37 of file DisplayInterface.h.

### 3.14.2.3 str\_cur\_ptr

```
uint8_t* T_Display_shift_data::str_cur_ptr
```

Definition at line 36 of file DisplayInterface.h.

### 3.14.2.4 str\_start\_ptr

```
uint8_t* T_Display_shift_data::str_start_ptr
```

Definition at line 35 of file DisplayInterface.h.

### 3.14.2.5 temporization

```
uint8_t T_Display_shift_data::temporization
```

Definition at line 39 of file DisplayInterface.h.

The documentation for this struct was generated from the following file:

- [DisplayInterface.h](#)

## 3.15 T\_LCD\_conf\_struct Struct Reference

```
#include <LCD.h>
```

### Public Attributes

- uint8\_t [i2c\\_addr](#)
- bool [backlight\\_en](#)
- bool [lineNumber\\_cnf](#)
- bool [fontType\\_cnf](#)
- bool [display\\_en](#)
- bool [cursor\\_en](#)
- bool [cursorBlink\\_en](#)
- bool [entryModeDir](#)
- bool [entryModeShift](#)

### 3.15.1 Detailed Description

Definition at line 125 of file LCD.h.

### 3.15.2 Member Data Documentation

#### 3.15.2.1 `backlight_en`

```
bool T_LCD_conf_struct::backlight_en
```

Definition at line 128 of file LCD.h.

#### 3.15.2.2 `cursor_en`

```
bool T_LCD_conf_struct::cursor_en
```

Definition at line 132 of file LCD.h.

#### 3.15.2.3 `cursorBlink_en`

```
bool T_LCD_conf_struct::cursorBlink_en
```

Definition at line 133 of file LCD.h.

#### 3.15.2.4 `display_en`

```
bool T_LCD_conf_struct::display_en
```

Definition at line 131 of file LCD.h.

#### 3.15.2.5 `entryModeDir`

```
bool T_LCD_conf_struct::entryModeDir
```

Definition at line 134 of file LCD.h.

### 3.15.2.6 entryModeShift

```
bool T_LCD_conf_struct::entryModeShift
```

Definition at line 135 of file LCD.h.

### 3.15.2.7 fontType\_cnf

```
bool T_LCD_conf_struct::fontType_cnf
```

Definition at line 130 of file LCD.h.

### 3.15.2.8 i2c\_addr

```
uint8_t T_LCD_conf_struct::i2c_addr
```

Definition at line 127 of file LCD.h.

### 3.15.2.9 lineNumber\_cnf

```
bool T_LCD_conf_struct::lineNumber_cnf
```

Definition at line 129 of file LCD.h.

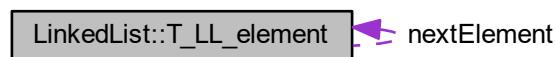
The documentation for this struct was generated from the following file:

- [LCD.h](#)

## 3.16 LinkedList::T\_LL\_element Struct Reference

Type defining a linked list element.

Collaboration diagram for LinkedList::T\_LL\_element:



## Public Attributes

- void \* [data\\_ptr](#)
- [T\\_LL\\_element](#) \* [nextElement](#)

### 3.16.1 Detailed Description

Type defining a linked list element.

This structure defines a linked list element. An element is defined by a pointer to the attached data and a pointer to the next element.

Definition at line 97 of file [LinkedList.h](#).

### 3.16.2 Member Data Documentation

#### 3.16.2.1 data\_ptr

```
void* LinkedList::T_LL_element::data_ptr
```

Definition at line 99 of file [LinkedList.h](#).

#### 3.16.2.2 nextElement

```
T_LL_element* LinkedList::T_LL_element::nextElement
```

Definition at line 100 of file [LinkedList.h](#).

The documentation for this struct was generated from the following file:

- [LinkedList.h](#)

## 3.17 scheduler::Task\_t Struct Reference

Type defining a task structure.

## Public Attributes

- [TaskPtr\\_t TaskPtr](#)
- [uint16\\_t period](#)

### 3.17.1 Detailed Description

Type defining a task structure.

This structure defines a task. A task is defined by a function to call (defined by its pointer) and a period.

Definition at line 107 of file scheduler.h.

### 3.17.2 Member Data Documentation

#### 3.17.2.1 period

```
uint16_t scheduler::Task_t::period
```

Period of the task

Definition at line 110 of file scheduler.h.

#### 3.17.2.2 TaskPtr

```
TaskPtr_t scheduler::Task_t::TaskPtr
```

Pointer to the task

Definition at line 109 of file scheduler.h.

The documentation for this struct was generated from the following file:

- [scheduler.h](#)

## 3.18 TempSensor Class Reference

Class for temperature sensor.

```
#include <TempSensor.h>
```

## Public Member Functions

- `TempSensor ()`  
*Class constructor.*
- `uint16_t * getTempPtr ()`  
*Get pointer to data raw\_temperature.*
- `uint16_t * getHumPtr ()`  
*Get pointer to data raw\_humidity.*
- `bool getTemp (uint16_t *temp)`  
*Get temperature data.*
- `bool getHumidity (uint16_t *hum)`  
*Get humidity data.*
- `void setValidity (bool validity)`  
*Set data val\_validity.*
- `void updateLastValidValues ()`
- `uint8_t GetTempInteger ()`  
*Temperature formatting function - Integer part.*
- `uint8_t GetTempDecimal ()`  
*Temperature formatting function - Decimal part.*
- `uint8_t GetHumInteger ()`  
*Humidity formatting function - Integer part.*
- `uint8_t GetHumDecimal ()`  
*Humidity formatting function - Decimal part.*
- `bool GetValidity ()`  
*Data validity get function.*

## Static Public Member Functions

- `static void readTempSensor_task ()`  
*Task for reading temperature and humidity values.*

## Private Attributes

- `uint16_t read_temperature`
- `uint16_t read_humidity`
- `bool validity_last_read`
- `bool validity`
- `uint32_t valid_pit`
- `uint16_t valid_temp`
- `uint16_t valid_hum`

### 3.18.1 Detailed Description

Class for temperature sensor.

This class defines all functions used to read data from temperature sensor and monitor it

Definition at line 19 of file TempSensor.h.

### 3.18.2 Constructor & Destructor Documentation

### 3.18.2.1 TempSensor()

```
TempSensor::TempSensor ( )
```

## Class constructor.

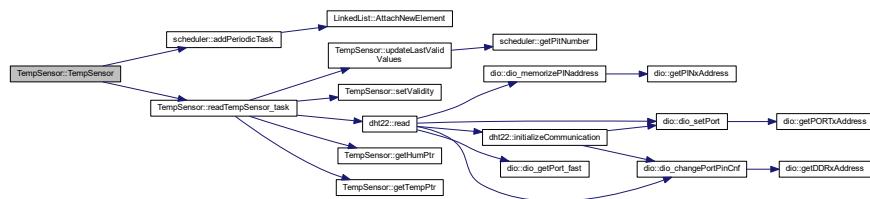
This function initializes all data of the class [TempSensor](#)

## Returns

Nothing

Definition at line 16 of file TempSensor.cpp.

Here is the call graph for this function:



### 3.18.3 Member Function Documentation

### 3.18.3.1 GetHumDecimal()

```
uint8_t TempSensor::GetHumDecimal ( ) [inline]
```

Humidity formatting function - Decimal part.

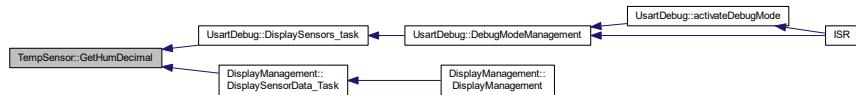
This function return the decimal part of the humidity

## Returns

Decimal value of the humidity

Definition at line 122 of file TempSensor.h.

Here is the caller graph for this function:



### 3.18.3.2 getHumidity()

```
bool TempSensor::getHumidity (
    uint16_t * hum )
```

Get humidity data.

This function returns the value of the humidity. If the official value is not valid, the function return false.

#### Parameters

out	hum	Humidity value
-----	-----	----------------

#### Returns

Validity of humidity

Definition at line 66 of file TempSensor.cpp.

### 3.18.3.3 GetHumInteger()

```
uint8_t TempSensor::GetHumInteger ( ) [inline]
```

Humidity formatting function - Integer part.

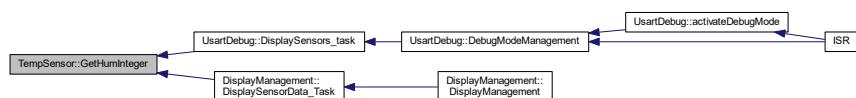
This function return the integer part of the humidity

#### Returns

Integer value of the humidity

Definition at line 111 of file TempSensor.h.

Here is the caller graph for this function:



### 3.18.3.4 getHumPtr()

```
uint16_t * TempSensor::getHumPtr ( )
```

Get pointer to data raw\_humidity.

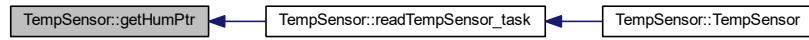
This function returns a pointer to the class member raw\_humidity

#### Returns

Pointer to raw\_humidity

Definition at line 41 of file TempSensor.cpp.

Here is the caller graph for this function:



### 3.18.3.5 getTemp()

```
bool TempSensor::getTemp (
    uint16_t * temp )
```

Get temperature data.

This function returns the value of the temperature. If the official value is not valid, the function return false.

#### Parameters

out	<i>temp</i>	Temperature value
-----	-------------	-------------------

#### Returns

Validity of temperature

Definition at line 72 of file TempSensor.cpp.

### 3.18.3.6 GetTempDecimal()

```
uint8_t TempSensor::GetTempDecimal ( ) [inline]
```

Temperature formatting function - Decimal part.

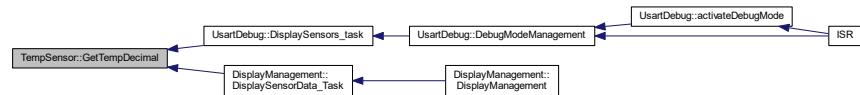
This function return the decimal part of the temperature

**Returns**

Decimal value of the temperature

Definition at line 100 of file TempSensor.h.

Here is the caller graph for this function:

**3.18.3.7 GetTempInteger()**

```
uint8_t TempSensor::GetTempInteger ( ) [inline]
```

Temperature formatting function - Integer part.

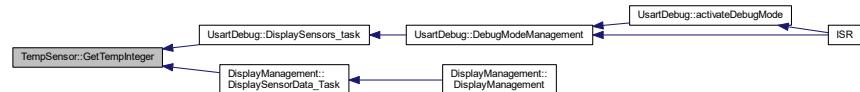
This function return the integer part of the temperature

**Returns**

Integer value of the temperature

Definition at line 89 of file TempSensor.h.

Here is the caller graph for this function:



### 3.18.3.8 getTempPtr()

```
uint16_t * TempSensor::getTempPtr ( )
```

Get pointer to data raw\_temperature.

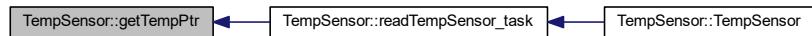
This function returns a pointer to the class member raw\_temperature

#### Returns

Pointer to raw\_temperature

Definition at line 46 of file TempSensor.cpp.

Here is the caller graph for this function:



### 3.18.3.9 GetValidity()

```
bool TempSensor::GetValidity ( ) [inline]
```

Data validity get function.

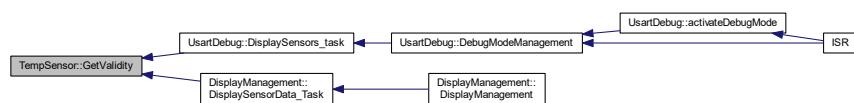
This function returns the validity of the sensor data

#### Returns

True if the sensor values are valid, false otherwise

Definition at line 133 of file TempSensor.h.

Here is the caller graph for this function:



### 3.18.3.10 readTempSensor\_task()

```
void TempSensor::readTempSensor_task ( ) [static]
```

Task for reading temperature and humidity values.

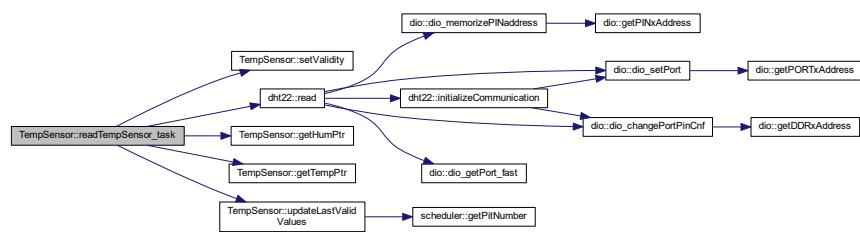
This task reads temperature and humidity data using DHT22 driver. It is called every 5 seconds.

#### Returns

Nothing

Definition at line 30 of file TempSensor.cpp.

Here is the call graph for this function:



Here is the caller graph for this function:



### 3.18.3.11 setValidity()

```
void TempSensor::setValidity (
    bool validity )
```

Set data `val_validity`.

This function sets the class member `val_validity`

#### Parameters

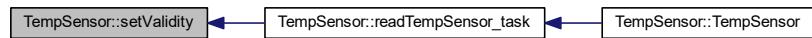
in	<code>validity</code>	Value of validity
----	-----------------------	-------------------

**Returns**

Nothing

Definition at line 36 of file TempSensor.cpp.

Here is the caller graph for this function:

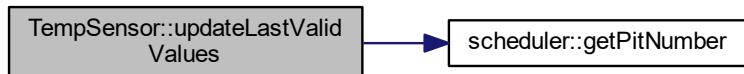


### 3.18.3.12 updateLastValidValues()

```
void TempSensor::updateLastValidValues( )
```

Definition at line 51 of file TempSensor.cpp.

Here is the call graph for this function:



Here is the caller graph for this function:



## 3.18.4 Member Data Documentation

#### 3.18.4.1 `read_humidity`

```
uint16_t TempSensor::read_humidity [private]
```

Raw value of humidity read from DHT22 (= real humidity \*10)

Definition at line 141 of file TempSensor.h.

#### 3.18.4.2 `read_temperature`

```
uint16_t TempSensor::read_temperature [private]
```

Raw value of temperature read from DHT22 (= real temperature \*10)

Definition at line 140 of file TempSensor.h.

#### 3.18.4.3 `valid_hum`

```
uint16_t TempSensor::valid_hum [private]
```

Valid value of humidity

Definition at line 148 of file TempSensor.h.

#### 3.18.4.4 `valid_pit`

```
uint32_t TempSensor::valid_pit [private]
```

pit number of the last time when data were valid

Definition at line 145 of file TempSensor.h.

#### 3.18.4.5 `valid_temp`

```
uint16_t TempSensor::valid_temp [private]
```

Valid value of temperature

Definition at line 147 of file TempSensor.h.

### 3.18.4.6 validity

```
bool TempSensor::validity [private]
```

validity of official temperature and humidity data

Definition at line 144 of file TempSensor.h.

### 3.18.4.7 validity\_last\_read

```
bool TempSensor::validity_last_read [private]
```

Validity of last read temperature and humidity data

Definition at line 142 of file TempSensor.h.

The documentation for this class was generated from the following files:

- [TempSensor.h](#)
- [TempSensor.cpp](#)

## 3.19 timer Class Reference

Class defining a timer.

```
#include <timer.h>
```

### Public Member Functions

- [timer \(\)](#)  
*Class constructor.*
- void [configureTimer1 \(uint16\\_t a\\_prescaler, uint16\\_t a\\_ctcValue\)](#)  
*Configures Timer #1.*
- void [startTimer1 \(\)](#)  
*Start Timer #1.*
- void [stopTimer1 \(\)](#)  
*Stops Timer #1.*
- uint16\_t [getTimer1Value \(\)](#)  
*Reads current value of timer #1.*

### Private Attributes

- uint8\_t [prescaler](#)

### 3.19.1 Detailed Description

Class defining a timer.

This class defines a timer/counter. The selected timer is configured in CTC mode and interrupts are enabled. The prescaler value and CTC value can both be configured by user.

Definition at line 19 of file timer.h.

### 3.19.2 Constructor & Destructor Documentation

#### 3.19.2.1 timer()

```
timer::timer ( )
```

Class constructor.

This function initializes class attributes

Returns

Nothing

Definition at line 13 of file timer.cpp.

### 3.19.3 Member Function Documentation

#### 3.19.3.1 configureTimer1()

```
void timer::configureTimer1 (
    uint16_t a_prescaler,
    uint16_t a_ctcValue )
```

Configures Timer #1.

This function configures hardware timer #1 in CTC mode, enables its interrupts, sets prescaler to `a_prescaler` and CTC value to `a_ctcValue`

Parameters

in	<code>a_prescaler</code>	prescaler value
in	<code>a_ctcValue</code>	Value to which the counter will compare before raising an interrupt

**Returns**

Nothing

Definition at line 18 of file timer.cpp.

Here is the caller graph for this function:



### 3.19.3.2 getTimer1Value()

```
uint16_t timer::getTimer1Value () [inline]
```

Reads current value of timer #1.

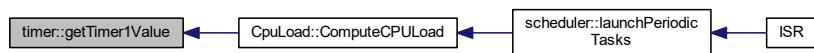
This function reads the value of of timer #1 using register TCNT1. The function is inlined to speed up SW execution.

**Returns**

Current timer value

Definition at line 58 of file timer.h.

Here is the caller graph for this function:



### 3.19.3.3 startTimer1()

```
void timer::startTimer1 ( )
```

Start Timer #1.

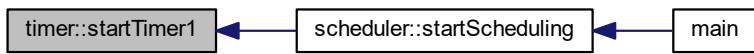
This functions starts Timer #1. Timer shall be initialized before this function is called.

#### Returns

Nothing

Definition at line 56 of file timer.cpp.

Here is the caller graph for this function:



### 3.19.3.4 stopTimer1()

```
void timer::stopTimer1 ( )
```

Stops Timer #1.

This functions stops timer #1 by resetting bits 0-2 of TCCR1B

#### Returns

Nothing

Definition at line 67 of file timer.cpp.

## 3.19.4 Member Data Documentation

### 3.19.4.1 prescaler

```
uint8_t timer::prescaler [private]
```

Definition at line 64 of file timer.h.

The documentation for this class was generated from the following files:

- [timer.h](#)
- [timer.cpp](#)

## 3.20 usart Class Reference

USART serial bus class.

```
#include <uart.h>
```

### Public Member Functions

- `uart (uint16_t a_BaudRate)`  
*Class usart constructor.*
- `void usart_sendString (String *str)`  
*Send a string on USART link.*
- `void setBaudRate (uint16_t a_BaudRate)`  
*Setting baud rate.*
- `void usart_init ()`  
*USART hardware initialization.*
- `uint8_t usart_read ()`  
*USART read function.*

### Private Member Functions

- `void usart_transmit (uint8_t Data)`  
*USART Transmit data.*

### Private Attributes

- `uint16_t BaudRate`

#### 3.20.1 Detailed Description

USART serial bus class.

This class defines all useful functions for USART serial bus

Definition at line 16 of file usart.h.

#### 3.20.2 Constructor & Destructor Documentation

##### 3.20.2.1 usart()

```
uart::uart (
    uint16_t a_BaudRate )
```

Class usart constructor.

Initializes the class and call hardware initialization function

**Parameters**

in	<i>a_BaudRate</i>	Desired Baud Rate (16 bit) - up to 57600
----	-------------------	--

**Returns**

Nothing.

Definition at line 17 of file usart.cpp.

Here is the call graph for this function:



### 3.20.3 Member Function Documentation

#### 3.20.3.1 setBaudRate()

```
void usart::setBaudRate (
    uint16_t a_BaudRate ) [inline]
```

Setting baud rate.

This function sets the attribute BaudRate of the class usart

**Parameters**

in	<i>a_BaudRate</i>	Desired Baud Rate (16 bit) - up to 57600
----	-------------------	--

**Returns**

Nothing

Definition at line 68 of file usart.cpp.

### 3.20.3.2 usart\_init()

```
void usart::usart_init ( )
```

USART hardware initialization.

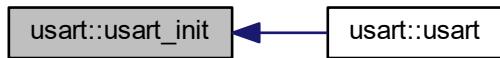
This function will initialize the USART using selected baudrate. User must pay attention to select one of the usually used Baud Rate (9600, 19200, 38400, 57600). Note that since an uint16 is used as argument, Baud rate cannot be more than 57600.

Returns

Nothing.

Definition at line 24 of file usart.cpp.

Here is the caller graph for this function:



### 3.20.3.3 usart\_read()

```
uint8_t usart::usart_read ( )
```

USART read function.

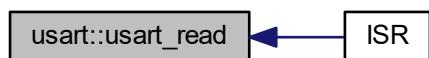
This function will read reception register of USART

Returns

The function returns the 8 bits read from reception buffer

Definition at line 84 of file usart.cpp.

Here is the caller graph for this function:



### 3.20.3.4 usart\_sendString()

```
void usart::usart_sendString (
    String * str )
```

Send a string on USART link.

This function writes the string object data to the serial link using usart\_transmit function

#### Parameters

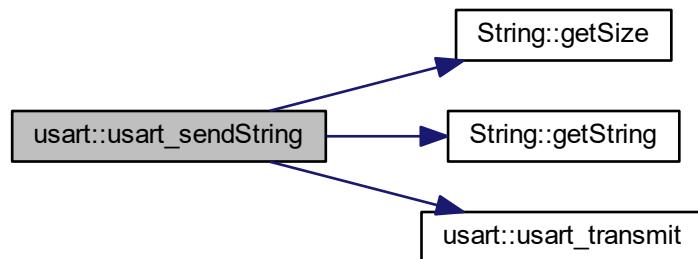
in	<i>str</i>	Pointer to the string being sent
----	------------	----------------------------------

#### Returns

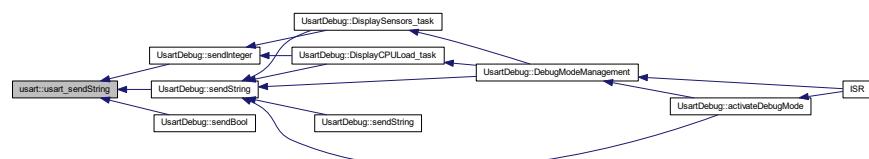
Nothing.

Definition at line 47 of file usart.cpp.

Here is the call graph for this function:



Here is the caller graph for this function:



### 3.20.3.5 usart\_transmit()

```
void usart::usart_transmit (
    uint8_t Data ) [private]
```

USART Transmit data.

Nothing Special. It just wait for the transmit buffer is empty before writing it again.

## Parameters

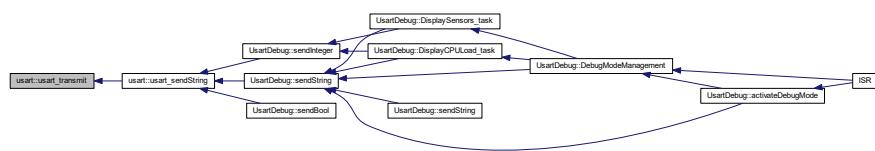
in	<i>Data</i>	Desired data char to transmit
----	-------------	-------------------------------

## Returns

Nothing.

Definition at line 75 of file usart.cpp.

Here is the caller graph for this function:



### **3.20.4 Member Data Documentation**

### 3.20.4.1 BaudRate

uint16\_t usart::BaudRate [private]

Defines the baud rate used by driver

Definition at line 72 of file usart.h.

The documentation for this class was generated from the following files:

- `uart.h`
  - `uart.cpp`

## 3.21 UsartDebug Class Reference

Class used for debugging on usart link.

```
#include <debug.h>
```

## Public Member Functions

- [UsartDebug \(\)](#)  
*Class UsartDebug constructor.*
- [void sendInteger \(uint16\\_t data, uint8\\_t base\)](#)  
*Send a integer data on USART link.*
- [void sendBool \(bool data, bool isText\)](#)  
*Send a boolean data on USART link.*
- [void sendString \(String \\*str\)](#)  
*Send a string on USART link.*
- [void sendString \(uint8\\_t \\*str\)](#)  
*Send a chain of characters on USART link.*
- [bool isDebugModeActive \(\)](#)  
*Check is debug mode is active or not.*
- [void activateDebugMode \(\)](#)  
*Activates debug mode.*
- [void DebugModeManagement \(uint8\\_t rcv\\_char\)](#)  
*Management of debug mode.*

## Static Public Member Functions

- [static void DisplaySensors\\_task \(\)](#)  
*Displays sensors data on usart link.*
- [static void DisplayCPULoad\\_task \(\)](#)  
*Displays CPU load data on usart link.*

## Private Attributes

- [debug\\_state\\_t debug\\_state](#)
- [bool debugModeActive\\_F](#)

### 3.21.1 Detailed Description

Class used for debugging on usart link.

This class defines functions used for sending debug data on USART link.

Definition at line 34 of file debug.h.

### 3.21.2 Constructor & Destructor Documentation

### 3.21.2.1 UsartDebug()

```
UsartDebug::UsartDebug ( )
```

Class [UsartDebug](#) constructor.

Initializes the class [UsartDebug](#)

Returns

Nothing

Definition at line 53 of file debug.cpp.

### 3.21.3 Member Function Documentation

#### 3.21.3.1 activateDebugMode()

```
void UsartDebug::activateDebugMode ( )
```

Activates debug mode.

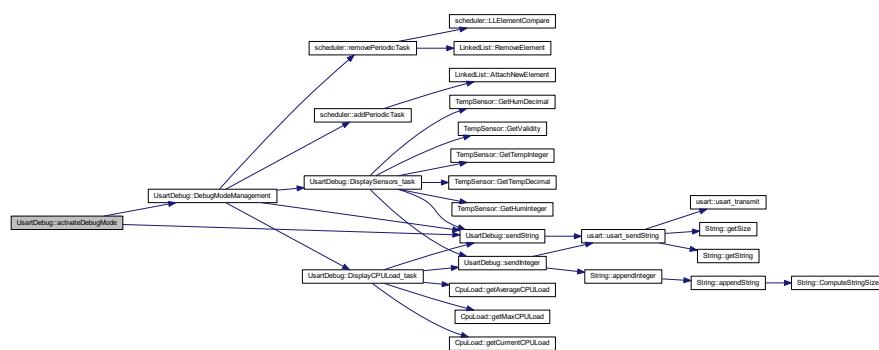
This function activates USART debug mode.

Returns

Nothing

Definition at line 142 of file debug.cpp.

Here is the call graph for this function:



Here is the caller graph for this function:



### 3.21.3.2 DebugModeManagement()

```
void UsartDebug::DebugModeManagement (
    uint8_t rcv_char )
```

Management of debug mode.

This function manages the debug mode according to the following state machine :

- init state : display main menu
- WAIT\_INIT state : handles user choice in main menu and selects next state
- DISPLAY\_DATA state : display sensor data periodically
- DISPLAY\_CPU\_LOAD : display CPU load periodically

It is called each time a data is received on USART and debug mode is active.

#### Parameters

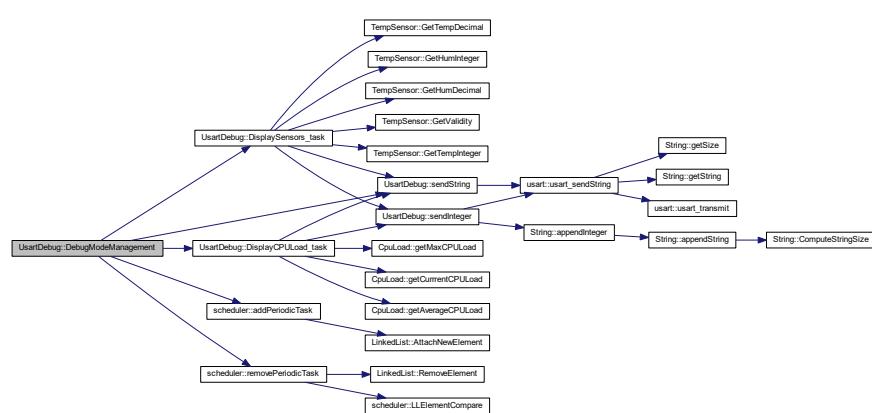
in	<i>rcv_char</i>	8 bits character received on USART
----	-----------------	------------------------------------

#### Returns

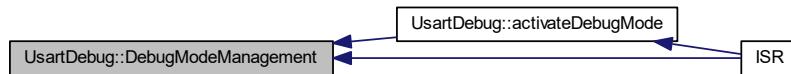
Nothing

Definition at line 150 of file debug.cpp.

Here is the call graph for this function:



Here is the caller graph for this function:



### 3.21.3.3 DisplayCPULoad\_task()

```
void UsartDebug::DisplayCPULoad_task ( ) [static]
```

Displays CPU load data on usart link.

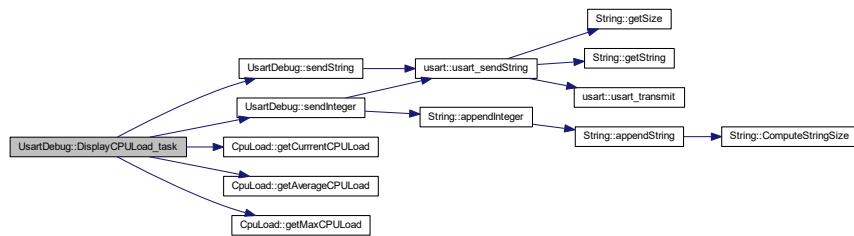
This task sends CPU load data (current and average load) on usart link every 5 seconds

## Returns

Nothing

Definition at line 126 of file debug.cpp.

Here is the call graph for this function:



Here is the caller graph for this function:



### 3.21.3.4 DisplaySensors\_task()

```
void UsartDebug::DisplaySensors_task( ) [static]
```

Displays sensors data on usart link.

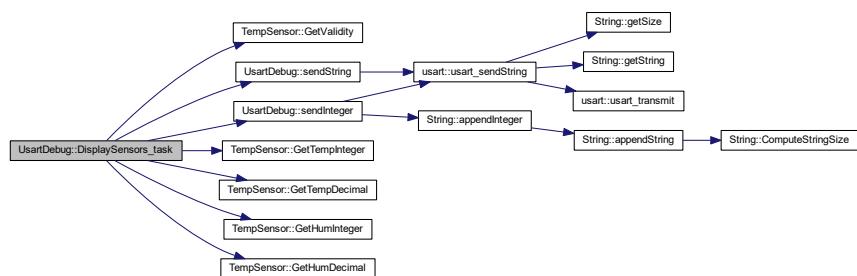
This task sends sensors data (temperature and humidity) on usart link every 5 seconds

#### Returns

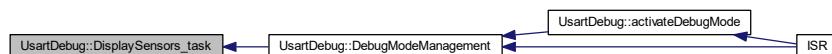
Nothing

Definition at line 94 of file debug.cpp.

Here is the call graph for this function:



Here is the caller graph for this function:



### 3.21.3.5 isDebugEnabled()

```
bool UsartDebug::isDebugEnabled( )
```

Check is debug mode is active or not.

This function checks if debug mode is active or not.

**Returns**

TRUE if debug mode is active, FALSE otherwise

Definition at line 137 of file debug.cpp.

Here is the caller graph for this function:

**3.21.3.6 sendBool()**

```
void UsartDebug::sendBool (
    bool data,
    bool isText )
```

Send a boolean data on USART link.

This function sends the requested boolean on USART link by calling driver's transmission function. The boolean data is first converted into a string and then sent. The parameter `isText` defines if the data is converted into a string (true/false) or an integer (1/0).

**Parameters**

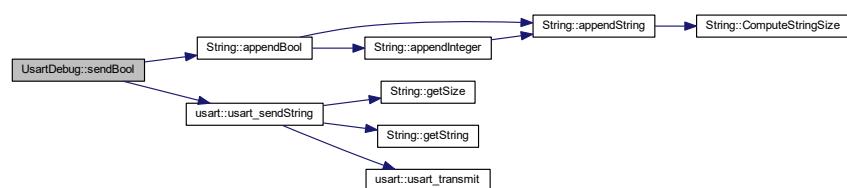
in	<code>data</code>	boolean data to be sent
in	<code>isText</code>	String conversion configuration

**Returns**

Nothing

Definition at line 85 of file debug.cpp.

Here is the call graph for this function:



### 3.21.3.7 sendInteger()

```
void UsartDebug::sendInteger (
    uint16_t data,
    uint8_t base )
```

Send a integer data on USART link.

This function sends the requested integer on USART link by calling driver's transmission function. The integer is first converted into a string and then sent

#### Parameters

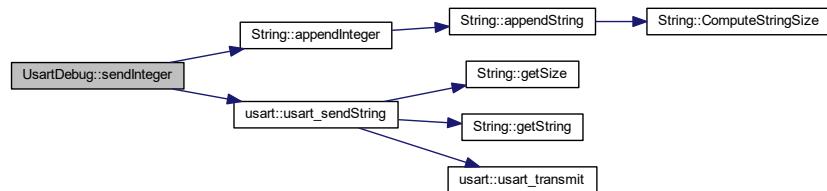
in	<i>data</i>	integer data to be sent
in	<i>base</i>	numerical base used to convert integer into string (between 2 and 36)

#### Returns

Nothing

Definition at line 72 of file debug.cpp.

Here is the call graph for this function:



Here is the caller graph for this function:



### 3.21.3.8 sendString() [1/2]

```
void UsartDebug::sendString (
    String * str )
```

Send a string on USART link.

This function sends the requested string on USART link by calling driver's transmission function

**Parameters**

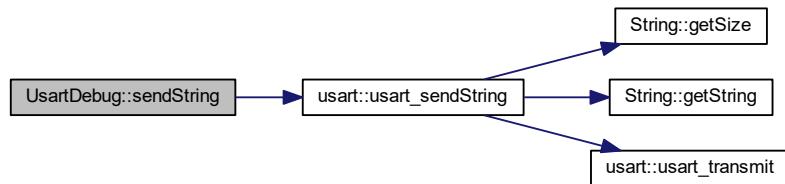
in	<i>str</i>	Pointer to the string being sent
----	------------	----------------------------------

**Returns**

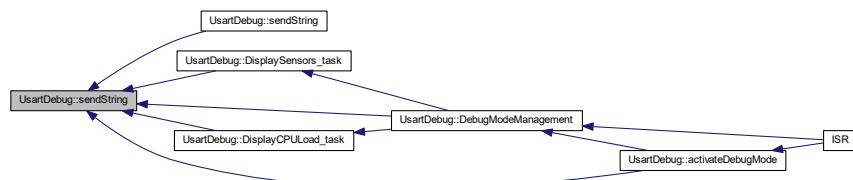
Nothing

Definition at line 59 of file debug.cpp.

Here is the call graph for this function:



Here is the caller graph for this function:

**3.21.3.9 sendString() [2/2]**

```
void UsartDebug::sendString (
    uint8_t * str )
```

Send a chain of characters on USART link.

This function sends the requested chain of characters on USART link by calling driver's transmission function. The chain is first converted into a string object.

**Parameters**

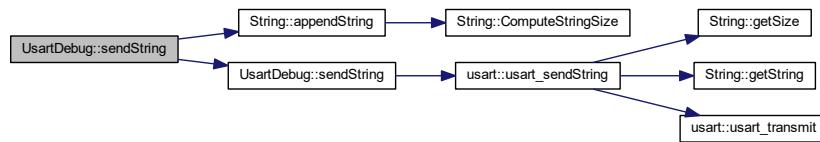
in	<i>str</i>	Pointer to the chain to send.
----	------------	-------------------------------

**Returns**

Nothing

Definition at line 65 of file debug.cpp.

Here is the call graph for this function:



### 3.21.4 Member Data Documentation

#### 3.21.4.1 debug\_state

```
debug_state_t UsartDebug::debug_state [private]
```

Definition at line 127 of file debug.h.

#### 3.21.4.2 debugModeActive\_F

```
bool UsartDebug::debugModeActive_F [private]
```

Debug mode activation flag

Definition at line 128 of file debug.h.

The documentation for this class was generated from the following files:

- [debug.h](#)
- [debug.cpp](#)

## Chapter 4

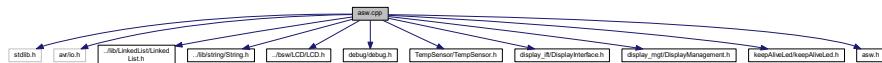
# File Documentation

### 4.1 asw.cpp File Reference

ASW main file.

```
#include <stdlib.h>
#include <avr/io.h>
#include "../lib/LinkedList/LinkedList.h"
#include "../lib/string/String.h"
#include "../bsw/LCD/LCD.h"
#include "debug/debug.h"
#include "TempSensor/TempSensor.h"
#include "display_ift/DisplayInterface.h"
#include "display_mgt/DisplayManagement.h"
#include "keepAliveLed/keepAliveLed.h"
#include "asw.h"
```

Include dependency graph for asw.cpp:



### Functions

- void [asw\\_init \(\)](#)

*Initialization of ASW.*

### Variables

- [T\\_ASW\\_cnf\\_struct ASW\\_cnf\\_struct](#)

#### 4.1.1 Detailed Description

ASW main file.

##### Date

15 mars 2018

##### Author

nicls67

#### 4.1.2 Function Documentation

##### 4.1.2.1 asw\_init()

```
void asw_init ( )
```

Initialization of ASW.

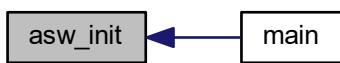
This function instantiates all applicative objects. The addresses of objects are then stored in ASW\_cnf\_struct structure. This function shall be called after BSW initialization function.

##### Returns

Nothing

Definition at line 31 of file asw.cpp.

Here is the caller graph for this function:



#### 4.1.3 Variable Documentation

### 4.1.3.1 ASW\_cnf\_struct

`T_ASW_cnf_struct ASW_cnf_struct`

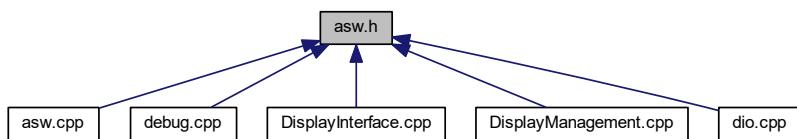
ASW configuration structure

Definition at line 28 of file asw.cpp.

## 4.2 asw.h File Reference

ASW main header file.

This graph shows which files directly or indirectly include this file:



### Classes

- struct `T_ASW_cnf_struct`  
*ASW configuration structure.*

### Functions

- void `asw_init()`  
*Initialization of ASW.*

### Variables

- `T_ASW_cnf_struct ASW_cnf_struct`

### 4.2.1 Detailed Description

ASW main header file.

#### Date

15 mars 2018

#### Author

nicls67

## 4.2.2 Function Documentation

### 4.2.2.1 asw\_init()

```
void asw_init ( )
```

Initialization of ASW.

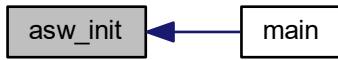
This function instantiates all applicative objects. The addresses of objects are then stored in ASW\_cnf\_struct structure. This function shall be called after BSW initialization function.

#### Returns

Nothing

Definition at line 31 of file asw.cpp.

Here is the caller graph for this function:



## 4.2.3 Variable Documentation

### 4.2.3.1 ASW\_cnf\_struct

```
T_ASW_cnf_struct ASW_cnf_struct
```

ASW configuration structure

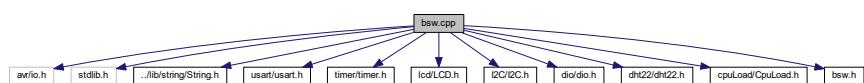
Definition at line 28 of file asw.cpp.

## 4.3 bsw.cpp File Reference

BSW main file.

```
#include <avr/io.h>
#include <stdlib.h>
#include "../lib/string/String.h"
#include "uart/usart.h"
#include "timer/timer.h"
#include "lcd/LCD.h"
#include "I2C/I2C.h"
#include "dio/dio.h"
#include "dht22/dht22.h"
#include "cpuLoad/CpuLoad.h"
#include "bsw.h"
```

Include dependency graph for bsw.cpp:



## Functions

- void **bsw\_init ()**

*Initialization of BSW.*

## Variables

- T\_BSW\_cnf\_struct BSW\_cnf\_struct

### 4.3.1 Detailed Description

BSW main file.

#### Date

13 mars 2018

#### Author

nicls67

### 4.3.2 Function Documentation

#### 4.3.2.1 bsw\_init()

```
void bsw_init ( )
```

Initialization of BSW.

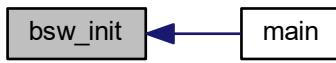
This function instantiates all driver objects, leading hardware initialization. The addresses of driver objects are then stored in BSW\_cnf\_struct structure.

Returns

Nothing

Definition at line 26 of file bsw.cpp.

Here is the caller graph for this function:



#### 4.3.3 Variable Documentation

##### 4.3.3.1 BSW\_cnf\_struct

`T_BSW_cnf_struct BSW_cnf_struct`

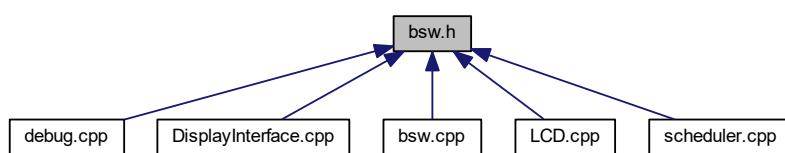
BSW configuration structure

Definition at line 24 of file bsw.cpp.

#### 4.4 bsw.h File Reference

BSW main header file.

This graph shows which files directly or indirectly include this file:



## Classes

- struct [T\\_BSW\\_cnf\\_struct](#)  
*BSW configuration structure.*

## Macros

- #define [USART\\_BAUDRATE](#) (uint16\_t)9600
- #define [I2C\\_BITRATE](#) (uint32\_t)100000

## Functions

- void [bsw\\_init](#) ()  
*Initialization of BSW.*

## Variables

- [T\\_BSW\\_cnf\\_struct BSW\\_cnf\\_struct](#)

### 4.4.1 Detailed Description

BSW main header file.

#### Date

13 mars 2018

#### Author

nicls67

### 4.4.2 Macro Definition Documentation

#### 4.4.2.1 I2C\_BITRATE

```
#define I2C_BITRATE (uint32_t)100000
```

[I2C bus bitrate is 100 kHz](#)

Definition at line 18 of file bsw.h.

#### 4.4.2.2 USART\_BAUDRATE

```
#define USART_BAUDRATE (uint16_t) 9600
```

uart connection to PC uses a baud rate of 9600

Definition at line 17 of file bsw.h.

### 4.4.3 Function Documentation

#### 4.4.3.1 bsw\_init()

```
void bsw_init ( )
```

Initialization of BSW.

This function instantiates all driver objects, leading hardware initialization. The addresses of driver objects are then stored in BSW\_cnf\_struct structure.

#### Returns

Nothing

Definition at line 26 of file bsw.cpp.

Here is the caller graph for this function:



### 4.4.4 Variable Documentation

#### 4.4.4.1 BSW\_cnf\_struct

```
T_BSW_cnf_struct BSW_cnf_struct
```

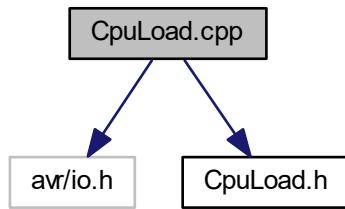
BSW configuration structure

Definition at line 24 of file bsw.cpp.

## 4.5 CpuLoad.cpp File Reference

Defines functions of class [CpuLoad](#).

```
#include <avr/io.h>
#include "CpuLoad.h"
Include dependency graph for CpuLoad.cpp:
```



### 4.5.1 Detailed Description

Defines functions of class [CpuLoad](#).

#### Date

21 mars 2019

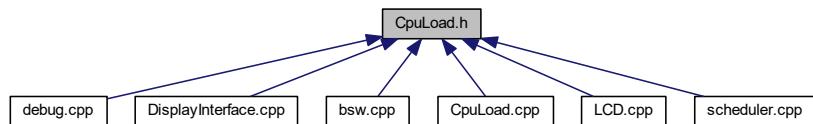
#### Author

nicls67

## 4.6 CpuLoad.h File Reference

[CpuLoad](#) class header file.

This graph shows which files directly or indirectly include this file:



## Classes

- class [CpuLoad](#)

*Class defining CPU load libraries.*

## Macros

- `#define NB_OF_SAMPLES 50`

### 4.6.1 Detailed Description

[CpuLoad](#) class header file.

#### Date

21 mars 2019

#### Author

nicls67

### 4.6.2 Macro Definition Documentation

#### 4.6.2.1 NB\_OF\_SAMPLES

```
#define NB_OF_SAMPLES 50
```

Definition at line 13 of file CpuLoad.h.

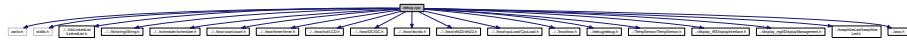
## 4.7 debug.cpp File Reference

This file defines classes for log and debug data transmission on USART link.

```
#include <avr/io.h>
#include <stdlib.h>
#include "../../lib/LinkedList/LinkedList.h"
#include "../../lib/string/String.h"
#include "../../scheduler/scheduler.h"
#include "../../bsw/usart/usart.h"
#include "../../bsw/timer/timer.h"
#include "../../bsw/lcd/LCD.h"
#include "../../bsw/I2C/I2C.h"
#include "../../bsw/dio/dio.h"
#include "../../bsw/dht22/dht22.h"
#include "../../bsw/cpuLoad/CpuLoad.h"
#include "../../bsw.h"
```

```
#include "../debug/debug.h"
#include "../TempSensor/TempSensor.h"
#include "../display_ift/DisplayInterface.h"
#include "../display_mgt/DisplayManagement.h"
#include "../keepAliveLed/keepAliveLed.h"
#include "../asw.h"

Include dependency graph for debug.cpp:
```



## Variables

- const uint8\_t str\_debug\_main\_menu []  
*Main menu of debug mode.*

### 4.7.1 Detailed Description

This file defines classes for log and debug data transmission on USART link.

#### Date

15 mars 2018

#### Author

nicls67

### 4.7.2 Variable Documentation

#### 4.7.2.1 str\_debug\_main\_menu

```
const uint8_t str_debug_main_menu[ ]
```

##### Initial value:

```
=
"\n\n"
"Menu principal : \n"
"1 : Afficher donnees capteurs\n"
"2 : Afficher charge CPU\n"
"\n"
"s : Quitter debug\n"
```

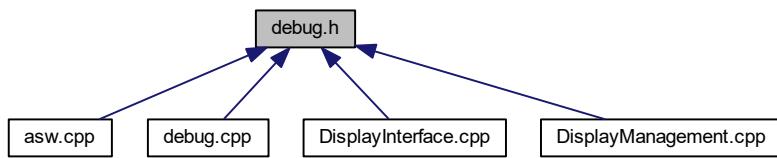
Main menu of debug mode.

Definition at line 42 of file debug.cpp.

## 4.8 debug.h File Reference

Header file for debug and logging functions.

This graph shows which files directly or indirectly include this file:



### Classes

- class [UsartDebug](#)

*Class used for debugging on usart link.*

### Macros

- `#define PERIOD_MS_TASK_DISPLAY_SENSORS 5000`
- `#define PERIOD_MS_TASK_DISPLAY_CPU_LOAD 5000`

### Enumerations

- enum [debug\\_state\\_t](#) { `INIT`, `WAIT_INIT`, `DISPLAY_DATA`, `DISPLAY_CPU_LOAD` }

*Defines the debug states.*

### 4.8.1 Detailed Description

Header file for debug and logging functions.

#### Date

15 mars 2018

#### Author

nicls67

### 4.8.2 Macro Definition Documentation

#### 4.8.2.1 PERIOD\_MS\_TASK\_DISPLAY\_CPU\_LOAD

```
#define PERIOD_MS_TASK_DISPLAY_CPU_LOAD 5000
```

Period for displaying CPU load data

Definition at line 14 of file debug.h.

#### 4.8.2.2 PERIOD\_MS\_TASK\_DISPLAY\_SENSORS

```
#define PERIOD_MS_TASK_DISPLAY_SENSORS 5000
```

Period for displaying temperature and humidity data

Definition at line 13 of file debug.h.

### 4.8.3 Enumeration Type Documentation

#### 4.8.3.1 debug\_state\_t

```
enum debug_state_t
```

Defines the debug states.

Enumerator

INIT	Init state : display the main menu
WAIT_INIT	Wait for a received character in init state
DISPLAY_DATA	Display sensor data in continuous
DISPLAY_CPU_LOAD	Display CPU load in continuous

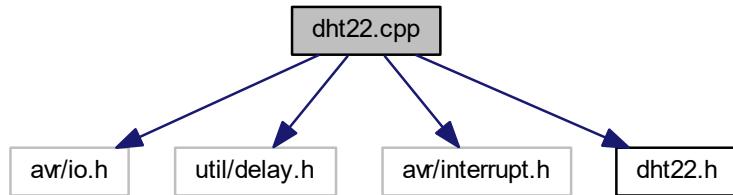
Definition at line 21 of file debug.h.

## 4.9 dht22.cpp File Reference

This file defines classes for DHT22 driver.

```
#include <avr/io.h>
#include <util/delay.h>
#include <avr/interrupt.h>
```

```
#include "dht22.h"
Include dependency graph for dht22.cpp:
```



## Macros

- `#define MAX_WAIT_TIME_US 100`

### 4.9.1 Detailed Description

This file defines classes for DHT22 driver.

#### Date

23 mars 2018

#### Author

nicls67

### 4.9.2 Macro Definition Documentation

#### 4.9.2.1 MAX\_WAIT\_TIME\_US

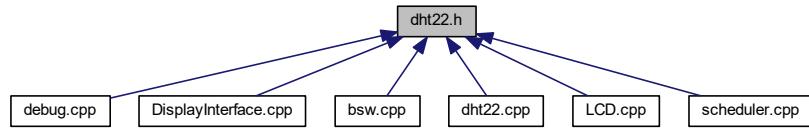
```
#define MAX_WAIT_TIME_US 100
```

Definition at line 20 of file `dht22.cpp`.

## 4.10 dht22.h File Reference

DHT22 driver header file.

This graph shows which files directly or indirectly include this file:



### Classes

- class [dht22](#)

*DHT 22 driver class.*

### Macros

- `#define DHT22_PORT ENCODE_PORT(PORT_B, 6)`

#### 4.10.1 Detailed Description

DHT22 driver header file.

##### Date

23 mars 2018

##### Author

nicls67

#### 4.10.2 Macro Definition Documentation

##### 4.10.2.1 DHT22\_PORT

```
#define DHT22_PORT ENCODE_PORT(PORT_B, 6)
```

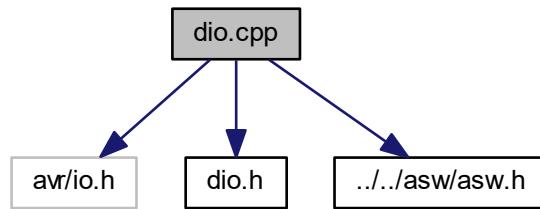
DHT22 is connected to port PB6

Definition at line 16 of file dht22.h.

## 4.11 dio.cpp File Reference

DIO library.

```
#include <avr/io.h>
#include "dio.h"
#include "../../asw/asw.h"
Include dependency graph for dio.cpp:
```



### 4.11.1 Detailed Description

DIO library.

#### Date

13 mars 2018

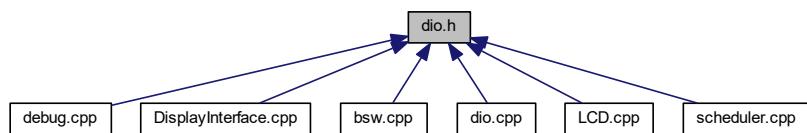
#### Author

nicls67

## 4.12 dio.h File Reference

DIO library header file.

This graph shows which files directly or indirectly include this file:



## Classes

- class [dio](#)  
*DIO class.*

## Macros

- `#define PORT_CNF_OUT 1`
- `#define PORT_CNF_IN 0`
- `#define ENCODE_PORT(port, pin) (uint8_t)((((uint8_t)(port & 0xF)) << 3) | (uint8_t)(pin & 0x7))`
- `#define DECODE_PORT(portcode) (uint8_t)((portcode >> 3) & 0xF)`
- `#define DECODE_PIN(portcode) (uint8_t)(portcode & 0x7)`
- `#define PORT_A 0`
- `#define PORT_B 1`
- `#define PORT_C 2`
- `#define PORT_D 3`

### 4.12.1 Detailed Description

DIO library header file.

#### Date

13 mars 2018

#### Author

nicls67

### 4.12.2 Macro Definition Documentation

#### 4.12.2.1 DECODE\_PIN

```
#define DECODE_PIN( portcode ) (uint8_t)(portcode & 0x7)
```

Macro used to extract pin index

Definition at line 19 of file dio.h.

#### 4.12.2.2 DECODE\_PORT

```
#define DECODE_PORT(  
    portcode ) (uint8_t) ((portcode >> 3) & 0xF)
```

Macro used to extract port index

Definition at line 18 of file dio.h.

#### 4.12.2.3 ENCODE\_PORT

```
#define ENCODE_PORT(  
    port,  
    pin ) (uint8_t) (((uint8_t)(port & 0xF)) << 3) | (uint8_t)(pin & 0x7))
```

Macro used to encode port and pin indexes into one single byte

Definition at line 17 of file dio.h.

#### 4.12.2.4 PORT\_A

```
#define PORT_A 0
```

PORTA index

Definition at line 21 of file dio.h.

#### 4.12.2.5 PORT\_B

```
#define PORT_B 1
```

PORTB index

Definition at line 22 of file dio.h.

#### 4.12.2.6 PORT\_C

```
#define PORT_C 2
```

PORTC index

Definition at line 23 of file dio.h.

#### 4.12.2.7 PORT\_CNF\_IN

```
#define PORT_CNF_IN 0
```

Pin is configured as input

Definition at line 15 of file dio.h.

#### 4.12.2.8 PORT\_CNF\_OUT

```
#define PORT_CNF_OUT 1
```

Pin is configured as output

Definition at line 14 of file dio.h.

#### 4.12.2.9 PORT\_D

```
#define PORT_D 3
```

PORTD index

Definition at line 24 of file dio.h.

## 4.13 dio\_port\_cnf.h File Reference

Digital ports configuration file.

### Macros

- #define PORTB\_CNF\_DDRB (uint8\_t)0b11000000  
*Defines the configuration of DDRB register.*
- #define PORTB\_CNF\_PORTB (uint8\_t)0b11000000  
*Defines the configuration of PORTB register.*

### 4.13.1 Detailed Description

Digital ports configuration file.

#### Date

19 mars 2019

#### Author

nicls67

### 4.13.2 Macro Definition Documentation

#### 4.13.2.1 PORTB\_CNF\_DDRB

```
#define PORTB_CNF_DDRB (uint8_t)0b11000000
```

Defines the configuration of DDRB register.

This constant defines the direction of IO pins of PORT B. It will configure register DDRB.

PB0 : N/A

PB1 : N/A

PB2 : N/A

PB3 : N/A

PB4 : N/A

PB5 : N/A

PB6 : OUT

PB7 : OUT

Definition at line 25 of file dio\_port\_cnf.h.

#### 4.13.2.2 PORTB\_CNF\_PORTB

```
#define PORTB_CNF_PORTB (uint8_t)0b11000000
```

Defines the configuration of PORTB register.

This constant defines the initial value of IO pins for PORT B. It will configure register PORTB. Pins configured as input shall not be configured here.

PB0 : N/A

PB1 : N/A

PB2 : N/A

PB3 : N/A

PB4 : N/A

PB5 : N/A

PB6 : HIGH

PB7 : HIGH

Definition at line 40 of file dio\_port\_cnf.h.

## 4.14 dio\_reg\_atm2560.h File Reference

### Macros

- #define PORTA\_PTR (volatile uint8\_t \*)(0x02 + 0x20)
- #define PORTB\_PTR (volatile uint8\_t \*)(0x05 + 0x20)
- #define PORTC\_PTR (volatile uint8\_t \*)(0x08 + 0x20)
- #define PORTD\_PTR (volatile uint8\_t \*)(0x0B + 0x20)
- #define PINA\_PTR (volatile uint8\_t \*)(0x00 + 0x20)
- #define PINB\_PTR (volatile uint8\_t \*)(0x03 + 0x20)
- #define PINC\_PTR (volatile uint8\_t \*)(0x06 + 0x20)
- #define PIND\_PTR (volatile uint8\_t \*)(0x09 + 0x20)
- #define DDRA\_PTR (volatile uint8\_t \*)(0x01 + 0x20)
- #define DDRB\_PTR (volatile uint8\_t \*)(0x04 + 0x20)
- #define DDRC\_PTR (volatile uint8\_t \*)(0x07 + 0x20)
- #define DDRD\_PTR (volatile uint8\_t \*)(0x0A + 0x20)

#### 4.14.1 Macro Definition Documentation

##### 4.14.1.1 DDRA\_PTR

```
#define DDRA_PTR (volatile uint8_t *) (0x01 + 0x20)
```

Macro defining pointer to DDR A register

Definition at line 24 of file dio\_reg\_atm2560.h.

##### 4.14.1.2 DDRB\_PTR

```
#define DDRB_PTR (volatile uint8_t *) (0x04 + 0x20)
```

Macro defining pointer to DDR B register

Definition at line 25 of file dio\_reg\_atm2560.h.

##### 4.14.1.3 DDRC\_PTR

```
#define DDRC_PTR (volatile uint8_t *) (0x07 + 0x20)
```

Macro defining pointer to DDR C register

Definition at line 26 of file dio\_reg\_atm2560.h.

##### 4.14.1.4 DDRD\_PTR

```
#define DDRD_PTR (volatile uint8_t *) (0x0A + 0x20)
```

Macro defining pointer to DDR D register

Definition at line 27 of file dio\_reg\_atm2560.h.

##### 4.14.1.5 PINA\_PTR

```
#define PINA_PTR (volatile uint8_t *) (0x00 + 0x20)
```

Macro defining pointer to PIN A register

Definition at line 19 of file dio\_reg\_atm2560.h.

#### 4.14.1.6 PINB\_PTR

```
#define PINB_PTR (volatile uint8_t *) (0x03 + 0x20)
```

Macro defining pointer to PIN B register

Definition at line 20 of file dio\_reg\_atm2560.h.

#### 4.14.1.7 PINC\_PTR

```
#define PINC_PTR (volatile uint8_t *) (0x06 + 0x20)
```

Macro defining pointer to PIN C register

Definition at line 21 of file dio\_reg\_atm2560.h.

#### 4.14.1.8 PIND\_PTR

```
#define PIND_PTR (volatile uint8_t *) (0x09 + 0x20)
```

Macro defining pointer to PIN D register

Definition at line 22 of file dio\_reg\_atm2560.h.

#### 4.14.1.9 PORTA\_PTR

```
#define PORTA_PTR (volatile uint8_t *) (0x02 + 0x20)
```

Macro defining pointer to PORT A register

Definition at line 14 of file dio\_reg\_atm2560.h.

#### 4.14.1.10 PORTB\_PTR

```
#define PORTB_PTR (volatile uint8_t *) (0x05 + 0x20)
```

Macro defining pointer to PORT B register

Definition at line 15 of file dio\_reg\_atm2560.h.

#### 4.14.1.11 PORTC\_PTR

```
#define PORTC_PTR (volatile uint8_t *) (0x08 + 0x20)
```

Macro defining pointer to PORT C register

Definition at line 16 of file dio\_reg\_atm2560.h.

#### 4.14.1.12 PORTD\_PTR

```
#define PORTD_PTR (volatile uint8_t *) (0x0B + 0x20)
```

Macro defining pointer to PORT D register

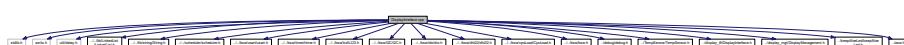
Definition at line 17 of file dio\_reg\_atm2560.h.

## 4.15 DisplayInterface.cpp File Reference

Source code file for display services.

```
#include <stdlib.h>
#include <avr/io.h>
#include <util/delay.h>
#include "../lib/LinkedList/LinkedList.h"
#include "../lib/string/String.h"
#include "../../scheduler/scheduler.h"
#include "../../bsw/usart/usart.h"
#include "../../bsw/timer/timer.h"
#include "../../bsw/lcd/LCD.h"
#include "../../bsw/I2C/I2C.h"
#include "../../bsw/dio/dio.h"
#include "../../bsw/dht22/dht22.h"
#include "../../bsw/cpuLoad/CpuLoad.h"
#include "../../bsw/bsw.h"
#include "../debug/debug.h"
#include "../TempSensor/TempSensor.h"
#include "../display_ift/DisplayInterface.h"
#include "../display_mgt/DisplayManagement.h"
#include "../keepAliveLed/keepAliveLed.h"
#include "../asw.h"
```

Include dependency graph for DisplayInterface.cpp:



### 4.15.1 Detailed Description

Source code file for display services.

#### Date

23 avr. 2019

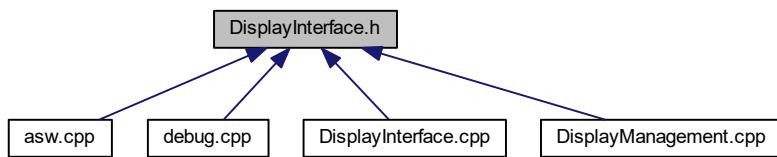
#### Author

nicls67

## 4.16 DisplayInterface.h File Reference

[DisplayInterface](#) class header file.

This graph shows which files directly or indirectly include this file:



### Classes

- struct [`T\_Display\_shift\_data`](#)  
*Structure containing shift data.*
- class [`DisplayInterface`](#)  
*Display interface services class.*

### Macros

- `#define DISPLAY_LINE_SHIFT_PERIOD_MS 500`
- `#define DISPLAY_LINE_SHIFT_TEMPO_TIME 6`

### Enumerations

- enum [`T\_DisplayInterface\_LineDisplayMode`](#) { `NORMAL`, `LINE_SHIFT`, `GO_TO_NEXT_LINE` }  
*Modes for line display.*

### 4.16.1 Detailed Description

[DisplayInterface](#) class header file.

Date

23 avr. 2019

Author

nicls67

### 4.16.2 Macro Definition Documentation

#### 4.16.2.1 DISPLAY\_LINE\_SHIFT\_PERIOD\_MS

```
#define DISPLAY_LINE_SHIFT_PERIOD_MS 500
```

In "line shift" mode for line display, line is shifted every 500 ms

Definition at line 43 of file DisplayInterface.h.

#### 4.16.2.2 DISPLAY\_LINE\_SHIFT\_TEMPO\_TIME

```
#define DISPLAY_LINE_SHIFT_TEMPO_TIME 6
```

In "line shift" mode for line display, a temporization of 3 periods is added at the end and the beginning of the lines

Definition at line 44 of file DisplayInterface.h.

### 4.16.3 Enumeration Type Documentation

#### 4.16.3.1 T\_DisplayInterface\_LineDisplayMode

```
enum T_DisplayInterface_LineDisplayMode
```

Modes for line display.

This enumeration defines the available modes for the line display functionality :

- 1- Normal mode : if the string is too long to be displayed entirely, the end of the string is cut.
- 2- Line shift mode : the display is moving to display all the string.
- 3- Next line mode : the remaining characters are displayed on the next lines.

**Enumerator**

NORMAL	
LINE_SHIFT	
GO_TO_NEXT_LINE	

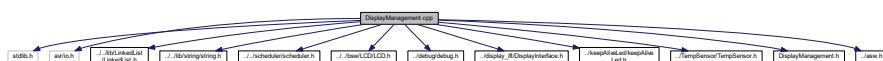
Definition at line 21 of file `DisplayInterface.h`.

## 4.17 DisplayManagement.cpp File Reference

Display management source file.

```
#include <stdlib.h>
#include <avr/io.h>
#include "../lib/LinkedList/LinkedList.h"
#include "../lib/string/string.h"
#include "../../scheduler/scheduler.h"
#include "../../bsw/LCD/LCD.h"
#include "../debug/debug.h"
#include "../display_ift/DisplayInterface.h"
#include "../keepAliveLed/keepAliveLed.h"
#include "../TempSensor/TempSensor.h"
#include "DisplayManagement.h"
#include "../asw.h"
```

Include dependency graph for `DisplayManagement.cpp`:



### 4.17.1 Detailed Description

Display management source file.

**Date**

1 mai 2019

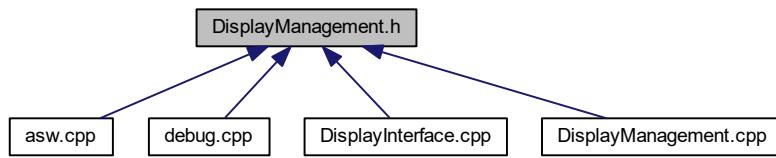
**Author**

nicls67

## 4.18 DisplayManagement.h File Reference

Display management class header file.

This graph shows which files directly or indirectly include this file:



### Classes

- class [DisplayManagement](#)

*Display management class.*

### Macros

- #define DISPLAY\_MGT\_LCD\_I2C\_ADDR 0x27
- #define DISPLAY\_MGT\_PERIOD\_TASK\_SENSOR 5000
- #define DISPLAY\_MGT\_LINE\_TEMP 0
- #define DISPLAY\_MGT\_LINE\_HUM 1

### Variables

- const [T\\_LCD\\_conf\\_struct](#) LCD\_init\_cnf  
*LCD configuration structure.*
- const uint8\_t [tempDisplayString](#) [] = "Temperature : "
- const uint8\_t [humidityDisplayString](#) [] = "Humidite : "

#### 4.18.1 Detailed Description

Display management class header file.

#### Date

1 mai 2019

#### Author

nicls67

## 4.18.2 Macro Definition Documentation

### 4.18.2.1 DISPLAY\_MGT\_LCD\_I2C\_ADDR

```
#define DISPLAY_MGT_LCD_I2C_ADDR 0x27
```

Definition at line 13 of file DisplayManagement.h.

### 4.18.2.2 DISPLAY\_MGT\_LINE\_HUM

```
#define DISPLAY_MGT_LINE_HUM 1
```

Current humidity is displayed on line 1

Definition at line 16 of file DisplayManagement.h.

### 4.18.2.3 DISPLAY\_MGT\_LINE\_TEMP

```
#define DISPLAY_MGT_LINE_TEMP 0
```

Current temperature is displayed on line 0

Definition at line 15 of file DisplayManagement.h.

### 4.18.2.4 DISPLAY\_MGT\_PERIOD\_TASK\_SENSOR

```
#define DISPLAY_MGT_PERIOD_TASK_SENSOR 5000
```

Display is updated every 5s

Definition at line 14 of file DisplayManagement.h.

## 4.18.3 Variable Documentation

#### 4.18.3.1 humidityDisplayString

```
const uint8_t humidityDisplayString[] = "Humidite : "
```

**String** used for humidity display

Definition at line 36 of file DisplayManagement.h.

#### 4.18.3.2 LCD\_init\_cnf

```
const T_LCD_conf_struct LCD_init_cnf
```

**Initial value:**

```
= {
    DISPLAY_MGT_LCD_I2C_ADDR,
    LCD_CNF_BACKLIGHT_ON,
    LCD_CNF_TWO_LINE,
    LCD_CNF_FONT_5_8,
    LCD_CNF_DISPLAY_ON,
    LCD_CNF_CURSOR_OFF,
    LCD_CNF_CURSOR_BLINK_OFF,
    LCD_CNF_ENTRY_MODE_DIRECTION_RIGHT,
    LCD_CNF_ENTRY_MODE_DISPLAY_SHIFT_OFF
}
```

**LCD** configuration structure.

This structure defines the initial configuration of the **LCD** screen.

Definition at line 22 of file DisplayManagement.h.

#### 4.18.3.3 tempDisplayString

```
const uint8_t tempDisplayString[] = "Temperature : "
```

**String** used for temperature display

Definition at line 35 of file DisplayManagement.h.

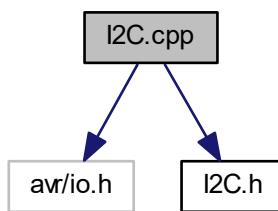
## 4.19 I2C.cpp File Reference

Two-wire interface (**I2C**) source file.

```
#include <avr/io.h>
```

```
#include "I2C.h"
```

Include dependency graph for I2C.cpp:



#### 4.19.1 Detailed Description

Two-wire interface ([I2C](#)) source file.

Date

19 avr. 2019

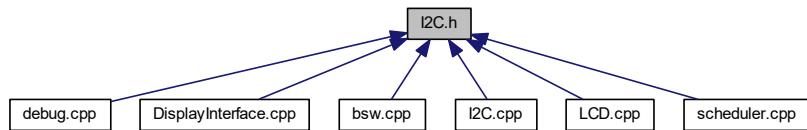
Author

nicls67

## 4.20 I2C.h File Reference

[I2C](#) class header file.

This graph shows which files directly or indirectly include this file:



### Classes

- class [I2C](#)

*Two-wire serial interface ([I2C](#)) class definition.*

### Macros

- #define [START](#) 0x08
- #define [SLA\\_ACK](#) 0x18
- #define [DATA\\_ACK](#) 0x28

#### 4.20.1 Detailed Description

[I2C](#) class header file.

Date

19 avr. 2019

Author

nicls67

## 4.20.2 Macro Definition Documentation

### 4.20.2.1 DATA\_ACK

```
#define DATA_ACK 0x28
```

TWSR status code : DATA has been transmitted and ACK has been received

Definition at line 15 of file I2C.h.

### 4.20.2.2 SLA\_ACK

```
#define SLA_ACK 0x18
```

TWSR status code : SLA has been transmitted and ACK has been received

Definition at line 14 of file I2C.h.

### 4.20.2.3 START

```
#define START 0x08
```

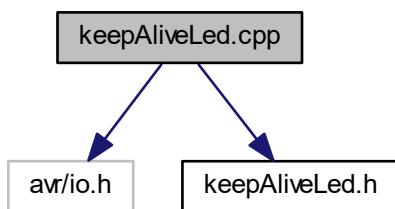
TWSR status code : START condition transmitted

Definition at line 13 of file I2C.h.

## 4.21 keepAliveLed.cpp File Reference

Definition of function for class [keepAliveLed](#).

```
#include <avr/io.h>
#include "keepAliveLed.h"
Include dependency graph for keepAliveLed.cpp:
```



### 4.21.1 Detailed Description

Definition of function for class [keepAliveLed](#).

#### Date

17 mars 2018

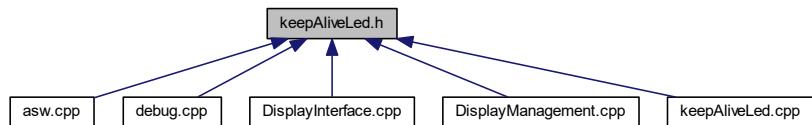
#### Author

nicls67

## 4.22 keepAliveLed.h File Reference

Class [keepAliveLed](#) header file.

This graph shows which files directly or indirectly include this file:



## Classes

- class [keepAliveLed](#)  
*Class for keep-alive LED blinking.*

## Macros

- `#define PERIOD_MS_TASK_LED SW_PERIOD_MS`
- `#define LED_PORT ENCODE_PORT(PORT_B, 7)`

### 4.22.1 Detailed Description

Class [keepAliveLed](#) header file.

#### Date

17 mars 2018

#### Author

nicls67

## 4.22.2 Macro Definition Documentation

### 4.22.2.1 LED\_PORT

```
#define LED_PORT ENCODE_PORT(PORT_B, 7)
```

LED is connected to port PB7

Definition at line 16 of file keepAliveLed.h.

### 4.22.2.2 PERIOD\_MS\_TASK\_LED

```
#define PERIOD_MS_TASK_LED SW_PERIOD_MS
```

Period for led blinking

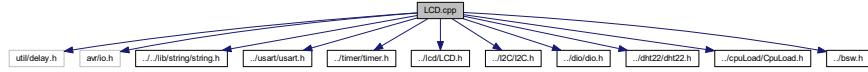
Definition at line 15 of file keepAliveLed.h.

## 4.23 LCD.cpp File Reference

[LCD](#) class source file.

```
#include <util/delay.h>
#include <avr/io.h>
#include "../lib/string/string.h"
#include "../uart/usart.h"
#include "../timer/timer.h"
#include "../lcd/LCD.h"
#include "../I2C/I2C.h"
#include "../dio/dio.h"
#include "../dht22/dht22.h"
#include "../cpuLoad/CpuLoad.h"
#include "../bsw.h"
```

Include dependency graph for LCD.cpp:



### 4.23.1 Detailed Description

[LCD](#) class source file.

#### Date

20 avr. 2019

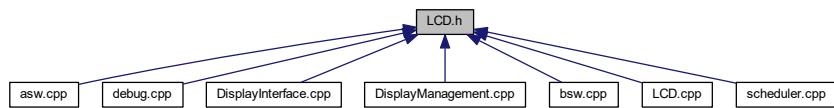
#### Author

nicls67

## 4.24 LCD.h File Reference

[LCD](#) class header file.

This graph shows which files directly or indirectly include this file:



## Classes

- struct [T\\_LCD\\_conf\\_struct](#)
  - class [LCD](#)
- Class for [LCD](#) S2004A display driver.*

## Macros

- #define [EN\\_PIN](#) 2
- #define [RW\\_PIN](#) 1
- #define [RS\\_PIN](#) 0
- #define [BACKLIGHT\\_PIN](#) 3
- #define [LCD\\_INST\\_CLR\\_DISPLAY\\_BIT](#) 0
- #define [LCD\\_INST\\_FUNCTION\\_SET](#) 5
- #define [LCD\\_INST\\_DISPLAY\\_CTRL](#) 3
- #define [LCD\\_INST\\_ENTRY\\_MODE\\_SET](#) 2
- #define [LCD\\_INST\\_SET\\_DDRAM\\_ADDR](#) 7
- #define [LCD\\_FCT\\_SET\\_FIELD\\_DL](#) 4
- #define [LCD\\_FCT\\_SET\\_FIELD\\_N](#) 3
- #define [LCD\\_FCT\\_SET\\_FIELD\\_F](#) 2
- #define [LCD\\_DISPLAY\\_CTRL\\_FIELD\\_D](#) 2
- #define [LCD\\_DISPLAY\\_CTRL\\_FIELD\\_C](#) 1
- #define [LCD\\_DISPLAY\\_CTRL\\_FIELD\\_B](#) 0
- #define [LCD\\_CNF\\_SHIFT\\_ID](#) 1

- #define LCD\_CNF\_SHIFT\_SH 0
- #define LCD\_CNF\_ONE\_LINE 0
- #define LCD\_CNF\_TWO\_LINE 1
- #define LCD\_CNF\_FONT\_5\_8 0
- #define LCD\_CNF\_FONT\_5\_11 1
- #define LCD\_CNF\_DISPLAY\_ON 1
- #define LCD\_CNF\_DISPLAY\_OFF 0
- #define LCD\_CNF\_CURSOR\_ON 1
- #define LCD\_CNF\_CURSOR\_OFF 0
- #define LCD\_CNF\_CURSOR\_BLINK\_ON 1
- #define LCD\_CNF\_CURSOR\_BLINK\_OFF 0
- #define LCD\_CNF\_ENTRY\_MODE\_DIRECTION\_RIGHT 1
- #define LCD\_CNF\_ENTRY\_MODE\_DIRECTION\_LEFT 0
- #define LCD\_CNF\_ENTRY\_MODE\_DISPLAY\_SHIFT\_ON 1
- #define LCD\_CNF\_ENTRY\_MODE\_DISPLAY\_SHIFT\_OFF 0
- #define LCD\_CNF\_BACKLIGHT\_ON 1
- #define LCD\_CNF\_BACKLIGHT\_OFF 0
- #define LCD\_RAM\_1\_LINE\_MIN 0
- #define LCD\_RAM\_1\_LINE\_MAX 0x4F
- #define LCD\_RAM\_2\_LINES\_MIN\_1 0
- #define LCD\_RAM\_2\_LINES\_MAX\_1 0x27
- #define LCD\_RAM\_2\_LINES\_MIN\_2 0x40
- #define LCD\_RAM\_2\_LINES\_MAX\_2 0x67
- #define LCD\_WAIT\_CLR\_RETURN 1600
- #define LCD\_WAIT\_OTHER\_MODES 40
- #define LCD\_SIZE\_NB\_CHAR\_PER\_LINE 20
- #define LCD\_SIZE\_NB\_LINES 4

## Enumerations

- enum T\_LCD\_command {  
    LCD\_CMD\_FUNCTION\_SET, LCD\_CMD\_CLEAR\_DISPLAY, LCD\_CMD\_DISPLAY\_CTRL, LCD\_CMD\_ENTRY\_MODE\_SET,  
    LCD\_CMD\_SET\_DDRAM\_ADDR }  
  
*LCD commands enumeration.*
- enum T\_LCD\_config\_mode { LCD\_MODE\_INSTRUCTION = 0, LCD\_MODE\_DATA = 1 }  
  
*LCD modes enumeration.*
- enum T\_LCD\_ram\_area { LCD\_DATA\_DDRAM, LCD\_DATA\_CGRAM }  
  
*Screen RAM definition.*

### 4.24.1 Detailed Description

LCD class header file.

#### Date

20 avr. 2019

#### Author

nicls67

## 4.24.2 Macro Definition Documentation

### 4.24.2.1 BACKLIGHT\_PIN

```
#define BACKLIGHT_PIN 3
```

Backlight pin is on P3

Definition at line 17 of file LCD.h.

### 4.24.2.2 EN\_PIN

```
#define EN_PIN 2
```

EN bit is on P2

Definition at line 14 of file LCD.h.

### 4.24.2.3 LCD\_CNF\_BACKLIGHT\_OFF

```
#define LCD_CNF_BACKLIGHT_OFF 0
```

Backlight is disabled

Definition at line 70 of file LCD.h.

### 4.24.2.4 LCD\_CNF\_BACKLIGHT\_ON

```
#define LCD_CNF_BACKLIGHT_ON 1
```

Backlight is enabled

Definition at line 69 of file LCD.h.

### 4.24.2.5 LCD\_CNF\_CURSOR\_BLINK\_OFF

```
#define LCD_CNF_CURSOR_BLINK_OFF 0
```

Cursor blinking is off, bit is set to 0

Definition at line 58 of file LCD.h.

#### 4.24.2.6 LCD\_CNF\_CURSOR\_BLINK\_ON

```
#define LCD_CNF_CURSOR_BLINK_ON 1
```

Cursor blinking is on, bit is set to 1

Definition at line 57 of file LCD.h.

#### 4.24.2.7 LCD\_CNF\_CURSOR\_OFF

```
#define LCD_CNF_CURSOR_OFF 0
```

Cursor is off, bit is set to 0

Definition at line 54 of file LCD.h.

#### 4.24.2.8 LCD\_CNF\_CURSOR\_ON

```
#define LCD_CNF_CURSOR_ON 1
```

Cursor is on, bit is set to 1

Definition at line 53 of file LCD.h.

#### 4.24.2.9 LCD\_CNF\_DISPLAY\_OFF

```
#define LCD_CNF_DISPLAY_OFF 0
```

Display is off, bit is set to 0

Definition at line 50 of file LCD.h.

#### 4.24.2.10 LCD\_CNF\_DISPLAY\_ON

```
#define LCD_CNF_DISPLAY_ON 1
```

Display is on, bit is set to 1

Definition at line 49 of file LCD.h.

#### 4.24.2.11 LCD\_CNF\_ENTRY\_MODE\_DIRECTION\_LEFT

```
#define LCD_CNF_ENTRY_MODE_DIRECTION_LEFT 0
```

Direction of shift is left, bit is set to 0

Definition at line 62 of file LCD.h.

#### 4.24.2.12 LCD\_CNF\_ENTRY\_MODE\_DIRECTION\_RIGHT

```
#define LCD_CNF_ENTRY_MODE_DIRECTION_RIGHT 1
```

Direction of shift is right, bit is set to 1

Definition at line 61 of file LCD.h.

#### 4.24.2.13 LCD\_CNF\_ENTRY\_MODE\_DISPLAY\_SHIFT\_OFF

```
#define LCD_CNF_ENTRY_MODE_DISPLAY_SHIFT_OFF 0
```

Display shift is not performed, bit is set to 0

Definition at line 66 of file LCD.h.

#### 4.24.2.14 LCD\_CNF\_ENTRY\_MODE\_DISPLAY\_SHIFT\_ON

```
#define LCD_CNF_ENTRY_MODE_DISPLAY_SHIFT_ON 1
```

Display shift is performed, bit is set to 1

Definition at line 65 of file LCD.h.

#### 4.24.2.15 LCD\_CNF\_FONT\_5\_11

```
#define LCD_CNF_FONT_5_11 1
```

Two-line configuration, bit is set to 1

Definition at line 46 of file LCD.h.

**4.24.2.16 LCD\_CNF\_FONT\_5\_8**

```
#define LCD_CNF_FONT_5_8 0
```

One-line configuration, bit is set to 0

Definition at line 45 of file LCD.h.

**4.24.2.17 LCD\_CNF\_ONE\_LINE**

```
#define LCD_CNF_ONE_LINE 0
```

One-line configuration, bit is set to 0

Definition at line 41 of file LCD.h.

**4.24.2.18 LCD\_CNF\_SHIFT\_ID**

```
#define LCD_CNF_SHIFT_ID 1
```

Field ID (increment or decrement) of command "entry mode set" is on bit DB1

Definition at line 37 of file LCD.h.

**4.24.2.19 LCD\_CNF\_SHIFT\_SH**

```
#define LCD_CNF_SHIFT_SH 0
```

Field SH (shift of display) of command "entry mode set" is on bit DB1

Definition at line 38 of file LCD.h.

**4.24.2.20 LCD\_CNF\_TWO\_LINE**

```
#define LCD_CNF_TWO_LINE 1
```

Two-line configuration, bit is set to 1

Definition at line 42 of file LCD.h.

#### 4.24.2.21 LCD\_DISPLAY\_CTRL\_FIELD\_B

```
#define LCD_DISPLAY_CTRL_FIELD_B 0
```

Field B (cursor blink) of command "display control" is on bit DB0

Definition at line 34 of file LCD.h.

#### 4.24.2.22 LCD\_DISPLAY\_CTRL\_FIELD\_C

```
#define LCD_DISPLAY_CTRL_FIELD_C 1
```

Field C (cursor on/off) of command "display control" is on bit DB1

Definition at line 33 of file LCD.h.

#### 4.24.2.23 LCD\_DISPLAY\_CTRL\_FIELD\_D

```
#define LCD_DISPLAY_CTRL_FIELD_D 2
```

Field D (display on/off) of command "display control" is on bit DB2

Definition at line 32 of file LCD.h.

#### 4.24.2.24 LCD\_FCT\_SET\_FIELD\_DL

```
#define LCD_FCT_SET_FIELD_DL 4
```

Field DL (data length) of command "function set" is on bit DB4

Definition at line 27 of file LCD.h.

#### 4.24.2.25 LCD\_FCT\_SET\_FIELD\_F

```
#define LCD_FCT_SET_FIELD_F 2
```

Field F (font type) of command "function set" is on bit DB2

Definition at line 29 of file LCD.h.

**4.24.2.26 LCD\_FCT\_SET\_FIELD\_N**

```
#define LCD_FCT_SET_FIELD_N 3
```

Field N (number of lines) of command "function set" is on bit DB3

Definition at line 28 of file LCD.h.

**4.24.2.27 LCD\_INST\_CLR\_DISPLAY\_BIT**

```
#define LCD_INST_CLR_DISPLAY_BIT 0
```

Instruction bit for "clear display" is DB0

Definition at line 20 of file LCD.h.

**4.24.2.28 LCD\_INST\_DISPLAY\_CTRL**

```
#define LCD_INST_DISPLAY_CTRL 3
```

Instruction bit for "display control" is DB3

Definition at line 22 of file LCD.h.

**4.24.2.29 LCD\_INST\_ENTRY\_MODE\_SET**

```
#define LCD_INST_ENTRY_MODE_SET 2
```

Instruction bit for "entry mode" is DB2

Definition at line 23 of file LCD.h.

**4.24.2.30 LCD\_INST\_FUNCTION\_SET**

```
#define LCD_INST_FUNCTION_SET 5
```

Instruction bit for "function set" is DB5

Definition at line 21 of file LCD.h.

#### 4.24.2.31 LCD\_INST\_SET\_DDRAM\_ADDR

```
#define LCD_INST_SET_DDRAM_ADDR 7
```

Instruction bit for "set DDRAM address" is DB7

Definition at line 24 of file LCD.h.

#### 4.24.2.32 LCD\_RAM\_1\_LINE\_MAX

```
#define LCD_RAM_1_LINE_MAX 0x4F
```

Maximum address value in 1-line mode

Definition at line 74 of file LCD.h.

#### 4.24.2.33 LCD\_RAM\_1\_LINE\_MIN

```
#define LCD_RAM_1_LINE_MIN 0
```

Minimum address value in 1-line mode

Definition at line 73 of file LCD.h.

#### 4.24.2.34 LCD\_RAM\_2\_LINES\_MAX\_1

```
#define LCD_RAM_2_LINES_MAX_1 0x27
```

Maximum address value in 2-lines mode for line 1

Definition at line 76 of file LCD.h.

#### 4.24.2.35 LCD\_RAM\_2\_LINES\_MAX\_2

```
#define LCD_RAM_2_LINES_MAX_2 0x67
```

Maximum address value in 2-lines mode for line 2

Definition at line 78 of file LCD.h.

**4.24.2.36 LCD\_RAM\_2\_LINES\_MIN\_1**

```
#define LCD_RAM_2_LINES_MIN_1 0
```

Minimum address value in 2-lines mode for line 1

Definition at line 75 of file LCD.h.

**4.24.2.37 LCD\_RAM\_2\_LINES\_MIN\_2**

```
#define LCD_RAM_2_LINES_MIN_2 0x40
```

Minimum address value in 2-lines mode for line 2

Definition at line 77 of file LCD.h.

**4.24.2.38 LCD\_SIZE\_NB\_CHAR\_PER\_LINE**

```
#define LCD_SIZE_NB_CHAR_PER_LINE 20
```

LCD screen has 20 characters per line

Definition at line 85 of file LCD.h.

**4.24.2.39 LCD\_SIZE\_NB\_LINES**

```
#define LCD_SIZE_NB_LINES 4
```

LCD screen has 4 lines

Definition at line 86 of file LCD.h.

**4.24.2.40 LCD\_WAIT\_CLR\_RETURN**

```
#define LCD_WAIT_CLR_RETURN 1600
```

Waiting time after clear display and return home operations is at least 1520 us

Definition at line 81 of file LCD.h.

#### 4.24.2.41 LCD\_WAIT\_OTHER\_MODES

```
#define LCD_WAIT_OTHER_MODES 40
```

Waiting time after all other modes is at least 38 us

Definition at line 82 of file LCD.h.

#### 4.24.2.42 RS\_PIN

```
#define RS_PIN 0
```

RS pin is on P0

Definition at line 16 of file LCD.h.

#### 4.24.2.43 RW\_PIN

```
#define RW_PIN 1
```

RW pin is on P1

Definition at line 15 of file LCD.h.

### 4.24.3 Enumeration Type Documentation

#### 4.24.3.1 T\_LCD\_command

```
enum T_LCD_command
```

LCD commands enumeration.

This enumeration defines all command modes available for [LCD](#) configuration

Enumerator

LCD_CMD_FUNCTION_SET	
LCD_CMD_CLEAR_DISPLAY	
LCD_CMD_DISPLAY_CTRL	
LCD_CMD_ENTRY_MODE_SET	
LCD_CMD_SET_DDRAM_ADDR	

Definition at line 93 of file LCD.h.

#### 4.24.3.2 T\_LCD\_config\_mode

enum [T\\_LCD\\_config\\_mode](#)

LCD modes enumeration.

This enumeration defines the possible modes for communication with [LCD](#). Two modes are possible, DATA for writing data in RAM and INSTRUCTION for configuring the display

Enumerator

LCD_MODE_INSTRUCTION	
LCD_MODE_DATA	

Definition at line 107 of file LCD.h.

#### 4.24.3.3 T\_LCD\_ram\_area

enum [T\\_LCD\\_ram\\_area](#)

Screen RAM definition.

This enumeration defines the RAM areas of the [LCD](#) screen : DDRAM for display, CGRAM for characters generation

Enumerator

LCD_DATA_DDRAM	
LCD_DATA_CGRAM	

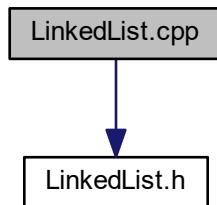
Definition at line 118 of file LCD.h.

## 4.25 LinkedList.cpp File Reference

---

```
#include "LinkedList.h"
```

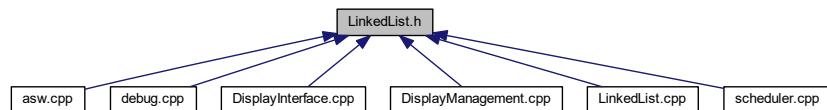
Include dependency graph for LinkedList.cpp:



## 4.26 LinkedList.h File Reference

Linked List library header file.

This graph shows which files directly or indirectly include this file:



### Classes

- class [LinkedList](#)  
*Linked list class.*
- struct [LinkedList::T\\_LL\\_element](#)  
*Type defining a linked list element.*

### Typedefs

- typedef bool(\* [CompareFctPtr\\_t](#)) (void \*LLElement, void \*CompareElement)

#### 4.26.1 Detailed Description

Linked List library header file.

##### Date

27 avr. 2019

##### Author

nicls67

### 4.26.2 Typedef Documentation

#### 4.26.2.1 CompareFctPtr\_t

```
typedef bool(* CompareFctPtr_t) (void *LLElement, void *CompareElement)
```

Type defining a pointer to the comparison function

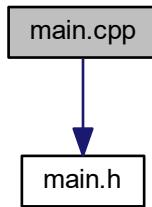
Definition at line 14 of file LinkedList.h.

## 4.27 main.cpp File Reference

Background task file.

```
#include "main.h"
```

Include dependency graph for main.cpp:



### Functions

- **ISR (TIMER1\_COMPA\_vect)**  
*Main software interrupt.*
- **ISR (USART0\_RX\_vect)**  
*USART Rx Complete interrupt.*
- int **main (void)**  
*Background task of program.*

### 4.27.1 Detailed Description

Background task file.

#### Date

12 mars 2018

#### Author

nicls67

## 4.27.2 Function Documentation

### 4.27.2.1 ISR() [1/2]

```
ISR (
    TIMER1_COMPA_vect )
```

Main software interrupt.

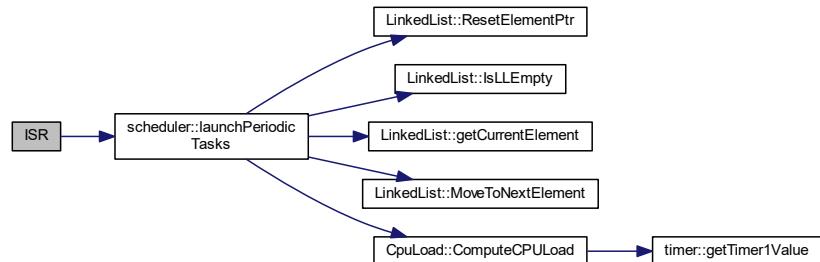
This function handles the interrupt raised by Timer #1. It wakes up the software every 500 ms to perform applications.

#### Returns

Nothing

Definition at line 19 of file main.cpp.

Here is the call graph for this function:



### 4.27.2.2 ISR() [2/2]

```
ISR (
    USART0_RX_vect )
```

USART Rx Complete interrupt.

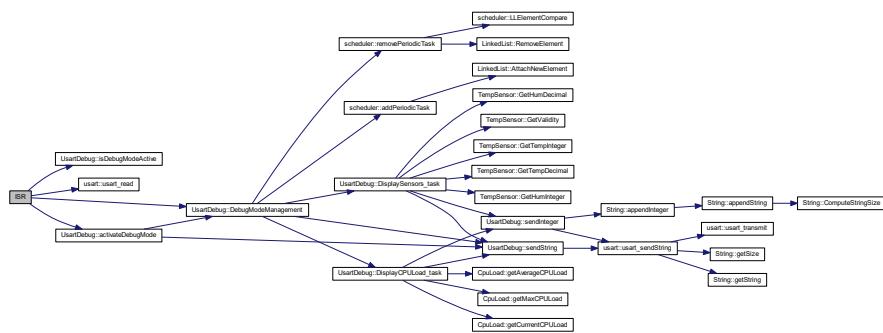
This function handles the interrupt raised when a frame has been received by USART. If debug mode mode is active, it calls debug mode management function. If inactive, it calls debug mode activation function if the received character is 'a'

Returns

Nothing

Definition at line 31 of file main.cpp.

Here is the call graph for this function:



#### 4.27.2.3 main()

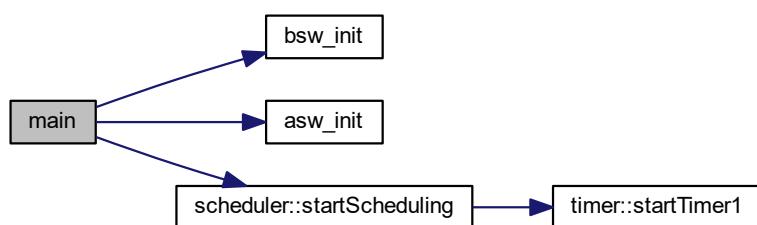
```
int main (
    void )
```

Background task of program.

This function initializes all the software and then goes into an infinite loop. Periodic interrupt will wake up the software to perform application

Definition at line 51 of file main.cpp.

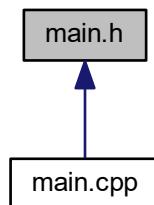
Here is the call graph for this function:



## 4.28 main.h File Reference

Background task header file.

This graph shows which files directly or indirectly include this file:



### 4.28.1 Detailed Description

Background task header file.

Date

17 mars 2018

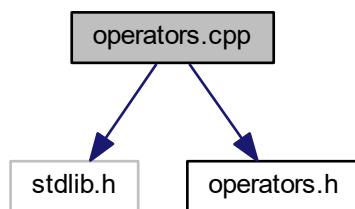
Author

nicls67

## 4.29 operators.cpp File Reference

c++ operators definitions

```
#include <stdlib.h>
#include "operators.h"
Include dependency graph for operators.cpp:
```



## Functions

- `void * operator new (size_t a_size)`  
*Operator new.*
- `void operator delete (void *ptr)`  
*Operator delete.*

### 4.29.1 Detailed Description

c++ operators definitions

#### Date

14 mars 2018

#### Author

nicls67

### 4.29.2 Function Documentation

#### 4.29.2.1 operator delete()

```
void operator delete (
    void * ptr )
```

Operator delete.

Equivalent to free function in C Free the memory zone at address ptr

#### Parameters

in	<code>ptr</code>	Pointer to the start of memory zone to free
----	------------------	---

#### Returns

Nothing

Definition at line 18 of file operators.cpp.

#### 4.29.2.2 operator new()

```
void* operator new (
    size_t a_size )
```

Operator new.

Equivalent to malloc function in C Allocates a memory zone of size a\_size

**Parameters**

in	a_size	memory size to allocate
----	--------	-------------------------

**Returns**

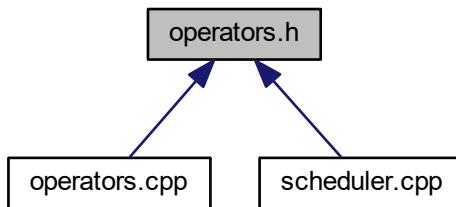
Pointer to the start of allocated memory zone

Definition at line 13 of file operators.cpp.

## 4.30 operators.h File Reference

c++ operators definitions header file

This graph shows which files directly or indirectly include this file:



### Functions

- void \* **operator new** (size\_t a\_size)  
*Operator new.*
- void **operator delete** (void \*ptr)  
*Operator delete.*

#### 4.30.1 Detailed Description

c++ operators definitions header file

**Date**

14 mars 2018

**Author**

nicls67

## 4.30.2 Function Documentation

### 4.30.2.1 operator delete()

```
void operator delete (
    void * ptr )
```

Operator delete.

Equivalent to free function in C Free the memory zone at address ptr

#### Parameters

in	<i>ptr</i>	Pointer to the start of memory zone to free
----	------------	---

#### Returns

Nothing

Definition at line 18 of file operators.cpp.

### 4.30.2.2 operator new()

```
void* operator new (
    size_t a_size )
```

Operator new.

Equivalent to malloc function in C Allocates a memory zone of size a\_size

#### Parameters

in	<i>a_size</i>	memory size to allocate
----	---------------	-------------------------

#### Returns

Pointer to the start of allocated memory zone

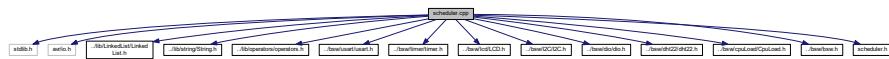
Definition at line 13 of file operators.cpp.

## 4.31 scheduler.cpp File Reference

Defines scheduler class.

```
#include <stdlib.h>
#include <avr/io.h>
#include "../lib/LinkedList/LinkedList.h"
#include "../lib/string/String.h"
#include "../lib/operators/operators.h"
#include "../bsw/usart/usart.h"
#include "../bsw/timer/timer.h"
#include "../bsw/lcd/LCD.h"
#include "../bsw/I2C/I2C.h"
#include "../bsw/dio/dio.h"
#include "../bsw/dht22/dht22.h"
#include "../bsw/cpuLoad/CpuLoad.h"
#include "../bsw/bsw.h"
#include "scheduler.h"
```

Include dependency graph for scheduler.cpp:



## Variables

- `scheduler * p_scheduler`

### 4.31.1 Detailed Description

Defines scheduler class.

#### Date

16 mars 2018

#### Author

nicls67

### 4.31.2 Variable Documentation

#### 4.31.2.1 p\_scheduler

`scheduler* p_scheduler`

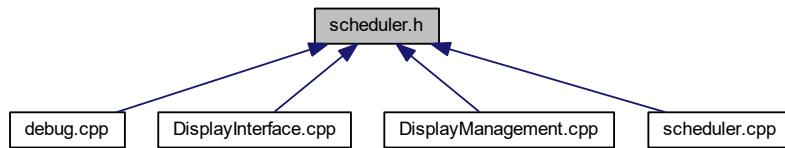
Pointer to scheduler object

Definition at line 29 of file scheduler.cpp.

## 4.32 scheduler.h File Reference

Scheduler class header file.

This graph shows which files directly or indirectly include this file:



### Classes

- class [scheduler](#)  
*Scheduler class.*
- struct [scheduler::Task\\_t](#)  
*Type defining a task structure.*

### Macros

- `#define SW_PERIOD_MS 500`
- `#define PRESCALER_PERIODIC_TIMER 256`
- `#define TIMER_CTC_VALUE ((F_CPU/PRESCALER_PERIODIC_TIMER)/(1000/SW_PERIOD_MS))`

### Typedefs

- `typedef void(* TaskPtr_t) (void)`  
*Type defining a pointer to function.*

### Variables

- `scheduler * p_scheduler`

#### 4.32.1 Detailed Description

Scheduler class header file.

##### Date

16 mars 2018

##### Author

nicls67

### 4.32.2 Macro Definition Documentation

#### 4.32.2.1 PRESCALER\_PERIODIC\_TIMER

```
#define PRESCALER_PERIODIC_TIMER 256
```

Value of prescaler to use for periodic timer

Definition at line 16 of file scheduler.h.

#### 4.32.2.2 SW\_PERIOD\_MS

```
#define SW_PERIOD_MS 500
```

Software period, used to define periodic timer interrupt

Definition at line 15 of file scheduler.h.

#### 4.32.2.3 TIMER\_CTC\_VALUE

```
#define TIMER_CTC_VALUE ((F_CPU/PRESCALER_PERIODIC_TIMER)/(1000/SW_PERIOD_MS))
```

Compare value for periodic timer

Definition at line 17 of file scheduler.h.

### 4.32.3 Typedef Documentation

#### 4.32.3.1 TaskPtr\_t

```
typedef void(* TaskPtr_t) (void)
```

Type defining a pointer to function.

Definition at line 22 of file scheduler.h.

### 4.32.4 Variable Documentation

#### 4.32.4.1 p\_scheduler

`scheduler* p_scheduler`

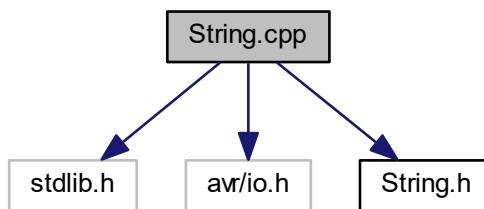
Pointer to scheduler object

Definition at line 29 of file scheduler.cpp.

### 4.33 String.cpp File Reference

[String](#) class source file.

```
#include <stdlib.h>
#include <avr/io.h>
#include "String.h"
Include dependency graph for String.cpp:
```



#### 4.33.1 Detailed Description

[String](#) class source file.

Date

2 mai 2019

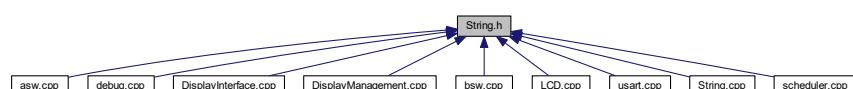
Author

nicls67

### 4.34 String.h File Reference

[String](#) class header file.

This graph shows which files directly or indirectly include this file:



## Classes

- class [String](#)

*String management class.*

### 4.34.1 Detailed Description

[String](#) class header file.

#### Date

2 mai 2019

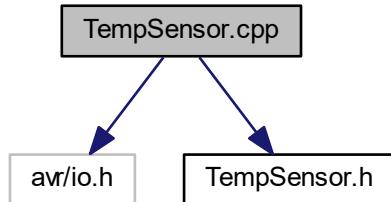
#### Author

nicls67

## 4.35 TempSensor.cpp File Reference

Defines function of class [TempSensor](#).

```
#include <avr/io.h>
#include "TempSensor.h"
Include dependency graph for TempSensor.cpp:
```



## Macros

- `#define PIT_BEFORE_INVALID 60`

### 4.35.1 Detailed Description

Defines function of class [TempSensor](#).

#### Date

23 mars 2018

#### Author

nicls67

## 4.35.2 Macro Definition Documentation

### 4.35.2.1 PIT\_BEFORE\_INVALID

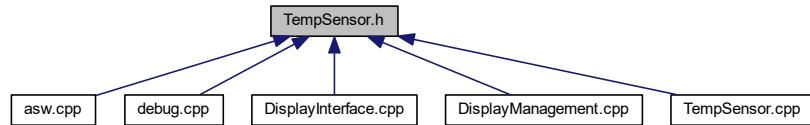
```
#define PIT_BEFORE_INVALID 60
```

Definition at line 14 of file TempSensor.cpp.

## 4.36 TempSensor.h File Reference

Class [TempSensor](#) header file.

This graph shows which files directly or indirectly include this file:



### Classes

- class [TempSensor](#)  
*Class for temperature sensor.*

### Macros

- `#define PERIOD_MS_TASK_TEMP_SENSOR 5000`

### 4.36.1 Detailed Description

Class [TempSensor](#) header file.

#### Date

23 mars 2018

#### Author

nicls67

### 4.36.2 Macro Definition Documentation

#### 4.36.2.1 PERIOD\_MS\_TASK\_TEMP\_SENSOR

```
#define PERIOD_MS_TASK_TEMP_SENSOR 5000
```

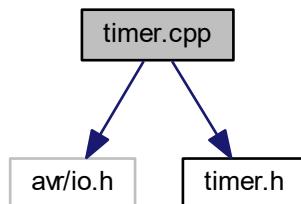
Period for reading temperature data

Definition at line 13 of file TempSensor.h.

## 4.37 timer.cpp File Reference

Defines function for class timer.

```
#include <avr/io.h>
#include "timer.h"
Include dependency graph for timer.cpp:
```



### 4.37.1 Detailed Description

Defines function for class timer.

#### Date

15 mars 2018

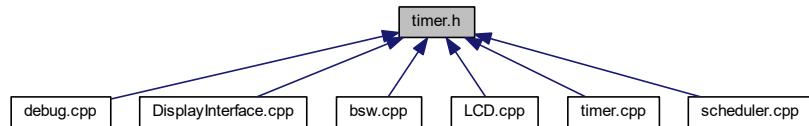
#### Author

nicls67

## 4.38 timer.h File Reference

Timer class header file.

This graph shows which files directly or indirectly include this file:



### Classes

- class [timer](#)

*Class defining a timer.*

### 4.38.1 Detailed Description

Timer class header file.

#### Date

15 mars 2018

#### Author

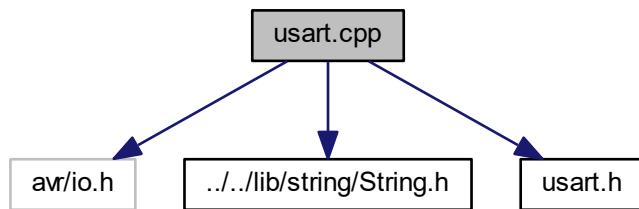
nicls67

## 4.39 usart.cpp File Reference

BSW library for USART.

```
#include <avr/io.h>
#include "../../lib/string/String.h"
#include "usart.h"
```

Include dependency graph for usart.cpp:



### 4.39.1 Detailed Description

BSW library for USART.

Date

13 mars 2018

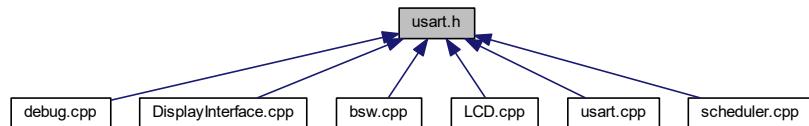
Author

nicls67

## 4.40 usart.h File Reference

Header file for USART library.

This graph shows which files directly or indirectly include this file:



### Classes

- class [uart](#)  
*USART serial bus class.*

### 4.40.1 Detailed Description

Header file for USART library.

Date

13 mars 2018

Author

nicls67



# Index

~String  
    String, 72

ASW\_cnf\_struct  
    asw.cpp, 118  
    asw.h, 120

activateDebugMode  
    UsartDebug, 109

addPeriodicTask  
    scheduler, 65

appendBool  
    String, 73

appendInteger  
    String, 74

appendString  
    String, 75

asw.cpp, 117  
    ASW\_cnf\_struct, 118  
    asw\_init, 118

asw.h, 119  
    ASW\_cnf\_struct, 120  
    asw\_init, 120

asw\_init  
    asw.cpp, 118  
    asw.h, 120

AttachNewElement  
    LinkedList, 59

avg\_load  
    CpuLoad, 8

BACKLIGHT\_PIN  
    LCD.h, 152

BSW\_cnf\_struct  
    bsw.cpp, 122  
    bsw.h, 124

backlight\_en  
    T\_LCD\_conf\_struct, 85

backlight\_enable  
    LCD, 55

BaudRate  
    uart, 107

bitrate  
    I2C, 38

blinkLed\_task  
    keepAliveLed, 39

bsw.cpp, 121  
    BSW\_cnf\_struct, 122  
    bsw\_init, 121

bsw.h, 122  
    BSW\_cnf\_struct, 124

bsw\_init, 124  
    I2C\_BITRATE, 123  
    USART\_BAUDRATE, 123

bsw\_init  
    bsw.cpp, 121  
    bsw.h, 124

Clear  
    String, 76

ClearLine  
    DisplayInterface, 24

cnfCursorBlink  
    LCD, 55

cnfCursorOnOff  
    LCD, 55

cnfDisplayOnOff  
    LCD, 55

cnfEntryModeDir  
    LCD, 56

cnfEntryModeShift  
    LCD, 56

cnfFontType  
    LCD, 56

cnfI2C\_addr  
    LCD, 56

cnfLineNumber  
    LCD, 56

command  
    LCD, 43

CompareFctPtr\_t  
    LinkedList.h, 163

ComputeCPUload  
    CpuLoad, 6

ComputeStringSize  
    String, 76

ConfigureBacklight  
    LCD, 43

ConfigureCursorBlink  
    LCD, 44

ConfigureCursorOnOff  
    LCD, 45

ConfigureDisplayOnOff  
    LCD, 45

ConfigureEntryModeDir  
    LCD, 46

ConfigureEntryModeShift  
    LCD, 47

ConfigureFontType  
    LCD, 47

ConfigureI2CAddr

LCD, 48  
 ConfigureLineNumber  
     LCD, 49  
 configureTimer1  
     timer, 99  
 CpuLoad, 5  
     avg\_load, 8  
     ComputeCPULoad, 6  
     CpuLoad, 6  
     current\_load, 8  
     getAverageCPULoad, 6  
     getCurrentCPULoad, 7  
     getMaxCPULoad, 7  
     last\_sum\_value, 8  
     max\_load, 9  
     sample\_cnt, 9  
     sample\_idx, 9  
     sample\_mem, 9  
 CpuLoad.cpp, 125  
 CpuLoad.h, 125  
     NB\_OF\_SAMPLES, 126  
 curElement\_ptr  
     LinkedList, 62  
 current\_load  
     CpuLoad, 8  
 cursor\_en  
     T\_LCD\_conf\_struct, 85  
 cursorBlink\_en  
     T\_LCD\_conf\_struct, 85  
  
 DATA\_ACK  
     I2C.h, 147  
 DDRA\_PTR  
     dio\_reg\_atm2560.h, 137  
 DDRB\_PTR  
     dio\_reg\_atm2560.h, 137  
 DDRC\_PTR  
     dio\_reg\_atm2560.h, 137  
 DDRD\_PTR  
     dio\_reg\_atm2560.h, 137  
 DECODE\_PIN  
     dio.h, 133  
 DECODE\_PORT  
     dio.h, 133  
 DHT22\_PORT  
     dht22.h, 131  
 DISPLAY\_LINE\_SHIFT\_PERIOD\_MS  
     DisplayInterface.h, 141  
 DISPLAY\_LINE\_SHIFT\_TEMPO\_TIME  
     DisplayInterface.h, 141  
 DISPLAY\_MGT\_LCD\_I2C\_ADDR  
     DisplayManagement.h, 144  
 DISPLAY\_MGT\_LINE\_HUM  
     DisplayManagement.h, 144  
 DISPLAY\_MGT\_LINE\_TEMP  
     DisplayManagement.h, 144  
 DISPLAY\_MGT\_PERIOD\_TASK\_SENSOR  
     DisplayManagement.h, 144  
 data\_ptr  
  
 LinkedList::T\_LL\_element, 87  
 ddram\_addr  
     LCD, 57  
 debug.cpp, 126  
     str\_debug\_main\_menu, 127  
 debug.h, 128  
     debug\_state\_t, 129  
     PERIOD\_MS\_TASK\_DISPLAY\_CPU\_LOAD, 128  
     PERIOD\_MS\_TASK\_DISPLAY\_SENSORS, 129  
 debug\_state  
     UsartDebug, 116  
 debug\_state\_t  
     debug.h, 129  
 debugModeActive\_F  
     UsartDebug, 116  
 DebugModeManagement  
     UsartDebug, 109  
 dht22, 10  
     dht22, 10  
     initializeCommunication, 11  
     read, 11  
 dht22.cpp, 129  
     MAX\_WAIT\_TIME\_US, 130  
 dht22.h, 131  
     DHT22\_PORT, 131  
 dio, 12  
     dio, 13  
     dio\_changePortPinCnf, 14  
     dio\_getPort, 15  
     dio\_getPort\_fast, 16  
     dio\_invertPort, 16  
     dio\_memorizePINaddress, 17  
     dio\_setPort, 18  
     getDDRxAddress, 19  
     getPINxAddress, 19  
     getPORTxAddress, 20  
     PINx\_addr\_mem, 21  
     PINx\_idx\_mem, 21  
     ports\_init, 21  
 dio.cpp, 132  
 dio.h, 132  
     DECODE\_PIN, 133  
     DECODE\_PORT, 133  
     ENCODE\_PORT, 134  
     PORT\_CNF\_IN, 134  
     PORT\_CNF\_OUT, 135  
     PORT\_A, 134  
     PORT\_B, 134  
     PORT\_C, 134  
     PORT\_D, 135  
 dio\_changePortPinCnf  
     dio, 14  
 dio\_getPort  
     dio, 15  
 dio\_getPort\_fast  
     dio, 16  
 dio\_invertPort  
     dio, 16

dio\_memorizePINaddress  
    dio, 17  
dio\_port\_cnf.h, 135  
    PORTB\_CNF\_DDRB, 136  
    PORTB\_CNF\_PORTB, 136  
dio\_reg\_atm2560.h, 136  
    DDRA\_PTR, 137  
    DDR\_B\_PTR, 137  
    DDRC\_PTR, 137  
    DDRD\_PTR, 137  
    PINA\_PTR, 137  
    PINB\_PTR, 137  
    PINC\_PTR, 138  
    PIND\_PTR, 138  
    PORTA\_PTR, 138  
    PORTB\_PTR, 138  
    PORTC\_PTR, 138  
    PORTD\_PTR, 139  
dio\_setPort  
    dio, 18  
display\_en  
    T\_LCD\_conf\_struct, 85  
DisplayCPUload\_task  
    UsartDebug, 111  
DisplayFullLine  
    DisplayInterface, 24  
DisplayInterface, 22  
    ClearLine, 24  
    DisplayFullLine, 24  
    DisplayInterface, 23  
    dummy, 29  
    FindFirstCharAddr, 25  
    getLLShiftDataPtr, 26  
    IsLineEmpty, 27  
    LL\_shift\_data\_ptr, 29  
    LLElementCompare, 27  
    lineEmptyTab, 29  
    p\_lcd, 29  
    shiftLine\_task, 28  
DisplayInterface.cpp, 139  
DisplayInterface.h, 140  
    DISPLAY\_LINE\_SHIFT\_PERIOD\_MS, 141  
    DISPLAY\_LINE\_SHIFT\_TEMPO\_TIME, 141  
    T\_DisplayInterface\_LineDisplayMode, 141  
DisplayManagement, 30  
    DisplayManagement, 31  
    DisplaySensorData\_Task, 31  
    GetIftPointer, 32  
    GetTempSensorPtr, 33  
    p\_display\_ift, 34  
    p\_tempSensor, 34  
DisplayManagement.cpp, 142  
DisplayManagement.h, 143  
    DISPLAY\_MGT\_LCD\_I2C\_ADDR, 144  
    DISPLAY\_MGT\_LINE\_HUM, 144  
    DISPLAY\_MGT\_LINE\_TEMP, 144  
    DISPLAY\_MGT\_PERIOD\_TASK\_SENSOR, 144  
    humidityDisplayString, 144  
LCD\_init\_cnf, 145  
tempDisplayString, 145  
DisplaySensorData\_Task  
    DisplayManagement, 31  
DisplaySensors\_task  
    UsartDebug, 111  
dummy  
    DisplayInterface, 29  
EN\_PIN  
    LCD.h, 152  
ENCODE\_PORT  
    dio.h, 134  
entryModeDir  
    T\_LCD\_conf\_struct, 85  
entryModeShift  
    T\_LCD\_conf\_struct, 85  
FindFirstCharAddr  
    DisplayInterface, 25  
firstElement  
    LinkedList, 63  
fontType\_cnf  
    T\_LCD\_conf\_struct, 86  
getAverageCPUload  
    CpuLoad, 6  
getCurrentElement  
    LinkedList, 60  
getCurrentCPUload  
    CpuLoad, 7  
GetDDRAMAddress  
    LCD, 49  
getDDRxAddress  
    dio, 19  
GetHumDecimal  
    TempSensor, 90  
GetHumInteger  
    TempSensor, 91  
getHumPtr  
    TempSensor, 91  
getHumidity  
    TempSensor, 90  
GetIftPointer  
    DisplayManagement, 32  
getLLShiftDataPtr  
    DisplayInterface, 26  
GetLineNumberCnf  
    LCD, 50  
getMaxCPUload  
    CpuLoad, 7  
getPINxAddress  
    dio, 19  
getPORTxAddress  
    dio, 20  
getPitNumber  
    scheduler, 66  
getSize  
    String, 77

getString  
  String, 77

getTemp  
  TempSensor, 92

GetTempDecimal  
  TempSensor, 92

GetTempInteger  
  TempSensor, 93

getTempPtr  
  TempSensor, 93

GetTempSensorPtr  
  DisplayManagement, 33

getTimer1Value  
  timer, 100

GetValidity  
  TempSensor, 94

humidityDisplayString  
  DisplayManagement.h, 144

I2C.cpp, 145

I2C.h, 146

- DATA\_ACK, 147
- SLA\_ACK, 147
- START, 147

I2C\_BITRATE  
  bsw.h, 123

I2C, 34

- bitrate, 38
- I2C, 35
- initializeBus, 36
- setBitRate, 36
- setTxAddress, 37
- tx\_address, 38
- writeByte, 37

i2c\_addr  
  T\_LCD\_conf\_struct, 86

ISR  
  main.cpp, 164

initializeBus  
  I2C, 36

initializeCommunication  
  dht22, 11

InitializeScreen  
  LCD, 50

isDebugModeActive  
  UsartDebug, 112

IsLLEmpty  
  LinkedList, 60

IsLineEmpty  
  DisplayInterface, 27

keepAliveLed, 38

- blinkLed\_task, 39
- keepAliveLed, 39

keepAliveLed.cpp, 147

keepAliveLed.h, 148

- LED\_PORT, 149
- PERIOD\_MS\_TASK\_LED, 149

LCD.cpp, 149

LCD.h, 150

- BACKLIGHT\_PIN, 152
- EN\_PIN, 152
- LCD\_CNF\_BACKLIGHT\_OFF, 152
- LCD\_CNF\_BACKLIGHT\_ON, 152
- LCD\_CNF\_CURSOR\_BLINK\_OFF, 152
- LCD\_CNF\_CURSOR\_BLINK\_ON, 152
- LCD\_CNF\_CURSOR\_OFF, 153
- LCD\_CNF\_CURSOR\_ON, 153
- LCD\_CNF\_DISPLAY\_OFF, 153
- LCD\_CNF\_DISPLAY\_ON, 153
- LCD\_CNF\_ENTRY\_MODE\_DIRECTION\_LEFT, 153
- LCD\_CNF\_ENTRY\_MODE\_DIRECTION\_RIGHT, 154
- LCD\_CNF\_ENTRY\_MODE\_DISPLAY\_SHIFT←OFF, 154
- LCD\_CNF\_ENTRY\_MODE\_DISPLAY\_SHIFT←ON, 154
- LCD\_CNF\_FONT\_5\_11, 154
- LCD\_CNF\_FONT\_5\_8, 154
- LCD\_CNF\_ONE\_LINE, 155
- LCD\_CNF\_SHIFT\_ID, 155
- LCD\_CNF\_SHIFT\_SH, 155
- LCD\_CNF\_TWO\_LINE, 155
- LCD\_DISPLAY\_CTRL\_FIELD\_B, 155
- LCD\_DISPLAY\_CTRL\_FIELD\_C, 156
- LCD\_DISPLAY\_CTRL\_FIELD\_D, 156
- LCD\_FCT\_SET\_FIELD\_DL, 156
- LCD\_FCT\_SET\_FIELD\_F, 156
- LCD\_FCT\_SET\_FIELD\_N, 156
- LCD\_INST\_CLR\_DISPLAY\_BIT, 157
- LCD\_INST\_DISPLAY\_CTRL, 157
- LCD\_INST\_ENTRY\_MODE\_SET, 157
- LCD\_INST\_FUNCTION\_SET, 157
- LCD\_INST\_SET\_DDRAM\_ADDR, 157
- LCD\_RAM\_1\_LINE\_MAX, 158
- LCD\_RAM\_1\_LINE\_MIN, 158
- LCD\_RAM\_2\_LINES\_MAX\_1, 158
- LCD\_RAM\_2\_LINES\_MAX\_2, 158
- LCD\_RAM\_2\_LINES\_MIN\_1, 158
- LCD\_RAM\_2\_LINES\_MIN\_2, 159
- LCD\_SIZE\_NB\_CHAR\_PER\_LINE, 159
- LCD\_SIZE\_NB\_LINES, 159
- LCD\_WAIT\_CLR\_RETURN, 159
- LCD\_WAIT\_OTHER\_MODES, 159
- RS\_PIN, 160
- RW\_PIN, 160
- T\_LCD\_command, 160
- T\_LCD\_config\_mode, 161
- T\_LCD\_ram\_area, 161
- LCD\_CNF\_BACKLIGHT\_OFF
- LCD.h, 152
- LCD\_CNF\_BACKLIGHT\_ON
- LCD.h, 152
- LCD\_CNF\_CURSOR\_BLINK\_OFF
- LCD.h, 152

LCD\_CNF\_CURSOR\_BLINK\_ON  
LCD.h, 152

LCD\_CNF\_CURSOR\_OFF  
LCD.h, 153

LCD\_CNF\_CURSOR\_ON  
LCD.h, 153

LCD\_CNF\_DISPLAY\_OFF  
LCD.h, 153

LCD\_CNF\_DISPLAY\_ON  
LCD.h, 153

LCD\_CNF\_ENTRY\_MODE\_DIRECTION\_LEFT  
LCD.h, 153

LCD\_CNF\_ENTRY\_MODE\_DIRECTION\_RIGHT  
LCD.h, 154

LCD\_CNF\_ENTRY\_MODE\_DISPLAY\_SHIFT\_OFF  
LCD.h, 154

LCD\_CNF\_ENTRY\_MODE\_DISPLAY\_SHIFT\_ON  
LCD.h, 154

LCD\_CNF\_FONT\_5\_11  
LCD.h, 154

LCD\_CNF\_FONT\_5\_8  
LCD.h, 154

LCD\_CNF\_ONE\_LINE  
LCD.h, 155

LCD\_CNF\_SHIFT\_ID  
LCD.h, 155

LCD\_CNF\_SHIFT\_SH  
LCD.h, 155

LCD\_CNF\_TWO\_LINE  
LCD.h, 155

LCD\_DISPLAY\_CTRL\_FIELD\_B  
LCD.h, 155

LCD\_DISPLAY\_CTRL\_FIELD\_C  
LCD.h, 156

LCD\_DISPLAY\_CTRL\_FIELD\_D  
LCD.h, 156

LCD\_FCT\_SET\_FIELD\_DL  
LCD.h, 156

LCD\_FCT\_SET\_FIELD\_F  
LCD.h, 156

LCD\_FCT\_SET\_FIELD\_N  
LCD.h, 156

LCD\_INST\_CLR\_DISPLAY\_BIT  
LCD.h, 157

LCD\_INST\_DISPLAY\_CTRL  
LCD.h, 157

LCD\_INST\_ENTRY\_MODE\_SET  
LCD.h, 157

LCD\_INST\_FUNCTION\_SET  
LCD.h, 157

LCD\_INST\_SET\_DDRAM\_ADDR  
LCD.h, 157

LCD\_RAM\_1\_LINE\_MAX  
LCD.h, 158

LCD\_RAM\_1\_LINE\_MIN  
LCD.h, 158

LCD\_RAM\_2\_LINES\_MAX\_1  
LCD.h, 158

LCD\_RAM\_2\_LINES\_MAX\_2  
LCD.h, 158

LCD\_RAM\_2\_LINES\_MIN\_1  
LCD.h, 158

LCD\_RAM\_2\_LINES\_MIN\_2  
LCD.h, 159

LCD\_SIZE\_NB\_CHAR\_PER\_LINE  
LCD.h, 159

LCD\_SIZE\_NB\_LINES  
LCD.h, 159

LCD\_WAIT\_CLR\_RETURN  
LCD.h, 159

LCD\_WAIT\_OTHER\_MODES  
LCD.h, 159

LCD\_init\_cnf  
DisplayManagement.h, 145

LCD, 40

- backlight\_enable, 55
- cnfCursorBlink, 55
- cnfCursorOnOff, 55
- cnfDisplayOnOff, 55
- cnfEntryModeDir, 56
- cnfEntryModeShift, 56
- cnfFontType, 56
- cnfI2C\_addr, 56
- cnfLineNumber, 56
- command, 43
- ConfigureBacklight, 43
- ConfigureCursorBlink, 44
- ConfigureCursorOnOff, 45
- ConfigureDisplayOnOff, 45
- ConfigureEntryModeDir, 46
- ConfigureEntryModeShift, 47
- ConfigureFontType, 47
- ConfigureI2CAddr, 48
- ConfigureLineNumber, 49
- ddram\_addr, 57
- GetDDRAMAddress, 49
- GetLineNumberCnf, 50
- InitializeScreen, 50
- LCD, 42
- SetDDRAMAddress, 51
- write, 52
- write4bits, 53
- WriteInRam, 54

LED\_PORT  
keepAliveLed.h, 149

LL\_shift\_data\_ptr  
DisplayInterface, 29

LLElementCompare  
DisplayInterface, 27

- scheduler, 67

last\_sum\_value  
CpuLoad, 8

launchPeriodicTasks  
scheduler, 67

line  
T\_Display\_shift\_data, 83

lineEmptyTab  
     DisplayInterface, 29

lineNumber\_cnf  
     T\_LCD\_conf\_struct, 86

LinkedList, 57  
     AttachNewElement, 59  
     curElement\_ptr, 62  
     firstElement, 63  
     getCurrentElement, 60  
     IsLLEmpty, 60  
     LinkedList, 59  
     MoveToNextElement, 61  
     RemoveElement, 61  
     ResetElementPtr, 62  
     T\_LL\_element, 58

LinkedList.cpp, 161

LinkedList.h, 162  
     CompareFctPtr\_t, 163

LinkedList::T\_LL\_element, 86  
     data\_ptr, 87  
     nextElement, 87

MAX\_WAIT\_TIME\_US  
     dht22.cpp, 130

main  
     main.cpp, 165

main.cpp, 163  
     ISR, 164  
     main, 165

main.h, 166

max\_load  
     CpuLoad, 9

MoveToNextElement  
     LinkedList, 61

NB\_OF\_SAMPLES  
     CpuLoad.h, 126

nextElement  
     LinkedList::T\_LL\_element, 87

operator delete  
     operators.cpp, 167  
     operators.h, 170

operator new  
     operators.cpp, 167  
     operators.h, 170

operators.cpp, 166  
     operator delete, 167  
     operator new, 167

operators.h, 169  
     operator delete, 170  
     operator new, 170

p\_DisplayInterface  
     T\_ASW\_cnf\_struct, 79

p\_DisplayManagement  
     T\_ASW\_cnf\_struct, 80

p\_TempSensor  
     T\_ASW\_cnf\_struct, 80

p\_cpupload  
     T\_BSW\_cnf\_struct, 81

p\_dht22  
     T\_BSW\_cnf\_struct, 81

p\_dio  
     T\_BSW\_cnf\_struct, 82

p\_display\_ift  
     DisplayManagement, 34

p\_i2c  
     T\_BSW\_cnf\_struct, 82

p\_keepAliveLed  
     T\_ASW\_cnf\_struct, 80

p\_lcd  
     DisplayInterface, 29  
     T\_BSW\_cnf\_struct, 82

p\_scheduler  
     scheduler.cpp, 171  
     scheduler.h, 173

p\_tempSensor  
     DisplayManagement, 34

p\_timer  
     T\_BSW\_cnf\_struct, 82

p\_usart  
     T\_BSW\_cnf\_struct, 82

p\_usartDebug  
     T\_ASW\_cnf\_struct, 80

PERIOD\_MS\_TASK\_DISPLAY\_CPU\_LOAD  
     debug.h, 128

PERIOD\_MS\_TASK\_DISPLAY\_SENSORS  
     debug.h, 129

PERIOD\_MS\_TASK\_LED  
     keepAliveLed.h, 149

PERIOD\_MS\_TASK\_TEMP\_SENSOR  
     TempSensor.h, 177

PINA\_PTR  
     dio\_reg\_atm2560.h, 137

PINB\_PTR  
     dio\_reg\_atm2560.h, 137

PINC\_PTR  
     dio\_reg\_atm2560.h, 138

PIND\_PTR  
     dio\_reg\_atm2560.h, 138

PINx\_addr\_mem  
     dio, 21

PINx\_idx\_mem  
     dio, 21

PIT\_BEFORE\_INVALID  
     TempSensor.cpp, 176

PORT\_CNF\_IN  
     dio.h, 134

PORT\_CNF\_OUT  
     dio.h, 135

PORT\_A  
     dio.h, 134

PORT\_B  
     dio.h, 134

PORT\_C  
     dio.h, 134

PORT\_D  
  dio.h, 135  
PORTA\_PTR  
  dio\_reg\_atm2560.h, 138  
PORTB\_CNF\_DDRB  
  dio\_port\_cnf.h, 136  
PORTB\_CNF\_PORTB  
  dio\_port\_cnf.h, 136  
PORTB\_PTR  
  dio\_reg\_atm2560.h, 138  
PORTC\_PTR  
  dio\_reg\_atm2560.h, 138  
PORTD\_PTR  
  dio\_reg\_atm2560.h, 139  
PRESCALER\_PERIODIC\_TIMER  
  scheduler.h, 173  
period  
  scheduler::Task\_t, 88  
pit\_number  
  scheduler, 70  
ports\_init  
  dio, 21  
prescaler  
  timer, 101  
  
RS\_PIN  
  LCD.h, 160  
RW\_PIN  
  LCD.h, 160  
read  
  dht22, 11  
read\_humidity  
  TempSensor, 96  
read\_temperature  
  TempSensor, 97  
readTempSensor\_task  
  TempSensor, 94  
RemoveElement  
  LinkedList, 61  
removePeriodicTask  
  scheduler, 68  
ResetElementPtr  
  LinkedList, 62  
  
SLA\_ACK  
  I2C.h, 147  
START  
  I2C.h, 147  
SW\_PERIOD\_MS  
  scheduler.h, 173  
sample\_cnt  
  CpuLoad, 9  
sample\_idx  
  CpuLoad, 9  
sample\_mem  
  CpuLoad, 9  
scheduler, 63  
  addPeriodicTask, 65  
  getPitNumber, 66  
  LLElementCompare, 67  
  launchPeriodicTasks, 67  
  pit\_number, 70  
  removePeriodicTask, 68  
  scheduler, 65  
  startScheduling, 69  
  Task\_t, 64  
  TasksLL\_ptr, 70  
  scheduler.cpp, 170  
  p\_scheduler, 171  
  scheduler.h, 172  
  p\_scheduler, 173  
  PRESCALER\_PERIODIC\_TIMER, 173  
  SW\_PERIOD\_MS, 173  
  TIMER\_CTC\_VALUE, 173  
  TaskPtr\_t, 173  
  scheduler::Task\_t, 87  
  period, 88  
  TaskPtr, 88  
sendBool  
  UsartDebug, 113  
sendInteger  
  UsartDebug, 114  
sendString  
  UsartDebug, 114, 115  
setBaudRate  
  uart, 103  
setBitRate  
  I2C, 36  
SetDDRAMAddress  
  LCD, 51  
setTxAddress  
  I2C, 37  
setValidity  
  TempSensor, 95  
shiftLine\_task  
  DisplayInterface, 28  
size  
  String, 78  
  T\_Display\_shift\_data, 83  
startScheduling  
  scheduler, 69  
startTimer1  
  timer, 100  
stopTimer1  
  timer, 101  
str\_cur\_ptr  
  T\_Display\_shift\_data, 84  
str\_debug\_main\_menu  
  debug.cpp, 127  
str\_start\_ptr  
  T\_Display\_shift\_data, 84  
String, 70  
  ~String, 72  
  appendBool, 73  
  appendInteger, 74  
  appendString, 75  
  Clear, 76

ComputeStringSize, 76  
 getSize, 77  
 getString, 77  
 size, 78  
 String, 71, 72  
 string, 78  
 string  
     String, 78  
 String.cpp, 174  
 String.h, 174  
  
 T\_ASW\_cnf\_struct, 79  
     p\_DisplayInterface, 79  
     p\_DisplayManagement, 80  
     p\_TempSensor, 80  
     p\_keepAliveLed, 80  
     p\_usartDebug, 80  
  
 T\_BSW\_cnf\_struct, 81  
     p\_cpupload, 81  
     p\_dht22, 81  
     p\_dio, 82  
     p\_i2c, 82  
     p\_lcd, 82  
     p\_timer, 82  
     p\_usart, 82  
  
 T\_Display\_shift\_data, 83  
     line, 83  
     size, 83  
     str\_cur\_ptr, 84  
     str\_start\_ptr, 84  
     temporization, 84  
  
 T\_DisplayInterface\_LineDisplayMode  
     DisplayInterface.h, 141  
  
 T\_LCD\_command  
     LCD.h, 160  
  
 T\_LCD\_conf\_struct, 84  
     backlight\_en, 85  
     cursor\_en, 85  
     cursorBlink\_en, 85  
     display\_en, 85  
     entryModeDir, 85  
     entryModeShift, 85  
     fontType\_cnf, 86  
     i2c\_addr, 86  
     lineNumber\_cnf, 86  
  
 T\_LCD\_config\_mode  
     LCD.h, 161  
  
 T\_LCD\_ram\_area  
     LCD.h, 161  
  
 T\_LL\_element  
     LinkedList, 58  
  
 TIMER\_CTC\_VALUE  
     scheduler.h, 173  
  
 Task\_t  
     scheduler, 64  
  
 TaskPtr  
     scheduler::Task\_t, 88  
  
 TaskPtr\_t  
     scheduler.h, 173  
  
     TasksLL\_ptr  
         scheduler, 70  
     tempDisplayString  
         DisplayManagement.h, 145  
  
 TempSensor, 88  
     GetHumDecimal, 90  
     GetHumInteger, 91  
     getHumPtr, 91  
     getHumidity, 90  
     getTemp, 92  
     GetTempDecimal, 92  
     GetTempInteger, 93  
     getTempPtr, 93  
     GetValidity, 94  
     read\_humidity, 96  
     read\_temperature, 97  
     readTempSensor\_task, 94  
     setValidity, 95  
     TempSensor, 90  
     updateLastValidValues, 96  
     valid\_hum, 97  
     valid坑, 97  
     valid\_temp, 97  
     validity, 97  
     validity\_last\_read, 98  
  
 TempSensor.cpp, 175  
     PIT\_BEFORE\_INVALID, 176  
  
 TempSensor.h, 176  
     PERIOD\_MS\_TASK\_TEMP\_SENSOR, 177  
  
 temporization  
     T\_Display\_shift\_data, 84  
  
 timer, 98  
     configureTimer1, 99  
     getTimer1Value, 100  
     prescaler, 101  
     startTimer1, 100  
     stopTimer1, 101  
     timer, 99  
  
 timer.cpp, 177  
  
 timer.h, 178  
  
 tx\_address  
     I2C, 38  
  
     USART\_BAUDRATE  
         bsw.h, 123  
  
 updateLastValidValues  
     TempSensor, 96  
  
 usart, 102  
     BaudRate, 107  
     setBaudRate, 103  
     usart, 102  
     usart\_init, 103  
     usart\_read, 104  
     usart\_sendString, 104  
     usart\_transmit, 105  
  
 usart.cpp, 178  
  
 usart.h, 179  
  
 usart\_init  
     usart, 103

uart\_read  
    uart, 104  
uart\_sendString  
    uart, 104  
uart\_transmit  
    uart, 105  
UsartDebug, 107  
    activateDebugMode, 109  
    debug\_state, 116  
    debugModeActive\_F, 116  
    DebugModeManagement, 109  
    DisplayCPULoad\_task, 111  
    DisplaySensors\_task, 111  
    isDebugModeActive, 112  
    sendBool, 113  
    sendInteger, 114  
    sendString, 114, 115  
    UsartDebug, 108

valid\_hum  
    TempSensor, 97  
valid坑  
    TempSensor, 97  
valid\_temp  
    TempSensor, 97  
validity  
    TempSensor, 97  
validity\_last\_read  
    TempSensor, 98

write  
    LCD, 52  
write4bits  
    LCD, 53  
writeByte  
    I2C, 37  
WriteInRam  
    LCD, 54