MODBUS Register Map

SONIC1 MODBUS register map is available on RS485_1 and on MODBUS/TCP. The register map consists of registers related to the SONIC1 controller and the time-of-flight measurements.

The SONIC1 ultrasonic bus is capable of supporting more than one pair of ultrasonic transducers. The parameters for each transducer pair are arranged in discreet MODBUS register blocks totaling 8 such blocks, indicating a maximum of 8 transducers pairs on a single SONIC1 ultrasonic bus.

The 8 transducer pair register blocks of 100 registers each, are named XPAIR0 through XPAIR7 in the top-level MODBUS map table..

The 8 XPAIR[x] blocks occupy the MODBUS register range 40300 through 41099, with each XPAIR[x] block on a 100 register boundary.

Address	Data Type	Register Name	R/W	Description
40001	UINT16	HEARTBEAT	R	1/10th second counter used to measure real time
40002	UINT16	STATUS	R	0x0001: Settings I/O Error 0x0002: Backup/Restore operation busy.
40003	UINT16	RELAYCTL	R/W	0x0001: RELAY: 1=ON 0=OFF Sets state of N/O relay contacts
40004	UINT16	CMD	R/W	Command Register Word: 0x8001(32769): **CMD_RESET** - Restart the instrument 0x8002(32770): **CMD_LOAD(0)** - Load settings from drive 0 0x8102(33 026): **CMD_LOAD(1)** - Load settings from drive 1 0x8202(33 282): **CMD_LOAD(2)** - Load settings from drive 2 0x8302(33 538): **CMD_LOAD(3)** - Load settings from drive 3 0x8402(32770): **CMD_LOAD(4)** - Load settings from drive 4 (Micro SD Card) 0x8003(32771): **CMD_STORE(0)** - Store settings to drive #0 0x8103(33027): **CMD_STORE(1)** - Store settings to drive #1 0x8203(33283): **CMD_STORE(2)** - Store settings to drive #2

				0x8303(33539): **CMD_STORE(3)** - Store settings to drive #3 0x8403(33 795): **CMD_STORE(4)** - Store settings to drive #4 (Micro SD Card) 0x8004(32772): **CMD_RELAY_ON** - Turn relay switch on 0x8005(32773): **CMD_RELAY_OFF** - Turn relay switch off 0x8006(32774): **CMD_RELAY_TOGGLE** - Toggle relay state 0x8007(32775): **CMD_BACKUP** - Backup user settings 0x8008(32776): **CMD_RESTORE** - Restore user settings 0x8009(32777): **CMD_FACTORY** - Restore factory settings 0x800A(32778): **CMD_RECORD_START(0)** - Start recording on drive #0 0x800A(32778): **CMD_RECORD_START(1)** - Start recording on drive #1 0x800A(32778): **CMD_RECORD_START(2)** - Start recording on drive #2 0x800A(32778): **CMD_RECORD_START(3)** - Start recording on drive #3 0x800A(32778): **CMD_RECORD_START(4)** - Start recording on drive #4 (Micro SD) 0x800B(32779): **CMD_RECORD_STOP** - Stop Recording 0x800C(32780): **CMD_RECORD_PLAY(0)** - Playback recording from drive #0 0x810C(32780): **CMD_RECORD_PLAY(1)** - Playback recording from drive #1 0x820C(32780): **CMD_RECORD_PLAY(2)** - Playback recording from drive #2 0x830C(32780): **CMD_RECORD_PLAY(3)** - Playback recording from drive #3 0x840C(32780): **CMD_RECORD_PLAY(4)** - Playback recording from drive #4 (Micro SD)

				0x800D(32781): **CMD_RESET_GEOMETRY(0)** - Reset the geometry for pair #0, and return to auto-ranging. 0x810D(33037): **CMD_RESET_GEOMETRY(1)** - Reset the geometry for pair #1, and return to auto-ranging. 0x820D(32781): **CMD_RESET_GEOMETRY(2)** - Reset the geometry for pair #2, and return to auto-ranging. 0x830D(33293): **CMD_RESET_GEOMETRY(3)** - Reset the geometry for pair #3, and return to auto-ranging. 0x840D(33805): **CMD_RESET_GEOMETRY(4)** - Reset the geometry for pair #4, and return to auto-ranging. 0x850D(34061): **CMD_RESET_GEOMETRY(5)** - Reset the geometry for pair #5, and return to auto-ranging. 0x860D(34317): **CMD_RESET_GEOMETRY(6)** - Reset the geometry for pair #6, and return to auto-ranging. 0x870D(34573): **CMD_RESET_GEOMETRY(7)** - Reset the geometry for pair #7, and return to auto-ranging.
40005	UINT16	FAULT	R	Fault Code 1: Invalid Command 2: Invalid Settings 3: Recording Failure
40080	UINT16	VER_MAJOR	R	Version Major
40081	UINT16	VER_MINOR	R	Version Minor
40082	UINT16	VER_HASH_0	R	Version Hash #0 (ASCII [MSB:LSB])
40083	UINT16	VER_HASH_1	R	Version Hash #1 (ASCII [MSB:LSB])
40084	UINT16	VER_HASH_2	R	Version Hash #2 (ASCII [MSB:LSB])
40085	UINT16	VER_HASH_3	R	Version Hash #3 (ASCII [MSB:LSB])
40086	UINT16	VER_HW_MAJ	R	Hardware Version Major
40087	UINT16	VER_HW_MIN	R	Hardware Version Minor
40100	UINT16	SER_0	R	Serial Number #0 bytes [0:1]

40101	UINT16	SER_1	R	Serial Number #1 bytes [2:3]
40102	UINT16	SER_2	R	Serial Number #2 bytes [4:5]
40103	UINT16	SER_3	R	Serial Number #3 bytes [6:7]
40104	UINT16	SER_4	R	Serial Number #4 bytes [8:9]
40105	UINT16	SER_5	R	Serial Number #5 bytes [10:11]
40110	UINT16	ENET_CFG	R/W	Ethernet Configuration Options 0x0001: DHCP Enabled 0x0002: Modbus/TCP Master
40111	UINT16	MAC_0	R/W	MAC Address [0:1]
40112	UINT16	MAC_1	R/W	MAC Address [2:3]
40113	UINT16	MAC_2	R/W	MAC Address [4:5]
40114	UINT16	IPV4_0	R/W	Ethernet IP Address Octets [0-1]
40115	UINT16	IPV4_1	R/W	Ethernet IP Address Octets [2-3]
40116	UINT16	MASK_0	R/W	Ethernet IP Mask Octets [0-1]
40117	UINT16	MASK_1	R/W	Ethernet IP Mask Octets [2-3]
40118	UINT16	GW_0	R/W	Ethernet IP Gateway Octets [0-1]
40119	UINT16	GW_1	R/W	Ethernet IP Gateway Octets [2-3]
40120	UINT16	MCAST_0	R/W	Ethernet IP multi-cast Octets [0-1]
40121	UINT16	MCAST_1	R/W	Ethernet IP multi-cast Octets [2-3]
40122	UINT16	FTP_PORT	R/W	Ethernet FTP Port
40123	UINT16	HTTP_PORT	R/W	Ethernet HTTP Port
40124	UINT16	MODBUS_PORT	R/W	Ethernet Modbus/TCP Port
40140	UINT16	SLAVE_IP_0	R/W	Ethernet IP Slave IP Octets [0-1]
40141	UINT16	SLAVE_IP_1	R/W	Ethernet IP Slave IP Octets [2-3]
40142	UINT16	TCP_SLAVE_ID	R/W	Modbus/TCP Slave ID
40143	UINT16	TCP_SLAVE_TO	R/W	Modbus/TCP Slave Timeout
40160	UINT16	RTU_1_BAUD	R/W	RTU baud rate / 100
40161	UINT16	RTU_1_BITS	R/W	RTU data bits 7,8
40162	UINT16	RTU_1_PARITY	R/W	RTU parity bit 0=none, 1=even, 2=odd

40163	UINT16	RTU_1_STOP	R/W	RTU number of stop bits 0,1,2,3
40164	UINT16	RTU_1_MASTER	R/W	RTU master mode 0=false (slave), 1=true
40165	UINT16	RTU_1_RTU	R/W	RTU rtu mode 0=false 1=true
40166	UINT16	RTU_1_ID	R/W	RTU modbus station id
40167	UINT16	RTU_1_TIMEOUT	R/W	RTU timeout in milliseconds
40170	UINT16	RTU_2_BAUD	R/W	RTU baud rate / 100
40171	UINT16	RTU_2_BITS	R/W	RTU data bits 7,8
40172	UINT16	RTU_2_PARITY	R/W	RTU parity bit 0=none, 1=even, 2=odd
40173	UINT16	RTU_2_STOP	R/W	RTU number of stop bits 0,1,2,3
40174	UINT16	RTU_2_MASTER	R/W	RTU master mode 0=false (slave), 1=true
40175	UINT16	RTU_2_RTU	R/W	RTU rtu mode 0=false 1=true
40176	UINT16	RTU_2_ID	R/W	RTU modbus station id
40177	UINT16	RTU_2_TIMEOUT	R/W	RTU timeout in milliseconds
40200	UINT16	REFRESH	R/W	Bus scan refresh period in seconds
40201	UINT16	REPEAT	R/W	Discovery repeat cycles complete indication
40202	UINT16	GUARD	R/W	Window guard time in milliseconds
40203	UINT16	RSP_REPT	R/W	Response query repetition count for resetting bus IDs
40204	UINT16	VFY_REPT	R/W	Repetition count for ID verification
40205	UINT16	WINDOW	R/W	Window time in milliseconds
40299	UINT16	XPAIR_COUNT	R	Count of the number of transducer pairs.
40300	*	XPAIR0	*	Transducer Pair Block #0
40400	*	XPAIR1	*	Transducer Pair Block #1
40500	*	XPAIR2	*	Transducer Pair Block #2
40600	*	XPAIR3	*	Transducer Pair Block #3
40700	*	XPAIR4	*	Transducer Pair Block #4
40800	*	XPAIR5	*	Transducer Pair Block #5

40900	*	XPAIR6	*	Transducer Pair Block #6
41000	*	XPAIR7	*	Transducer Pair Block #7
41300	*	INT_XPAIR0	*	Integer Transducer Pair Block #0
41400	*	INT_XPAIR1	*	Integer Transducer Pair Block #1
41500	*	INT_XPAIR2	*	Integer Transducer Pair Block #2
41600	*	INT_XPAIR3	*	Integer Transducer Pair Block #3
41700	*	INT_XPAIR4	*	Integer Transducer Pair Block #4
41800	*	INT_XPAIR5	*	Integer Transducer Pair Block #5
41900	*	INT_XPAIR6	*	Integer Transducer Pair Block #6
42000	*	INT_XPAIR7	*	Integer Transducer Pair Block #7

XPAIR<n>

This MODBUS register block represents data associated with a transducer pair. The variable <n> represents a multiplier between 0 and 7. Each register block begins at register offsets of 100.

Address	Data Type	Register Name	R/W	Description
-	-	-	-	***** GEOMETRY *****
xxx00	FLOAT32	OPPOSITE	R/W	The distance in meters, from one side of the flow changer to the other.
xxx02	FLOAT32	ADJACENT	R/W	The distance in meters, from one sensor to the other in the direction parallel to the air flow
xxx04	FLOAT32	HYPOTENUSE	R/W	The distance in meters, from one sensor to the other in a straight line from one to the other. Set to zero (default) to enable auto-ranging.
xxx06	FLOAT32	AREA	R/W	The flow chamber cross section are in sq. meters.
xxx08	UINT16	SIGN	R/W	The sign indicating the direction of flow, either + or -
-	-	-	-	***** Flow Tuning and Results *****
xxx10	FLOAT32	METERS_SEC	R	Last meters per second reading

xxx12	FLOAT32	METERS_SEC_LP	R	Low pass filtered meters per second reading
xxx14	FLOAT32	CUBIC_MS	R	Cubic meters per second reading
xxx16	FLOAT32	CUBIC_MS_LP	R	Low pass filtered meters per second reading
xxx18	FLOAT32	TEMPC_FLOW	R	Temperature of the flow chamber in degrees celsius
xxx20	FLOAT32	TEMPC_UNIT	R	Temperature of the flow unit in degrees celsius
-	-	-	-	***** Pair Sampling *****
xxx22	UINT16	PIEZO_KHZ		The resonant frequency (in KHz) of the piezo element
xxx23	UINT16	CHIRP	R/W	The duration of the acoustic chirp in cycles. This determines the duration of the acoustic energy envelope. Typically between 8-16 cycles
xxx24	UINT16	TXGAIN	R/W	Acoustic transmitter gain, in units of percent from 0-100
xxx25	UINT16	RXGAIN	R/W	Acoustic receiver gain in steps between 0-14
xxx26	UINT16	WINDOW	R/W	Trigger window (silent bus), in units of milliseconds
xxx27	UINT16	SAMP_KHZ	R/W	The acoustic receiver ADC sampling frequency in units of Kilo-Hertz
xxx28	UINT16	SAMP_SZ	R/W	The acoustic receiver digital capture size, in units of meters
xxx29	UINT16	PERIOD	R/W	The period at which acoustic samples are taken, in units of milliseconds
-	-	-	-	***** Detector Selector *****
xxx30	UINT16	DETECTOR	R/W	0 = Box Detector (Default)
xxx31	UINT16	DETECTOR_STATUS	R	0x0001: DETECTOR_RANGING The detector is in the ranging mode temporarily. The transducers have moved or been blocked, and range is being re-established. This will resolve itself once the transducer position has been stabilized or the blockage resolved. 0x0002: DETECTOR_BAD_SAMP Bad Samples Count > 0

xxx32	UINT16	DETECTOR_BAD_SAMPS	R	Number of back-to-back bad samples
xxx33	UINT16	DETECTOR_VBANK	R	Virtual Memory Bank (Determined by automatic ranging).
-	-	-	-	***** Pair Time-of-Flight Box Detector *****
xxx35	UINT16	SCALE_OUT_MIN	R/W	Adjusts the detector normalized output scale minimum value (normally -10000.0)
xxx36	UINT16	SCALE_OUT_MAX	R/W	Adjusts the detector normalized output scale maximum value (normally 10000.0)
xxx37	UINT16	DISCRIMINATOR	R/W	Enable the phase discriminator function.
xxx38	UINT16	SENSITIVITY	R/W	Adjusts the waveform detection sensitivity. Increasing sensitivity improves precision but reduces noise rejection
xxx39	FLOAT32	TOLERANCE	R/W	Adjusts the waveform frequency tolerance as a percentage of waveform period
xxx41	FLOAT32	DURATION	R/W	Adjusts the required duration of the waveform in units of cycles
xxx43	UINT16	LOW_PASS	R/W	Low pass filter sample period. Zero disables
xxx44	FLOAT32	ZERO_CUT	R/W	Zero-flow cut-off. The point at which flow is determined to be insignificant and reading forced to zero (0.0).
xxx46	UINT16	SEGMENT_SZ	R/W	Waveform detector sample segment number of samples
xxx47	FLOAT32	CORRECTION	R/W	Correction Factor applied to the final meters/sec calculation
xxx49	FLOAT32	OFFSET	R/W	Absolute offset added to meters-sec after polarization.
-	-	-	-	***** Pair Preset Values *****
xxx51	UINT16	PRESET	R/W	Preset Transducer Pair Configuration 0 - Typical Drift/Tunnel Cross Section 1 - Drift/Tunnel Cross Section w/discriminator 2 - Fan #1 (85% TX, #2 RX) 3 - Fan #2 (100% TX, #2 RX)

-	-	-	-	***** Pair variables *****
xxx54	FLOAT32	VREF_0	R	Reference Voltage #0
xxx56	FLOAT32	VREF_1	R	Reference Voltage #1
xxx58	FLOAT32	VCHARGE_0	R	Transmitter low-side voltage #0
xxx60	FLOAT32	VCHARGE_1	R	Transmitter low-side voltage #1
xxx62	FLOAT32	TEMPC_0	R	Temperature C #0
xxx64	FLOAT32	TEMPC_1	R	Temperature C #1
-	-	-	-	***** Pair Version *****
xxx66	UINT16	HW_VERSION_0	R	Hardware Version Transducer #0 MSB = Major, LSB = Minor
xxx67	UINT16	SW_VERSION_0	R	Firmware Version Transducer #0 MSB = Major, LSB = Minor
xxx68	UINT16	HW_VERSION_1	R	Hardware Version Transducer #1 MSB = Major, LSB = Minor
xxx69	UINT16	SW_VERSION_1	R	Firmware Version Transducer #1 MSB = Major, LSB = Minor
-	-	-	-	***** Pair Serial Numbers & Slave ID #0 *****
xxx70	UINT16	SLAVE_0	R	Slave ID #0
xxx71	UINT16	XDUC_SER_0_0	R/W	Serial Number Transducer #0 [0:1]
xxx72	UINT16	XDUC_SER_0_1	R/W	Serial Number Transducer #0 [2:3]
xxx73	UINT16	XDUC_SER_0_2	R/W	Serial Number Transducer #0 [4:5]
xxx74	UINT16	XDUC_SER_0_3	R/W	Serial Number Transducer #0 [6:7]
xxx75	UINT16	XDUC_SER_0_4	R/W	Serial Number Transducer #0 [8:9]
xxx76	UINT16	XDUC_SER_0_5	R/W	Serial Number Transducer #0 [10:11]

	-	-	-	-	*** Pair Serial Numbers & Slave ID #1 ***
	xxx77	UINT16	SLAVE_1	R	Slave ID #1
	xxx78	UINT16	XDUC_SER_1_0	R/W	Serial Number Transducer #1 [0:1]
	xxx79	UINT16	XDUC_SER_1_1	R/W	Serial Number Transducer #1 [2:3]
	xxx80	UINT16	XDUC_SER_1_2	R/W	Serial Number Transducer #1 [4:5]
	xxx81	UINT16	XDUC_SER_1_3	R/W	Serial Number Transducer #1 [6:7]
	xxx82	UINT16	XDUC_SER_1_4	R/W	Serial Number Transducer #1 [8:9]
	xxx83	UINT16	XDUC_SER_1_5	R/W	Serial Number Transducer #1 [10:11]
	-	-	-	-	*** Time of Flight ***
	xxx90	FLOAT32	XDUC_TOF_0	R	Time of flight in Microseconds [0]
	xxx92	FLOAT32	XDUC_TOF_AVG_0	R	Average Time of Flight in Microseconds [1]
INT_XPAIR<n>	xxx94	FLOAT32	XDUC_TOF_1	R	Time of flight in Microseconds [1]
This MODBUS	xxx96	FLOAT32	XDUC_TOF_AVG_1	R	Average Time of Flight in Microseconds [1]

between 0 and a multiplier

Address	Data Type	Register Name	R/W	Description
-	-	-	-	*** Geometry ***
xxx00	UINT16	OPPOSITE_1000	R/W	The distance in meters * 1000, from one side of the flow changer to the other.
xxx02	UINT16	ADJACENT_1000	R/W	The distance in meters * 1000, from one sensor to the other in the direction parallel to the air flow
xxx04	UINT16	HYPOTENUSE_1000	R/W	The distance in meters * 1000, from one sensor to the other in a straight line from one to the other. Set to zero (default) to enable auto-ranging.
xxx06	UINT16	AREA_1000	R/W	The flow chamber cross section are in sq. meters * 1000
-	-	-	-	*** Flow Tuning and Results ***
xxx10	INT16	METERS_SEC_100	R	Last meters per second * 100

xxx12	INT16	METERS_SEC_LP_100	R	Low pass filtered meters per second * 100
xxx14	INT16	CUBIC_MS_100	R	Cubic meters per second * 100
xxx16	INT16	CUBIC_MS_LP_100	R	Low pass filtered meters per second * 100
xxx18	INT16	TEMPC_FLOW_100	R	Temperature of the flow chamber in degrees celsius * 100
xxx20	INT16	TEMPC_UNIT_100	R	Temperature of the flow unit in degrees celsius * 100
-	-	-	-	***** Pair Time-of-Flight Box Detector *****
xxx39	UINT16	TOLERANCE_100	R/W	Adjusts the waveform frequency tolerance as a percentage of waveform period * 100
xxx41	UINT16	DURATION_100	R/W	Adjusts the required duration of the waveform in units of cycles * 100
xxx44	INT16	ZERO_CUT_1000	R/W	Zero-flow cut-off. The point (* 1000) at which flow is determined to be insignificant and reading forced to zero (0.0).
xxx47	INT16	CORRECTION_100	R/W	Correction Factor applied to the final meters/sec calculation * 100
xxx49	INT16	OFFSET_100	R/W	Absolute offset added to meters-sec after polarization * 100
				***** Pair variables *****
xxx54	UINT16	VREF_0_1000	R	Reference Voltage * 1000 #0
xxx56	UINT16	VREF_1_1000	R	Reference Voltage * 1000 #1
xxx58	UINT16	VCHARGE_0_100	R	Transmitter low-side voltage * 100 #0
xxx60	UINT16	VCHARGE_1_100	R	Transmitter low-side voltage * 100 #1
xxx62	INT16	TEMPC_0_100	R	Temperature C * 100 #0
xxx64	INT16	TEMPC_1_100	R	Temperature C * 100 #1
xxx90	UINT16	XDUC_TOF_0_100	R	Time of flight in Microseconds [0] * 100
xxx92	UINT16	XDUC_TOF_AVG_0_100	R	Average Time of Flight in Microseconds [0] * 100
xxx94	UINT16	XDUC_TOF_1_100	R	Time of flight in Microseconds [1] * 100
xxx96	UINT16	XDUC_TOF_AVG_1_100	R	Average Time of Flight in Microseconds [1] * 100