

7 Bit BCD Scaling Addendum

This Manual Addendum explains how to configure the 905U-G to Scale values from a normal analog signal and convert them to a 7-bit BCD value.

This feature allows five normal analog values (registers) to be converted to five 7-bit BCD values.

Each BCD output uses 7 consecutive registers which can be read locally via the Fieldbus or transmitted to another location.

Registers

4200 – 4204 raw analog inputs in ELPRO 4-20mA scale

These registers are where the raw analog value is initially mapped to.

If the value is coming from a remote site, then the remote site needs to be configured to send the value to these registers.

4220-4254 – The BCD values from each analog value are displayed in consecutive registers as digital outputs (on/off indications).

These registers hold the converted BCD value.

Each BCD value uses 7 consecutive registers, e.g. 4220- 4226 for analog #1, 4227-4233 for analog #2, etc which will hold the BCD values (See appendix 3 for the complete BCD conversion table)

4260-4294 – BCD Inverse.

These registers hold the complete inverse of registers 4220-4254, e.g. If the BCD value in 4220-4226 is 0001010 then the value in 4260-4266 will be 1110101.

Configuration

The values that you wish to convert need to be mapped to the “Raw Analog input” registers 4200 – 4204.

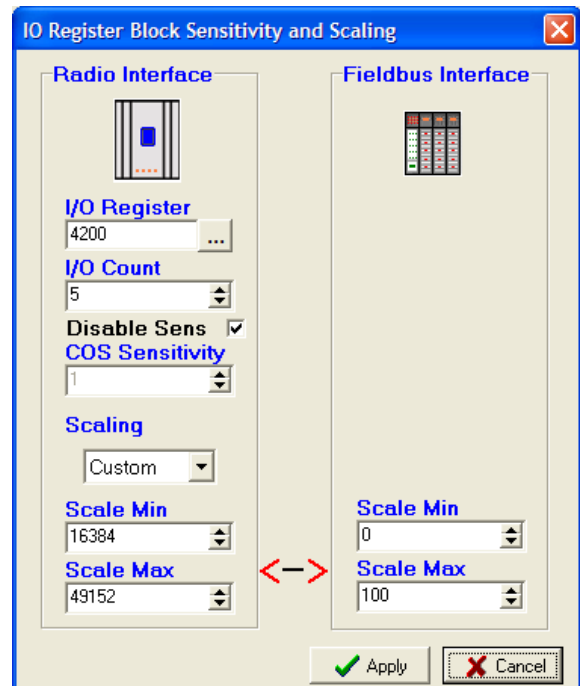
The Values can be Block mapped from another Gateway register or mapped directly from a remote 905U-X I/O radio using normal radio mappings.

Because the BCD resolution is 2% the analog input sensitivity on the sending device needs to be reduced down to 1%.

To convert the analog to BCD the values need to be scaled to a 0-100% range. This is done by enabling the Scaling under the Sensitivity option of the E-Series Config menu and setting up a “Sens/Scale Block”.

Setup the Scale/Sensitivity block so that the radio interface scale of 16384-49152 equals the Fieldbus Interface scale of 0-100 (see picture)

Note: A Scaled/Sensitivity Block must be configured for the BCD conversion to work.



Operation

When configured you should now see that when a value is sent to the 4200 register it will be converted to a 0-100% scale and written into register 4205. The value will then be converted to a 7-bit BCD value and outputted to the 7 BCD registers 4220-4226.

The same operation is done for the remaining 4 analog inputs but to the next registers in the range.

The BCD Digital output registers can be block mapped to other internal Gateway registers or mapped to remote 905U I/O modules via normal radio mappings.

Note: If transmitting the BCD value to a remote location it should be noted that every bit change will generate a radio message which could significantly overload the system communications if the raw input analog values are constantly changing.

Testing

For testing purposes there are a couple of other register locations that display intermediate conversion values.

4205 – 4209 Analog inputs scaled to percentage 0-100.

These values hold a direct conversion from the raw analog value in 4200-4204 to a scaled 0-100%, e.g. if value is 32768 then the scaled value will be 50%. (See appendix 3 for a complete BCD conversion table)

4210 – 4214 Analog inputs scaled as a decimal BCD value.

These registers hold the decimal BCD values for the associated analog input, e.g.

If the Value is 50% then the decimal BCD value will be 40.

This is calculated by working out which binary bits will be on and then calculating the total value for all the binary bits,

e.g. 50% is using the 5th and 7th bit which equates to the decimal values (32+8) = 40

Bit	2	3	4	5	6	7	8
%	2%	4%	8%	10%	20%	40%	80%
Binary	0	0	0	1	0	1	0
Decimal	1	2	4	8	16	32	64

Each binary bit has a decimal value which is shown here

Note: This is a customised BCD value as it is only using 7 of the 8 bits (the least significant bit has been dropped)

BCD Conversion Table

The Following Conversion table shows the correlation between a normal analog mA value, Percentage, Decimal, Binary and the BCD value and output registers.

%	mA	Dec	Binary	BCD (dec)	DO1	DO2	DO3	DO4	DO5	DO6	DO7
					2%	4%	8%	10%	20%	40%	80%
0	4.00	16384	0000000	0000							
2	4.32	17039	0000001	0001							
4	4.64	17695	0000010	0002							
6	4.96	18350	0000011	0003							
8	5.28	19005	0000100	0004							
10	5.60	19661	0001000	0008							
12	5.92	20316	0001001	0009							
14	6.24	20972	0001010	0010							
16	6.56	21627	0001011	0011							

