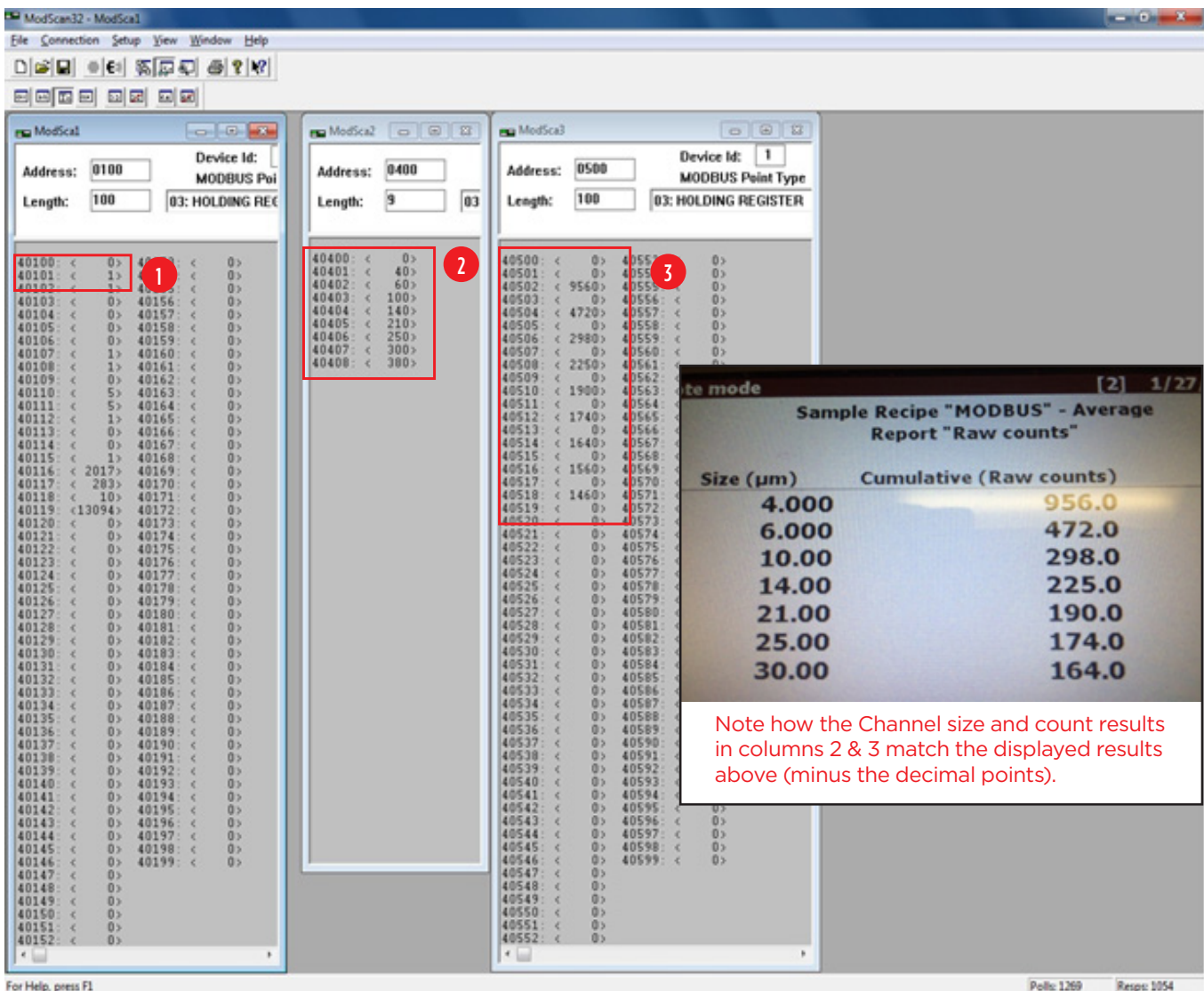


PODS+ MODBUS Protocol

The following simple example illustrates how one can use a Modbus utility like ModScan32 to access and control the PODS+ Instrument using the “Modbus over Ethernet” or “Modbus over serial” options.

The example shows in column 1 the commands for registers 100 and 101 to first put the instrument into *Remote mode* (a “1” command to register 100) and then *Start sample* (a “1” command to register 101).



The screenshot shows the ModScan32 interface with three Modbus registers displayed. The first register (40100) is highlighted with a red box and a circled '1'. The second register (40400) is highlighted with a red box and a circled '2'. The third register (40500) is highlighted with a red box and a circled '3'. A sample report overlay is shown in the bottom right corner, displaying channel size and count data.

Size (µm)	Cumulative (Raw counts)
4.000	956.0
6.000	472.0
10.00	298.0
14.00	225.0
21.00	190.0
25.00	174.0
30.00	164.0

Note how the Channel size and count results in columns 2 & 3 match the displayed results above (minus the decimal points).

Note*

1. In “Base 1” type Modbus utilities the address number is incremented by 1 as shown below.
2. Address block 400 -499 shows channel size information: 4, 6, 10, 14, 21, 25, 38µm
3. Address block 500-599 shows channel count data

100	R/W	Mode	0 = Local Mode
			1 = Remote Mode
101	W	Control	0 = Stop Sample (Remote mode only)
			1 = Start Sample (Remote mode only)
			2 = Clear Buffer (Remote mode only)
101	R	State	0 = Idle
			1 = Purging
			2 = Pressurizing
			3 = Pulling Tare
			4 = Sampling
			5 = Holding

IDENTIFICATION BLOCK (0 - 99)

REGISTER NUMBER	READ/WRITE	NAME	DESCRIPTION
0 - 4	R	Manufacturer	10 ASCII characters
5 - 9	R	Model	10 ASCII characters
10 - 14	R	Serial Number	10 ASCII characters
15 - 19	R	Sensor Serial Number	10 ASCII characters
20	NA	NA	
21	NA	NA	
22	R	Calibration Due Date (YYYY)	
23	R	Calibration Due Date (MM,DD)	
24 - 29	R	Firmware Version	12 ASCII characters
30 - 34	R	FPGA Version	10 ASCII characters
34 - 99	NA	NA	

CONTROL BLOCK (100 - 299)

REGISTER NUMBER	READ/WRITE	NAME	DESCRIPTION
100	R/W	Mode	0 = Local Mode
			1 = Remote Mode
101	W	Control	0 = Stop Sample (Remote mode only)
			1 = Start Sample (Remote mode only)
			2 = Clear Buffer (Remote mode only)
101	R	State	0 = Idle
			1 = Purging
			2 = Pressurizing
			3 = Pulling Tare
			4 = Sampling
			5 = Holding
102	R	Status	Bit 0 = System Failure
			Bit 1 = Flow Regulation Failure
			Bit 2 = Under Pressure
			Bit 3 = Over Pressure
			Bit 4 = Ambient Over Temp
			Bit 5 = Sensor Cell Error
			Bit 6 = Low Battery
			Bit 7 = Coincidence alarm
			Bit 8 = Particle difference alarm
			Bit 9 = N/A
			Bit 10 = N/A
			Bit 11 = N/A
			Bit 12 = N/A
			Bit 13 = N/A
			Bit 14 = N/A
Bit 15 = N/A			
103	R/W = Remote mode only	Sample Mode	0 = BOTTLE W = Remote mode only
			1 = ONLINE W = Remote mode only
			2 = FILTER W = Remote mode only
104	R/W	Liquid Type	0 = Oil W = Remote mode only
			1 = Fuels W = Remote mode only
			2 = Glycol W = Remote mode only
			3 = Water W = Remote mode only

CONTROL BLOCK (100 - 299)

REGISTER NUMBER	READ/WRITE	NAME	DESCRIPTION
105	R/W	Flow rate (ml/min)	0 = Automatic W = Remote mode only
			1 = 50 ml/min W = Remote mode only
			2 = 30 ml/min W = Remote mode only
			3 = 15 ml/min W = Remote mode only
106	R/W	Number of Samples	1 - 500 W = Remote mode only
			0 = Infinite W = Remote mode only
107	R/W	Number of Runs	1 - 10 W = Remote mode only
108	R/W	Discard First Run	0 = No W = Remote mode only
			1 = Yes W = Remote mode only
109	R/W	Tare/Purge volume	5 - 999 ml. W = Remote mode only
110	R/W	Run Volume	5 - 50 ml. W = Remote mode only
111	R/W	Dilution factor	1 - 100 W = Remote mode only
112	R/W	Hold time (Hours)	0 - 23 W = Remote mode only
113	R/W	Hold time (Min,Sec)	Min, Sec. (00:00 to 23:59, BCD format.)
			W = Remote mode only
114	R/W	Reporting Standard	0 = Run Counter (Counts/ml)
			W = Remote mode only
			1 = Run Counter (RAW)
			W = Remote mode only
			2 = ISO 4406
			W = Remote mode only
			3 = NAS 1638
			W = Remote mode only
			4 = SAE AS4059
			W = Remote mode only
			5 = NAVAIR 01-1A-17
			W = Remote mode only
			6 = DEFSTAN 91-91
			W = Remote mode only
			7 = GOST 17216-2001
			W = Remote mode only
			8 = ASTM D7619-12
W = Remote mode only			
9 = User defined report			
W = Remote mode only			

CONTROL BLOCK (100 - 299)

REGISTER NUMBER	READ/WRITE	NAME	DESCRIPTION
115	R/W	Date Year	Four digit year (yyyy)
			W = Remote mode only
116	R/W	Date Month, Day	two digit month and tow digit day (mm,dd)
117	R/W	Time Hour	Four digit hour (hh) 24 hour format.
118	R/W	Time Minute, Second	two digit minute, tow digit second (mm,ss)
119 - 139	NA	NA	
140 - 147	R/W	User field 1 Name	16 ASCII characters W = Remote mode only
148 - 149	NA	NA	
150 - 157	R/W	User field 2 Name	16 ASCII characters W = Remote mode only
158 - 159	NA	NA	
160 - 167	R/W	User field 3 Name	16 ASCII characters W = Remote mode only
168 - 169	NA	NA	
170 - 177	R/W	User field 4 Name	16 ASCII characters W = Remote mode only
178 - 179	NA	NA	
180-187	R/W	User field 5 Name	16 ASCII characters W = Remote mode only
188 - 189	NA	NA	
190 - 197	R/W	User field 6 Name	16 ASCII characters W = Remote mode only
198 - 199	NA	NA	
200 - 212	R	User field 1 Value	25 ASCII characters
213 - 214	NA	NA	
215 - 227	R	User field 2 Value	25 ASCII characters
228 - 229	NA	NA	
230 - 242	R	User field 3 Value	25 ASCII characters
243 - 244	NA	NA	
245 - 257	R	User field 4 Value	25 ASCII characters
258 - 259	NA	NA	
260 - 272	R	User field 5 Value	25 ASCII characters
273 - 274	NA	NA	
275 - 287	R	User field 6 Value	25 ASCII characters
288 - 298	NA	NA	
299	W	Save Recipes	Write a '1' to force the recipe to be saved.

DATA BLOCK (300 - 399)

REGISTER NUMBER	READ/WRITE	NAME	DESCRIPTION
300	R	Record count	Number of records in buffer (0 - 3000)
300	W	Advance record	Advances the record pointer to the next record and removes the current record.
301	R	Sample number	1 - 500
302	R	Run number	1 - 10, 0xFFFF = Average
303	R	Date (yyyy)	Date Years (yyyy>= 2015)
304	R	Date (mm/dd)	Date month/day (mm=1 - 12) (dd=1 - 31)
305	R	Time (hh)	Time hours (hh=0 - 23)
306	R	Time (mm/ss)	Time minutes/seconds (mm=0-59)(ss=0-59)
307	R	Status	Bit 0 = System Failure (NA)
			Bit 1 = Flow Regulation Failure (NA)
			Bit 2 = Under Pressure
			Bit 3 = Over Pressure (NA)
			Bit 4 = Ambient Over Temp (NA)
			Bit 5 = Sensor Cell Error
			Bit 6 = Low Battery
			Bit 7 = Coincidence alarm
			Bit 8 = Particle difference alarm
			Bit 9 = NA
			Bit 10 = NA
			Bit 11 = NA
			Bit 12 = NA
			Bit 13 = NA
			Bit 14 = Counts are Concentration
Bit 15 = Counts are Cumulative			
308	R	Flow rate	15 - 50ml/min.
309	R	Run volume	5 - 50ml.
310	R	Sample temperature	0 to 1005 (0 C to 100.5C)
311	R	RH	0 to 1000 (0% to 100.0%)
312	R	Dilution factor	1-100

DATA BLOCK (300 - 399)

REGISTER NUMBER	READ/WRITE	NAME	DESCRIPTION
313	R	Reporting Standard	0 = Run Counter (Counts/ml)
			1 = Run Counter (RAW)
			2 = ISO 4406
			3 = NAS 1638
			4 = SAE AS4059
			5 = NAVAIR 01-1A-17
			6 = DEFSTAN 91-91
			7 = GOST 17216-2001
			8 = ASTM D7619-12
			9 = User defined report
314	R	Calibration method	0 = MTDPSL
			1 = ISO11171
			2 = ACFTD
			3 = PSL
315	R	Liquid Type	0 = Oil
			1 = Fuels
			2 = Glycol
			3 = Water
316	R	Count alarms	0x0004 = ch3 count alarm.
317 - 319	NA	NA	
320 - 339	R	Classification	
340 - 399	NA	NA	

CHANNEL SIZES (400 - 499)

REGISTER NUMBER	READ/WRITE	NAME	DESCRIPTION
400	R	Ch1 size	100 = 1.00 μ
401	R	Ch2 size	100 = 1.00 μ
402	R	Ch3 size	100 = 1.00 μ
403	R	Ch4 size	100 = 1.00 μ
404	R	Ch5 size	100 = 1.00 μ
405	R	Ch6 size	100 = 1.00 μ
406	R	Ch7 size	100 = 1.00 μ
407	R	Ch8 size	100 = 1.00 μ
408	R	Ch9 size	100 = 1.00 μ
409 - 499	NA	NA	

COUNTS (500 - 599)

REGISTER NUMBER	READ/WRITE	NAME	DESCRIPTION
500	R	Ch1 High	Counts High word
501	R	Ch1 Low	Counts Low word 100 = 10.0
502	R	Ch2 High	Counts High word
503	R	Ch2 Low	Counts Low word 100 = 10.0
504	R	Ch3 High	Counts High word
505	R	Ch3 Low	Counts Low word 100 = 10.0
506	R	Ch4 High	Counts High word
507	R	Ch4 Low	Counts Low word 100 = 10.0
508	R	Ch5 High	Counts High word
509	R	Ch5 Low	Counts Low word 100 = 10.0
510	R	Ch6 High	Counts High word
511	R	Ch6 Low	Counts Low word 100 = 10.0
512	R	Ch7 High	Counts High word
513	R	Ch7 Low	Counts Low word 100 = 10.0
514	R	Ch8 High	Counts High word
515	R	Ch8 Low	Counts Low word 100 = 10.0
516	R	Ch9 High	Counts High word
517	R	Ch9 Low	Counts Low word 100 = 10.0
518 - 599	NA	NA	

CHANNEL CLASSIFICATIONS (600 - 699)

REGISTER NUMBER	READ / WRITE	NAME	DESCRIPTION
600 - 601	R	Ch1 classification	4 ASCII characters
602 - 603	R	Ch2 classification	4 ASCII characters
604 - 605	R	Ch3 classification	4 ASCII characters
606 - 607	R	Ch4 classification	4 ASCII characters
608 - 609	R	Ch5 classification	4 ASCII characters
610 - 611	R	Ch6 classification	4 ASCII characters
612 - 613	R	Ch7 classification	4 ASCII characters
614 - 615	R	Ch8 classification	4 ASCII characters
616 - 617	R	Ch9 classification	4 ASCII characters
618 - 699	NA	NA	

USER FIELD NAMES (700 - 799)

REGISTER NUMBER	READ/WRITE	NAME	DESCRIPTION
700 - 707	R	User field name 1	16 ASCII characters
708 - 714	NA	NA	
715 - 722	R	User field name 2	16 ASCII characters
723 - 729	NA	NA	
730 - 737	R	User field name 3	16 ASCII characters
738 - 744	NA	NA	
745 - 752	R	User field name 4	16 ASCII characters
753 - 759	NA	NA	
760 - 767	R	User field name 5	16 ASCII characters
767 - 774	NA	NA	
775 - 782	R	User field name 6	16 ASCII characters
783 - 799	NA	NA	

USER FIELD VALUES (800 - 899)

REGISTER NUMBER	READ/WRITE	NAME	DESCRIPTION
800 - 812	R	User field name 1	25 ASCII characters
813 - 814	NA	NA	
815 - 827	R	User field name 2	25 ASCII characters
828 - 829	NA	NA	
830 - 842	R	User field name 3	25 ASCII characters
843 - 844	NA	NA	
845 - 857	R	User field name 4	25 ASCII characters
858 - 859	NA	NA	
860 - 872	R	User field name 5	25 ASCII characters
873 - 874	NA	NA	
875 - 887	R	User field name 6	25 ASCII characters
888 - 899	NA	NA	