



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 & BACnet MS-TP communications. This document is for the MODbus protocol, a separate BACnet document is provided. 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



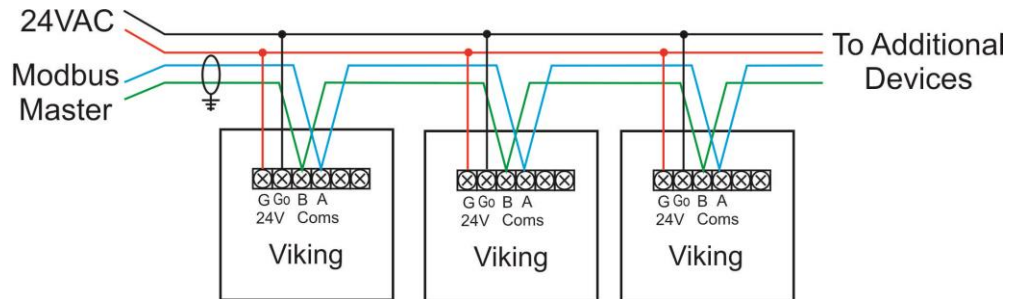
An animated icon will be displayed on the Viking home screen whenever a Modbus master is communicating with the Viking and passing valid data.



## 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 different 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.



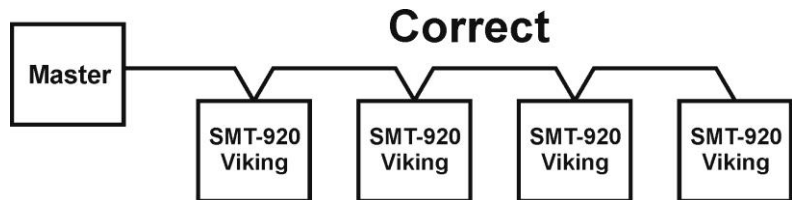
## Wiring Examples

### 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.

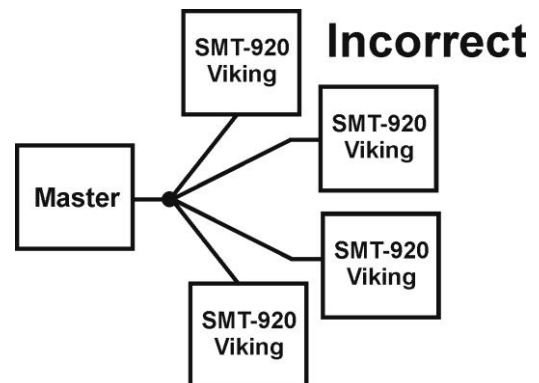
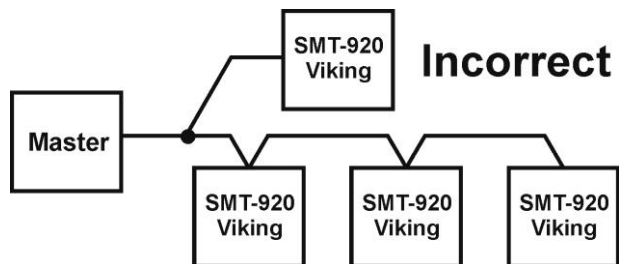
When wiring the SMT-970, it is important that you use screened cables. All screens should be joined together and grounded in 1 location only.

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.



```

COMMUNICATIONS
ADDRESS 07
BAUD 9600 MODBUS
SAVE REJECT SELECT
    
```

## 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 divided into function categories to assist with locating the necessary modbus point for your needs, An index is also provided at the end of this document.

### **Object List for Function 1 “Coil Status” registers**

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

---

<sup>1</sup> 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

---

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

---

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<br>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<br>Deg F 1:1<br>0 = Heating OFF |

---

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

---

|          |                                     |
|----------|-------------------------------------|
| Function | Un-Occupied Fan Mode                |
| Address  | 40041                               |
| Type     | Read / Write                        |
| Settings | 0= Auto Fan Mode<br>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<br>1 = Outside economy damper<br>2 = Inside Economy damper<br>3 = Heat Valve<br>4 = Cool Valve<br>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<br>Read / Write Version II+   |
| Settings | Displays the current 0/10V value @/10.<br>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<br>Read / Write Version II+   |
| Settings | Displays the current 0/10V value @/10.<br>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<br>December = 12 |

---

|          |                      |
|----------|----------------------|
| Function | Real Time Clock Date |
| Address  | 40314                |
| Type     | Read/Write           |
| Settings | 1 = 1<br>31 = 31     |

---

---

|          |  |
|----------|--|
| Function | Real Time Clock Day  |
| Address  | 40315  |
| Type     | Read/Write   |
| Settings | Monday = 0<br>Sunday = 6<br>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

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|          |                 |
|----------|-----------------|
| 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<br>1 = 9.6K<br>2 = 19.2 K<br>3 = 38.4K |

---

|          |   |
|----------|---|
| Function | Auxiliary Relay Override  |
| Address  | 40014   |
| Type     | Read / Write  |
| Settings | 0 = Relay 6 OFF<br>1 = relay 6 ON<br>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<br>1 = Modbus controls Coils & 0-10V outputs<br>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<br>1 = Viking held in "Start" Program<br>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<br>1 = Input Closed |

---

|          |                                    |
|----------|------------------------------------|
| Function | Auxiliary 2 input status           |
| Address  | 40345                              |
| Type     | Read                               |
| Settings | 0 = Input Open<br>1 = Input Closed |

---

|          |  |
|----------|--|
| Function | Heat Pump / Heat Cool selection switch status              |
| Address  | 40337  |
| Type     | Read   |
| Settings | 0 = Heat Cool Control logic<br>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<br>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

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|          |   |
|----------|---|
| 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<br>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<br>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<br>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<br>3 = 3min<br>4 = 4 min<br>5 = 5 min |

---

|          |   |
|----------|---|
| Function | Compressor Minimum run Timer                  |
| Address  | 40067   |
| Type     | Read / Write                                  |
| Settings | 0 = Off<br>3 = 3min<br>4 = 4 min<br>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<br>1 = Set Temperature adjustment only permitted<br>2 = Set temperature and program only permitted<br>3 = All function buttons locked |

---

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

---

|          |                        |
|----------|------------------------|
| Function | C/F Display            |
| Address  | 40029                  |
| Type     | Read / Write           |
| Settings | 0 = Deg F<br>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

---

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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*Great care has been taken in the preparation of this addendum.  
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*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.*

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