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Application Engineering Europe

CORESENSE™ DIAGNOSTICS FOR COPELAND™ STREAM COMPRESSORS MODBUS® SPECIFICATION

1 Introduction

Stream with CoreSense™ Diagnostics provides advanced motor protection, diagnostics as well as Modbus® communication. Modbus communication enables reading compressor operating and alarm information from CoreSense both locally and remotely. By monitoring and analyzing data from the Copeland™ compressor, the module can accurately detect the cause of electrical and system related issues. If an unsafe condition is detected, the module trips the compressor. A flashing LED indicator communicates an alert code and guides the service technician more quickly and accurately to the root cause of a problem.

The module also has a RS-485 isolated communication port, by which the modules can communicate with the system controller or the network master. The details of the communication are provided in this document.

1.1 Abbreviations

RTU ➔ Remote Terminal Unit
DLT ➔ Discharge Line Temperature
OAC ➔ Overall Alarm Count (Total number of alarms since the module has been installed)
CRC ➔ Cyclic Redundancy Check
CMD ➔ Command
VFD ➔ Variable Frequency Drive

1.1 Intent

This document defines the CoreSense Diagnostics module standard usage of the Modbus protocol specification. This will allow 3rd party controllers to easily communicate to the CoreSense Diagnostics device using a standard Modbus interface.

1.2 Scope

This document only defines the Modbus options that are used in Stream with CoreSense Diagnostics. It is not intended to replace the Modbus protocol specification. This specification defines the common usage of the Physical layer, Data Link layer and some parts of the Application layer interface.

1.3 References

For the details of the Modbus specification, refer to

- Modicon Modbus Protocol Reference Guide PI–MBUS–300 Rev. J
- www.modbus.org

2 General description

Modbus uses a three-layer protocol:

- Physical layer: the hardware interface;
- Data Link layer: defines the reliable exchange of messages;
- Application layer: defines message structures for the exchange of application specific information.

Modbus has some required features, some recommended features, and some optional features. This specification starts with the physical layer and then works up to the application layer. The application layer defined in this specification defines the standard Modbus memory map and data interchange.

Modbus is a protocol with a single master and multiple slave devices. The master device initiates all messages.

3 Modbus type identification

Two types of Modbus are used with Stream compressors. The only possibility to identify which one is fitted in a CoreSense module is to open the module lid, and to look at the circuit board and label.

Most of the features are the same; the main differences are explained in this chapter.

3.1 Modbus with 10 DIP-switch

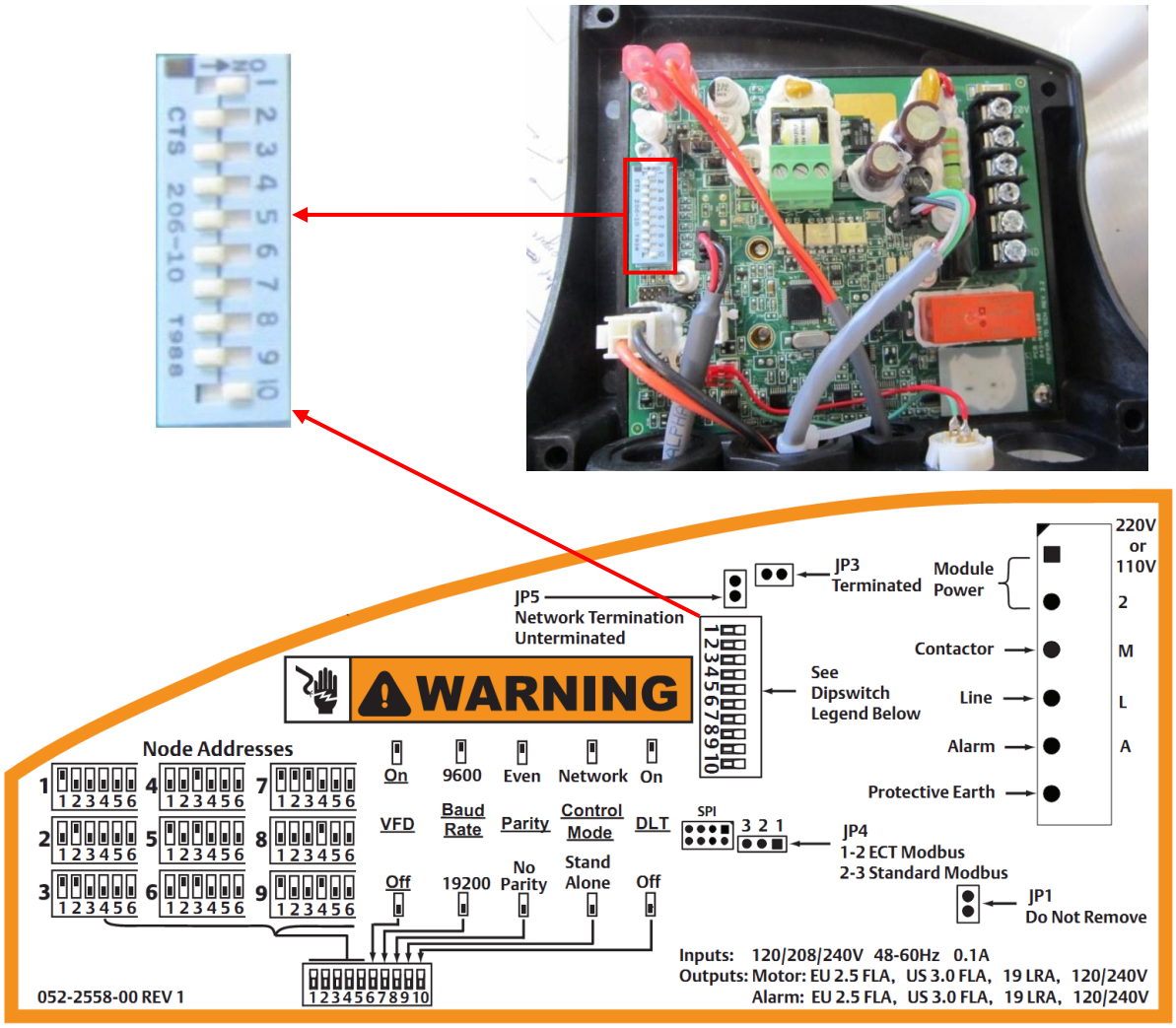

Figure 1: View of the circuit board and label for 10 DIP-switch Modbus

The information given in the following chapters is based on the operation of the Modbus new version (12 DIP-switch).

The input and holding register tables (Chapters 6.3.2 and 6.3.3) are valid for the 12 DIP-switch version but most of the listed commands are also valid for the 10 DIP-switch model. The following input register data are specific to the 10 DIP-switch and therefore are not listed in Chapter 6.3.2.

Address (Hex)	Contents	Qty	Min	Max	Unit	Data description
00E3	OAC of DLT fault	5	0	65535	1 time	One counter means one time
00E4	OAC of current sensor fault warning	6	0	65535	1 time	One counter means one time
00F9	OAC of motor overheat alarm	27	0	65535	1 time	One counter means one time

Table 1: Input register command specific to 10 DIP-switch module

3.2 Modbus with 12 DIP-switch – New version

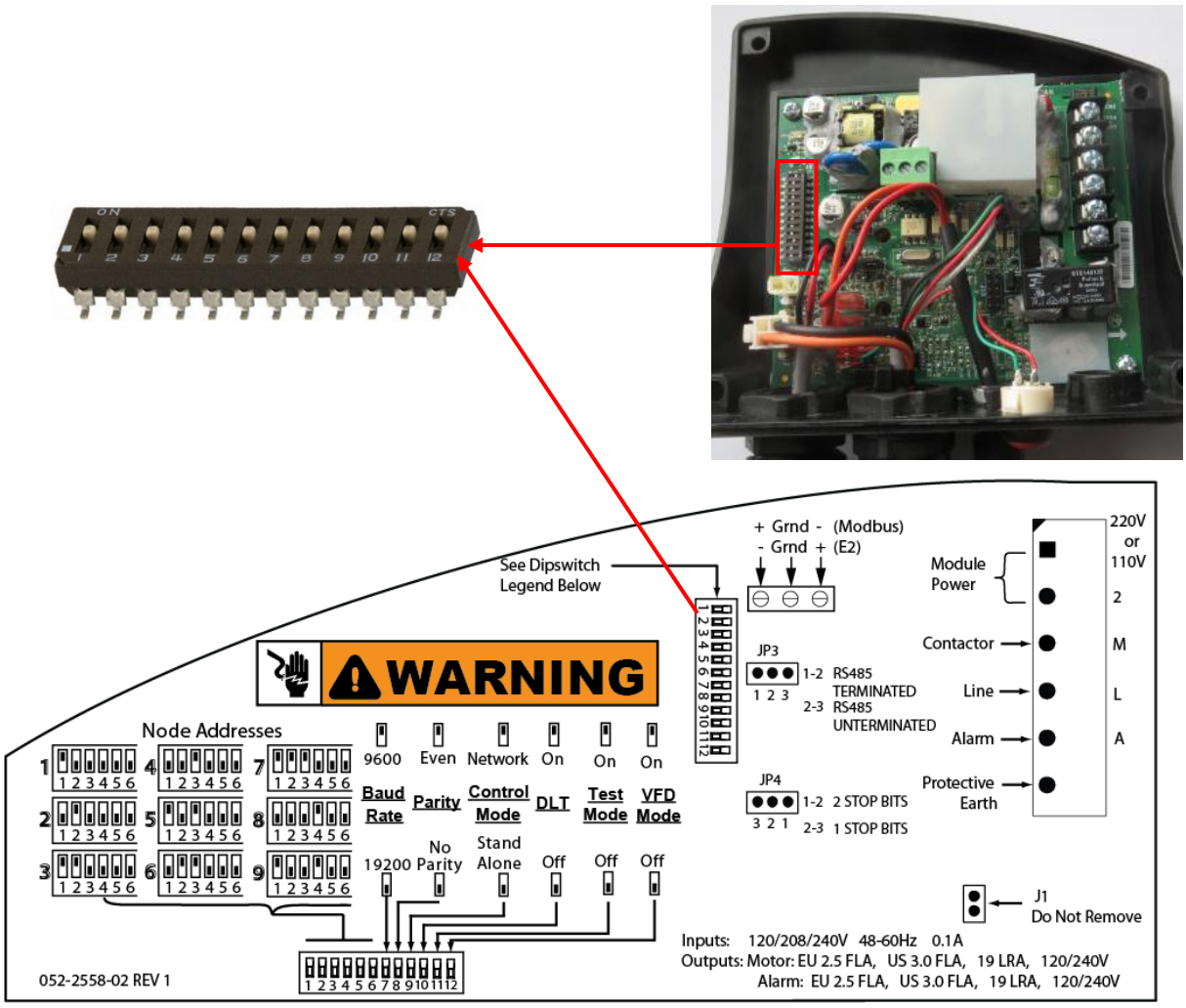

Figure 2: View of the circuit board and label for 10 DIP-switch Modbus

3.3 DIP-Switch functions

DIP-switch function		Factory setting	DIP-switch position	
			10 DIP-switch	12 DIP-switch
Node address for communication		On	1	1
Node address for communication		Off	2 to 5	2 to 6
Communications Baud rate Off: 19200 Baud	On: 9600 Baud	Off	7	7
Off: No parity	On: Even parity	Off	8	8
Off: Stand-alone mode	On: Network mode	Off	9	9
On: DLT enabled	Off: DLT disabled	On	10	10
Self-test function for oil functionality		TBD	---	11
On: VFD application	Off: Non VFD application	Off	6	12

Table 2: CoreSense Diagnostics DIP-switch setting

NOTE: **The following chapters are based on the operation of the present Modbus (12 DIP-switch). For the other Modbus type, please refer to Chapters 3.1 and 3.3 about the 10 DIP-switch model.**

4 Physical layer

This layer defines the hardware interface to the network.

4.1 Topology

Stream with CoreSense Diagnostics uses the “two-wire” configuration (two signal wires plus a ground). The standard configuration will be to directly wire to the cable forming a daisy-chain.

4.1.1 Wire used

The recommended wire is shielded twisted pair (22 AWG or **0.33 mm^2**). The shield is also used as the circuit ground.

Figure 3: Recommended communication wire (shielded twisted pair 22AWG or 0.33 mm^2)

4.1.2 Bus bias

All master devices must provide a means to bias the network. The recommended pull-down on the RS485 “+” output is a 511Ω resistor, but up to a 1KΩ resistor is acceptable. The recommended pull-up resistor on the RS485 “–“ output is a 511Ω resistor, but up to 1KΩ is acceptable. These bias resistors can either be always enabled or they can be enabled through jumpers. The bias is applied at one point in the network.

4.1.3 Termination

All master devices must provide a 150Ω termination resistor. The last slave in the network must have a 150Ω resistor for termination. In this module, there is a jumper provision to enable this termination. The jumper is located between positions 1-2 at “JP3” (see **Figure 4**). The last CoreSense module in the network shall be populated with a header on this jumper. For the other CoreSense modules in the network, this jumper needs not be populated.

4.2 Data signalling rates

4.2.1 Baud rate selection

The default communication port default settings are 19200, no parity, 8 data, 2 stop bits. The baud rate (19200 OR 9600) and parity (Even or No parity) is user-configurable through DIP-switch. The data length and stop bits are not configurable.

4.2.2 Parity selection

Emerson Climate Technologies Modbus communication parity is user-configurable (Even or No parity).

DIP-switch Nr. 8 On ➔ Even.

DIP-switch Nr. 8 Off ➔ No parity (default setting).

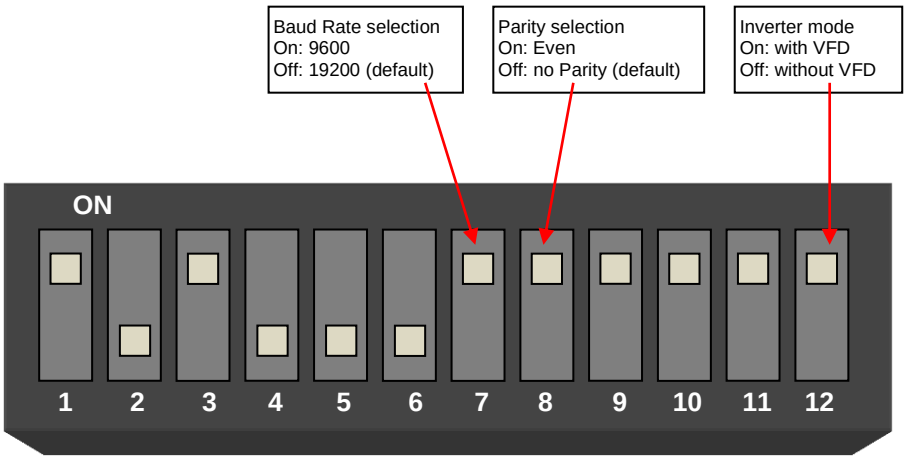

Figure 4: Baud rate and parity selection through 12 DIP-switches

4.3 Labelling

The module has a “COMM PORT” with the connector pins, labelled from left to right as:

- “ + GND – ”
- + = RS485 “A” circuit connection
- GND = Common
- – = RS485 “B” circuit connection

4.4 Connectors

A three-position screw cable connector is used for Modbus communication.

4.5 Wiring and connections

The Modbus wiring should be connected to module connector “+”, “GND”, “–“.

Figure 5: Modbus "Comm Port"

NOTE: **RS485 is polarity sensitive. "+" wires must connect to other "+" terminals and "–" wires must connect to other "–" terminals. The shield wire is connected to the centre terminal.**

5 Data Link layer

Modbus uses master/slave protocol where there is a single master device that initiates all messages. The Data Link layer defines the reliable transfer of a message transferred from the master to one or more slave devices and the reliable transfer of the response message (when the command message is sent to a single device). The CoreSense Diagnostics module is a slave in the network and the rack controller is the master.

5.1 Node address

The DIP-switch setting combination gives the node address. Combination positions 1 to 6 will be used to define a node address from 1 to 62. Positions 7 to 12 will be used for Baud rate, parity, network mode, discharge temperature protection, self-test mode, and VFD enable (Variable Frequency Drive).

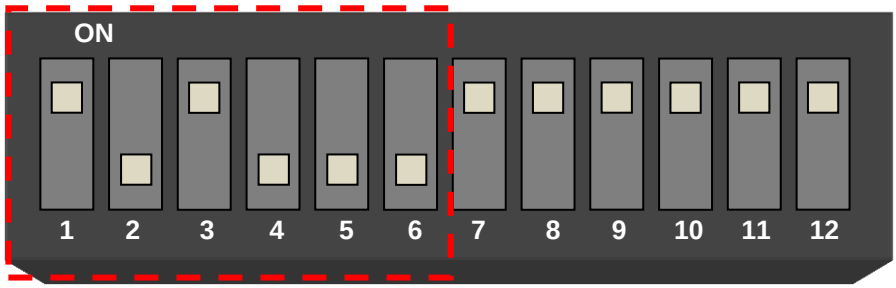

Figure 6: Switches 1 to 6 are used to set the module Modbus address

See **Table 1 and Tables 3 to 9** for more information about setting the DIP-switches.

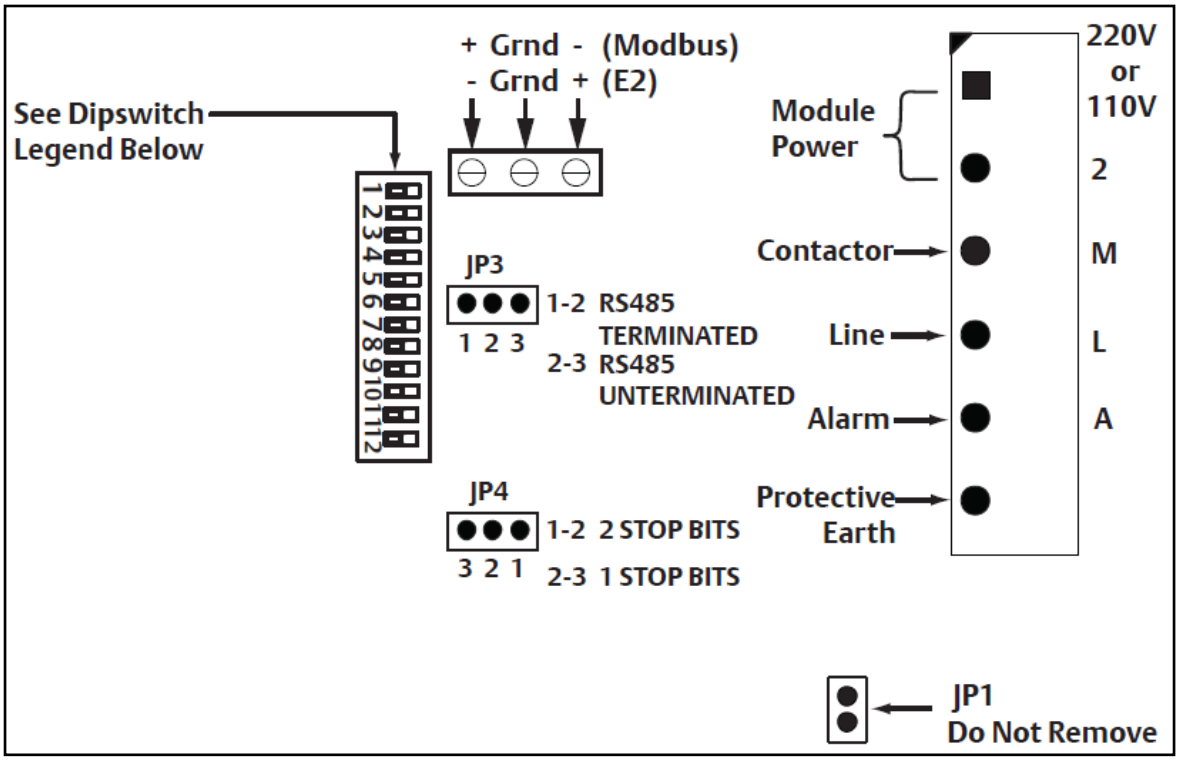

Figure 7: Default jumper settings on the CoreSense module

5.2 DIP-Switch settings

Node address	1	2	3	4	5	6
#1	On	Off	Off	Off	Off	Off
#2	Off	On	Off	Off	Off	Off
#3	On	On	Off	Off	Off	Off
#4	Off	Off	On	Off	Off	Off
#5	On	Off	On	Off	Off	Off
#6	Off	On	On	Off	Off	Off
#7	On	On	On	Off	Off	Off
#8	Off	Off	Off	On	Off	Off
#9	On	Off	Off	On	Off	Off
#10	Off	On	Off	On	Off	Off
#11	On	On	Off	On	Off	Off
#12	Off	Off	On	On	Off	Off
#13	On	Off	On	On	Off	Off
#14	Off	On	On	On	Off	Off
#15	On	On	On	On	Off	Off
#16	Off	Off	Off	Off	On	Off
#17	On	Off	Off	Off	On	Off
#18		On	Off	Off	On	Off
#19	On	On	Off	Off	On	Off
#20	Off	Off	On	Off	On	Off
#21	On	Off	On	Off	On	Off
#22	Off	On	On	Off	On	Off
#23	On	On	On	Off	On	Off
#24	Off	Off	Off	On	On	Off
#25	On	Off	Off	On	On	Off
#26	Off	On	Off	On	On	Off
#27	On	On	Off	On	On	Off
#28	Off	Off	On	On	On	Off
#29	On	Off	On	On	On	Off
#30	Off	On	On	On	On	Off
#31	Off	Off	Off	Off	On	Off
#32	Off	Off	Off	Off	Off	On

Node address	1	2	3	4	5	6
#32	Off	Off	Off	Off	Off	On
#33	On	Off	Off	Off	Off	On
#34	Off	On	Off	Off	Off	On
#35	On	On	Off	Off	Off	On
#36	Off	Off	On	Off	Off	On
#37	On	Off	On	Off	Off	On
#38	Off	On	On	Off	Off	On
#39	On	On	On	Off	Off	On
#40	Off	Off	Off	On	Off	On
#41	On	Off	Off	On	Off	On
#42	Off	On	Off	On	Off	On
#43	On	On	Off	On	Off	On
#44	Off	Off	On	On	Off	On
#45	On	Off	On	On	Off	On
#46	Off	On	On	On	Off	On
#47	On	On	On	On	Off	On
#48	Off	Off	Off	Off	On	On
#49	On	Off	Off	Off	On	On
#50	Off	On	Off	Off	On	On
#51	On	On	Off	Off	On	On
#52	Off	Off	On	Off	On	On
#53	On	Off	On	Off	On	On
#54	Off	On	On	Off	On	On
#55	On	On	On	Off	On	On
#56	Off	Off	Off	On	On	On
#57	On	Off	Off	On	On	On
#58	Off	On	Off	On	On	On
#59	On	On	Off	On	On	On
#60	Off	Off	On	On	On	On
#61	On	Off	On	On	On	On
#62	Off	On	On	On	On	On
#63	On	On	On	On	On	On

Table 3: Node address settings

Baud rate	7
19200	Off
9600	On

Table 3: Baud rate DIP-switch settings

Parity	8
None	Off
Even	On

Table 4: Parity DIP-switch settings

Mode	9
Stand-alone	Off
Network	On

Table 5: Network mode DIP-switch settings

Discharge temperature lockout	10
Disable	Off
Enable	On

Table 6: High discharge temp. protection DIP-switch settings

Oil functionality Self-test mode	11
Disable	Off
Enable	On

Table 7: Oil functionality test DIP Switch settings

VFD DIP-switch	12
Non VFD	Off
VFD	On

Table 8: VFD DIP-switch settings

5.3 RTU Transmission mode

The Modbus communication in the CoreSense Diagnostics module uses RTU mode. The default character framing is an 11-bit character as follows:

- 1 start bit
- 8 data bits
- 2 stop bits (or if “Even parity” is selected 1 stop bit and 1 parity bit)

A standard 2-byte CRC 16 is used for frame verification.

5.4 Response message timeout

As per the Modbus specification, each device can define its own maximum timeout for the response to be sent to a request. The maximum timeout for the module is one second.

6 Application layer

The Application layer defines the type and format of the messages that will be sent.

6.1 Available functions

Standard Modbus function codes supported by CoreSense Diagnostics module				
Switch no.	**Function code**	**Function name**	**Registers**	**Access**
1	0x04	Read input registers	Input registers	Read only
2	0x03	Read holding registers	Holding registers	Read / Write
3	0x06	Write single register	Holding registers	Read / Write
4	0x10	Write multiple register	Holding registers	Read / Write

Table 9: Standard Modbus function codes

6.2 Data types

Modbus requires that all multiple byte data be sent in Big Endian format (most significant byte to least significant byte).

6.3 Functions supported

6.3.1 Coil input status

The module does not support function call 0x2.

6.3.2 Input register (command 0x04), version 1.13

Address (Hex) Start	Address (Hex) End	Contents	Qty	Min	Max	Unit	Scale	Data Description
0000 000A 0010 001A	0009 000F 0019 001B	Division Name	28					"x"
001C 0020	001F 0021	Product Name	6					'x'
0022	0029	Product code	8					'x'
002A	0030	Control Module Version Number	7					'x'
0031	0037	Sensor Module Version Number	7					'x'
0077 007A	0079 007D	Seven Days of compressor run time	7	0	240	6 min.		7 days, compressor run time
007E 0080	007F 0084	Seven Days of compressor start times	7	0		1 time		7 days, compressor start times
0085	0086	Total Compressor Run Time	2	0	4294967295	h		One count means 1 hours
0087	0088	Total Compressor Starts	2	0	4294967295	start		One count means 1 start
0089	008A	Total Insufficient Oil Pressure Run Time	2	0	4294967295	h		One count means 1 hour
0097	009A	Bit Alarm Code Correspondence	4					Each bit represents a digital alarm. (64 bits). The bits are numbered from Bit 0 to Bit 63 Refer to Table 11 in Section 5.3.4.
009B 00A0	009F 00A4	Ten Most Recent Alarms	10					Alarm Id of ten most recent alarms
	00A5	Eight Days Alarm History of EEPROM Failure Warning	0	0	1			BIT0 - Today BIT1 - Today-1 …….. BIT7 - Today-7 0 - Not present 1 - Present
	00AA	Eight Days Alarm History of High Discharge Temp Fault	5	0	1			BIT0 - Today BIT1 - Today-1 …….. BIT7 - Today-7 0 - Not present 1 Present
	00AB	Eight Days Alarm History of Current Sensor Fault Warning	6	0	1			BIT0 - Today BIT1 - Today-1 …….. BIT7 - Today-7 0 - Not present 1 Present
	00AC	Eight Days Alarm History of Loss of Communication From Rack Controller To Control Module Warning	7	0	1			BIT0 - Today: BIT1 - Today-1 …….. BIT7 - Today-7 0 - Not present 1 Present
	00AD	Eight Days Alarm History of Loss of Communication From Sensor Module to Control Module Warning	8	0	1			BIT0 - Today BIT1 - Today-1 …….. BIT7 - Today-7 0 - Not present 1 Present
	00AE	Eight Days Alarm History of Insufficient Oil Pressure Warning	9	0	1			BIT0 - Today BIT1 - Today-1 …….. BIT7 - Today-7 0 - Not present 1 Present

00B2	Eight Days Alarm History of Sensor Module Failure Warning	13	0	1			BIT0 - Today BIT1 - Today-1 ……. BIT7 - Today-7: 0 - Not present 1 Present
00B4	Eight Days Alarm History of High Discharge Temperature Alarm	15	0	1			BIT0 - Today BIT1 - Today-1 …….. BIT7 - Today-7 0 - Not present 1 Present
00B6	Eight Days Alarm History of Locked Rotor Alert	17	0	1			BIT0 - Today BIT1 - Today-1 …….. BIT7 - Today-7 0 - Not present 1 Present
00B7	Eight Days Alarm History of Missing Phase Alert	18	0	1			BIT0 - Today BIT1 - Today-1 …….. BIT7 - Today-7 0 - Not present 1 Present
00B9	Eight Days Alarm History of Compressor Low Voltage Alert	20	0	1			BIT0 - Today BIT1 - Today-1 …….. BIT7 - Today-7 0 - Not present 1 Present
00BC	Eight Days Alarm History of Voltage Imbalance Alarm	23	0	1			BIT0 - Today BIT1 - Today-1 …….. BIT7 - Today-7 0 - Not present 1 Present
00C0	Eight Days Alarm History of Motor Overheat Alarm	27	0	1			BIT0 - Today BIT1 - Today-1 …….. BIT7 - Today-7) 0 - Not present 1 Present
00C1	Eight Days Alarm History of Protection Trip Alarm	28	0	1			BIT0 - Today BIT1 - Today-1 …….. BIT7 - Today-7 0 - Not present 1 Present
00C6	Eight Days Alarm History of High Discharge Temperature Lockout	33	0	1			BIT0 - Today BIT1 - Today-1 …….. BIT7 - Today-7 0 - Not present 1 Present
00C7	Eight Days Alarm History of Locked Rotor Lockout	35	0	1			BIT0 - Today BIT1 - Today-1 …….. BIT7 - Today-7 0 - Not present 1 Present
00C9	Eight Days Alarm History of Missing Phase Lockout	36	0	1			BIT0 - Today BIT1 - Today-1 …….. BIT7 - Today-7 0 - Not present 1 Present
00CD	Eight Days Alarm History of Insufficient Oil Pressure Lockout	40	0	1			BIT0 - Today BIT1 - Today-1 …….. BIT7 - Today-7 0 - Not present 1 to 42 - Present
00D1	Eight Days Alarm History of Control Module Failure Lockout	44	0	1			BIT0 - Today BIT1 - Today-1 …….. BIT7 - Today-7 0 - Not present 1 to 46 - Present

00D3	Eight Days Alarm History of Compressor Low Voltage Lockout	46	0	1			BIT0 - Today BIT1 - Today-1 …….. BIT7 - Today-7 0 - Not present 1 to 48 - Present
00DE	OAC of EEPROM Failure Warning	0	0	65535	1 time		One counter means one times
00E5	OAC of Loss of Communication From Rack Controller to Control Module Warning	7	0	65535	1 time		One counter means one times
00E6	OAC of Loss of Communication From Sensor Module to Control Module Warning	8	0	65535	1 time		One counter means one times
00E7	OAC of Insufficient Oil Pressure Warning	9	0	65535	1 time		One counter means one times
00EB	OAC of Sensor Module Failure Warning	13	0	65535	1 time		One counter means one times
00ED	OAC of High Discharge Temperature Alarm	15	0	65535	1 time		One counter means one times
00EF	OAC of Locked Rotor Alert	17	0	65535	1 time		One counter means one times
00F0	OAC of Missing Phase Alert	18	0	65535	1 time		One counter means one times
00F2	OAC of Compressor Low Voltage Alert	20	0	65535	1 time		One counter means one times
00F5	OAC of Voltage Imbalance Alarm	23	0	65535	1 time		One counter means one times
00FA	OAC of Protection Trip Alarm	28	0	65535	1 time		One counter means one times
00FF	OAC of High Discharge Temperature Lockout	33	0	65535	1 time		One counter means one times
0101	OAC of Locked Rotor Lockout	35	0	65535	1 time		One counter means one times
0102	OAC of Missing Phase Lockout	36	0	65535	1 time		One counter means one times
0106	OAC of Insufficient Oil Pressure Lockout	40	0	65535	1 time		One counter means one times
010A	OAC of Control Module Failure	44	0	65535	1 time		One counter means one times
010C	OAC of Compressor Low Voltage Lockout	46	0	65535	1 time		One counter means one times
0117	Current Status	1	0	1			0 = No Alarm 1= Alarm <u>Alert (/Warning) (1XX)</u> 101: Discharge Temperature Probe Failure 106: Discharge Temp Probe open 107: Discharge Temp Probe short 108: Current Sensor Fault 109: Loss of Communication From Rack Controller To Control Module 110: Loss of Communication From Sensor Module to Control Module 111: Insufficient Oil Pressure 115: Sensor Module Failure 117: Control Module Failure

0117	Current Status	1	0	1			Trip with Auto Reset (2XX) 200: High Discharge Line Temperature 202: Locked Rotor 203: Missing Phase 205: Compressor Low Voltage 208: Voltage Imbalance 212: Motor Overheat Lockout with Manual Reset (3XX) 300:High Discharge Temperature 302:Locked Rotor 303:Missing Phase 304:Phase Loss 307:Insufficient Oil Pressure 311:Control Module Failure 312:Compressor Low Voltage
011C	DIP-Switch_1	1	0	1			Communication Board DIP Switch: BIT15 - DS15 BIT14 - DS14 …… BIT1 - DS1 BIT0 - DS0 1 = ON 0 = OFF
0123	Input Status	1	0	1			BIT0 - Demand Status 1 = Present
			0	1			BIT1 - Compressor Running BIT2 - Injection Present BIT3 - Top Cap Thermistor installed BIT4 - 250 DTC valve thermistor installed BIT5 - TRUE if solenoid is open 1=TRUE 0=FALSE
			0	1			BIT6 - Operating Voltage 1 = 230V, 0 = 110V
			1	2			BIT7 - Line Frequency 1 = 50Hz 2 = 60Hz
0126	Output Status1	1	0	1			BIT3 - CrankCase Heater Status 0 = Open 1 = Closed
0127	Output Status2		0	1			BIT14 –Previous Reset Status 0 = Hard reset 1 = Soft reset
			0	1			BIT13 -Oil Pressure Status BIT12 -HPCO Status BIT11 -LPCO /Suction pressure Status 1 = Normal 0 = Trip
			0	1			BIT10 –PTC3 Status BIT9 -PTC2 Status BIT8 -PTC1 Status 0 = Normal 1= Trip
			0	1			BIT7 - Spare Input -1 Status BIT6 - Spare Input -2 Status BIT4 -StandAlone_Unloader_2 Command Status BIT3 -StandAlone_Unloader_1 Command Status BIT2 – Standalone Demand Status 0 = Not active 1 = Active
			0	1			BIT5- Wake up pushbutton status 0 = Not pressed 1 = Pressed
			0	1			BIT1 – Unloader2 Triac Short Circuit Protection Input Status BIT0 - Unloader1 Triac Short Circuit Protection Input Status 0 = Normal 1 = short circuit condition has happened
0129	Discharge Temperature Value	1	-70.0	585.35	°F		(Discharge temp sensor value/100)-70
012B	Compressor R Phase Voltage	1	0	655,35	V	1/100	(R Phase Compressor Voltage/100)
012C	Compressor Y Phase Voltage	1	0	655,35	V	1/100	(Y Phase Compressor Voltage/100)
012D	Compressor B Phase Voltage	1	0	655,35	V	1/100	(B Phase Compressor Voltage/100)

	0130	Compressor Current Y Phase	1	0	655,35	A	1/100	Current = Value / 100
	0133	LRA Peak Current	1	0	655,35	A	1/00	LRA Peak Current = Value / 100
0136	**0137**	Power Consumption	2	0	4294967 ,295	kW	1/1000	Power Consumption = Value / 1000
	0143	Module Stack Overflow Reset Counters	1	0	65535			
	0144	Module Stack Underflow Reset Counters	1	0	65535			
	0145	Module MCLK Reset Counters	1	0	65535			
	0146	Module BOR Reset Counters	1	0	65535			
	0147	Module WDT Reset Counters	1	0	65535			
	0148	Module RI Reset Counters	1	0	65535			
	0149	Module Unknown Reset Counters	1	0	65535			
	015A	T1 Stack Overflow Reset Counters	1	0	65535			
	015B	T1 Stack Underflow Reset Counters	1	0	65535			
	015C	T1 MCLK Reset Counters	1	0	65535			
	015D	T1 BOR Reset Counters	1	0	65535			
	015E	T1 WDT Reset Counters	1	0	65535			
	015F	T1 RI Reset Counters	1	0	65535			
	0160	T1 Unknown Reset Counters	1	0	65535			
0161	**0162**	T1 valid response counters	2	0	4294967 295			
0163	**0164**	T1 CRC error counters	2	0	4294967 295			
0165	**0166**	T1 frame error counters	2	0	4294967 295			
0167	**0168**	T1 total frame counters	2	0	4294967 295			
0173	**0174**	Total No. of Short Cycles	2	0	4294967 295	Cycle		One count means 1 cycle
0179	**017A**	Total CCH Run Hours	2	0	4294967 295	h		One counter means 1 hours
017B	**017C**	Total Alarm Run Hours	2	0	4294967 295	h		One count means 1 hours

Table 10: Module information

6.3.3 Holding register (command 0x03, 0x06, 0x10)

Address (Hex) Start	Address (Hex) Start	Contents	Qty	Min	Max	Unit	Default	Scale	Data Description
0000	0010	Customer Name	17						'x'
000A	000F								
0011	0014	Customer ID	4						'x'
0015	0024	Customer Location	16						'x'
001A	001F								
0025	0036	Compressor Model Number	18						'x'
002A	002F								
0037	0042	Compressor Serial Number	12						'x'
003A	003F								
0051	0059	Module Part Number	12						'x'
005A	005C								
005D	005F	Module Serial Number	12						'x'
0060	0069								
	0085	Alert Trigger Parameters Configuration	20	-70	585.35	°F	309	1/100	DLT temp trip set point value, Unit : 0.01°F Set point = (Word - 7000)/100(°F)
	0086			-70	585.35	°F	266	1/100	DLT temp trip reset point value, Unit : 0.01°F Reset point =(Word -7000)/100(°F)
	008C			0	65535	V	230		Compressor Nominal Voltage
	008D			0	65535	Hz	60		Compressor Nominal Frequency
	008E			2	8	%	5		Voltage Imbalance Setting 0x02 - 2% 0x03 - 3% 0x04 - 4% 0x05 - 5% 0x06 - 6% 0x07 - 7% 0x08 - 8% Others - NA
	00B4	Lockout Status Configuration1	1	0	1				BIT0 - High Discharge Temperature Lockout Status BIT3 - Miss Phase Lockout Status BIT5 - Rack Controller Lockout Status BIT6 - Part Winding Delay Lockout Status 1 - Enable 0 - Disable
	00D2	Sensor Module Required							0x01 – No Sensor Module is equipped 0x02 – Sensor Module is equipped

Table 11: Holding register

6.3.4 Status table

The current status of the CoreSense module can be read by using either register 0x117 (analog signal) or 0x97:0x9A (digital alarm). Please use only one of the 2 registers to read the current status of the module.

Status Table is used to decode the “module status” in Modbus address register 0x97:0x9A shown in **Table 11** in Chapter 6.3.2. The code sent by the module for status is a number that can be indexed into the table to decode the state of the module.

Register 0097:009A is showing less than 64 bits in the table below, because only the alarm IDs that belong to Stream CoreSense are shown. This register supports not only Stream CoreSense but also other Emerson CoreSense products (for example CoreSense in Scroll).

Bit number	Register 1	Register 2	Register 3	Register 4
BIT0	Normal running and fault temperature probe	Voltage imbalance trip	Control module failure lockout	
BIT1	Communication lost between current sensor and sensor module	Missing phase trip	Normal Off	
BIT2	Oil pressure warning	Locked rotor trip	Normal running	
BIT3	No communication to sensor module	Motor overhead trip	Anti-short cycle time delay	
BIT4	Hardware configuration mismatch	Low oil pressure lockout	Compressor low voltage trip lockout	
BIT5	No communication to E2	High discharge pressure lockout		
BIT6	High discharge temp trip	Locked rotor lockout		
BIT7	Compressor low voltage trip	Missing phase lockout		
BIT8	System trip			
BIT9	Short cycle warning			
BIT10	Open circuit warning			
BIT11	Reserve phase lockout			
BIT12	Welded contactor warning			
BIT13	Module low voltage trip			
BIT14	DLT fault warning			
BIT15	Current sensor fault warning			

Table 12: BIT alarm status table

Alarm ID	Module Status	Alarm ID	Module Status
7	Normal running & fault discharge temperature probe	24	Voltage imbalance trip
		28	Missing phase trip
12	Connection lost between current sensor and sensor module	31	Locked rotor trip
		32	Motor overheat trip
13	Insufficient oil pressure warning	37	Insufficient oil pressure lockout
16	No communication to sensor module	39	High discharge temperature lockout
17	Hardware configuration mismatch (module programmed to have a sensor module and it is not detected or module programmed not to have a sensor module and it is detected.)	41	Locked rotor lockout
		42	Missing phase lockout
		43	CoreSense diagnostics control module failure lockout
		44	Normal Off
18	No communication to rack controller	45	Normal running
19	High discharge temperature trip	46	Anti short cycle delay - time remaining
21	Compressor low voltage trip	54	Low voltage lockout

Table 13: Status table

7 Troubleshooting

If the communication module does not respond, here is a list of general troubleshooting tips:

1. Check the wiring connection. Ensure the wiring is correctly connected and the connector is not loose.
2. Check the power to the CoreSense module. Check the power supply line and ensure the power is on and the green LED is on.
3. Check the module network address. The address should match the address that the master has requested. The valid addresses are 1 to 31. “0” is not a valid address.
4. Check your master data format setting. Ensure the master node data format setting to: RTU mode, 1 start bit, 8 data bits, no parity bit, and 2 stop bits.
5. Check the master node baud rate setting. Set your master node baud rate as 19200 and then try to communicate with the module. If the module does not respond, then set to 9600 baud rate and try it again.

Any third party PC debugging tool can also be used by sending a query for getting the firmware version number.

The response indicates the version number as 1.01R00 (this number is only an example and may change according to models).

	Address	CMD	Start		Length		CRC	
Request for version number	08	04	00	00	00	07	50	95

The request and response is hex value.

	Address	CMD	Bytes															
Response	08	04	0E	00	32	00	2E	00	30	00	33	00	44	00	31	00	31	87	14