

Application Note

Parsing the SPN, FMI, and Occurrence Count of a DTC from Modbus® Registers

This application note shows you how to parse out the SPN, FMI, and Occurrence Count components of the DTC (Diagnostic Trouble Code) from Modbus registers using the equation method below.

Each DTC is contained in 2 modbus registers as a 32-bit number where register N is the most significant 16 bits and Register N+1 is the least significant 16 bits. The Modbus scanning device must be set up for 32-bit int with least significant register first.

Let NN represent the the 32 bit number represented in Registers N and N+1, where N is the least significant register.

We can extract The SPN, FMI, and Occurrence count by ANDing Hex Numbers and bit shifting as indicated below, where & is a bitwise AND operation, and >> or << is a bit shift operation. "0x" in front of a number indicates it is in Hexadecimal (Hex) format.

OCCURRENCE COUNT = NN & 0x0000003F;

SPN = ((NN & 0x0xFF000000)>>24) + ((NN & 0x00FF0000)>>8) + ((NN & 0x0000E000)<< 3);

FMI = (NN & 0x00001F00) >> 8;

Example

Suppose Register N contains the Hex Value of 0xE903 and Register N+1 contains the Hex Value 0x68F9.

Then, the 32-bit number is 0x68F9E903 since the DGC implements 32 bit numbers with the least significant register first.

Occurrence Count = (0x68F9E903 & 0x0000001F) = 0x00000003;

FMI = ((NN & 0x00001F00) >> 8) = (0x00000900 >> 8) = 0x00000009;

$$\begin{aligned} \text{SPN} &= ((\text{NN} \& \text{0x0xFF000000})\gg 24) + \\ &\quad ((\text{NN} \& \text{0x00FF0000})\gg 8) + \\ &\quad ((\text{NN} \& \text{0x0000E000})\ll 3) \\ &= ((\text{0x68F9E903} \& \text{0xFF000000}) \gg 24) + \\ &\quad ((\text{0x68F9E903} \& \text{0x00EE0000}) \gg 8) + \\ &\quad (\text{0x68F9E903} \& \text{0x0000E000}) \ll 3) \\ &= (\text{0x68000000} \gg 24) + (\text{0x00F90000} \gg 8) + \\ &\quad (\text{0x0000E000} \ll 3) \\ &= \text{0x00000068} + \text{0x0000F900} + \text{0x00070000} \\ &= \text{0x0007F968} \\ &= 522600 \end{aligned}$$

For More Information

For further questions, contact Basler Electric Technical Support at 618-654-2341 or visit www.basler.com/support. For additional information including more application notes, product bulletins, instruction manuals, and technical papers, visit www.basler.com.

Name	Description	Group	Register	Type	Bytes	R/W	Unit	Range
ECU Metering	Active DTC1	GG	11226	Uint32	4	R	n/a	Suppose the 32 bits of DTC Data is in Register N and N+1. SPN = (Register N: Most Significant 3 bits * 65536) + (Register N+1: LS Byte * 256) + (Register N+1: MS Byte) FMI = Register N: Bits 8-12 Occurrence Count = Register N: Bits 0 through 6
ECU Metering	Active DTC2	GG	11228	Uint32	4	R	n/a	
	•							
	•							
	•							
ECU Metering	Active DTC16	GG	11256	Uint32	4	R	n/a	
ECU Metering	Previously Active DTC1	GG	11258	Uint32	4	R	n/a	
ECU Metering	Previously Active DTC2	GG	11260	Uint32	4	R	n/a	
	•							
	•							
	•							
ECU Metering	Previously Active DTC16	GG	11288	Uint32	4	R	n/a	

Figure 1 - Modbus Registers for Diagnostic Trouble Codes (DTC's) from the DGC-2020HD Instruction Manual

Register	Description	Type	Units	Scaling Factor	R/W	Range
45106	Active DTC 1	Uint32	n/a	n/a	R	Suppose the 32 bits of DTC Data is in Register N and N+1. SPN = (Register N: Most Significant 3 bits * 65536) + (Register N+1: LS Byte * 256) + (Register N+1: MS Byte) FMI = Register N: Bits 8-12 Occurrence Count = Register N: Bits 0 through 6
45108	Active DTC 2	Uint32	n/a	n/a	R	
	•					
	•					
	•					
45136	Active DTC 16	Uint32	n/a	n/a	R	
45138	Previously Active DTC 1	Uint32	n/a	n/a	R	
45140	Previously Active DTC 2	Uint32	n/a	n/a	R	
	•					
	•					
	•					
45168	Previously Active DTC 16	Uint32	n/a	n/a	R	

Figure 2 - Legacy Modbus Registers for Diagnostic Trouble Codes (DTC's) from the DGC-2020HD Instruction Manual