

# Modbus Integration Guidelines

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CoolMasterNet  
CooLinkNet  
CooLinkHub

Modbus Integration  
Guidelines



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## 1 Connection

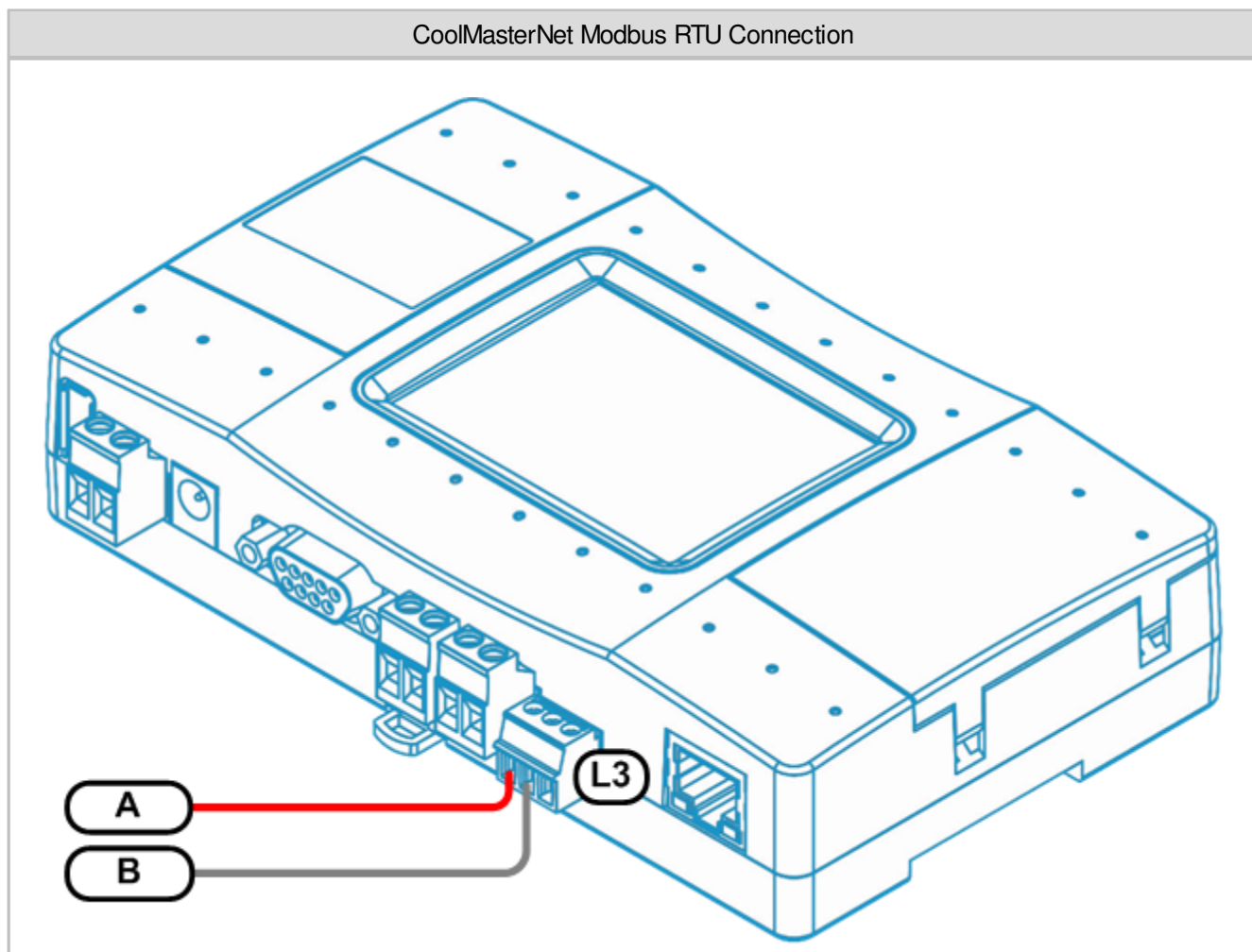
CoolAutomation devices support Modbus RTU and Modbus IP protocols with accordance to the Modbus Organization specifications listed below:

- MODBUS Application Protocol Specification
- MODBUS over Serial Line Specification and Implementation Guide
- MODBUS Messaging on TCP/IP Implementation Guide

Modbus RTU is supported by CoolMasterNet, CoolLinkNet and CoolLinkHub, Modbus IP is supported by CoolMasterNet and CoolLinkHub.

### 1.1 Modbus RTU Connection

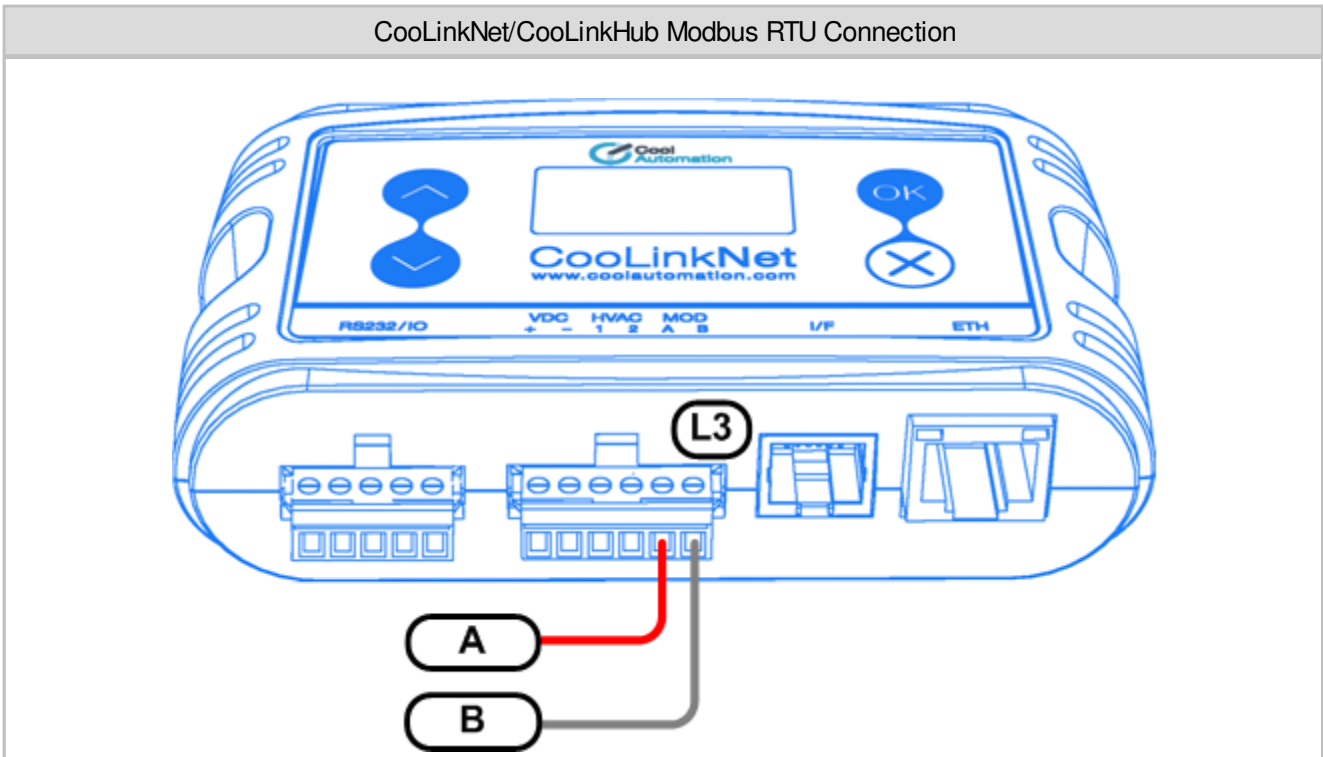
In Modbus RTU mode physical connection of the CoolAutomation devices is done over “Two-Wire” electrical interface in accordance with EIA/TIA-485 standard. Connection is made via 485-A and 485-B terminals. Ground wire connection is not mandatory but highly recommended.



In CoolMasterNet Line L3 is recommended for Modbus RTU connection, although Lines L4, L5, L6 and L7 can also be used for that purpose. Picture above shows connection to Line L3.



### CoolLinkNet/CoolLinkHub Modbus RTU Connection



In CoolLinkNet/CoolLinkHub only Line L3 can be used for Modbus RTU connection.

## 1.2 Modbus IP Connection

Modbus IP is supported in CoolMasterNet and CoolLinkHub devices. Device acts as a Modbus Server, communicating on the Ethernet TCP/IP network. Physical connection in this case is made via RJ45 Ethernet connector.



## 2 Configuration

CoolAutomation device must be properly configured to support Modbus functionality. Configuration is made via CoolAutomation's proprietary ASCII\_IF interface described in details in [Programmer Reference Manual \(PRM\)](#) document for the corresponding device.

It is allowed to have a number of simultaneous Modbus RTU and Modbus IP connections to the same device.

### 2.1 Modbus RTU Configuration

Modbus RTU interface module of the CoolAutomation device has to be activated by assigning appropriate communication Line. In CoolMasterNet it is highly recommended to use Line L3, although it is possible to use any of the L4, L5, L6, L7 lines. In CoolLinkNet and CoolLinkHub Line L3 usage for Modbus RTU is mandatory.

CoolMasterNet Modbus RTU activation:

```
>line type L3 CG5
OK, Boot Required!
```

CoolLinkNet/CoolLinkHub Modbus RTU activation:

```
>line type L3 CLMB
OK, Boot Required!
```

To check if Modbus RTU module is already activated and read it's parameters, including Slave Address, `line` command should be used:

CoolMasterNet:

```
>line
L1: DK Master U00/G00 myid:0B
Tx:2/2 Rx:2/2 TO:0/0 CS:0/0 Co1:0/0 NAK:0/0
L2: Unused
Tx:0/0 Rx:0/0 TO:0/0 CS:0/0 Co1:0/0 NAK:0/0
L3: CG5 Modbus Address:0x50(80) 9600_8N1
Tx:0/0 Rx:0/0 TO:0/0 CS:0/0 Co1:0/0 NAK:0/0
L4: Unused
Tx:0/0 Rx:0/0 TO:0/0 CS:0/0 Co1:0/0 NAK:0/0
L5: Unused
Tx:0/0 Rx:0/0 TO:0/0 CS:0/0 Co1:0/0 NAK:0/0
L6: Unused
Tx:0/0 Rx:0/0 TO:0/0 CS:0/0 Co1:0/0 NAK:0/0
L7: Unused
Tx:0/0 Rx:0/0 TO:0/0 CS:0/0 Co1:0/0 NAK:0/0
L8: Unused
Tx:0/0 Rx:0/0 TO:0/0 CS:0/0 Co1:0/0 NAK:0/0
OK
```

CoolLinkNet/CoolLinkHub:

```
>line
L1: Unused
Tx:0/0 Rx:0/0 TO:0/0 CS:0/0 Co1:0/0 NAK:0/0
L2: Unused
Tx:0/0 Rx:0/0 TO:0/0 CS:0/0 Co1:0/0 NAK:0/0
L3: CLMB Address:0x50(80) 9600_8N1
Tx:0/0 Rx:0/0 TO:0/0 CS:0/0 Co1:0/0 NAK:0/0
L4: MIM2 Slave U00/G00 Not Connected
Tx:0/0 Rx:0/0 TO:0/0 CS:0/0 Co1:0/0 NAK:0/0
L5: Unused
Tx:0/0 Rx:0/0 TO:0/0 CS:0/0 Co1:0/0 NAK:0/0
OK
```

Next: For CoolMasterNet and CoolLinkHub VA's have to be configured to use Modbus RTU module. See: [VA's Configuration](#).

#### 2.1.1 Modbus Slave Address

Modbus Slave Address can be queried with `line` command or changed with `line myid` command. In the example below the new Slave Address will become 0x51 (81 decimal) after power reset:

```
>line myid L3 51
OK, Boot Required!
```

The default (factory set) Modbus Slave Address for CoolAutomation devices is 0x50 hexadecimal (80 decimal).

#### 2.1.2 Modbus RTU Frame Format

The default Modbus RTU frame format in CoolAutomation devices is 9600\_8N1:

Baud Rate	9600 bps
Data Bits	8
Parity	None
Stop Bits	1



Frame format parameters are configurable with `line baud` command:

```
>line baud L3 19200_8N2
OK, Boot Required!
```

New frame format will be 19200 bps, 8 data bits, no parity, 2 stop bits.

## 2.2 Modbus IP Configuration

Modbus IP is supported in CoolMasterNet and CoolLinkHub devices. CoolLinkNet has no Modbus IP support. Modbus IP module is activated with below command:

```
>modbus IP enable
OK, Boot Required!
```

Modbus IP server is started by device only after it establishes an Ethernet link and gets proper IP address (dynamic via DHCP or static). Ethernet and IP management is done with `ifconfig` command that is out of the spec of this document.

To query Modbus IP status use `modbus` command without parameters:

```
>modbus
ModBus IP      : enabled
server port    : 502
CG4/5 ignore   : none
OK
```

The default TCP/IP port number used by Modbus IP Server is 502. This is "well-known" Ethernet port assigned for the Modbus TCP/IP protocol. If required port number can be changed (new port number will be 503):

```
>modbus server port 503
OK, Boot Required!
```

Next: VA's have to be configured to use Modbus IP Server. See: [VA's Configuration](#).

## 2.3 VA's Configuration

VA's are used in CoolMasterNet and CoolLinkHub devices. For CoolLinkNet device this chapter is not applicable. VA's -Virtual Addresses are used in order to simplify translation of the Indoor Unit identifier/number - UID into addresses of related Modbus objects: holding registers, input registers, coils and discrete inputs.

UID is a string in format **Ln.XYY**. For Example:

**L1.102** - Indoor Unit 102 on line L1

**L2.003** - Indoor Unit 003 on line L2

List of UID's detected (visible) by CoolAutomation device can be retrieved with `ls` command.

```
>ls
L1.100 ON 19C 30C High Fan OK # 0
L1.101 OFF 28C 23C High Cool OK - 0
```

Each UID can have none, one or a number of associated VA's. VA's are plain numbers starting from 1. Device can automatically allocate and associate VA's with existing (visible by `ls` command) UID's:

```
>va auto
OK
```

To query allocated VA's use `va` command without parameters:

```
>va
INDOORS
```



```
L1.100 --> 0001 [Hex: 0x0011 | Dec: 00017]
L1.101 --> 0002 [Hex: 0x0021 | Dec: 00033]
OK
```

VA reporting string has following fields:

UID	Associated VA	Base Address Hex	Base Address Decimal
L1.100	0001	0x0011	00017

Base Address is a starting address of the Modbus objects block related to VA and it's UID. Any operations with Indoor Unit referenced by UID (query or change status) are made with Modbus objects from that block. Size of the Modbus objects block for Indoor Unit is 16 addresses. Content of the Modbus objects block is described in [CoolMasterNet Tables](#).

Base Address is calculated as:  $Base\ Address = VA * 16 + 1$

Below example shows relation between UID, VA, Base Address and Modbus objects

UID	VA	Base Address	Modbus Objects Block			
			Discrete Inputs	Coils	Input Registers	Holding Registers
L1.100	0001	0x0011	----> 0x0011	0x0011	0x0011	0x0011
			...	...	...	...
			0x0020	0x0020	0x0020	0x0020
L1.101	0002	0x0021	----> 0x0021	0x0021	0x0021	0x0021
			...	...	...	...
			0x0030	0x0030	0x0030	0x0030

VA's can be allocated or deallocated (deleted) all together or separately. As shown above for automatic VA's allocation `va auto` command is used. It is possible to allocate VA for specific UID. For example, allocate VA 0004 for UID L1.102:

```
>va + L1.102 0004
OK
```

In this case UID does not have to be detected (visible) by CoolAutomation device at the VA allocation time. It is allowed to allocate a number of VA's for any given UID.

To delete all allocated VA's:

```
>va delall
OK
```

Specific VA can also be deleted (below command will delete VA 0004):

```
>va - 0004
OK
```

Alternatively all VA's associated with specific UID can be deleted (below command will delete all VA's associated with UID L1.102):

```
>va - L1.102
OK
```

Once VA's are allocated Modbus RTU and Modbus IP can be properly used to access Indoor Unit parameters via associated VA's.



## 3 Modbus Tables

### Supported Modbus Exception Codes

Exception Code	Exception Name
0x01 (01)	Illegal Function
0x02 (02)	Illegal Data Address
0x03 (03)	Illegal Data Value
0x04 (04)	Server Device Failure
0x05 (05)	Acknowledgment
0x06 (06)	Server Device Busy
0x0A (10)	Gateway Path Unavailable

### 3.1 CoolMasterNet Modbus Tables

#### Supported Modbus functions

Function Code		Function Definition
Dec	Hex	
1	0x01	Read Coils
2	0x02	Read Discrete Inputs
3	0x03	Read Holding Registers
4	0x04	Read Input Register
5	0x05	Write Single Coil
6	0x06	Write Single Register
15	0x0F	Write Single Coil
16	0x10	Write Multiple Registers





**Indoor Unit Modbus objects block**

Base Address	Holding Registers	Input Registers	Coils	Discrete Inputs			
+0	<p style="text-align: center;">Operation Mode</p> <p>0-Cool    4-HAUX    8-VAM Auto            1-Heat    5-Fan        9-VAM Bypass            2-Auto    6-HH         10-VAM Heat Exc            3-Dry     11-VAM Normal</p>	<p style="text-align: center;">UID Ln.XYY</p> <p>Bits    Bits    Bits            15..12 11..8    7..0            Ln     X     YY</p>	<p style="text-align: center;">On/Off</p> <p>0-OFF 1-ON</p>	<p style="text-align: center;">Therm_ON/Demand Status</p>			
+1	<p style="text-align: center;">Fan Speed</p> <p>0-Low    3-Auto            1-Med    4-Top        7-VAM Super Hi            2-High   5-Very Lo    8-VAM Lo FreshUp               9-VAM Hi FreshUp</p>	<p style="text-align: center;">Room Temperature x10 °C</p>	<p style="text-align: center;">Filter Sign</p>	<p style="text-align: center;">Indoor Communication Failure (Indoor disconnected)</p>			
+2	<p style="text-align: center;">Set Temperature x10 °C</p>	<p style="text-align: center;">HVAC Malfunction Code String<sup>2</sup> First two characters</p>	<p style="text-align: center;">External Terminals Status (Read Only) 0-Open, 1-Closed (short)</p>	Reserved			
+3	<p style="text-align: center;">On/Off</p> <p>0-OFF 1-ON</p>	<p style="text-align: center;">HVAC Malfunction Code String<sup>2</sup> Last two characters</p>	<p style="text-align: center;">Inhibit<sup>4</sup></p>				
+4	<p style="text-align: center;">Filter Sign</p>	Reserved	Reserved				
+5	<p style="text-align: center;">Swing</p> <p>0-Vertical    1-30 deg    5-Auto            4-Horizontal 2-45 deg    6-OFF               3-60 deg</p>						
+6	<p style="text-align: center;">Room Temperature x10 °C (Read Only<sup>5</sup>)</p>						
+7	<p style="text-align: center;"><a href="#">HVAC Malfunction Code</a> (Read Only)</p>						
+8	<p style="text-align: center;">Local Wall Controller Lock Bits<sup>3</sup></p> <p>LSB            Bit 0 - Inhibit On/Off control            Bit 1 - Inhibit Mode control            Bit 2 - Inhibit Set Temperature control            Bit 7 - Inhibit All control operations</p>						
+9	<p style="text-align: center;">Set Temperature Limits<sup>1</sup> v0.4.4</p>					<p style="text-align: center;">Digital Output 1</p>	<p style="text-align: center;">Digital Input 1</p>
+10 0xA	Reserved					<p style="text-align: center;">Digital Output 2</p>	<p style="text-align: center;">Digital Input 2</p>
+11 0xB			<p style="text-align: center;">Digital Output 3</p>		<p style="text-align: center;">Digital Input 3</p>		
+12 0xC			<p style="text-align: center;">Digital Output 4</p>	<p style="text-align: center;">Digital Input 4</p>			
+13 0xD		<p style="text-align: center;">Analog Input 1</p>	<p style="text-align: center;">Digital Output 5</p>	<p style="text-align: center;">Digital Input 5</p>			
+14 0xE		<p style="text-align: center;">Analog Input 2</p>	<p style="text-align: center;">Digital Output 6</p>	<p style="text-align: center;">Digital Input 6</p>			
+15 0xF			<p style="text-align: center;">Reserved</p>	<p style="text-align: center;">Reserved</p>	<p style="text-align: center;">Reserved</p>		

**<sup>1</sup> Set Temperature Limits Encoding**

MSB	LSB
Bits 15..8	Bits 7..0
High Limit x2	Low Limit x2

For example, 0x4020 means



High Limit =  $0x40/2 = 32$ (decimal)

Low Limit =  $0x20/2 = 16$ (decimal)

Zero value of High Limit or Low Limit means that corresponding limit is not in use.

## 2 HVAC Malfunction Code String Encoding

This parameter is a HVAC malfunction code in string format, same as reported by `1s` command. Here are some examples:

Malfunction Code	String	Input Register Values
0	"OK_..."	0x4F4B, 0x2020
6608	"6608"	0x3636, 0x3038

## 3 Locks compatibility

Lock type	Compatible HVAC Model	Notes
Inhibit On/Off control	DK, SA, TO, PN	
Inhibit Mode control	DK, SA, TO, PN, MD, TR, KT, CG	v 0.4.9
Inhibit Set Temperature control	DK, SA, TO, PN	
Inhibit All control operations	HT, MD, TR, KT, CG	v 0.4.7

## 4 Inhibit

Writing this coil activates or deactivates (according to value 1 or 0) inhibit of the indoor unit ON operation. Upon inhibit activation current ON/OFF status of the indoor unit is stored and indoor unit is unconditionally turned OFF after about 8s delay. Indoor unit will be forced OFF until inhibit deactivation. On inhibit deactivation indoor unit will be turned ON if ON status was previously stored at inhibit activation. This function is oriented to work with window sensor to prevent HVAC operation while window is open.

## 5 Writing Room Temperature Holding Register

For some HVAC models (ME,SI,CH,EL,GRNS) it is possible to write this holding register to suggest room temperature to related indoor unit. This functionality is similar to `feed` command described in PRM document.

### 3.1.1 Special Devices

- PAC YG66

This device supports Digital Inputs 1..6 and Digital Outputs 1..6 accessed via corresponding Coils and Discrete Inputs listed in "**Indoor Unit Modbus objects block**" table.

- PAC YG63

This device supports Analog Inputs 1,2 accessed via corresponding Inputs Registers listed in "**Indoor Unit Modbus objects block**" table. The actual Analog Input value should be calculated as

$$\text{Analog Input Value} = \text{Input Register Value} / 10$$

For example if temperature sensor is connected to Analog Input 1 of PAC YG63 and Analog Input 1 Input Register is read as 275 the temperature is  $275/10 = 27.5$

## 3.2 CoolLinkNet Modbus Tables

### Supported Modbus functions

Function Code		Function Definition
Dec	Hex	
3	0x03	Read Holding Registers
6	0x06	Write Single Register
16	0x10	Write Multiple Registers



Holding Reg Address*		Description	Read Write	Required**		Notes
Hex	Dec			Version	Model	
CooLinkNet Internals						
0001	1	CooLinkNet Version	R			Major*100 + Minor*10 + SubMinor
0002	2	CooLinkNet S/N	R			Lower 16 bit
0003	3	CooLinkNet Model	R			Two ASCII characters
0004	4	Modbus Address	R W			Modbus Address change is effective only after reset
0005	5	Reset	W			1 - Enter Boot mode CooLinkNet does not respond to the write request to this register 2 - Reset
0010	16	Internal State <ul style="list-style-type: none"> <li>0 - Not Connected to RC line</li> <li>1 - Connecting</li> <li>2 - Connected as single RC</li> <li>3 - Connected as Master RC. Detected Slave RC</li> <li>4 - Connected as Slave RC</li> </ul>	R			
0011	17	0 - Master Mode (default) 1 - Slave Mode	R W	0.0.4		
0021	33	UID	R			MSB - X, LSB - YY
Indoor Status and Control						
0100	256	On/Off 0-Off, 1-On	R W			
0101	257	Operation Mode <ul style="list-style-type: none"> <li>0-Cool</li> <li>1-Heat</li> <li>2-Auto</li> <li>3-Dry</li> <li>4-HAUX</li> <li>5-Fan</li> </ul>	R W			
0102	258	Fan Speed <ul style="list-style-type: none"> <li>0-Low</li> <li>1-Med</li> <li>2-High</li> <li>3-Auto</li> <li>4-Top</li> </ul>	R W			
0103	259	Set Point °C	R W			
0104	260	Failure Code	R			
0105	261	Indoor Ambient Temperature °C	R			MSB - Integer Part LSB - Fraction Part * 0.01
0110	272	Feed Temperature °C	R W	0.2.4		0xFFFF - disable feed

\* If Version or Model is not specified, it means that register is supported in any CooLinkNet version and/or model.

### 3.3 HVAC Malfunction Codes

The value read from "HVAC Malfunction Code" holding register can be translated into native malfunction code applicable for specific HVAC manufacturer. In most cases that value and native code are equal but for some HVAC models translation to alphanumeric representation required. Following tables can be used for such translation.

- Zero value (0x0000) means that there is no HVAC malfunction.
- 0xFFFF hexadecimal (65535 decimal) value indicates that communication with indoor unit was lost.

HVAC Type	Native Malfunction Code Format
DK	XX (see <a href="#">DK type HVAC malfunction codes translation table</a> )
PN, SA, TO	Xnn (see <a href="#">PN, SA, TO type HVAC malfunction codes translation table</a> )



ME	nnnn decimal
GR	HH hexadecimal (low nibble or high nibble)
LG	nn decimal
MG,TR,KT,CG	EH if code == 0x1H PH if code == 0x2H H# if code == 0x3H
SM	nnn decimal
Others	HH hexadecimal

**DK type HVAC malfunction codes translation table**

000 (0x00) - OK	001 (0x01) - 01	002 (0x02) - 02	003 (0x03) - 03
004 (0x04) - 04	005 (0x05) - 05	006 (0x06) - 06	007 (0x07) - 07
008 (0x08) - 08	009 (0x09) - 09	010 (0x0A) - 0A	011 (0x0B) - 0H
012 (0x0C) - 0C	013 (0x0D) - 0J	014 (0x0E) - 0E	015 (0x0F) - 0F
016 (0x10) - A0	017 (0x11) - A1	018 (0x12) - A2	019 (0x13) - A3
020 (0x14) - A4	021 (0x15) - A5	022 (0x16) - A6	023 (0x17) - A7
024 (0x18) - A8	025 (0x19) - A9	026 (0x1A) - AA	027 (0x1B) - AH
028 (0x1C) - AC	029 (0x1D) - AJ	030 (0x1E) - AE	031 (0x1F) - AF
032 (0x20) - C0	033 (0x21) - C1	034 (0x22) - C2	035 (0x23) - C3
036 (0x24) - C4	037 (0x25) - C5	038 (0x26) - C6	039 (0x27) - C7
040 (0x28) - C8	041 (0x29) - C9	042 (0x2A) - CA	043 (0x2B) - CH
044 (0x2C) - CC	045 (0x2D) - CJ	046 (0x2E) - CE	047 (0x2F) - CF
048 (0x30) - E0	049 (0x31) - E1	050 (0x32) - E2	051 (0x33) - E3
052 (0x34) - E4	053 (0x35) - E5	054 (0x36) - E6	055 (0x37) - E7
056 (0x38) - E8	057 (0x39) - E9	058 (0x3A) - EA	059 (0x3B) - EH
060 (0x3C) - EC	061 (0x3D) - EJ	062 (0x3E) - EE	063 (0x3F) - EF
064 (0x40) - H0	065 (0x41) - H1	066 (0x42) - H2	067 (0x43) - H3
068 (0x44) - H4	069 (0x45) - H5	070 (0x46) - H6	071 (0x47) - H7
072 (0x48) - H8	073 (0x49) - H9	074 (0x4A) - HA	075 (0x4B) - HH
076 (0x4C) - HC	077 (0x4D) - HJ	078 (0x4E) - HE	079 (0x4F) - HF
080 (0x50) - F0	081 (0x51) - F1	082 (0x52) - F2	083 (0x53) - F3
084 (0x54) - F4	085 (0x55) - F5	086 (0x56) - F6	087 (0x57) - F7
088 (0x58) - F8	089 (0x59) - F9	090 (0x5A) - FA	091 (0x5B) - FH
092 (0x5C) - FC	093 (0x5D) - FJ	094 (0x5E) - FE	095 (0x5F) - FF
096 (0x60) - J0	097 (0x61) - J1	098 (0x62) - J2	099 (0x63) - J3
100 (0x64) - J4	101 (0x65) - J5	102 (0x66) - J6	103 (0x67) - J7
104 (0x68) - J8	105 (0x69) - J9	106 (0x6A) - JA	107 (0x6B) - JH
108 (0x6C) - JC	109 (0x6D) - JJ	110 (0x6E) - JE	111 (0x6F) - JF
112 (0x70) - L0	113 (0x71) - L1	114 (0x72) - L2	115 (0x73) - L3
116 (0x74) - L4	117 (0x75) - L5	118 (0x76) - L6	119 (0x77) - L7
120 (0x78) - L8	121 (0x79) - L9	122 (0x7A) - LA	123 (0x7B) - LH
124 (0x7C) - LC	125 (0x7D) - LJ	126 (0x7E) - LE	127 (0x7F) - LF
128 (0x80) - P0	129 (0x81) - P1	130 (0x82) - P2	131 (0x83) - P3
132 (0x84) - P4	133 (0x85) - P5	134 (0x86) - P6	135 (0x87) - P7



136 (0x88) - P8	137 (0x89) - P9	138 (0x8A) - PA	139 (0x8B) - PH
140 (0x8C) - PC	141 (0x8D) - PJ	142 (0x8E) - PE	143 (0x8F) - PF
144 (0x90) - U0	145 (0x91) - U1	146 (0x92) - U2	147 (0x93) - U3
148 (0x94) - U4	149 (0x95) - U5	150 (0x96) - U6	151 (0x97) - U7
152 (0x98) - U8	153 (0x99) - U9	154 (0x9A) - UA	155 (0x9B) - UH
156 (0x9C) - UC	157 (0x9D) - UJ	158 (0x9E) - UE	159 (0x9F) - UF
160 (0xA0) - M0	161 (0xA1) - M1	162 (0xA2) - M2	163 (0xA3) - M3
164 (0xA4) - M4	165 (0xA5) - M5	166 (0xA6) - M6	167 (0xA7) - M7
168 (0xA8) - M8	169 (0xA9) - M9	170 (0xAA) - MA	171 (0xAB) - MH
172 (0xAC) - MC	173 (0xAD) - MJ	174 (0xAE) - ME	175 (0xAF) - MF
176 (0xB0) - 30	177 (0xB1) - 31	178 (0xB2) - 32	179 (0xB3) - 33
180 (0xB4) - 34	181 (0xB5) - 35	182 (0xB6) - 36	183 (0xB7) - 37
184 (0xB8) - 38	185 (0xB9) - 39	186 (0xBA) - 3A	187 (0xBB) - 3H
188 (0xBC) - 3C	189 (0xBD) - 3J	190 (0xBE) - 3E	191 (0xBF) - 3F
192 (0xC0) - 40	193 (0xC1) - 41	194 (0xC2) - 42	195 (0xC3) - 43
196 (0xC4) - 44	197 (0xC5) - 45	198 (0xC6) - 46	199 (0xC7) - 47
200 (0xC8) - 48	201 (0xC9) - 49	202 (0xCA) - 4A	203 (0xCB) - 4H
204 (0xCC) - 4C	205 (0xCD) - 4J	206 (0xCE) - 4E	207 (0xCF) - 4F
208 (0xD0) - 50	209 (0xD1) - 51	210 (0xD2) - 52	211 (0xD3) - 53
212 (0xD4) - 54	213 (0xD5) - 55	214 (0xD6) - 56	215 (0xD7) - 57
216 (0xD8) - 58	217 (0xD9) - 59	218 (0xDA) - 5A	219 (0xDB) - 5H
220 (0xDC) - 5C	221 (0xDD) - 5J	222 (0xDE) - 5E	223 (0xDF) - 5F
224 (0xE0) - 60	225 (0xE1) - 61	226 (0xE2) - 62	227 (0xE3) - 63
228 (0xE4) - 64	229 (0xE5) - 65	230 (0xE6) - 66	231 (0xE7) - 67
232 (0xE8) - 68	233 (0xE9) - 69	234 (0xEA) - 6A	235 (0xEB) - 6H
236 (0xEC) - 6C	237 (0xED) - 6J	238 (0xEE) - 6E	239 (0xEF) - 6F
240 (0xF0) - ?0	241 (0xF1) - ?1	242 (0xF2) - ?2	243 (0xF3) - ?3
244 (0xF4) - ?4	245 (0xF5) - ?5	246 (0xF6) - ?6	247 (0xF7) - ?7
248 (0xF8) - ?8	249 (0xF9) - ?9	250 (0xFA) - ?A	251 (0xFB) - ?H
252 (0xFC) - ?C	253 (0xFD) - ?J	254 (0xFE) - ?E	255 (0xFF) - ?F

**PN, SA, TO type HVAC malfunction codes translation table**

000 (0x00) - OK	001 (0x01) - A01	002 (0x02) - A02	003 (0x03) - A03
004 (0x04) - A04	005 (0x05) - A05	006 (0x06) - A06	007 (0x07) - A07
008 (0x08) - A08	009 (0x09) - A09	010 (0x0A) - A10	011 (0x0B) - A11
012 (0x0C) - A12	013 (0x0D) - A13	014 (0x0E) - A14	015 (0x0F) - A15
016 (0x10) - A16	017 (0x11) - A17	018 (0x12) - A18	019 (0x13) - A19
020 (0x14) - A20	021 (0x15) - A21	022 (0x16) - A22	023 (0x17) - A23
024 (0x18) - A24	025 (0x19) - A25	026 (0x1A) - A26	027 (0x1B) - A27
028 (0x1C) - A28	029 (0x1D) - A29	030 (0x1E) - A30	031 (0x1F) - A31
032 (0x20) - C00	033 (0x21) - C01	034 (0x22) - C02	035 (0x23) - C03
036 (0x24) - C04	037 (0x25) - C05	038 (0x26) - C06	039 (0x27) - C07



040 (0x28) - C08	041 (0x29) - C09	042 (0x2A) - C10	043 (0x2B) - C11
044 (0x2C) - C12	045 (0x2D) - C13	046 (0x2E) - C14	047 (0x2F) - C15
048 (0x30) - C16	049 (0x31) - C17	050 (0x32) - C18	051 (0x33) - C19
052 (0x34) - C20	053 (0x35) - C21	054 (0x36) - C22	055 (0x37) - C23
056 (0x38) - C24	057 (0x39) - C25	058 (0x3A) - C26	059 (0x3B) - C27
060 (0x3C) - C28	061 (0x3D) - C29	062 (0x3E) - C30	063 (0x3F) - C31
064 (0x40) - E00	065 (0x41) - E01	066 (0x42) - E02	067 (0x43) - E03
068 (0x44) - E04	069 (0x45) - E05	070 (0x46) - E06	071 (0x47) - E07
072 (0x48) - E08	073 (0x49) - E09	074 (0x4A) - E10	075 (0x4B) - E11
076 (0x4C) - E12	077 (0x4D) - E13	078 (0x4E) - E14	079 (0x4F) - E15
080 (0x50) - E16	081 (0x51) - E17	082 (0x52) - E18	083 (0x53) - E19
084 (0x54) - E20	085 (0x55) - E21	086 (0x56) - E22	087 (0x57) - E23
088 (0x58) - E24	089 (0x59) - E25	090 (0x5A) - E26	091 (0x5B) - E27
092 (0x5C) - E28	093 (0x5D) - E29	094 (0x5E) - E30	095 (0x5F) - E31
096 (0x60) - F00	097 (0x61) - F01	098 (0x62) - F02	099 (0x63) - F03
100 (0x64) - F04	101 (0x65) - F05	102 (0x66) - F06	103 (0x67) - F07
104 (0x68) - F08	105 (0x69) - F09	106 (0x6A) - F10	107 (0x6B) - F11
108 (0x6C) - F12	109 (0x6D) - F13	110 (0x6E) - F14	111 (0x6F) - F15
112 (0x70) - F16	113 (0x71) - F17	114 (0x72) - F18	115 (0x73) - F19
116 (0x74) - F20	117 (0x75) - F21	118 (0x76) - F22	119 (0x77) - F23
120 (0x78) - F24	121 (0x79) - F25	122 (0x7A) - F26	123 (0x7B) - F27
124 (0x7C) - F28	125 (0x7D) - F29	126 (0x7E) - F30	127 (0x7F) - F31
128 (0x80) - H00	129 (0x81) - H01	130 (0x82) - H02	131 (0x83) - H03
132 (0x84) - H04	133 (0x85) - H05	134 (0x86) - H06	135 (0x87) - H07
136 (0x88) - H08	137 (0x89) - H09	138 (0x8A) - H10	139 (0x8B) - H11
140 (0x8C) - H12	141 (0x8D) - H13	142 (0x8E) - H14	143 (0x8F) - H15
144 (0x90) - H16	145 (0x91) - H17	146 (0x92) - H18	147 (0x93) - H19
148 (0x94) - H20	149 (0x95) - H21	150 (0x96) - H22	151 (0x97) - H23
152 (0x98) - H24	153 (0x99) - H25	154 (0x9A) - H26	155 (0x9B) - H27
156 (0x9C) - H28	157 (0x9D) - H29	158 (0x9E) - H30	159 (0x9F) - H31
160 (0xA0) - J00	161 (0xA1) - J01	162 (0xA2) - J02	163 (0xA3) - J03
164 (0xA4) - J04	165 (0xA5) - J05	166 (0xA6) - J06	167 (0xA7) - J07
168 (0xA8) - J08	169 (0xA9) - J09	170 (0xAA) - J10	171 (0xAB) - J11
172 (0xAC) - J12	173 (0xAD) - J13	174 (0xAE) - J14	175 (0xAF) - J15
176 (0xB0) - J16	177 (0xB1) - J17	178 (0xB2) - J18	179 (0xB3) - J19
180 (0xB4) - J20	181 (0xB5) - J21	182 (0xB6) - J22	183 (0xB7) - J23
184 (0xB8) - J24	185 (0xB9) - J25	186 (0xBA) - J26	187 (0xBB) - J27
188 (0xBC) - J28	189 (0xBD) - J29	190 (0xBE) - J30	191 (0xBF) - J31
192 (0xC0) - L00	193 (0xC1) - L01	194 (0xC2) - L02	195 (0xC3) - L03
196 (0xC4) - L04	197 (0xC5) - L05	198 (0xC6) - L06	199 (0xC7) - L07
200 (0xC8) - L08	201 (0xC9) - L09	202 (0xCA) - L10	203 (0xCB) - L11
204 (0xCC) - L12	205 (0xCD) - L13	206 (0xCE) - L14	207 (0xCF) - L15



208 (0xD0) - L16	209 (0xD1) - L17	210 (0xD2) - L18	211 (0xD3) - L19
212 (0xD4) - L20	213 (0xD5) - L21	214 (0xD6) - L22	215 (0xD7) - L23
216 (0xD8) - L24	217 (0xD9) - L25	218 (0xDA) - L26	219 (0xDB) - L27
220 (0xDC) - L28	221 (0xDD) - L29	222 (0xDE) - L30	223 (0xDF) - L31
224 (0xE0) - P00	225 (0xE1) - P01	226 (0xE2) - P02	227 (0xE3) - P03
228 (0xE4) - P04	229 (0xE5) - P05	230 (0xE6) - P06	231 (0xE7) - P07
232 (0xE8) - P08	233 (0xE9) - P09	234 (0xEA) - P10	235 (0xEB) - P11
236 (0xEC) - P12	237 (0xED) - P13	238 (0xEE) - P14	239 (0xEF) - P15
240 (0xF0) - P16	241 (0xF1) - P17	242 (0xF2) - P18	243 (0xF3) - P19
244 (0xF4) - P20	245 (0xF5) - P21	246 (0xF6) - P22	247 (0xF7) - P23
248 (0xF8) - P24	249 (0xF9) - P25	250 (0xFA) - P26	251 (0xFB) - P27
252 (0xFC) - P28	253 (0xFD) - P29	254 (0xFE) - P30	255 (0xFF) - P31



## 4 Commands Reference

[line](#)  
[modbus](#)  
[va](#)

### 4.1 line

#### SYNOPSIS

```
line
line type <Ln> <TYPE>
line myid <Ln> <SA>
line baud <Ln> <FRAME>
```

#### DESCRIPTION

<Ln> parameter denotes communication line number like for example: **L3** or **L4**.

- Without parameters **line** command prints status of all communication lines available in specific device.
- **line type** command is used to activate Modbus RTU module on line <Ln>. <TYPE> parameter can be **cg5** or **cg4** (see [Legacy CoolGate Mode](#)) for CoolMasterNet device and **clmb** for CoolLinkNet device.
- **line myid** command will change Modbus Slave Address of the Modbus RTU module running on line <Ln>. Parameter <SA> is a new Modbus Slave Address in hexadecimal format. Accepted range of addresses is 01..F7. New address will be in use after power reset.
- **line baud** command is used to change Modbus RTU frame format for line <Ln>. <FRAME> parameter format is <BAUD>\_<8|9><N|E|O><1|2>. Supported baud rates for <BAUD> parameter are: 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200. Frame format change is effective only after power reset.

#### EXAMPLE

See examples in [Modbus RTU Configuration](#) chapter.

### 4.2 modbus

#### SYNOPSIS

```
modbus
modbus IP <enable|disable>
modbus server port <PORT>
modbus ignore r
modbus cg4
```

#### DESCRIPTION

This command is available only in CoolMasterNet device.

- Without parameters **modbus** command prints status of the Modbus IP Server.
- **modbus IP** command is used to enable or disable Modbus IP activation.
- **modbus server port** command will change Modbus IP Server TCPI/IP port number. New port number will be effective only after power reset.
- **modbus ignore r** command will toggle ignore flag used by Modbus RTU module in attempt to access non implemented holding or input register. If ignore flag is set, attempt to access non existing register(s) will not





cause the "Illegal Data Address" Modbus exception. This feature enables accessing of the multiple registers block with gap(s).

- `modbus cg4` command is used for legacy CoolGate Modbus RTU operation mode (see [Legacy CoolGate Mode](#)). It prints relation between detected UID's and CoolGate Modbus objects Base Addresses.

#### EXAMPLE

See examples in [Modbus IP Configuration](#) chapter.

## 4.3 va

### SYNOPSIS

```
va
va auto
va + <UID> <VA>
va delall
va - <UID> |<VA>
va ram <N>
```

### DESCRIPTION

This command is available only in CoolMasterNet device.

<UID> parameter denotes Indoor Unit identifier/number like for example: `I1.100` or `I2.003`. <VA> parameter denotes VA number in decimal format.

- Without parameters `va` command prints status of all allocated VA's.
- `va auto` command is used to automatically distribute VA's for all detected UID's one to one. Previously allocated VA's will be deleted
- `va + <UID> <VA>` command will allocate VA for given UID. Number of VA's allocated for UID is not limited.
- `va delall` command will delete all allocated VA's.
- `va - <UID>` will delete all allocated VA's for given UID.
- `va - <VA>` will delete specific VA.
- `va ram <N>` resizes RAM memory used for VA's. Parameter <N> denotes a desired total number of VA's that can be allocated. By default N=170. VA's memory resize is effective only after power reset.

#### EXAMPLE

See examples in [VA's Configuration](#) chapter.



## 5 Legacy CoolGate Mode

CoolMasterNet Modbus RTU module can be configured to work in legacy CoolGate mode. This is done for backward compatibility with CoolAutomation's CoolGate devices. This mode is not recommended for use in new projects.

Activation of legacy CoolGate mode is made with below command:

```
>line type L3 CG4  
OK, Boot Required!
```

In this case a number of critical limitations should be taken in account:

- HVAC communication lines are not distinguished. I.e. for example, UID's L1.101 and L2.101 are treated as a same indoor unit.
- UID's range is limited.
- Only Modbus RTU mode is supported. Modbus IP is not supported in CoolGate mode.
- Features available in CoolMasterNet that were not previously implemented in CoolGate devices are not accessible via Modbus RTU module in CoolGate mode.

Details of the CoolGate Modbus implementation can be found in [CoolGate Programmer Reference Manual](#). Minor changes and improvements made in CoolMasterNet Modbus RTU module compared to CoolGate are depicted in following subchapters.