

# **Agriculture Sensor FAQ (CLOVER)**

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## **Agriculture Sensor FAQ**

### **General Sensor FAQ:**

Question	Answer
Why is the System LED rapidly blinking on my sensor?	While a sensor is not joined to a network it will continuously blink the System LED to indicate its unconnected status to the user. Ensure your LoRaWAN gateway is connected to your Network Server and verify the DevEUI, AppEUI and AppKey for the device.
Why does my LoRa LED blink periodically?	The LoRa LED indicates LoRa traffic being sent or received by the device. A short blink indicates the sensor has just transmitted, while a longer blink indicates the sensor has received a message.
How do I add my sensor to a Network Server?	Provisioning a sensor on a Network Server will vary based on your Network Server provider. An example of how to perform this on the TEKTELIC Network Server is available in your sensors user manual. Most network server providers will require you to enter the DevEUI, AppEUI and AppKey of your device on their service.
What version of LoRaWAN do the sensors implement?	All TEKTELIC Sensor products run LoRaWAN 1.0.2

The serial numbers on my case are different from the serial numbers on the circuit board. Did my order get mixed up?	All TEKTELIC products have multiple serial numbers so we can track the devices at each stage of production. It is normal that you sensor board and sensor assembly have different numbers.			
What can I find the commissioning values for my sensors? (DEVEUI, APPEUI and APPKEY)	We keep the commissioning values for each sensor secure on our own server. We send the commissioning values for each sensor sent with a shipment but if this was misplaced please send the serial number the revision and the Tcode of the sensor and we can get the information for you.			
	This occurs when the channel plan does not reflect the			
	number of channels accepted by the gateway. By default,			
	all sensors come up in 64 channel mode which results in			
	lost packets if a gateway with less than 64 channels is			
Why is my sensor sending more packets than the	used. If you have an 8 channel gateway for example,			
Network Server receives?	ensure this is configured in the device settings in the			
	Network Server. In the TEKTELIC NS under the			
	"advanced network settings" tab change the configuration			
	of the "default channel mask" to reflect the number of			
	channels used by the gateway used.			

### Input FAQ:

Question	Answer				
	Gravitational Water Content (GWC) is the mass of water per mass of dry				
	soil. Just like Volumetric Water Content (VWC), it is another way of				
What is CMC and have is it	determining how wet your soil is. There are no technical differences				
different than VWC?	between GWC and VWC, as they both calculate the same result (ie. "The				
	soil is wet by X amount"). The only difference between GWC and VWC is				
	how the result is presented. GWC presents the mass of water in terms of				
	<i>grams (g)</i> and VWC presents a <i>percentage (%)</i> of how wet your soil is.				
	As GWC represents only the mass of water per mass of dry soil, it is not				
	possible to interpret the measurement as a percentage. Therefore, you				
How do I interpret GWC?	can assume that any value between "Dry" and "Wet" has a degree of water				
	content in it. Values exceeding the "Wet" threshold can be interpreted as				
	more "wet."				
	See the following formula:				
	VWC = (GWC * soil density) / (water density)				

	When converting from GWC to VWC, you might find the results to be							
	inaccurate. This inaccuracy may come from any additional							
Important note for customers	fertilizers/additives applied to the soil.							
using fertilizers/additives:	fertilizers, additives applied to the soli.							
0	As the Agriculture Sensor was only tested with regular water/soil it may not							
	he able to accurately match the VWC conversion							
	Input 1 readings are a frequency presented in LUE. Diagon refer to the table							
	Input 1 readings are a frequency presented in kHz. Please refer to the table							
	perow for a conversion from this frequency to GWC (gravimetric water							
	content):							
	GWC	Frequen	ncy range	_				
	Dry	1402	1399	-				
	0.1	1399	1396	-				
	0.2	1396	1391	-				
How do I convert the readings for	0.3	1391	1380	-				
soil moisture into GWC?	0.4	1201	1276	-				
	0.5	1376	1370	-				
	0.7	1371	1366	1				
	0.8	1366	1361					
	0.9	1361	1356					
	1	1356	1351					
	1.1	1351	1346					
	1.2	1346	1341					
	Wet	1341	1322					
How do I convert the readings for	The readi	ngs from 1	register 0:	x 02 02 (Input 2) are a voltage, in mV.				
soil temperature into °C?		0	0					
	The prem	ise is. whe	en the vol	tage reading goes up, the soil temperature is				
	dronning	,						
	The form	ula usod to	o perform	the conversion is: soiltemp				
		$\mathbf{I} \mathbf{U} \mathbf{U} \mathbf{U} \mathbf{U} \mathbf{U} \mathbf{U} \mathbf{U} U$	$\frac{1}{2}$	the conversion is, somethip				
	32.40 <sup>m</sup>	LIN(V)+2	.00.00.					
	Refer to t	he followi	ing table i	for a quick look-up of the conversion:				
<b>I</b>								

	A	В		Α	В		Α	В
	mV from		40	330	47.63	81	535	32.14
	either input	Calculated	41	335	47.15	82	540	31.84
1	3 or 4	Temp	42	340	46.68	83	545	31.54
2	140	74.82	43	345	46.21	84	550	31.25
3	145	73.71	44	350	45.75	85	555	30.96
4	150	72.65	45	355	45.3	86	560	30.67
5	155	71.62	46	360	44.85	87	565	30.38
6	160	70.62	47	365	44.41	88	570	30.1
7	165	69.65	48	370	43.97	89	575	29.82
8	170	68.71	49	375	43.54	90	580	29.54
9	175	67.8	50	380	43.12	91	585	29.26
10	180	66.91	51	385	42.7	92	590	28.99
11	185	66.04	52	390	42.29	93	595	28.72
12	190	65.2	53	395	41.88	94	600	28.45
13	195	64.38	54	400	41.47	95	605	28.18
14	200	63.58	55	405	41.08	96	610	27.91
15	205	62.79	56	410	40.68	97	615	27.65
16	210	62.03	57	415	40.29	98	620	27.39
17	215	61.28	58	420	39.91	99	625	27.13
18	220	60.55	59	425	39.53	100	630	26.88
19	225	59.84	60	430	39.15	101	635	26.62
20	230	59.14	61	435	38.78	102	640	26.37
21	235	58.46	62	440	38.42	103	645	26.12
22	240	57.79	63	445	38.05	104	650	25.87
23	245	57.13	64	450	37.7	105	655	25.62
24	250	56.49	65	455	37.34	106	660	25.38
25	255	55.86	66	460	36.99	107	665	25.13
26	260	55.24	67	465	36.64	108	670	24.89
27	265	54.64	68	470	36.3	109	675	24.65
28	270	54.04	69	475	35.96	110	680	24.42
29	275	53.45	70	480	35.62	111	685	24.18
30	280	52.88	71	485	35.29	112	690	23.94
31	285	52.32	72	490	34.96	113	695	23.71
32	290	51.76	73	495	34.63	114	700	23.48
33	295	51.22	74	500	34.31	115	705	23.25
34	300	50.68	75	505	33.99	116	710	23.02
35	305	50.15	76	510	33.67	117	715	22.8
36	310	49.63	77	515	33.36	118	720	22.57
37	315	49.12	78	520	33.05	119	725	22.35
38	320	48.62	79	525	32.74	120	730	22.13
39	325	48.12	80	530	32.44	121	735	21.91

121   735   21.91   162   940   13.97     122   740   21.69   163   945   13.8     124   750   21.47   164   950   13.63     124   750   21.04   165   955   13.46     125   775   20.21   168   970   12.96     126   760   20.83   167   965   13.12     127   765   20.62   168   970   12.96     128   770   20.41   169   975   12.79     129   775   20.2   170   980   12.42     130   780   19.99   171   985   12.46     131   785   19.79   172   990   12.3     132   790   19.58   173   995   12.13     133   795   19.38   174   1000   11.65     136   810   18.58   178   1002   11.33     138   820   18.38   179   1025		Α	В		А	В			
122   740   21.69   163   945   13.8     123   745   21.47   164   950   13.63     124   750   21.26   165   955   13.46     125   755   21.04   166   960   13.12     126   760   20.83   167   965   13.12     127   765   20.02   170   980   12.62     130   780   19.99   171   985   12.46     131   785   19.79   172   990   12.3     132   790   19.58   173   995   11.13     133   785   19.81   176   1010   11.65     134   800   18.77   177   1015   11.49     137   815   18.81   1020   11.33     138   820   18.38   179   1025   11.17     139   825   18.18   10030   11.02     140   830   17.79   182   1040   10.71	121	735	21.91	162	940	13.97			
123   745   21.47   164   950   13.63     124   750   21.26   165   955   13.46     125   755   21.04   166   960   13.29     126   760   20.83   167   965   13.12     127   765   20.62   168   970   12.96     128   770   20.2   170   980   12.62     130   780   19.99   171   985   12.46     131   785   19.79   172   990   12.3     132   790   19.58   173   995   12.13     133   795   19.38   174   1000   11.65     136   810   18.77   177   1015   11.49     137   81.5   18.88   178   1020   11.33     138   820   18.38   179   1025   11.17     139   825   18.18   10030   11.02     140   830   17.79   182   1040   10.71	122	740	21.69	163	945	13.8			
124   750   21.26   165   955   13.46     125   755   21.04   166   960   13.29     126   760   20.83   167   965   13.12     127   765   20.62   168   970   12.96     128   770   20.41   169   975   12.79     129   775   20.2   170   980   12.62     130   780   19.99   171   985   12.46     131   785   19.79   172   990   12.3     132   790   19.58   173   995   12.13     133   795   19.38   174   1000   11.97     134   800   19.17   76   1010   11.63     137   815   18.88   178   1020   11.13     138   820   18.38   179   1025   11.17     139   825   18.18   10030   11.02     141   835   17.79   182   1005   10.44	123	745	21.47	164	950	13.63			
125   755   21.04   166   960   13.29     126   760   20.83   167   965   13.12     127   765   20.62   168   970   12.96     128   770   20.41   169   975   12.79     129   775   20.2   170   980   12.46     130   780   19.99   171   985   12.46     131   785   19.79   172   990   12.3     132   790   19.58   173   995   12.13     133   795   19.38   174   1000   11.97     134   800   19.18   175   1005   11.81     135   805   18.97   176   1010   11.65     136   810   18.77   177   1015   11.43     137   815   18.58   178   1020   11.33     138   820   18.38   1030   11.02     140   830   17.79   182   1040   10.71	124	750	21.26	165	955	13.46			
126   760   20.83   167   965   13.12     127   765   20.62   168   970   12.96     128   770   20.41   169   975   12.79     129   775   20.2   170   980   12.62     130   780   19.99   171   985   12.13     132   790   19.58   173   995   12.13     133   795   19.38   174   1000   11.97     134   800   19.18   175   1010   11.65     136   810   18.77   177   1015   11.49     137   815   18.58   178   1020   11.33     138   820   18.38   179   1025   11.17     139   825   18.18   1030   11.02     141   835   17.79   182   1040   10.71     142   840   17.6   183   1045   10.55     143   845   17.41   184   1005   9.4	125	755	21.04	166	960	13.29			
127   765   20.62   168   970   12.96     128   770   20.41   169   975   12.79     129   775   20.2   170   980   12.62     130   780   19.99   171   985   12.46     131   785   19.79   172   990   12.3     132   790   19.58   174   1000   11.97     134   800   19.18   175   1010   11.65     135   805   18.97   176   1010   11.65     136   810   18.77   177   1015   11.49     137   815   18.88   178   1002   11.33     138   820   18.38   179   1025   11.17     139   825   18.18   180   1030   11.02     140   830   17.91   182   1040   10.71     142   840   17.6   183   1065   19.4     143   845   17.41   184   1055	126	760	20.83	167	965	13.12			
128   770   20.41   169   975   12.79     129   775   20.2   170   980   12.62     130   780   19.99   171   985   12.46     131   785   19.79   172   990   12.3     132   790   19.58   173   995   12.13     133   795   19.38   174   1000   11.81     135   805   18.77   177   1015   11.49     137   815   18.58   178   1020   11.33     138   820   18.38   179   1025   11.17     139   825   18.18   180   1030   11.02     140   830   17.99   181   1035   10.46     141   835   17.79   182   1040   10.71     142   840   17.6   183   1045   10.53     143   845   17.41   184   1005   9.44     144   850   16.28   190   9.94	127	765	20.62	168	970	12.96			
129   775   20.2   170   980   12.62     130   780   19.99   171   985   12.46     131   785   19.79   172   990   12.3     132   790   19.58   173   995   12.13     133   795   19.38   174   1000   11.97     134   800   19.18   175   1005   11.81     135   805   18.97   176   1010   11.65     136   810   18.77   177   1015   11.49     137   815   18.88   1020   11.33     138   820   18.38   179   1025   11.17     139   825   18.18   1030   11.02     140   830   17.9   182   1040   10.71     142   840   17.6   183   1045   10.55     143   845   17.41   184   1050   10.4     144   850   16.65   188   1070   9.79	128	770	20.41	169	975	12.79			
130   780   19.99   171   985   12.46     131   785   19.79   172   990   12.3     132   790   19.58   173   995   12.13     133   795   19.38   174   1000   11.97     134   800   19.18   175   1005   11.81     135   805   18.97   176   1010   11.65     136   810   18.77   177   1015   11.49     137   815   18.88   179   1025   11.17     138   820   18.38   179   1025   11.02     140   830   17.99   181   1035   10.86     141   835   17.79   182   1040   10.71     142   840   17.6   183   1045   10.55     143   845   17.1   184   1050   10.4     144   850   16.21   18   1070   9.79     148   870   16.47   189   1075	129	775	20.2	170	980	12.62			
131   785   19.79   172   990   12.3     132   790   19.58   173   995   12.13     133   795   19.38   174   1000   11.97     134   800   19.18   175   1005   11.81     135   805   18.97   176   1010   11.65     136   810   18.77   177   1015   11.49     137   815   18.88   178   1020   11.33     138   820   18.38   179   1025   11.17     139   825   18.18   1030   11.02     140   830   17.99   182   1040   10.71     142   840   17.6   183   1045   10.55     143   845   17.41   184   1050   10.44     144   850   17.22   185   10.05   10.24     145   855   17.03   186   1060   10.09     146   860   16.41   19   1075   9.64 <th>130</th> <th>780</th> <th>19.99</th> <th>171</th> <th>985</th> <th>12.46</th> <th></th> <th></th> <th></th>	130	780	19.99	171	985	12.46			
132   790   19.58   173   995   12.13     133   795   19.38   174   1000   11.97     134   800   19.18   175   1005   11.81     135   805   18.97   176   1010   11.65     136   810   18.77   177   1015   11.49     137   815   18.88   178   1020   11.33     138   820   18.38   179   1025   11.17     139   825   18.18   180   1030   11.02     140   830   17.99   181   1035   10.66     141   835   17.79   182   1040   10.71     142   840   17.6   183   1045   10.55     143   845   17.41   184   1050   10.4     144   850   17.22   185   1055   10.24     145   855   17.03   186   1070   9.79     146   860   16.47   189   1075	131	785	19.79	172	990	12.3			
133   795   19.38   174   1000   11.97     134   800   19.18   175   1005   11.81     135   805   18.97   176   1010   11.65     136   810   18.77   177   1015   11.49     137   815   18.85   178   1002   11.33     138   820   18.38   179   1025   11.17     139   825   18.18   180   1030   11.02     140   830   17.99   181   1035   10.86     141   835   17.79   182   1040   10.71     142   840   17.6   183   1045   10.55     143   845   17.41   184   1050   10.4     144   850   17.22   185   1055   10.24     145   855   17.03   186   1060   10.09     146   860   16.47   189   1075   9.64     149   875   16.28   100   9.94 <th>132</th> <td>790</td> <td>19.58</td> <td>173</td> <td>995</td> <td>12.13</td> <td></td> <td></td> <td></td>	132	790	19.58	173	995	12.13			
134   800   19.18   175   1005   11.81     135   805   18.97   176   1010   11.65     136   810   18.77   177   1015   11.49     137   815   18.88   178   1002   11.33     138   820   18.38   179   1025   11.17     139   825   18.18   180   1030   11.02     140   830   17.99   181   1035   10.66     141   835   17.79   182   1040   10.71     142   840   17.61   183   1045   10.55     143   845   17.71   184   1050   10.4     144   850   17.22   185   10.65   10.4     145   855   17.03   186   1060   10.09     146   860   16.84   187   1055   9.4     147   865   16.65   188   1070   9.79     148   870   16.47   19   10.85	133	795	19.38	174	1000	11.97			
135     805     18.97     176     1010     11.65       136     810     18.77     177     1015     11.49       137     815     18.58     178     1020     11.33       138     820     18.38     179     1025     11.17       139     825     18.18     180     1030     11.02       140     830     17.99     181     1035     10.86       141     835     17.79     182     1040     10.71       142     840     17.6     183     1045     10.55       143     845     17.41     184     1050     10.4       144     850     17.22     185     1055     10.24       145     855     17.03     186     1060     10.09       146     860     16.47     189     1075     9.64       147     865     16.52     192     1090     9.19       150     880     15.52     192	134	800	19.18	175	1005	11.81			
136     810     18.77     177     1015     11.49       137     815     18.58     178     1020     11.33       138     820     18.38     179     1025     11.17       139     825     18.18     180     1030     11.02       140     830     17.99     181     1035     10.86       141     835     17.79     182     1040     10.71       142     840     17.6     183     1045     10.55       143     845     17.41     184     1050     10.4       144     850     17.22     185     10.60     10.09       145     855     17.03     186     1060     10.09       146     860     16.47     189     1075     9.64       149     875     16.28     190     9.39       150     880     15.1     191     1085     9.34       151     885     15.52     192     1009	135	805	18.97	176	1010	11.65			
137     815     18.58     178     1020     11.33       138     820     18.38     179     1025     11.17       139     825     18.18     180     1030     11.02       140     830     17.99     181     1035     10.86       141     835     17.79     182     1040     10.71       142     840     17.6     183     1045     10.55       143     845     17.41     184     1050     10.4       144     850     17.22     185     1055     10.24       145     855     17.03     186     1060     10.09       146     860     16.44     187     1065     9.94       147     865     16.65     188     1070     9.79       148     870     16.47     189     1075     9.64       149     875     16.28     190     1080     9.49       150     880     16.1     191	136	810	18.77	177	1015	11.49			
138     820     18.38     179     1025     11.17       139     825     18.18     180     1030     11.02       140     830     17.99     181     1035     10.86       141     835     17.79     182     1040     10.71       142     840     17.6     183     1045     10.55       143     845     17.41     184     1050     10.4       144     850     17.22     185     10055     10.24       145     855     17.03     186     1060     10.09       146     860     16.84     187     1065     9.94       147     865     16.65     188     1070     9.79       148     870     16.47     189     1075     9.64       149     875     16.28     190     9.19     1108     9.44       150     880     16.1     191     1085     9.44     16.6       152     890	137	815	18.58	178	1020	11.33			
139     825     18.18     180     1030     11.02       140     830     17.99     181     1035     10.86       141     835     17.79     182     1040     10.71       142     840     17.6     183     1045     10.55       143     845     17.41     184     1050     10.4       144     850     17.22     185     10.55     10.24       145     855     17.03     186     1060     10.09       146     860     16.84     187     1065     9.94       147     865     16.65     188     1070     9.79       148     870     16.47     189     1075     9.64       150     880     16.1     191     1085     9.34       151     885     15.92     192     1090     9.19       152     890     15.74     193     1095     9.04       153     895     15.55     194	138	820	18.38	179	1025	11.17			
140   830   17.99   181   1035   10.86     141   835   17.79   182   1040   10.71     142   840   17.6   183   1045   10.55     143   845   17.41   184   1050   10.4     144   850   17.22   185   1055   10.24     145   855   17.03   186   1060   10.09     146   860   16.84   187   1065   9.94     147   865   16.65   188   1070   9.79     148   870   16.47   189   1075   9.64     149   875   16.28   190   1080   9.49     150   880   16.1   191   1085   9.34     151   885   15.92   192   1090   9.19     152   890   15.74   193   1095   9.04     153   895   15.55   194   1100   8.89   203   1145   7.6     154   900 <t< th=""><th>139</th><th>825</th><th>18.18</th><th>180</th><th>1030</th><th>11.02</th><th></th><th></th><th></th></t<>	139	825	18.18	180	1030	11.02			
141   835   17.79   182   1040   10.71     142   840   17.6   183   1045   10.55     143   845   17.41   184   1050   10.4     144   850   17.22   185   1055   10.24     145   855   17.03   186   1060   10.09     146   860   16.84   187   1065   9.94     147   865   16.65   188   1070   9.79     148   870   16.47   189   1075   9.64     149   875   16.28   190   1080   9.49     150   880   16.1   191   1085   9.34     151   885   15.92   192   1090   9.19     152   890   15.74   193   1095   9.04     153   895   15.55   194   1100   8.89   203   1145   7.6     154   900   15.37   195   1110   8.64   206   1160   7.18 <th>140</th> <th>830</th> <th>17.99</th> <th>181</th> <th>1035</th> <th>10.86</th> <th></th> <th></th> <th></th>	140	830	17.99	181	1035	10.86			
142   840   17.6   183   1045   10.55     143   845   17.41   184   1050   10.4     144   850   17.22   185   1055   10.24     145   855   17.03   186   1060   10.09     146   860   16.84   187   1065   9.94     147   865   16.65   188   1070   9.79     148   870   16.47   189   1075   9.64     149   875   16.28   190   1080   9.49     150   880   16.1   191   1085   9.34     151   885   15.92   192   1090   9.19     152   890   15.74   193   1095   9.04     153   895   15.55   194   1100   8.89   203   1145   7.6     154   900   15.37   195   1110   8.62   205   1155   7.32     156   910   15.02   197   1115   8.46 <t< th=""><th>141</th><th>835</th><th>17.79</th><th>182</th><th>1040</th><th>10.71</th><th></th><th></th><th></th></t<>	141	835	17.79	182	1040	10.71			
143     845     17.41     184     1050     10.4       144     850     17.22     185     1055     10.24       145     855     17.03     186     1060     10.09       146     860     16.84     187     1065     9.94       147     865     16.65     188     1070     9.79       148     870     16.47     189     1075     9.64       149     875     16.28     190     1080     9.49       150     880     16.1     191     1085     9.34       151     885     15.92     192     1090     9.19       152     890     15.74     193     1095     9.04       153     895     15.55     194     1100     8.89     203     1145     7.6       154     900     15.37     195     1110     8.66     205     1155     7.32       155     905     15.2     197     11115     <	142	840	17.6	183	1045	10.55			
144     850     17.22     185     1055     10.24       145     855     17.03     186     1060     10.09       146     860     16.84     187     1065     9.94       147     865     16.65     188     1070     9.79       148     870     16.47     189     1075     9.64       149     875     16.28     190     1080     9.49       150     880     16.1     191     1085     9.34       151     885     15.92     192     1090     9.19       152     890     15.74     193     1095     9.04       153     895     15.55     194     1100     8.89     203     1145     7.6       154     900     15.37     195     1105     8.75     204     1150     7.46       155     905     15.2     196     1110     8.66     205     1155     7.32       156     910 <td< th=""><th>143</th><th>845</th><th>17.41</th><th>184</th><th>1050</th><th>10.4</th><th></th><th></th><th></th></td<>	143	845	17.41	184	1050	10.4			
145     855     17.03     186     1060     10.09       146     860     16.84     187     1065     9.94       147     865     16.65     188     1070     9.79       148     870     16.47     189     1075     9.64       149     875     16.28     190     1080     9.49       150     880     16.1     191     1085     9.34       151     885     15.92     192     1090     9.19       152     890     15.74     193     1095     9.04       153     895     15.55     194     1100     8.89     203     1145     7.6       154     900     15.37     195     1105     8.75     204     1150     7.46       155     905     15.2     196     1110     8.6     205     1155     7.32       156     910     15.02     197     1115     8.46     206     1160     7.18	144	850	17.22	185	1055	10.24			
146     860     16.84     187     1065     9.94       147     865     16.65     188     1070     9.79       148     870     16.47     189     1075     9.64       149     875     16.28     190     1080     9.49       150     880     16.1     191     1085     9.34       151     885     15.92     192     1090     9.19       152     890     15.74     193     1095     9.04       153     895     15.55     194     1100     8.89     203     1145     7.6       154     900     15.37     195     1105     8.75     204     1150     7.46       155     905     15.2     196     1110     8.6     205     1155     7.32       156     910     15.02     197     1115     8.46     206     1160     7.18       157     915     14.84     198     1120     8.31 <t< th=""><th>145</th><th>855</th><th>17.03</th><th>186</th><th>1060</th><th>10.09</th><th></th><th></th><th></th></t<>	145	855	17.03	186	1060	10.09			
147   865   16.65   188   1070   9.79     148   870   16.47   189   1075   9.64     149   875   16.28   190   1080   9.49     150   880   16.1   191   1085   9.34     151   885   15.92   192   1090   9.19     152   890   15.74   193   1095   9.04     153   895   15.55   194   1100   8.89   203   1145   7.6     154   900   15.37   195   1105   8.75   204   1150   7.46     155   905   15.2   196   1110   8.66   205   1155   7.32     156   910   15.02   197   1115   8.46   206   1160   7.18     157   915   14.84   198   1120   8.31   207   1165   7.04     158   920   14.66   199   1125   8.17   208   1170   6.9     159   92	146	860	16.84	187	1065	9.94			
148   870   16.47   189   1075   9.64     149   875   16.28   190   1080   9.49     150   880   16.1   191   1085   9.34     151   885   15.92   192   1090   9.19     152   890   15.74   193   1095   9.04     153   895   15.55   194   1100   8.89   203   1145   7.6     154   900   15.37   195   1105   8.75   204   1150   7.46     155   905   15.2   196   1110   8.6   205   1155   7.32     156   910   15.02   197   1115   8.46   206   1160   7.18     157   915   14.84   198   1120   8.31   207   1165   7.04     158   920   14.66   199   1125   8.17   208   1170   6.9     159   925   14.49   200   1130   8.02   209   1175   6.	147	865	16.65	188	1070	9.79			
14987516.2819010809.4915088016.119110859.3415188515.9219210909.1915289015.7419310959.0415389515.5519411008.89203114515490015.3719511058.75204115015590515.219611108.6205115515691015.0219711158.46206116015791514.8419811208.3120711657.0415892014.6619911258.1720811706.915992514.4920011308.0220911756.7616093014.3220111357.8821011806.6216193514.1420211407.7421111856.49	148	870	16.47	189	1075	9.64			
15088016.119110859.3415188515.9219210909.1915289015.7419310959.0415389515.5519411008.8920311457.615490015.3719511058.7520411507.4615590515.219611108.620511557.3215691015.0219711158.4620611607.1815791514.8419811208.3120711657.0415892014.6619911258.1720811706.915992514.4920011308.0220911756.7616093014.3220111357.8821011806.6216193514.1420211407.7421111856.49	149	875	16.28	190	1080	9.49			
15188515.9219210909.1915289015.7419310959.0415389515.5519411008.8920311457.615490015.3719511058.7520411507.4615590515.219611108.620511557.3215691015.0219711158.4620611607.1815791514.8419811208.3120711657.0415892014.6619911258.1720811706.915992514.4920011308.0220911756.7616093014.3220111357.8821011806.6216193514.1420211407.7421111856.49	150	880	16.1	191	1085	9.34			
15289015.7419310959.0415389515.5519411008.8920311457.615490015.3719511058.7520411507.4615590515.219611108.620511557.3215691015.0219711158.4620611607.1815791514.8419811208.3120711657.0415892014.6619911258.1720811706.915992514.4920011308.0220911756.7616093014.3220111357.8821011806.6216193514.1420211407.7421111856.49	151	885	15.92	192	1090	9.19			
15389515.5519411008.8920311457.615490015.3719511058.7520411507.4615590515.219611108.620511557.3215691015.0219711158.4620611607.1815791514.8419811208.3120711657.0415892014.6619911258.1720811706.915992514.4920011308.0220911756.7616093014.3220111357.8821011806.6216193514.1420211407.7421111856.49	152	890	15.74	193	1095	9.04			
15490015.3719511058.7520411507.4615590515.219611108.620511557.3215691015.0219711158.4620611607.1815791514.8419811208.3120711657.0415892014.6619911258.1720811706.915992514.4920011308.0220911756.7616093014.3220111357.8821011806.6216193514.1420211407.7421111856.49	153	895	15.55	194	1100	8.89	203	1145	7.6
15590515.219611108.620511557.3215691015.0219711158.4620611607.1815791514.8419811208.3120711657.0415892014.6619911258.1720811706.915992514.4920011308.0220911756.7616093014.3220111357.8821011806.6216193514.1420211407.7421111856.49	154	900	15.37	195	1105	8.75	204	1150	7.46
15691015.0219711158.4620611607.1815791514.8419811208.3120711657.0415892014.6619911258.1720811706.915992514.4920011308.0220911756.7616093014.3220111357.8821011806.6216193514.1420211407.7421111856.49	155	905	15.2	196	1110	8.6	205	1155	7.32
15791514.8419811208.3120711657.0415892014.6619911258.1720811706.915992514.4920011308.0220911756.7616093014.3220111357.8821011806.6216193514.1420211407.7421111856.49	156	910	15.02	197	1115	8.46	206	1160	7.18
158     920     14.66     199     1125     8.17     208     1170     6.9       159     925     14.49     200     1130     8.02     209     1175     6.76       160     930     14.32     201     1135     7.88     210     1180     6.62       161     935     14.14     202     1140     7.74     211     1185     6.49	157	915	14.84	198	1120	8.31	207	1165	7.04
159     925     14.49     200     1130     8.02     209     1175     6.76       160     930     14.32     201     1135     7.88     210     1180     6.62       161     935     14.14     202     1140     7.74     211     1185     6.49	158	920	14.66	199	1125	8.17	208	1170	6.9
160     930     14.32     201     1135     7.88     210     1180     6.62       161     935     14.14     202     1140     7.74     211     1185     6.49	159	925	14.49	200	1130	8.02	209	1175	6.76
161 935 14.14 202 1140 7.74 211 1185 6.49	160	930	14.32	201	1135	7.88	210	1180	6.62
	161	935	14.14	202	1140	7.74	211	1185	6.49

How do I convert the readings from the Thermistor and Watermark into Soil Water Tension?

Watermark 1 & 2 will provide frequency readings. A reading of soil temperature from the thermistor will also be taken into account when calculating the final kPa value of soil water tension, for increased accuracy.

Final kPa of soil water tension is calculated by the following steps:

1. Obtain a reading of the frequency from Watermarks 1 or 2 or both. These are registers 0x 05 04 and 0x 06 04 respectively. Table 2-4 below can be used for conversion of the frequencies read from the Watermarks to get an **initial** kPa value. From Table 2-4, use the column on the right to find the appropriate range that the reading from the Watermarks fits into. Then use the formula directly to the left (from the left column) to calculate the kPa of soil water tension.

kPa = 0 kPa = 9 - (Hz - 4330) \* 0.004286 kPa = 15 - (Hz - 2820) \* 0.003974 kPa = 35 - (Hz - 1110) \* 0.01170 kPa = 55 - (Hz - 770) \* 0.05884 kPa = 75 - (Hz - 600) \* 0.1176 kPa = 100 - (Hz - 485) \* 0.2174 kPa = 200 - (Hz - 293) \* 0.5208 kPa = 200

for Hz > 6430 for 4330 <= Hz <= 6430 for 2820 <= Hz <= 4330 for 1110 <= Hz <= 2820 for 770 <= Hz <= 1110 for 600 <= Hz <= 770 for 485 <= Hz <= 600 for 293 <= Hz <= 485 for Hz < 293

 Obtain a reading from input 3 or 4 or both. These are registers 0x 03 02, 0x 04 02 respectively. Use the equation below to calculate a temperature from the mV reading.

Temp = -31.96ln(x) + 213.25

x = mV reading from input 3 or 4

This calculation represents the **soil temperature**.

3. Perform this next step only if the soil temperature varies from 24°C. Using the initial kPa value calculated in step #1, and the soil temperature calculated in step #2, calculate a 'temperature adjusted' kPa of soil water tension by using this formula:



**Note:** To obtain decoders that convert the readings from the sensor, please see the <u>following section</u>.