

*Weigh Shark*<sup>®</sup>  
**Modbus Serial and  
Ethernet Interface**





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## 2.0 Technical Description

The Weigh Shark Modbus Slave interface allows a PLC, Operator Interface, PC or other Modbus Master device to access scale data over a RS-485 or Ethernet network.

The Weigh Shark scale provides the Modbus Slave interface thru the RS-485 port (Port 2) or the 10/100 Base-T Ethernet network.

Both the serial port and Ethernet port interfaces use the same data tables and can operate at the same time.

The following operations can be performed using the Modbus interface:

- Totals can be read and cleared. Current totals, run times and average rates as well as previous total information can be read.
- Current Rate and Belt Speed.
- Calibration Data can be read but NOT written. However a Zero Test can be performed thru the interface.
- Digital and Analog Inputs can be read and Outputs can be read and written.
- Data registers for the Truck load out systems can read and written.
- Scale name can be read and written. Total names can be read.



## 3.0 Port Setup

This section covers the basic steps of the Modbus Slave port Configuration. Configuration should be performed by qualified personal.

### 3.1 RS-485 Setup.

#### 3.1.1 Software Configuration

The RS-485 port is capable running the MODBUS RTU protocol at 9600baud, 8 bit, no parity, and 1 stop bit.

To setup the RS-485 port for Modbus:

- Press the key under **I/O**.
- Use the **▼** key to move the cursor to **Serial Ports**.
- Press **Enter**.
- Use the **▼** key to move the cursor to **Port 2 (RS-485)**.
- Press **Enter**.
- Press the key under **Edit**. A cursor should display after the word **Function**.
- Use the **+** key to change the function to **MODBUS RTU**.
- Press the key under **Apply**.
- The screen will change back to the previous screen. Line 3 shows **Modbus/RTU ID**.
- To change the **Modbus/RTU ID** use the **▼** key to move the cursor to line 3. Use the **+/-** key to change the value.
- **Cycle the power on the scale for the serial port changes to take affect.**

#### 3.1.2 Hardware Configuration

##### 3.1.2.1 RS-485 Port

The RS-485 hardware port is a 3 pin terminal located at the top left side of the main circuit board. If the network cable is going to be run long distances it is recommended that it be isolated; contact factory for more details.

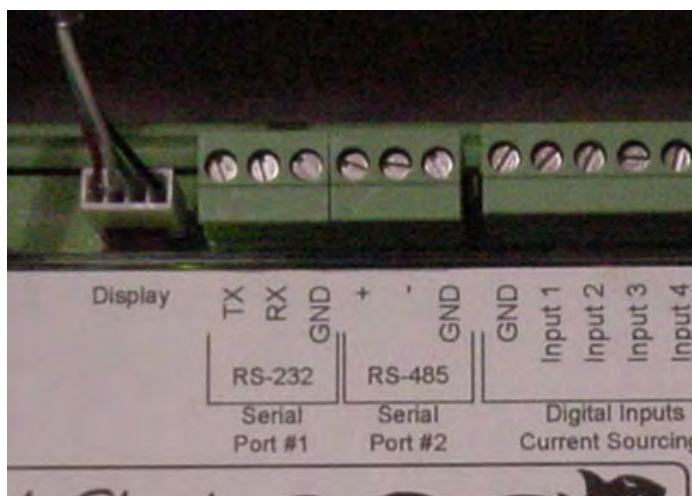


Figure 1



### 3.1.2.2 RS-485 Port Termination Resistor

The RS-485 port comes standard with a 220Ω termination resistor installed. To change this 2 jumpers must be removed.

- Remove circuit board cover by removing the 4 screws (2 on each side of the cover).
- Locate the two jumpers (JP1) below and to the right of the 3 pin RS-485 terminal.



Figure 2 - RS-485 Termination Jumpers ON

- Remove the 2 jumpers and place them on only 1 pin each for storage.



Figure 3 - RS-485 Termination Jumpers OFF



## 3.2 Ethernet Configuration

### 3.2.1 Software Configuration

#### 3.2.1.1 Enable Modbus/IP

To enable Modbus on the Ethernet port Modbus/IP must be turned ON.

- Press the key under **I/O**.
- Use the **▲** key to move the cursor up. This will move to the last item in the I/O menu which is **Network**.
- Press **ENTER** when the cursor is by **Network**.
- The Network menu should display.
- Use the **▲** key to move the cursor up; this will switch to the last screen of the network settings.
- Continue pressing the **▲** until the cursor is pointing to **Modbus/IP (+/-)**.
- Use the +/- keys to change the value to **ON**.
- Press **<<Back** key to return to previous screen.

#### 3.2.1.2 Set IP Address

An IP address consists of 4 groups of numbers; each group can be a value between 0 and 254. An example of an IP address is: 192.168.000.001. In most simple networks the first 3 groups of numbers stay the same between all the scales and PLC's; only the last group of numbers changes from scale to scale. For example if there were 5 scales on the network the numbering could be as follows:

Scale 1	192.168.000.001
Scale 2	192.168.000.002
Scale 3	192.168.000.003
Scale 4	192.168.000.004
Scale 5	192.168.000.005

The default IP address for all scales is 192.168.000.100. This should be changed on ALL the scales to a unique value.

To change the IP Address of a scale:

- Press the key under **I/O**.
- Use the **▲** key to move the cursor up. This will move to the last item in the I/O menu which is **Network**.
- Press **ENTER** when the cursor is by **Network**.
- The Network menu should display.
- The cursor should now be pointing to **IP Address**.
- Press **ENTER** to open the edit screen for the IP Address.
- Press the arrow key under **EDIT**. This will display the cursor under the last group of numbers.
- Use the **◀▶** keys to move the cursor left or right.
- Use the +/- keys to increase or decrease the number under the cursor.
- When the correct IP Address is set, press the arrow key under **Apply**. This will save the value and return back to the Network menu.
- If an error is made during the edit process press **Default** to return the IP address back to the factory default of 192.168.000.100.
- Pressing **EXIT** during the edit process will exit the screen without making changes.

Repeat the process for setting the network mask, gateway and name server.



### 3.2.2 Ethernet Hardware

The Weigh Shark Remote Display accepts standard RJ-12 10/100 Base-T Ethernet connection. The network port is located to the right of the 24Vdc power terminals. Figure 5 shows the empty port and the port with a network cable plugged in.

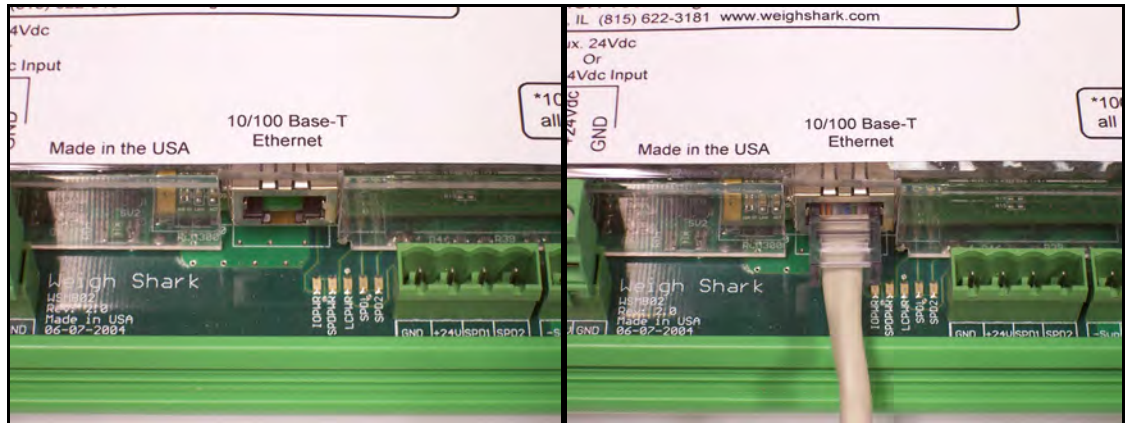


Figure 4



## 4.0 Modbus Registers

The Modbus registers are the same regardless of the port (RS-485 or Ethernet) used to access them. All register addresses are listed as decimal numbers and are Base 1; registers are numbered starting at 1.

### 4.1 Input Registers

Command: 0x02 Read Discrete Inputs

Inputs can be read as individual bits or as a single 16bit register.

Address	Function	Holding Register
1	Digital Input 1	92:0
2	Digital Input 2	92:1
3	Digital Input 3	92:2
4	Digital Input 4	92:3
5	Current Loop status ( 1 = Loop closed; 0 = Loop Open)	92:4
6	Truck Output	92:5
7	Truck Input	92:6
8	Truck Ready	92:7
9	Truck Done	92:8
10	Truck at Cutoff	92:9
11	Ticket Printing Enabled	92:10

### 4.2 Output Registers

Command: 0x01 Read Coils  
0x05 Write Single Coil

Output values are Read/Write. For Digital outputs to be under Modbus control their function must be set to MODBUS. Outputs can be read/written as individual bits or in one of 2 16bit registers.

Address	Function	Holding Register
1	Digital Output 1	93:0
2	Digital Output 2	93:1
3	Digital Output 3	93:2
4	Digital Output 4	93:3
5	Clear Total 1	93:4
6	Clear Total 2	93:5
7	Clear Total 3	93:6
8	Clear Total 4	93:7
9	Clear All Totals	93:8
10	Print Total 1 Ticket	93:9
11	Print Total 2 Ticket	93:10
12	Print Total 3 Ticket	93:11
13	Print Total 4 Ticket	93:12
14	Truck Load Out Clear	93:13
15	Truck Load Out Start	93:14
16	Truck Load Out Stop	93:15
17	Clear Truck Total	94:0
18	Print Truck Ticket	94:1





### 4.3 Input and Holding Registers

Command:       0x04 – Read Input Register  
                   0x03 – Read Holding Register  
                   0x06 – Write Single Register  
                   0x16 – Write Multiple Registers

Data Types:  
   Int – 16bit Word  
   Long – 32bit Signed (stored in 2 Registers)  
   Unsigned Long – 32 bit unsigned (stored in 2 Registers)  
   Float – 32bit floating point (stored in 2 Registers)

Multi-byte values that are stored in 2 registers are stored as follows:  
 123456789 = 0x075BCD15 hex

Register 0 = CD15  
 Register 1 = 075B

Address	Date Type	Read/Write	Description
1	float	r/w	Conveyor Angle (Angle Sensor must be installed)
2			
3	float	r/w	Cosine of Conveyor Angle
4			
5	float	r/w	Multiplier for Load Cell AD
6			
7	int	r/w	Angle Sensor Update
8	int	r/w	Angle Sensor Status
9	int	r/w	Angle Sensor Calibration
10	int	r/w	Used to perform Zero Calibration. See section 5.1
11	int	r/w	Clear Totals. See section 5.3
12	int	r/w	Clear Total 1. ( Setting to 1 will clear Daily Total)
13	int	r/w	Spare4;
14	int	r/w	Spare5;
15	int	r/w	Spare6;
16	unsigned int	r/w	Down Counts
17	unsigned int	r/w	Previous Down Counts
18	long	r	Total 1 Accumulator in Lbs or Kg
19		r	
20	long	r	Total 1 Accumulator in Hundredth of Tons
21		r	
22	long	r	Total 2 Accumulator in Tenth of Tons
23		r	
24	long	r	Total 3 Accumulator in Tenth of Tons
25		r	
26	long	r	Total 4 Accumulator in whole Tons
27		r	
28	long	r	Run Time 1 in Seconds
29		r	
30	long	r	Run Time 2 in Seconds



31		r	
32	long	r	Run Time 3 in Seconds
33		r	
34	long	r	Run Time 4 in Seconds
35		r	
36	long	r	Previous Total 1 in lbs
37		r	
38	long	r	Previous Total 2 in Tenth of Tons
39		r	
40	long	r	Previous Total 3 in Tenth of Tons
41		r	
42	long	r	Previous Total 4 in Whole Tons
43		r	
44	unsigned long	r	Total 1 Last Clear in Seconds since January 1, 1980.
45		r	
46	unsigned long	r	Total 2 Last Clear in Seconds since January 1, 1980.
47		r	
48	unsigned long	r	Total 3 Last Clear in Seconds since January 1, 1980.
49		r	
50	unsigned long	r	Total 4 Last Clear in Seconds since January 1, 1980.
51		r	
52	long	r	Previous Run Time 1 in Seconds
53		r	
54	long	r	Previous Run Time 2 in Seconds
55		r	
56	long	r	Previous Run Time 3 in Seconds
57		r	
58	long	r	Previous Run Time 4 in Seconds
59		r	
60	long	r	Unused
61		r	
62	long	r	Average Rate in Hundredth of TPH
63		r	
64	long	r	Unfiltered Belt speed in hundredth of FPM
65		r	
66	long	r	Average Belt Speed in Hundredth of FPM
67		r	
68	long	r	Percent Load in Hundredth of %
69		r	
70	long	r	Unfiltered Load Cell AD value
71		r	
72	long	r	Filtered Load Cell AD Value
73		r	
74	long	r	Unused
75		r	
76	long	r	Scale weight in Hundredth of Lbs.
77		r	
78	long	r/w	Set point Value for Input 1
79		r/w	
80	long	r/w	Set point Value for Input 2



81		r/w	
82	long	r/w	Set point Value for Input 3
83		r/w	
84	long	r/w	Set point Value for Input 4
85		r/w	
86	unsigned long	r	Zero Calibration Value
87		r	
88	long	r	Span Calibration Value
89		r	
90	float	r	Belt Length in Feet
91		r	
92	int	r	Inputs (See Section 4.1)
93	int	r/w	Outputs (See Section 4.2)
94	int	r/w	Outputs (See Section 4.2)
95	int	r/w	Current Loop Output (See section 5.2)
96	int	r	Load Cell ADC Gain
97	int	r	Day
98	int	r	Month
99	int	r	Year
100	int	r	hour
101	int	r	min
102	int	r	sec
103	int	r	units ( 0 = English; 1 = Metric)
104	unsigned long	r	Total Trucks Loaded
105		r	
106	unsigned long	r	Total Tons loaded in Hundredth of tons
107		r	
108	unsigned long	r	Total Fill Time in Seconds
109		r	
110	float	r	Average Truck Weight
111		r	
112	float	r	Average Truck Fill Time
113		r	
114	float	r	Average Truck Fill Tons Per Hour
115		r	
116	float	r	Average Difference between Truck Loads
117		r	
118	float	r	Current Truck Percent Full
119		r	
120	float	r	Current Truck Estimate seconds until full
121		r	
122	float	r	Average Trucks per Hour
123		r	
124	unsigned long	r/w	Truck Cutoff Weight in Hundredth of Tons
125		r/w	
126	unsigned long	r/w	Truck Minimum Load in Hundredth of Tons
127		r/w	
128	unsigned long	r/w	Truck Maximum Load in Hundredth of Tons
129		r/w	
130	unsigned long	r	Current Truck Fill Time



131		r	
132	unsigned long	r/w	Current Truck Target Weight in Hundredth of Tons
133		r/w	
134	long	r	Current Truck Accumulator
135		r	
136	long	r	Current Truck Difference of Actual from Target weight
137		r	
138	int	r	Truck State
139	int	r	Truck Status
140	float	r	Idler Span in feet
141		r	
142	unsigned long	r	Time and Date of Last Zero. (Seconds since January 1, 1980.)
143		r	
144	unsigned long	r	Time and Date of Last Span. (Seconds since January 1, 1980.)
145		r	
146	float	r	Zero Test Belt Length
147		r	
148	unsigned long	r	New Zero Value
149		r	
150	long	r	Run Time 1 in thousandths of hours
151		r	
152	long	r	Average Rate in hundredth of tons based on Run Time 1.
153		r	
154	unsigned int	r	Cutoff Value
155	unsigned Int	r	Standard Rate in tph
156	char	r	Total 1 Name (16 characters)
157		r	
158		r	
159		r	
160		r	
161		r	
162		r	
163		r	
164	char	r	Total 2 Name (16 characters)
165		r	
166		r	
167		r	
168		r	
169		r	
170		r	
171		r	
172	char	r	Total 3 Name (16 characters)
173		r	
174		r	
175		r	
176		r	
177		r	
178		r	



179		r	
180	char	r	Total 4 Name (16 characters)
181		r	
182		r	
183		r	
184		r	
185		r	
186		r	
187		r	
188	char	r/w	Scale Name (26 Characters)
189		r/w	
190		r/w	
191		r/w	
192		r/w	
193		r/w	
194		r/w	
195		r/w	
196		r/w	
197		r/w	
198		r/w	
199		r/w	
200		r/w	
201	char	r/w	Truck ID (20 characters)
202		r/w	
203		r/w	
204		r/w	
205		r/w	
206		r/w	
207		r/w	
208		r/w	
209		r/w	
210		r/w	
211	char	r	Software Version (20 characters)
212		r	
213		r	
214		r	
215		r	
216		r	
217		r	
218		r	
219		r	
220		r	
221	char	r	Hardware Version (20 characters)
222		r	
223		r	
224		r	
225		r	
226		r	
227		r	



228		r	
229		r	
230		r	
<b>Daily Total</b>			
231	long	r	1 - Accumulator in Lbs or Kg
232		r	
233	long	r	1 - Previous Accumulator in Lbs or Kg
234		r	
235	long	r	1 - Run Time in Seconds
236		r	
237	long	r	1 - Previous Run Time in Seconds
238		r	
239	unsigned int	r	1 - Down Counts
240	unsigned int	r	1 - Previous Down Counts
241	unsigned long	r	1 - Previous Clear
242		r	
243	long	r	1 - DO NOT USE - Factory use only
244		r	
245	unsigned long	r	1- Production Time in Seconds
246		r	
247	unsigned int	r	1 - Production Down Counts
248	unsigned long	r	1 - Last Production Time
249		r	
250	unsigned int	r	1 - Last Production Down Counts
251	unsigned int	r	1 - Auxiliary Counter
252	unsigned long	r	1 - Auxiliary Timer in Seconds
253		r	
254	unsigned int	r	1 - Last Auxiliary Counter
255	unsigned long	r	1 - Last Auxiliary Timer in Seconds
256		r	
<b>Weekly Total</b>			
257	long	r	2 - Accumulator in tenth of tons
258		r	
259	long	r	2 - Previous Accumulator in tenth of tons
260		r	
261	long	r	2 - Run Time in Seconds
262		r	
263	long	r	2 - Previous Run Time in Seconds
264		r	
265	unsigned int	r	2 - Down Counts
266	unsigned int	r	2 - Previous Down Counts
267	unsigned long	r	2 - Previous Clear
268		r	
269	long	r	2 - DO NOT USE - Factory use only
270		r	
271	unsigned long	r	2- Production Time in Seconds
272		r	



273	unsigned int	r	2 - Production Down Counts
274	unsigned long	r	2 - Last Production Time
275		r	
276	unsigned int	r	2 - Last Production Down Counts
277	unsigned int	r	2 - Auxiliary Counter
278	unsigned long	r	2 - Auxiliary Timer in Seconds
279		r	
280	unsigned int	r	2 - Last Auxiliary Counter
281	unsigned int	r	2 - Last Auxiliary Timer in Seconds
282		r	
<b>Monthly Total</b>			
283	long	r	3 - Accumulator in tenth of tons
284		r	
285	long	r	3 - Previous Accumulator in tenth of tons
286		r	
287	long	r	3 - Run Time in Seconds
288		r	
289	long	r	3 - Previous Run Time in Seconds
290		r	
291	unsigned int	r	3 - Down Counts
292	unsigned int	r	3 - Previous Down Counts
293	unsigned long	r	3 - Previous Clear
294		r	
295	long	r	3 - DO NOT USE - Factory use only
296		r	
297	unsigned long	r	3- Production Time in Seconds
298		r	
299	unsigned int	r	3 - Production Down Counts
300	unsigned long	r	3 - Last Production Time
301		r	
302	unsigned int	r	3 - Last Production Down Counts
303	unsigned int	r	3 - Auxiliary Counter
304	unsigned long	r	3 - Auxiliary Timer in Seconds
305		r	
306	unsigned int	r	3 - Last Auxiliary Counter
307	unsigned int	r	3 - Last Auxiliary Timer in Seconds
308		r	
<b>Yearly Total</b>			
309	long	r	4 - Accumulator in tons
310		r	
311	long	r	4 - Previous Accumulator in tons
312		r	
313	long	r	4 - Run Time in Seconds
314		r	
315	long	r	4 - Previous Run Time in Seconds
316		r	
317	unsigned int	r	4 - Down Counts



318	unsigned int	r	4 - Previous Down Counts
319	unsigned long	r	4 - Previous Clear
320		r	
321	long	r	4 - DO NOT USE - Factory use only
322		r	
323	unsigned long	r	4- Production Time in Seconds
324		r	
325	unsigned int	r	4 - Production Down Counts
326	unsigned long	r	4 - Last Production Time
327		r	
328	unsigned int	r	4 - Last Production Down Counts
329	unsigned int	r	4 - Auxiliary Counter
330	unsigned long	r	4 - Auxiliary Timer in Seconds
331		r	
332	unsigned int	r	4 - Last Auxiliary Counter
333	unsigned int	r	4 - Last Auxiliary Timer in Seconds
334		r	
<b>Weight Logging Total – used for Weight Logging</b>			
335	long	r	5 - Accumulator in Lbs or Kg
336		r	
337	long	r	5 - Previous Accumulator in Lbs or Kg
338		r	
339	long	r	5 - Run Time in Seconds
340		r	
341	long	r	5 - Previous Run Time in Seconds
342		r	
343	unsigned int	r	5 - Down Counts
344	unsigned int	r	5 - Previous Down Counts
345	unsigned long	r	5 - Previous Clear
346		r	
347	long	r	5 - DO NOT USE - Factory use only
348		r	
349	unsigned long	r	5- Production Time in Seconds
350		r	
351	unsigned int	r	5 - Production Down Counts
352	unsigned long	r	5 - Last Production Time
353		r	
354	unsigned int	r	5 - Last Production Down Counts
355	unsigned int	r	5 - Auxiliary Counter
356	unsigned long	r	5 - Auxiliary Timer in Seconds
357		r	
358	unsigned int	r	5 - Last Auxiliary Counter
359	unsigned int	r	5 - Last auxiliary Timer in Seconds
360		r	
<b>Day Accumulator – Resets when new day starts</b>			
361	long	r	6 - Accumulator in Lbs or Kg
362		r	





363	long	r	6 - Previous Accumulator in Lbs or Kg
364		r	
365	long	r	6 - Run Time in Seconds
366		r	
367	long	r	6 - Previous Run Time in Seconds
368		r	
369	unsigned int	r	6 - Down Counts
370	unsigned int	r	6 - Previous Down Counts
371	unsigned long	r	6 - Previous Clear
372		r	
373	long	r	6 - DO NOT USE - Factory use only
374		r	
375	unsigned long	r	6- Production Time in Seconds
376		r	
377	unsigned int	r	6 - Production Down Counts
378	unsigned long	r	6 - Last Production Time
379		r	
380	unsigned int	r	6 - Last Production Down Counts
381	unsigned int	r	6 - auxiliary Counter
382	unsigned long	r	6 - auxiliary Timer in Seconds
383		r	
384	unsigned int	r	6 - Last Auxiliary Counter
385	unsigned int	r	6 - Last auxiliary Timer in Seconds
386		r	
387			
388			
389			
390			
391			
392			
393			
394			
395			
396			
397			
398			
399			
400			
401			
402			
403			
404			
405			
406			
407			
408			
409			



410			
411			
412	unsigned long	r	ip address
413		r	
414	unsigned long	r	mask
415		r	
416	unsigned long	r	name server
417		r	
418	unsigned long	r	dns
419		r	
420	unsigned int	r	mac address
421	unsigned int	r	"
422	unsigned int	r	"
423	unsigned int	r	"
424	unsigned int	r/w	Password for Calibration Changes 44810



## 5.0 Special Functions

### 5.1 Performing a Zero Calibration

Holding Registers Used:            10 – Read/Write Zero Calibration status  
   146 – Current Belt Length  
   148 – New Zero Value

A Zero Calibration can be performed at any time. However it is up to the user to be sure that the belt is empty during the test. There is nothing in the scale that will prevent a user from doing a Zero Calibration with a fully loaded belt.

The Zero Calibration is done using the stored belt length so it is not necessary to watch the belt for 1 complete revolution.

Values are Read and Written to Holding Register 10. The user will write values to the register and the scale will update the register with the current status of the Zero Test.

To start Zero Calibration:

- Write 1 to holding register 10. The Zero Calibration will start.
- Read register 10. During the Zero Calibration it will read 2.
- While test is running register 146 will show how far the belt has traveled.
- When test is done register 10 will read 3 and register 148 will contain the new Zero Value.
- Write 4 to register 10 to accept new Zero Value.
- Writing any other value to register 10 will cancel the test with no changes made to the calibration.

Register 10		
0	r	Zero Calibration not running
1	w	Start Zero Calibration
2	r	Zero Calibration Running
3	r	Zero Calibration Complete
4	w	Apply new Zero value
99	r/w	Cancel Zero Calibration

### 5.2 Current Loop Output

Holding Registers Used:            95 – Current Loop

Setting the Analog output function to Modbus will allow the current loop to be controlled directly by the Modbus master.

The current loop is a 16bit DAC. The value written to register 95 will directly output to the DAC.

The Analog Output settings, Action, Averaging and Range will still affect the output.



### 5.3 Clearing Totals

There are 2 ways to clear scale totals.

1. Use Digital outputs addresses 5 – 9. (Or write to their corresponding Holding Registers)
2. Write to Holding Register 11.
  - a. Normally Register 11 is read as -1.
  - b. Writing the following values will clear the corresponding total.

0	Clear All Totals
1	Clear Total 1
2	Clear Total 2
3	Clear Total 3
4	Clear Total 4
5	Clear Truck Totals

- c. After total is clear Register will read -1.

Totals can be cleared at any time.