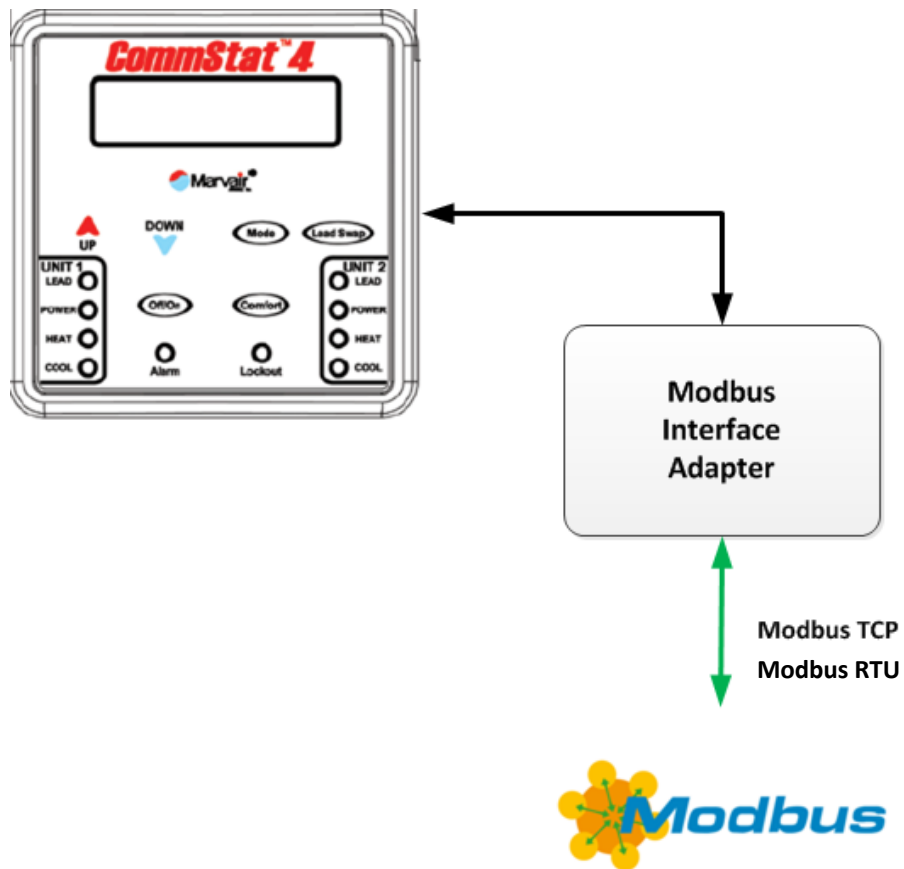


CommStat™ 4 Modbus Interface Adapter

Installation and Operation Manual



Manufactured By:

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This manual describes the steps to install and operate the Marvair® CommStat™ 4 Modbus Interface Adapter. This device provides both Ethernet and serial interfaces to allow a remote system to read and write parameters to the CommStat™ 4 controller through the Modbus TCP or Modbus RTU communications protocol.

The following materials are provided in the Modbus Interface Adapter package:


- Modbus Interface Adapter device
- Installation and Operations Manual (this manual)

The following materials should be provided by the installer:

- Laptop with Windows 7, 8, or 10 to configure the IP address of the Modbus Interface Adapter
- Mechanical and electrical installation hand tools (wire cutters & strippers, drill, drill bits)

Important Safety Information

1. Turn Electrical Power OFF at the breaker or fuse box BEFORE installing or working on the Modbus adapter. LINE VOLTAGES ARE HAZARDOUS or LETHAL.
2. OBSERVE and COMPLY with ALL applicable ELECTRICAL AND BUILDING CODES and ORDINANCES.
3. INSTALLATION and SERVICE should be performed ONLY by QUALIFIED and EXPERIENCED PEOPLE.
4. USE COMMON SENSE and **BE SAFETY CONSCIOUS**.

This is the safety alert symbol.  When you see this symbol in the manual, be alert to the potential for personnel injury or equipment damage. Understand the signal word DANGER, WARNING and CAUTION. These words are used to identify levels of the seriousness of the hazard.



Failure to comply will result in death or severe personal injury and/or property damage.



Failure to comply could result in death or severe personal injury and/or property damage.



Failure to comply could result in minor personal injury and/or property damage.

IMPORTANT is used to point out helpful suggestions that will result in improved installation, reliability or operation.

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General Description

The self-contained Marvair® Modbus Interface Adapter provides an Ethernet or a serial gateway to the Marvair CommStat™ 4 HVAC controller through which an external host can read and write information from the CommStat 4 as if it were a Modbus TCP or Modbus RTU device. It is powered by 24VDC or 48VDC. The external host located, for example, within a Network Operations Center (NOC), can monitor and control the operation of the HVAC units connected to the CommStat 4 controller. The adapter supports CommStat 4 controllers with protocol version 3 or later with software revision 67 or later.

The adapter includes (see figure 1):

- Flange-mount enclosure with the interface adapter
- 15ft (457cm) two-conductor power cable
- 15ft (457cm) RJ11 cable for connection to the CommStat4 unit
- 15ft (457cm) Cat5e cable for Modbus TCP connection to the external monitoring system
- 15ft (457cm) Serial cable for Modbus RTU connection to the external monitoring system

Installation

The adapter can be mounted at any convenient location within the shelter. Mounting ears with pre-drilled holes are provided on the base of the adapter to allow it to be installed directly on a shelter wall or within an equipment enclosure. The Cat5e Ethernet, serial communication, CommStat 4 communication, and power cables supplied with the adapter are each 15ft. (457cm) in length. The adapter should be mounted to ensure that the distance from end connection points to the adapter does not exceed 15ft. (457cm) including all necessary conduit routing. Note that the adapter must be installed inside the shelter; it is not suitable for installation either inside an HVAC unit or where exposure to external weather is possible. The adapter is installed as follows:

- Mount the adapter inside the shelter using the four pre-drilled screw holes on the adapter base.
- Run the two-conductor power cable (grey insulation) to a suitable DC power source. The adapter can be powered by 24VDC or 48VDC. The black wire is +24/48VDC and the white is VDC RTN.
- Remove the lower cover from the CommStat 4 controller. Plug the RJ11 connector on the flat, black CommStat 4 communications cable into one of the two Master communications ports at the middle, bottom of the CommStat 4 circuit board. Note that if the shelter has two CommStat 4 controllers, one of these ports may already be used for the master/slave connection. Reinstall the lower cover of the CommStat 4 controller. See Figure 3.
- Remove the six screws from the cover of the adapter then remove the cover. Turn the breaker on the power feed circuit to the On position and verify that the red LED on the processor board is On. If the red LED is not On, turn the power feed circuit breaker to the Off position, swap the black and white wires at the DC power source, then turn the breaker to the On position. The red power LED will now be On. See Figure 2. Reinstall the cover.

DO NOT make the power connections with power applied to the feed circuit. This can create electrical arcing and cause permanent damage to the circuit boards. ALWAYS make electrical connections with the feed circuit breaker in the Off position and after verifying the absence of voltage with a meter.

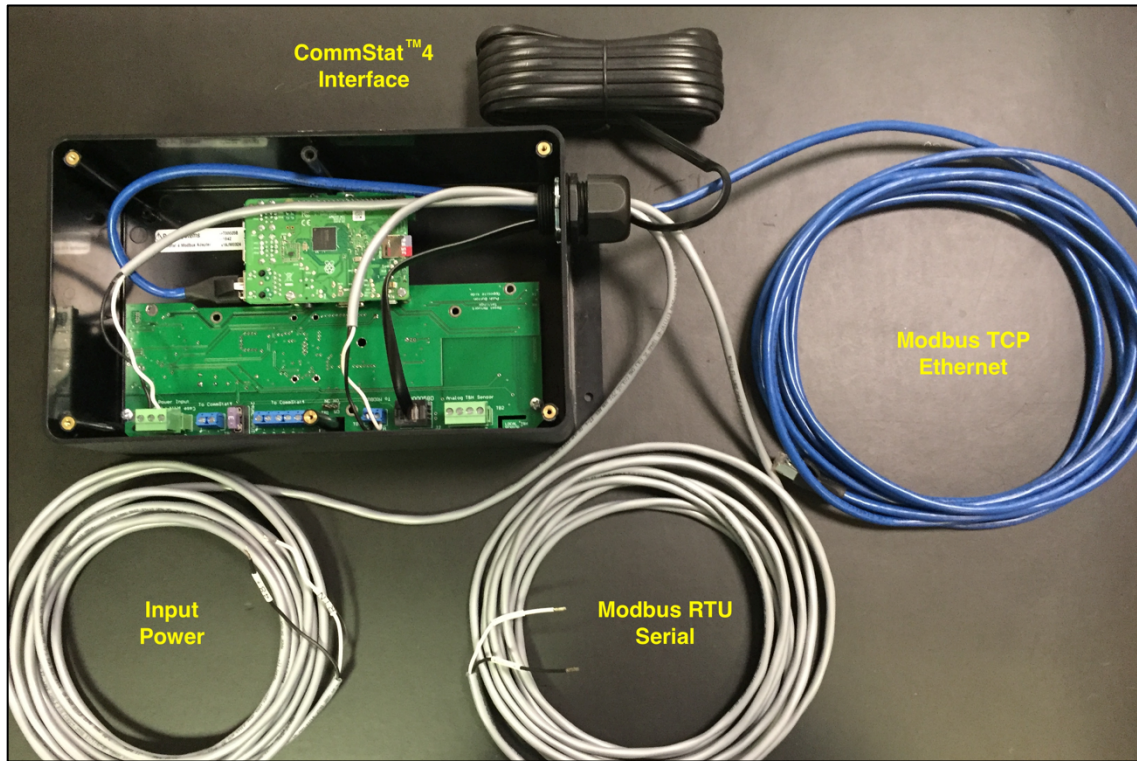


Figure 1: Modbus Interface Adapter External Connections

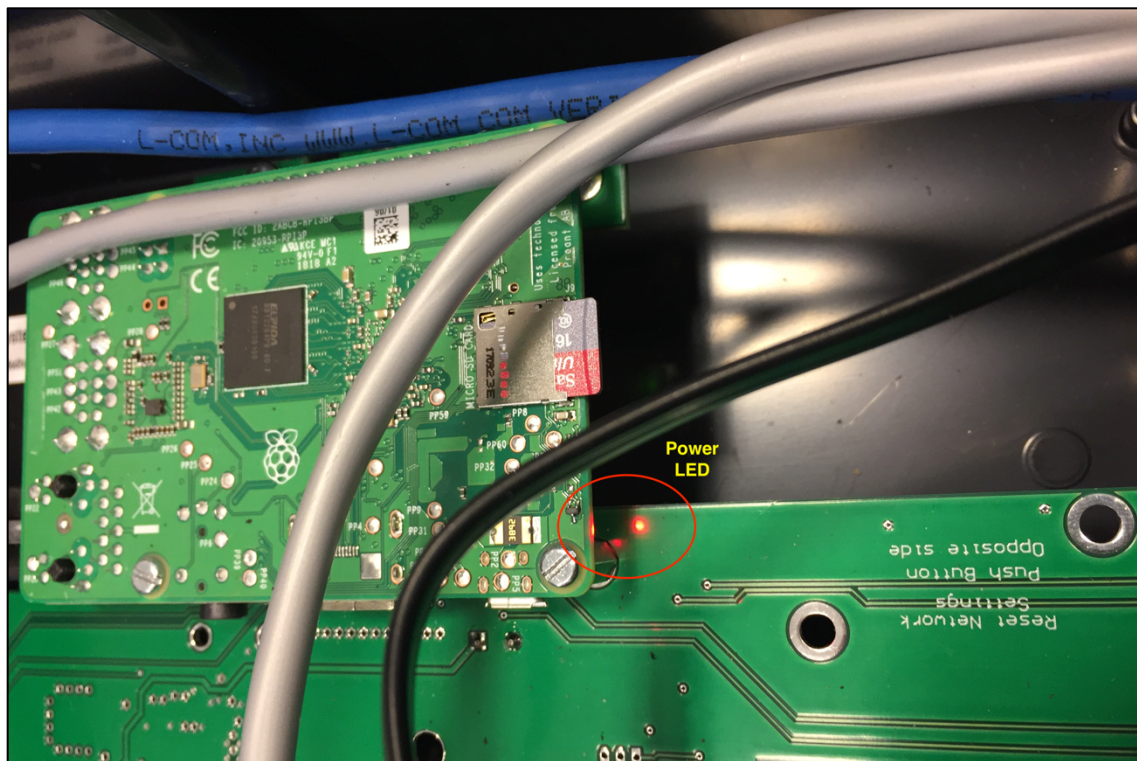


Figure 2: Modbus Interface Adapter Power LED

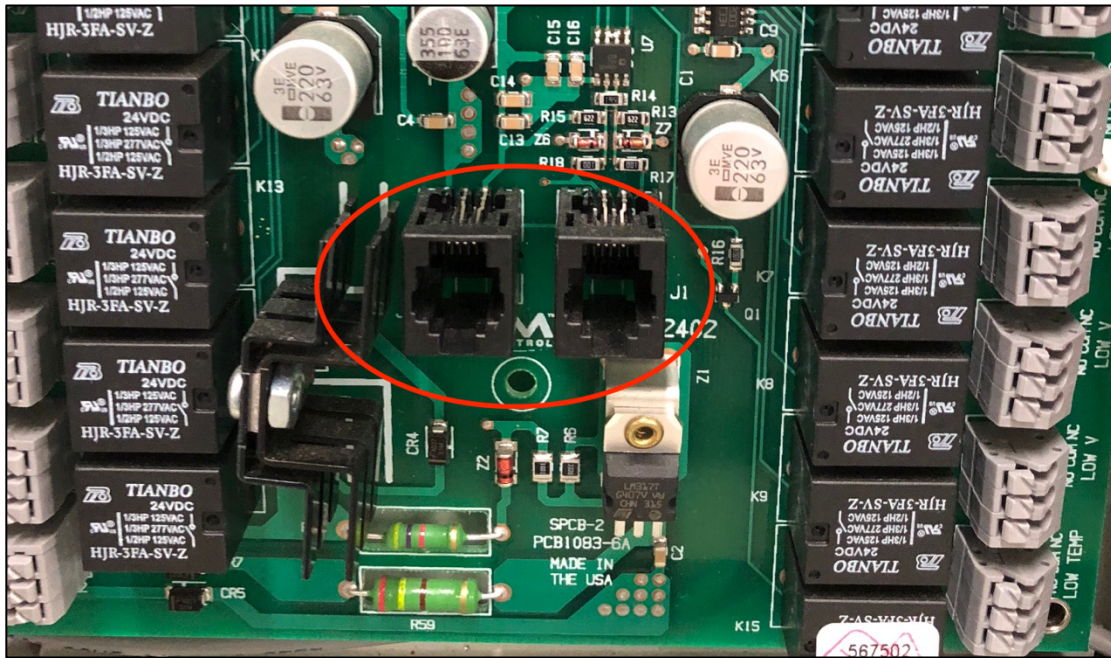


Figure 3: CommStat™ 4 to Modbus Interface Adapter Connection

IP Address Configuration

The adapter has a default static IP address of 192.168.1.19. If a different IP address is required a laptop can be used to re-configure the adapter. In order to establish communications, the laptop must have an IP address within the same subnet as the adapter. The laptop will be assigned the temporary static IP address of 192.168.1.100. From the Windows desktop select **Start, Control Panel, Network and Sharing Center**:

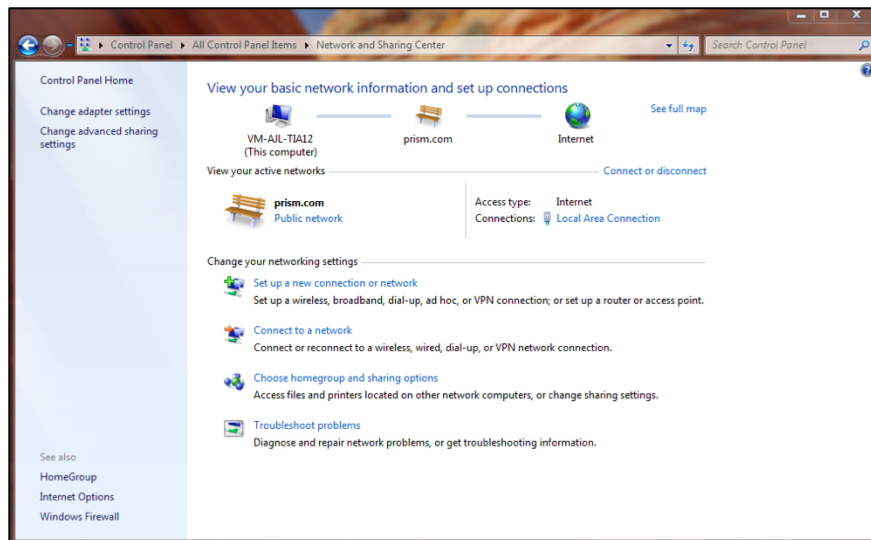


Figure 4: Network and Sharing Center

Click **Change adapter settings**:

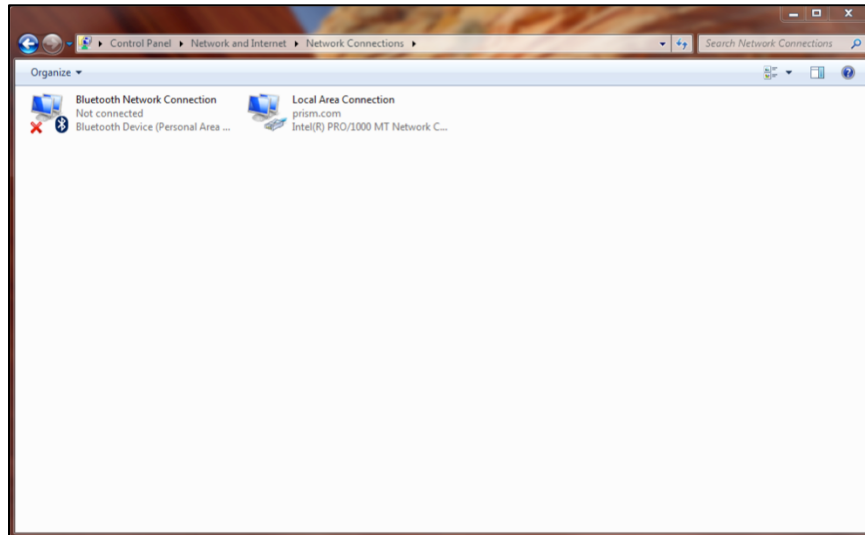


Figure 5: Network and Sharing Center

Right-click on the **Local Area Connection** and select **Properties** from the drop down menu:

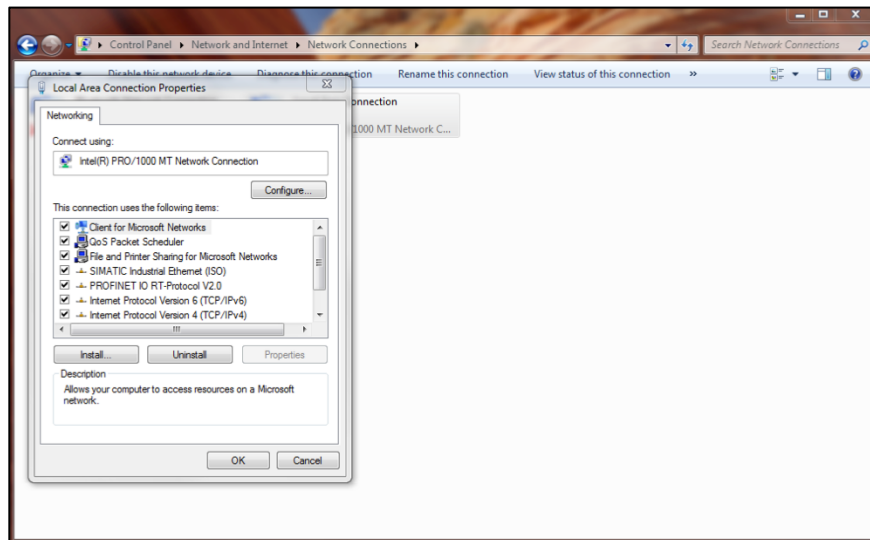


Figure 6: Local Area Connection Properties

Click **Internet Protocol Version 4 (TCP/IPv4)** then click the **Properties** key:

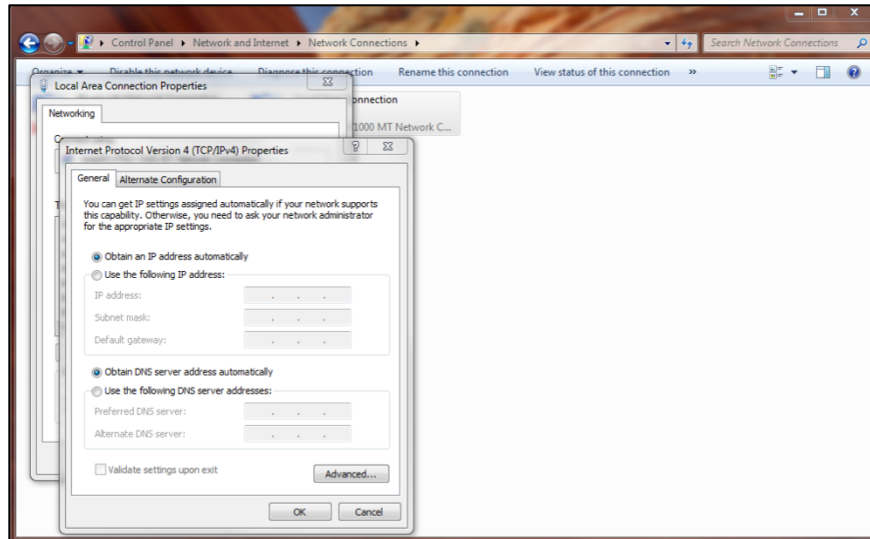


Figure 7: Internet Protocol Version 4 (TCP/IPv4) Properties

If there are values in any of the IP address fields on this screen, record these addresses prior to implementing any changes so that the original values can be restored after the adapter has been updated. Click **Use the following IP address** and enter **192.168.1.100** in the **IP address** field and **255.255.255.0** in the **Subnet mask** field. Do not enter any values into any of the other IP address fields. The properties page should look like the following:

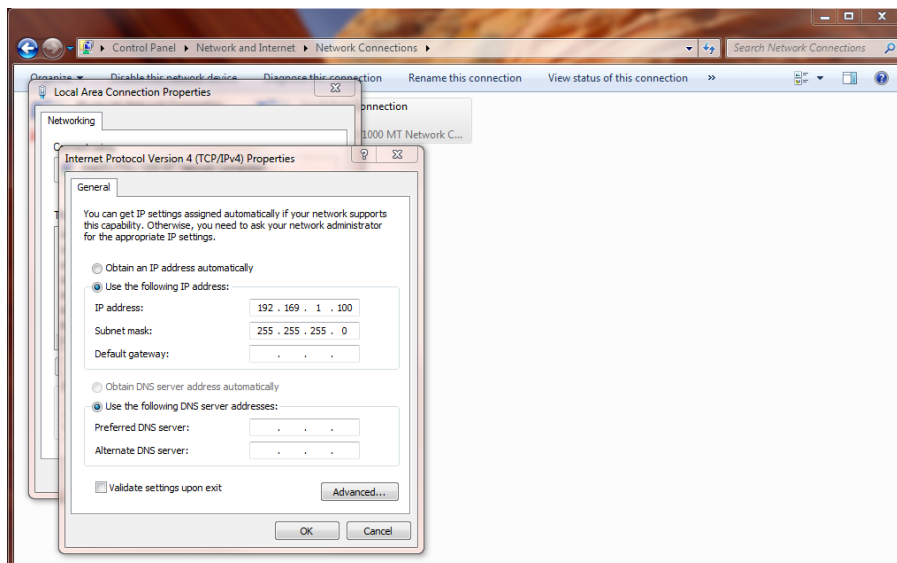


Figure 8: Internet Protocol Version 4 (TCP/IPv4) Properties

Click the **OK** key to accept the changes and close the **Internet Protocol Version 4 (TCP/IPv4) Properties** page. Click the **Close** key to accept the changes and close the **Local Area Connection Properties** page. Finally, close the **Network and Sharing Center** window to return to the desktop.

Plug the Ethernet cable from the adapter into the RJ45 port of the laptop. Open an Internet browser (Internet Explorer, Chrome, Firefox, Safari) and type <http://192.168.1.19> into the address bar. The adapter network configuration page will then be displayed. Select either DHCP or Static IP address configuration and, if static, complete the IP Address, Subnet Mask, and Default Gateway fields. Press the **Save** pushbutton to accept the configuration changes. The adapter will reboot and after 60 seconds the new network configuration will be active. Note that if the new network parameters are on a different subnet, the browser will lose communications to the adapter after the reboot.

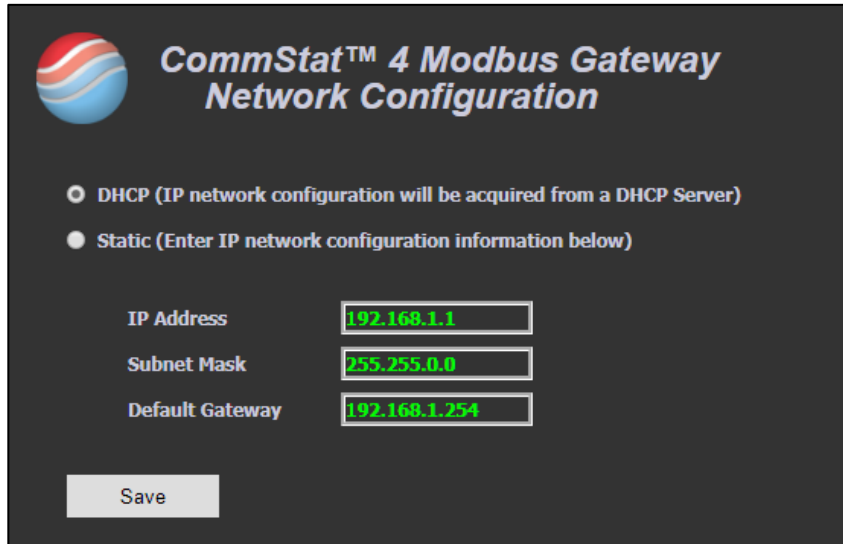


Figure 9: Adapter Network Configuration Page

If the network status of the adapter is unknown, the IP address fields can be reset. With power applied to the adapter, press the Reset Network Settings push button on the underside of the top right-hand corner of the main circuit board (see figure 10). The adapter will restart and its IP address will revert to the default value of 192.168.1.19 after approximately one minute.

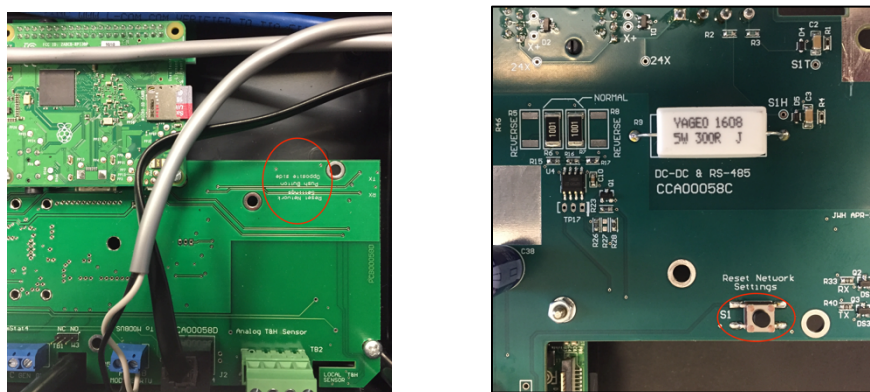


Figure 10: Reset Network Settings Push Button

CommStat™ 4 Modbus Read Registers

The adapter supports Modbus TCP/IP read requests from the Master system through port 502 of the configured IP address of the interface adapter. The read registers are detailed in the table below.

Register	Source	Value	Description	Comments
40001	Master	Master's firmware revision number	[Self-explanatory]	Must be less than 255
40002	Master	Protocol Version Number (3 or 4)	[Self-explanatory]	[Self-explanatory]
40003	Master	Setting #2	F/C	0: Celsius, 1: Fahrenheit
40004	Master	Setting #3	Changeover days	Half Days, range 1 to 14
40005	Master	Setting #4	Cool set point	See CommStat™ 4 manual
40006	Master	Setting #5	Heat set point	See CommStat™ 4 manual
40007	Master	Setting #6	High building temp 1 set point	See CommStat™ 4 manual
40008	Master	Setting #7	High building temp 2 set point	See CommStat™ 4 manual
40009	Master	Setting #8	Low building temp set point	See CommStat™ 4 manual
40010	Master	Setting #9	Blower on	0: Off, 1: On
40011	Master	Setting #10	High voltage input enable / alarm output enable	
40012	Master	Setting #11	Anti-short cycle timer	Number of minutes (see CommStat™ 4 manual)
40013	Master	Setting #12	Stage 1 Differential	See CommStat™ 4 manual
40014	Master	Setting #13	Stage 2 differential	See CommStat™ 4 manual
40015	Master	Setting #14	Off differential	See CommStat™ 4 manual
40016	Master	Setting #15	Blower off time delay	See CommStat™ 4 manual
40017	Master	Setting #16	Operational units when generator is used	[Self-explanatory]
40018	Master	Setting #17	Smoke auto reset	0: Manual Reset, 3 to 10: # minutes until auto reset
40019	Master	Setting #18	Smoke relay	0: Normally Open, 1: Normally Closed
40020	Master	Setting #19	ECON mode enable	0: No, 1: Yes, 2: Verizon special setting
40021	Master	Setting #20	Multiple sensors	0: No, 1: Yes
40022	Master	Setting #21	Aux. 1 relay	0: Normally Open, 1: Normally Closed, 2: Off
40023	Master	Setting #22	Aux. 2 relay	0: Normally Open, 1: Normally Closed, 2: Off
40024	Master	Setting #23	Excessive cycle	0: Off, Non-Zero: # cycles allowed in 2 hour period
40025	Master	Setting #24	Language	0: English, 1: Spanish, 2: French
40026	Master	Setting #25	AC / HP system	0: HP, 1: One AC, 2: Two AC
40027	Master	Setting #26	Master/slave	0: Slave, 1: Master
40028	Master	Setting #27	Stage 3 differential	See CommStat™ 4 manual
40029	Master	Setting #28	Stage 4 differential	See CommStat™ 4 manual
40030	Master	Setting #29	Stage 5 differential	See CommStat™ 4 manual
40031	Master	Setting #30	Stage 6 differential	See CommStat™ 4 manual

Table 1: CommStat™ 4 Modbus Read Registers

CommStat™ 4
Modbus Adapter
Installation & Operation

Register	Source	Value	Description	Comments
40032	Master	Setting #31	Stage 7 differential	See CommStat™ 4 manual
40033	Master	Setting #32	Stage 8 differential	See CommStat™ 4 manual
40034	Master	Setting #33	Stage 9 differential	See CommStat™ 4 manual
40035	Master	Setting #34	Stage 10 differential	See CommStat™ 4 manual
40036	Master	Setting #35	Stage 11 differential	See CommStat™ 4 manual
40037	Master	Setting #36	Stage 12 differential	See CommStat™ 4 manual
40038	Master	Setting #37	Total Number of Units	See CommStat™ 4 manual
40039	Master	Setting #38	Stage 2 differential in econ cooling mode	See CommStat™ 4 manual
40040	Master	Controller On/Off	Whether the controller is in on or off mode	0 :Off, 1: On
40041	Master	Lead unit	Which unit is the lead unit	0: Master #1, 1: Master #2, 2: Slave #1, 3: Slave #2
40042	Master	Password #1	First byte of the password	Password = (password #1 * 4) + password #2
40043	Master	Password #2	Second byte of the password	Password = (password #1 * 4) + password #2
40044	Master	Master controller inputs	Master's status of smoke, hydrogen, gen, aux #1, aux #2	See note 1
40045	Master	Master controller's unit #1 inputs	Master's unit #1 voltage, lockout, econ mode status	See note 2
40046	Master	Master controller's unit #2 inputs	Master's unit #2 voltage, lockout, econ mode status	See note 2
40047	Master	Master controller's unit #1 outputs	[Self-explanatory]	See note 3
40048	Master	Master controller's unit #2 outputs	[Self-explanatory]	See note 3
40049	Master	Output command master to slave unit #1	[Self-explanatory]	See note 3
40050	Master	Output command master to slave unit #2	[Self-explanatory]	See note 3
40051	Master	Saved value of master unit #1 outputs	[Self-explanatory]	Internal Use
40052	Master	Saved value of master unit #2 outputs	[Self-explanatory]	Internal Use
40053	Master	Saved value command master to slave unit #1	[Self-explanatory]	Internal Use
40054	Master	Saved value command master to slave unit #2	[Self-explanatory]	Internal Use
40055	Master	Master controller lockout status	[Self-explanatory]	See note 4
40056	Master	Current stage	[Self-explanatory]	See note 5
40057	Master	Current temperature	[Self-explanatory]	240: sensor fault, < 240: current temperature
40058	Master	Time left for the comfort mode operation.	[Self-explanatory]	#minutes left in comfort mode / 3
40059	Slave	Slave embedded firmware revision number	[Self-explanatory]	Must be less than 255
40060	Slave	Slave controller inputs	Slave's status of smoke, hydrogen, gen, aux #1, aux #2	See note 1
40061	Slave	Slave controller's unit #1 inputs	Slave's unit #1 voltage, lockout, econ mode status	See note 2
40062	Slave	Slave controller's unit #2 inputs	Slave's unit #2 voltage, lockout, econ mode status	See note 2
40063	Slave	Slave's #1 temp sensor reading	[Self-explanatory]	0: sensor fault, 30 – 150: current temperature (F)
40064	Slave	Slave's #2 temp sensor reading	[Self-explanatory]	0: sensor fault, 30 – 150: current temperature (F)
40065	Slave	Slave's #3 temp sensor reading	[Self-explanatory]	0: sensor fault, 30 – 150: current temperature (F)
40066	Slave	Slave's unit #1 output status	[Self-explanatory]	See note 3
40067	Slave	Slave's unit #2 output status	[Self-explanatory]	See note 3
40068	Slave	Slave controller lockout status	[Self-explanatory]	See note 6

Table 1: CommStat™ 4 Modbus Read Registers

Notes:

Note	Description
1	Bit<7:5> are always clear; if bit<4> is set, controller senses smoke; if bit<3> is set, controller senses high hydrogen level; if bit<2> is set, controller senses generator being used; if bit<1> is set, controller senses aux 1 signal present; if bit<0> is set, controller senses aux 2 signal present.
2	Bit<7:5> are always clear; if bit<4> is set, this unit has 24V present; if bit<3> is set, this unit has 230V present; if bit<2> is set, this unit is locked out; if bit<1> is set, this unit is operating in AC mode; if bit<0> is set, this unit is operating in economizer mode. [Note] If bit<1:0> are clear, it is undetermined whether this unit is operating in AC or economizer mode.
3	Bit<7> is always clear; if bit<6> is set, this unit is outputting to Y; if bit<5> is set, this unit is outputting to 2; if bit<4> is set, this unit is outputting to O; if bit<3> is set, this unit is outputting to W; if bit<2> is set, this unit is outputting to G; if bit<1> is set, this unit is outputting to MAR; if bit<0> is set, this unit is outputting to DCAMR.
4	If bit<7> is set, master controller is in high building temp 2 lockout; if bit<6> is set, master controller is in high building temp 1 lockout; if bit<5> is set, master controller is in low building temp lockout; if bit<4> is set, master controller is in smoke alarm lockout; if bit<3> is set, slave controller's unit #2 is in lockout; if bit<2> is set, slave controller's unit #1 is in lockout; if bit<1> is set, master controller's unit #2 is in lockout; if bit<0> is set, master controller's unit #1 is in lockout. [Note] High temp building temp lockout and low building temp lockout are mutually exclusive.

Notes:

Note	Description
5	If value is 0, it is in stage 12 cooling; if value is 1, it is in stage 11 cooling; if value is 2, it is in stage 10 cooling; if value is 3, it is in stage 9 cooling; if value is 4, it is in stage 8 cooling; if value is 5, it is in stage 7 cooling; if value is 6, it is in stage 6 cooling; if value is 7, it is in stage 5 cooling; if value is 8, it is in stage 4 cooling; if value is 9, it is in stage 3 cooling; if value is 10, it is in stage 2 cooling; if value is 11, it is in stage 1 cooling; if value is 12, it is in stage 0; if value is 13, it is in stage 1 heating; if value is 14, it is in stage 2 heating; if value is 15, it is in stage 3 heating; if value is 16, it is in stage 4 heating.
6	If bit<7> is set, slave controller is in high building temp 2 lockout; if bit<6> is set, slave controller is in high building temp 1 lockout; if bit<5> is set, slave controller is in low building temp lockout; if bit<4> is set, slave controller is in smoke alarm lockout; if bit<3> is set, slave controller's unit #2 is in lockout; if bit<2> is set, slave controller's unit #1 is in lockout; if bit<1> is set, master controller's unit #2 is in lockout; if bit<0> is set, master controller's unit #1 is in lockout. [Note] High temp building temp lockout and low building temp lockout are mutually exclusive.

CommStat™ 4 Modbus Write Registers

The adapter supports Modbus TCP/IP write requests from the Master system through port 502 of the configured IP address of the interface adapter. The write registers are detailed in the table below.

Register	Source	Value	Description
40101	Remote	Write Control	See write procedure below
40102	Remote	Setting #2	F/C
40103	Remote	Setting #3	Changeover days
40104	Remote	Setting #4	Cool set point
40105	Remote	Setting #5	Heat set point
40106	Remote	Setting #6	High building temp 1 set point
40107	Remote	Setting #7	High building temp 2 set point
40108	Remote	Setting #8	Low building temp set point
40109	Remote	Setting #9	Blower on
40110	Remote	Setting #10	High voltage input enable / alarm output enable
40111	Remote	Setting #11	Anti-short cycle timer
40112	Remote	Setting #12	Stage 1 Differential
40113	Remote	Setting #13	Stage 2 differential
40114	Remote	Setting #14	Off differential
40115	Remote	Setting #15	Blower off time delay
40116	Remote	Setting #16	Operational units when generator is used
40117	Remote	Setting #17	Smoke auto reset
40118	Remote	Setting #18	Smoke relay
40119	Remote	Setting #19	ECON mode enable
40120	Remote	Setting #20	Multiple sensors
40121	Remote	Setting #21	Aux. 1 relay
40122	Remote	Setting #22	Aux. 2 relay
40123	Remote	Setting #23	Excessive cycle
40124	Remote	Setting #24	Language
40125	Remote	Setting #25	AC / HP system
40126	Remote	Setting #26	Master/slave
40127	Remote	Setting #27	Stage 3 differential
40128	Remote	Setting #28	Stage 4 differential
40129	Remote	Setting #29	Stage 5 differential
40130	Remote	Setting #30	Stage 6 differential

Table 2: CommStat™ 4 Modbus Write Registers

Register	Source	Value	Description
40131	Remote	Setting #31	Stage 7 differential
40132	Remote	Setting #32	Stage 8 differential
40133	Remote	Setting #33	Stage 9 differential
40134	Remote	Setting #34	Stage 10 differential
40135	Remote	Setting #35	Stage 11 differential
40136	Remote	Setting #36	Stage 12 differential
40137	Remote	Setting #37	Total Number of Units
40138	Remote	Setting #38	Stage 2 differential in econ cooling mode
40139	Remote	Controller On/Off	Whether the controller should be on or off
40140	Remote	Lead unit	Which unit should be the lead unit
40141	Remote	Password #1	First byte of the password
40142	Remote	Password #2	Second bytes of the password
40143	Remote	Function code	The purpose of this communication signal

Table 2: CommStat™ 4 Modbus Write Registers

The process to update parameters in the CommStat 4 unit is controlled through the use of register 40101. The sequence of operation and the corresponding values for register 40101 are as follows:

Register 40101 Value	Description
0	Normal operation, current parameter values are copied to “new parameter values” registers each cycle
Remote Client Writes 1	Adapter stops copying current parameter values to “new parameter values” registers each cycle allowing the remote client to make updates to selected parameters
Remote Client Writes 2	Instructs adapter to write “new parameter values” to CommStat™ 4 at the next available cycle
Adapter Writes 3	Adapter indicates confirmation of write request and waiting for write cycle completion
Adapter Writes 0	Adapter indicates completion of write to CommStat™ 4

Technical Specifications

Electrical

Voltage: 24VDC to 60VDC (nominal 24VDC or 48VDC)
Current: 1A typical

Environmental

Temperature: -30C (-22F) to 70C (158F)
Relative Humidity: 0% to 95%, non-condensing

Mechanical

Dimensions: 10.00 inches x 6.00 inches x 3.00 inches (25.40 cm x 15.24 cm x 7.62 cm)
Weight: 1.37 lbs (0.62 kg)
Construction Material: POLYLAK® PA-765 ABS Thermoplastic (flammability rating UL94-5VA)

External Connections

Power Supply Terminal Block

The two-position power input terminal block has the following connections:

Wire Color	Label	Description
Black	V+	Power Input
White	COM	Power Return

Figure 11: Power Input Terminal Block Connections

Modbus RTU Interface Terminal Block

The two-position CommStat™ 4 interface terminal block has the following connections:

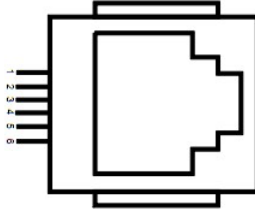
Wire Color	Label	Description
Black	A	RS-485 RX/TX A
White	B	RS-485 RX/TX B

Figure 12: Modbus RTU Interface Terminal Block Connections

The preset Modbus RTU serial configuration is 9600, N, 8, 1.

CommStat™ 4 Interface RJ11 Connector

The female RJ11 socket CommStat™ 4 interface terminal block has the following pinout:

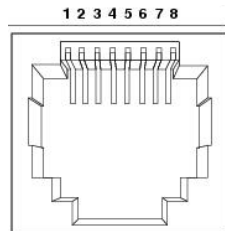


Pin	Label
1	NC
2	Ground
3	RS-485 RX/TX A
4	RS-485 RX/TX B
5	VCC
6	NC

Figure 13: RJ11 Connector Pinout

Ethernet RJ45 Connector

The female RJ45 socket provides the Ethernet connection for the Master system. The pinout for this connector supports the TIA/EIA T568B standard where the individual pin assignments are:



Pin	Label
1	RD+
2	RD-
3	TD+
4	NC
5	NC
6	TD-
7	NC
8	NC

Figure 14: RJ45 Connector Pinout

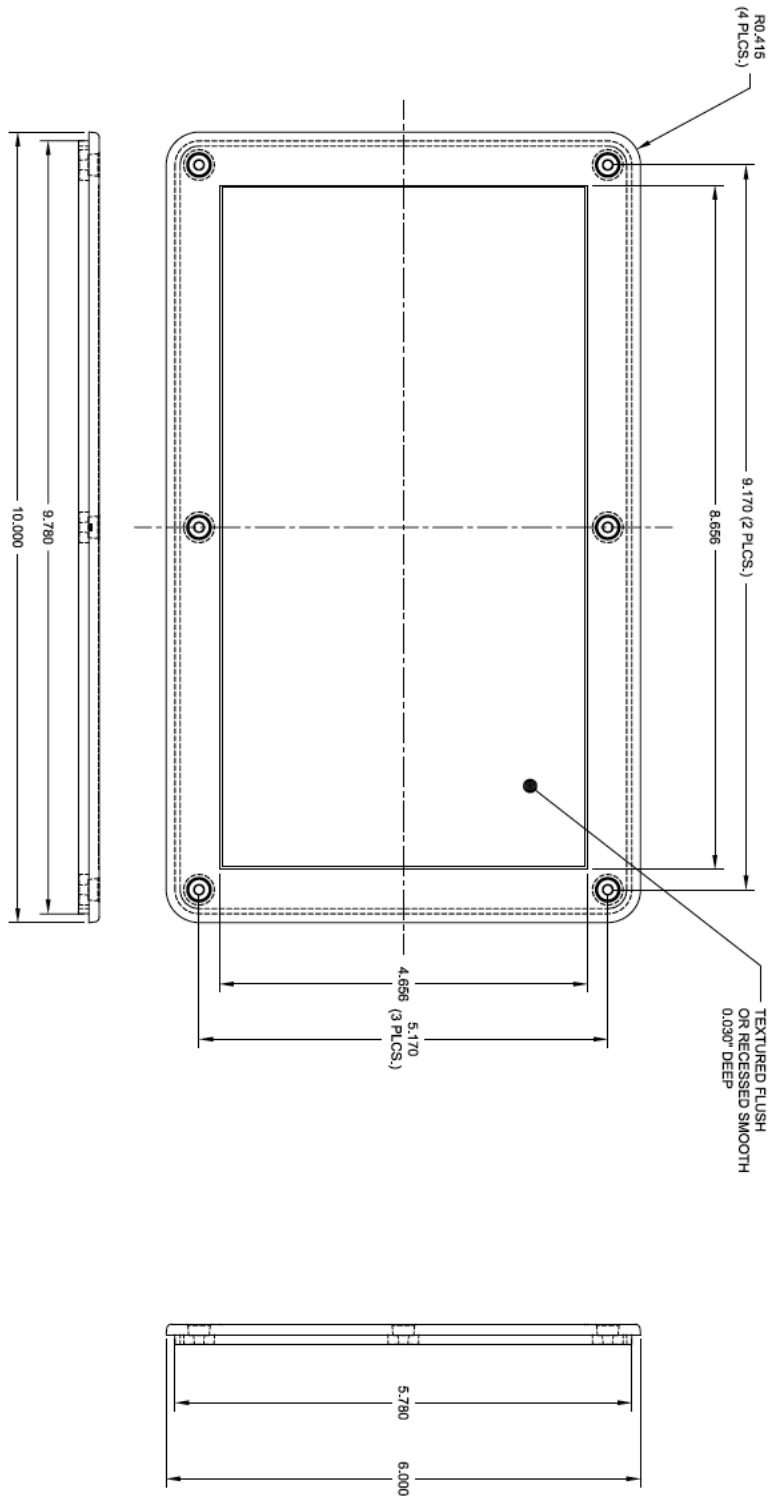


Figure 16: Adapter Enclosure Dimensions-2