SMT-920

Viking

Modbus Addendum

Document version 1.1

Version 2.7 Viking firmware

Preface
The SMT-920 Viking HVAC controller from Smart Temp Australia is a standalone commercial Air conditioning controller with integrated MODbus RTU communication. This capability enables the SMT-920 to be networked back to a suitably equipped master control system.

The information provided in this addendum should be used in conjunction with the SMT-920 Viking controller and other third-party manuals as appropriate.

Note:
Although you can poll the SMT-920 and discover many more points than listed here, many of these non-documented points are used as internal flags or for service and advanced function used for testing and diagnosis. If you alter any value not listed below erratic Viking response may be experienced requiring a factory reset. There may be a fee for this service.

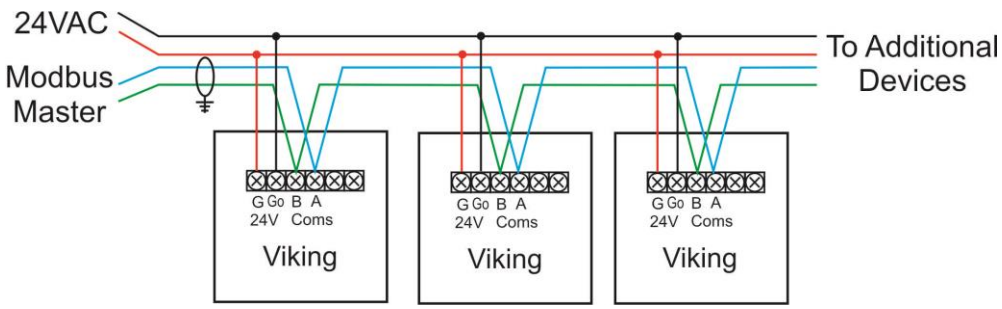
Protocol – Both devices
MODbus RTU Half Duplex
9600 Baud (4800, 19200 or 38400 can also be selected if required)
8 data bits
No parity
1 stop bit

An animated icon will be displayed on the Viking home screen whenever a Modbus master is communicating with the Viking and passing valid data.

Wiring Overview

Modbus is a simple protocol that is extremely popular due to its robustness and simple implementation. It is also a “forgiving” protocol and will tolerate many installation errors. This being stated however, correct wiring practices should be used to achieve maximum reliability.

Different devices can co-exist on a single node provided they all share the same network settings (baud rate, parity & speed etc) however they must have <u>different</u> network addresses. Show below is an example of wiring multiple viking in 1 network all powered from a single 24VAC power supply. You can alternatively power the Viking from 240VAC or multiple power supplies if desired.

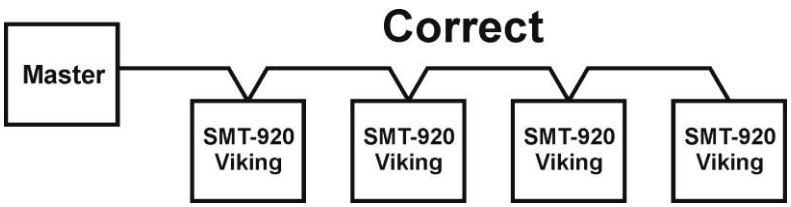


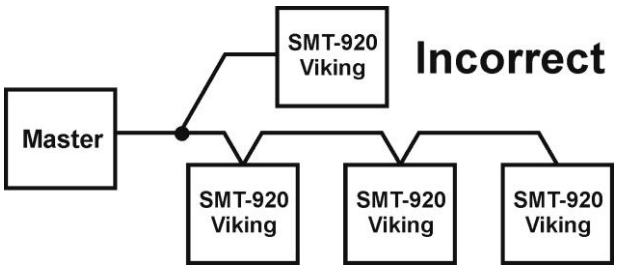
Wiring Examples

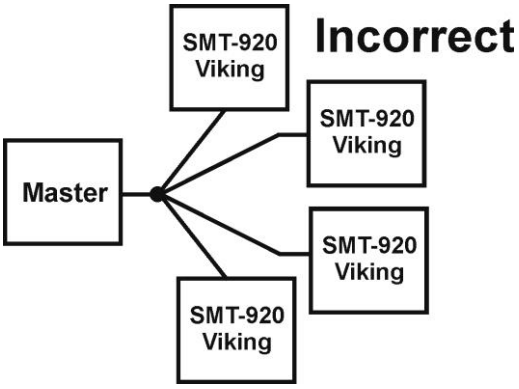
Any ModBus network should be wired in series only, “T” branches or “Star” wiring will seriously diminish or destroy the communications within the node. Examples are given below.

When wiring the SMT-970, it is important that you use screened cables. All screens should be joined together and grounded in 1 location only.

For long runs, the last device ONLY on any node should have the EOL (End Of line) 120 ohm resistor in circuit.







Setting Network Address in the SMT-920 *(See the SMT-920 Installer manual for more detailed information)*

1. Enter the Installer Menu Option by pressing **<F3>** (installer) button.
2. A warning window will be shown to inform you that proceeding will shut down the HVAC system. Press **<F3>** to enter the installer menu. The Viking will now turn off any system under its control.
3. Continually tap the **<F1>** button (“NO”) to move through the installer menu options until you see the window “EDIT COMMUNICATIONS SETTINGS”
4. Tap the **<F2>** (“YES”) button to enter the communications settings window.
5. Use the **<F3>** (“SELECT”) button to select between “Address” “Baud” and driver (MODbus or BACnet). Use the  buttons to adjust the highlighted value to your desired value.
6. Press **<F1>** to exit this sub menu.
7. Exit the installer menu.

Object List

The Viking Modbus data is within the “40XXX” range for all control registers, the relay are in the coil registers. Depending on your choice of Modbus Master you may need to enter the address using the full address - such as “40012” or by selecting “Holding Registers” and entering the address simply as “12”.

These modbus registers are shown as Base “1” (PLC addressing) format. Depending on your modbus master addressing format you may need to subtract 1 from these values to convert to base “0” (protocol addressing) format.

This object list is devided into function catagories to assist with loacting the neccessary modbus point for your needs, An index is also provided at the end of this doccument.

Object List for Function 1 “Coil Status” registers

Function group	Coil Status	
Type	Read only	
	Read / write[1] (2.0+ firmware)	
Address	00001	0 = G1 relay Off 1 = G1 relay On
	00002	0 = Y2 relay Off 1 = Y2 relay On
	00003	0 = Aux relay Off 1 = Aux relay On
	00004	0 = Y1 relay Off 1 = Y1 relay ON
	00005	0 = W1 relay Off 1 = W1 relay ON
	00006	0 = Y3 Relay Off 1 = Y3 Relay On

[1] To write to the SMT-920 Vikings coils, you must first “Unlock” the coils from Viking control by sending a “1” to register 40053. This register will automatically reset to “0” if communications is lost for 4 minutes.

Object List for Function 3 “Holding Registers”

Start (Run) Programming settings

Function	“Start” event Cool set temperature
Address	40017
Type	Read / Write
Settings	Deg C (@-20)/2 Deg F 1:1

Function	“Start” event Heat set temperature
Address	40018
Type	Read / Write
Settings	Deg C (@-20)/2 Deg F 1:1

Function	“Start” event Fan Mode
Address	40019
Type	Read / Write
Settings	0 = Auto Fan 1= Fan ON Note: This register only applies when the fan mode is set as “user adjustable”. If the fan mode is “Locked” into Auto or ON mode by Installer menu (or ModBus point 40060), changing this register will have no effect.

Function	Heat Set point control limit
Address	40030
Type	Read / Write
Settings	Deg C (@-20)/2 Deg F 1:1 This sets the maximum permitted heating set temperature

Function	Cool Set point control limit
Address	40031
Type	Read / Write
Settings	Deg C (@-400)/10 Deg F 1:1 This sets the minimum permitted cooling set temperature

Function	Fan Purge
Address	40038
Type	Read / Write
Settings	0 = Off to 10 Mins in 1 minute steps

Function	After Hours Run Period
Address	40039
Type	Read / Write
Settings	0 = Off 12 hours in 30 minute steps @/2= hours

Function	After Hours Run Initiate
Address	40055
Type	Read / Write
Settings	0 = After hours run timer OFF 1= After hours run timer active

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Function	Indoor Fan locked functions
Address	40060
Type	Read / Write
Settings	0 = Locked in Auto Mode 1= Locked in ON mode 2 = User selectable

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Function	Room sensor open circuit function
Address	40061
Type	Read / Write
Settings	0 = Run fan during “start” program only 1= Force Viking to OFF mode 2 = Run fan continuously (for as long as sensor is open circuit)

Function	Inside temperature reading - Deg C
Address	40310
Type	Read only
Settings	(@-400)/10 (32767 = sensor missing)

Function	Inside temperature reading - Deg F
Address	40311
Type	Read only
Settings	(@-400)/10 (32767 = sensor missing)

Function	Outside temperature reading - Deg C
Address	40313
Type	Read only
Settings	(@-400)/10 (32767 = sensor missing)

Function	Outside temperature reading - Deg F
Address	40314
Type	Read only
Settings	(@-400)/10 (32767 = sensor missing)

Function	Room temperature shown on LCD - Deg C
Address	40316
Type	Read only
Settings	(@-400)/10 Note - This would also be the Smart Sensor value if fitted.

Function	Room temperature shown on LCD - Deg F
Address	40317
Type	Read only
Settings	(@-400)/10 Note - This could be the Smart Sensor value if fitted.

Function	Inside RH value
Address	40320
Type	Read only
Settings	@/10 Note - This reading is taken from the RS-SS (Smart Sensor) if fitted. 32767 = Sensor missing

Function	Indoor Air Quality (0-10v) Input
Address	40321
Type	Read only
Settings	@/10

Function	Outside RH value
Address	40322
Type	Read only
Settings	@/10 Note - This reading is taken from the RS-SS (Smart Sensor) if fitted. 32767 Sensor missing

Setback (Stop event) temperature settings

Function	Stop Mode Cooling set point
Address	40049
Type	Read / Write
Settings	Deg C (@-20)/2 Deg F 1:1 200 = Cooling OFF

Function	Stop Mode Heating set point
Address	40050
Type	Read / Write
Settings	Deg C (@-20)/2 Deg F 1:1

Un-Occupied mode settings

Function	Un-Occupied Mode Heat Set point
Address	40027
Type	Read / Write
Settings	Deg C (@-20)/2 Deg F 1:1 0 = Heating OFF

Function	Un-Occupied Cool Heat Set point
Address	40028
Type	Read / Write
Settings	Deg C (@-20)/2 Deg F 1:1 2000 = Cooling OFF

Function	Un-Occupied Fan Mode
Address	40041
Type	Read / Write
Settings	0= Auto Fan Mode 1 = Fan On mode

Analogue Input Outputs settings (Heating & cooling valves or economy cycle)

Function	Analogue Output 1 Function
Address	40073
Type	Read / Write
Settings	0 = Output not used 1 = Outside economy damper 2 = Inside Economy damper 3 = Heat Valve 4 = Cool Valve 5 = Heat & Cool valve

Function	Analogue Output 2 Function
Address	40010
Type	Read / Write
Settings	0 = Output not used 1 = Outside economy damper 2 = Inside Economy damper 3 = Heat Valve 4 = Cool Valve 5 = Heat & Cool valve

Function	Economy Enable
Address	40040
Type	Read / Write
Settings	0 = Economy function disabled 1 = Economy function Enabled Note: You cannot select option 1 (economy enabled) unless you first assign at least one of the analogue outputs (register 40010 & 40073) to either Economy Inside or Economy Outside)

Function	Cooling Valve Span
Address	40056
Type	Read / Write
Settings	Sets the range of the cooling valve in 0.5 steps @ =0.5c / 1F Note: this setting has no effect unless 40020 (Analogue output 2) or 40073 (analogue output 1) is set for function 4 (cooling valve)

Function	Heating Valve Span
Address	40057
Type	Read / Write
Settings	Sets the range of the heating valve in 0.5 steps @ =0.5c / 1F Note: this setting has no effect unless 40020 (Analogue output 2) or 40073 (analogue output 1) is set for function 3 (heating valve)

Function	0-10 control range
Address	40058
Type	Read / Write
Settings	0 = 0-10V valve / actuator 1 = 2-10V valve / actuator

Function	Economy Function High Outside Temperature Limit
Address	40068
Type	Read / Write
Settings	Deg C (@-20)/2 Deg F 1:1 Sets the maximum permitted outside air temperature suitable for economy cycle (no longer applicable after version 2.50)

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Function	Day Time Ventilation Settings
Address	40013
Type	Read / Write
Settings	Sets the amount the outside air damper will open when the system is running

Function	Analogue Output 1 Value
Address	40477
Type	Read Only Read / Write Version II+
Settings	Displays the current 0/10V value @/10. To write to the SMT-920 Vikings analogue output, you must first “Unlock” the outputs from Viking control by sending a “1” to register 40053. This register will automatically reset to “0” if communications is lost for 4 minutes or more.

Function	Analogue Output 2 Value
Address	40478
Type	Read Only Read / Write Version II+
Settings	Displays the current 0/10V value @/10. To write to the SMT-920 Vikings analogue output, you must first “Unlock” the outputs from Viking control by sending a “1” to register 40053. This register will automatically reset to “0” if communications is lost for 4 minutes or more.

Clock Functions

Function	Real Time Clock Year
Address	40312
Type	Read/Write
Settings	15 = 2015

Function	Real Time Clock Month
Address	40313
Type	Read/Write
Settings	January = 1 December = 12

Function	Real Time Clock Date
Address	40314
Type	Read/Write
Settings	1 = 1 31 = 31

Function	Real Time Clock Day
Address	40315
Type	Read/Write
Settings	Monday = 0 Sunday = 6 Note, the Viking calculates the day based on the date.

Function	Real Time Clock Hour
Address	40316
Type	Read/Write
Settings	24 hour clock format

Function	Real Time Clock Minute
Address	40317
Type	Read/Write
Settings	1 to 60

Function	Real Time Clock Second
Address	40318
Type	Read/Write
Settings	1 to 60

Modbus Functions

Function	Network Address
Address	40022
Type	Read / Write
Settings	1 to 255.

Function	Communications Baud Rate
Address	40054
Type	Read / Write
Settings	0 = 4.8k 1= 9.6K 2 = 19.2 K 3 = 38.4K

Function	Auxiliary Relay Override
Address	40014
Type	Read / Write
Settings	0 = Relay 6 OFF 1= relay 6 ON Register 40042 (relay 6 function) must be set to 6 (Modbus controls relay 6) for this register to control the Auxiliary relay.

Function	Coil & AO override
Address	40053
Type	Read / Write
Settings	0 = Viking controls Coils & 0-10V outputs 1 = Modbus controls Coils & 0-10V outputs This register will automatically reset to “0” if communications is lost for 4 minutes.

Function	Start / Stop program override by Modbus
Address	40059
Type	Read / Write
Settings	0 = Viking controls Start / Stop Program 1= Viking held in “Start” Program 2 = Viking held on “Stop” Program

Function	0-10v input status
Address	40321
Type	Read
Settings	@ / 10

Function	Auxiliary 1 input status
Address	40344
Type	Read
Settings	0 = Input Open 1 = Input Closed

Function	Auxiliary 2 input status
Address	40345
Type	Read
Settings	0 = Input Open 1 = Input Closed

Function	Heat Pump / Heat Cool selection switch status
Address	40337
Type	Read
Settings	0 = Heat Cool Control logic 1 = Heat Pump Control logic

Function	Reversing valve or Heat Cool Fan control mode
Address	40338
Type	Read
Settings	0 = Heat Pump RV in Heat - Heat Cool Fan on with heat 1 = Heat Pump RV in Cool – Heat Cool No Fan with heat

Function	Last / Current mode called
Address	40348
Type	Read

Settings	2 = Heat Mode 3 = Cool Mode

Function	Analogue Output 1 value
Address	40478
Type	Read / Write
Settings	@/10V

Function	Analogue Output 2 value
Address	40477
Type	Read / Write
Settings	@/10V

Equipment Control Options

Function	Stage 1 Span
Address	40032
Type	Read / Write
Settings	0.5 to 5c in 0.5c steps (1=0.5, 2=1.0c etc)

Function	Stage 2 Span
Address	40033
Type	Read / Write
Settings	0= Stage OFF 0 to 5c in 0.5c steps (0 = OFF, 1=0.5, 2=1.0c etc)

Function	Stage 3 Span
Address	40048
Type	Read / Write
Settings	0= Stage OFF 0 to 5c in 0.5c steps (0 = OFF, 1=0.5, 2=1.0c etc)

Function	Upstage delay time
Address	40052
Type	Read / Write
Settings	0 to 90 Mins in 5 min intervals

Function	Compressor Lead Lag
Address	40063
Type	Read / Write
Settings	0 = Lead Lag is ON 1 = Lead Lag is OFF

Function	Smart Staging delay
Address	40065
Type	Read / Write
Settings	0 to 15 Mins in 1 min intervals

Function	Compressor Anti cycle Timer
Address	40066
Type	Read / Write
Settings	0 = Off 3 = 3min 4 = 4 min 5 = 5 min

Function	Compressor Minimum run Timer
Address	40067
Type	Read / Write
Settings	0 = Off 3 = 3min 4 = 4 min 5 = 5 min

General Installer Options

Function	Current PIN
Address	40021
Type	Read / Write
Settings	Set the current three digit security PIN

Function	Keyboard Lock level
Address	40022
Type	Read / Write
Settings	0 = Lock OFF 1 = Set Temperature adjustment only permitted 2 = Set temperatureand program only permitted 3 = All function buttons locked

Function	Room sensor (2 wire) calibration
Address	40025
Type	Read / Write
Settings	45 = No adjustment (+/- 4.5c adjustment) 1 = 0.1c

Function	C/F Display
Address	40029
Type	Read / Write
Settings	0 = Deg F 1 = Deg C

Function	Relay 6 Function
Address	40042
Type	Read / Write
Settings	0 = Auxillary Heating 1 = Compressor 4 2 = Close with time clock 3 = Close with after hours active 4 = Close when Viking running 5 = Off (no function) 6 = Off (no function) 7 = Close on high humidity This sets the function for the auxillary relay

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Function	Clock display
Address	40043
Type	Read / Write
Settings	0 = AM/PM 1 = 24 Hour

Function	Auxillary input 1 Function
Address	40045
Type	Read / Write
Settings	0 = Not Used 1 = Fault - Normall Open 2 = Fault – Normally Closed 3 = Delay Start Viking (random 0-90 seconds) 4 = Force On 5 = After hours initiate 6 = Occupancy mode initiate 7 = Fire - Emergency shutdown 8 = Introduce fresh air (requires outside air damper)

Function	Auxillary input 2 Function
Address	40046
Type	Read / Write
Settings	0 = Not Used 1 = Fault - Normall Open 2 = Fault – Normally Closed 3 = Delay Start Viking (random 0-90 seconds) 4 = Force On 5 = After hours initiate 6 = Occupancy mode initiate 7 = Fire - Emergency shutdown 8 = Introduce fresh air (requires outside air damper)

Function	Program type
Address	40047
Type	Read / Write
Settings	0 = Manual Mode (no time clock control must use aux input to turn on/off) 1 = 7 Day - 1 start/stop event 2 = 7 Day - 2 start/stop events 3 = 365 day programming – 1 start/stop event 4 = 365 day programming – 2 start/stop events 5 = Always ON

Function	Service Override
Address	40051
Type	Read / Write
Settings	0 = Off 1 = ON Service mode removes all anticycle and upstage timing and elimiates all safety systems - Use with caution.

Revision History

Version 1	June 2012	Original Document

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Sorted by register Number

Sorted by register type

Great care has been taken in the preparation of this addendum.
Smart Temp Australia P/L takes no responsibility for errors or omissions contained in this document. It is the responsibility of the user to ensure this thermostat, or equipment connected to it is operating to their respective specifications and in a safe manner.

Due to ongoing product improvement Smart Temp Australia P/L reserves the right to change the specifications of the SMT-920 Viking thermostat (or its components) without notice.