

RCS

Model RS21
Model OS21

Remote Temperature Sensor
for *CommStar* RS485 Networks



Installation and Operation Manual

Product Rev D or later

DCN: 141-01021-02
Rev 02

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RS21/OS21 Remote Temperature Sensor

The RS21 is a wall mounted remote temperature sensor. The OS21 is an outside version mounted in a weatherproof enclosure. These remote sensors communicate via the *CommStar* RS485 twisted pair network and protocol. You can read temperature data and configure the sensors with commands via the network.

Network functions supported:

- Temperature reporting: -20 to 127 degrees F
- Address Setting: Settable from network: 1 to 254 (default address is 1)
- Temperature Mode: Selectable from network: F or C mode
- Calibration Offset: Settable from network: +/- 10 degrees

Installation

Wiring to the RS21/OS21

The recommended wiring to the sensor is Category 3 or 5, 24GA twisted pair cable. Most any 24GA or larger twisted pair cable can be used. Two pairs are required. One pair for power and one pair for data.

The recommended network wiring is to homerun each sensor back to an individual RS485 channel on the CommStar network control unit or RS485 hub. However, multi-drop or daisy chain connections of multiple sensors on one channel can be used (up to 254 devices). In either case, the maximum cable length is 4000 ft total.

Mounting the RS21/OS21

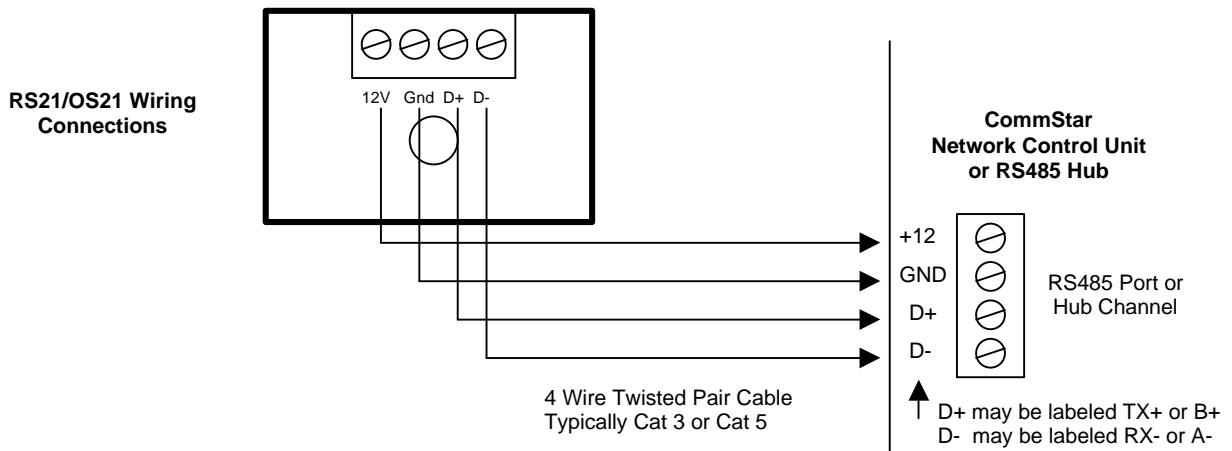
Mount the RS21 in a location that best represents the area that you want to monitor. Avoid outside walls, direct sunlight exposed areas or locations directly in the path of forced air vents.

The OS21 is supplied in a weatherproof outdoor housing. Since the sensor is essentially measuring the housing temperature (which will be ambient outside air temp), it must be mounted in a location that does not get direct sunlight exposure. If this cannot be avoided, then the temperature reading during direct sunlight exposure may not be ambient air temp.

Connection to the Network

The wiring to the RS21/OS21 is the 4 wire CommStar RS485 network wiring. Two of the network wires are for power ground and 12VDC. The other two wires are network data, D+ and D-. Be sure to observe polarities on both pairs of wires. RS485 network data connections are wired + to + and - to -. Some RS485 network connections are labeled TX+/RX- or B+/ A-. Regardless of the label name, always connect positive to positive and negative to negative.

Route the network cable through the RS21/OS21 enclosure and securely attach the wires to the correct terminals on the terminal block.



Operation

CommStar Network Control Unit Support

The RS21/OS21 remote sensors are supported by the CS30/308/48 series of CommStar Network Control Units (NCU) RS485 ports. Up to 254 sensor devices can be attached to a NCU. There is built in software support for up to **32 sensors** (32 is total for all thermostats and sensors).

CommStar WinEVM Support

The CommStar WinEVM Event Manager software for PC/Windows computers is used for setup and control of CommStar Network Control Units and any attached RS485 network devices. RS21 sensors are part of the **HVAC class** of network devices.

Setting the RS21's network address and other configuration options with WinEVM.

DEFAULT ADDRESS: The RS21 will power up with a default RS485 network address is 1.

CHANGING THE RS21 NETWORK ADDRESS: Connect the RS21 to a CommStar RS485 network and send it a new network address with **WinEVM** using the following steps:

1. Connect the RS21 to the CommStar RS485 network either on a CS308 RS485 channel or to an external 8AH485 hub channel. Power up the NCU.
2. Remove the cover of the RS21 and set it into programming mode by pressing the programming button on the RS21 PCB until the status LED flashes rapidly. (See the RS21 command section for more information on the programming mode)
3. When the RS21 LED starts flashing rapidly, it is ready to accept a new network address.
4. Open WinEVM on the PC that is connected to the CommStar NCU Com 1 port.
5. From WinEVM menu bar, select **Utilities** and then **Mega Controller** (or click on the Mega Controller Icon).
6. From the Mega Controller window, click on the "**Send ASCII**" button:
7. Enter the following command string in the **ASCII Data** window: `A=x CNA=y` (ex: `A=1 CNA=2`)
where x is the old address (or 255 if you don't know it) and y is the new address from 2 to 254.
8. Select "**Out of the controller**" and port "**RS485**".
- 9 Click the "**Send**" button.
10. When the RS21 receives the command, the LED will stop blinking. The new address is set.
11. Close the **Send ASCII** window by clicking on "**OK**".

Configuring other RS21 options.

You can configure the RS21's other variables using this same procedure. Substitute the network command desired into the ASCII Data window. See the Network Commands section for other configuration commands.

Configuring the RS21 with other RS485 networks.

When using the RS21 with RS485 networks other than CommStar/WinEVM, you can use an ASCII terminal emulator program such as Hyperterm, to set the network address and other configuration variables. Set the terminal program port settings to 9600 baud, 8 data bits, no parity, 1 stop bit and no flow control.

WinEVM Setup for using RS21 Sensors

WinEVM Device Class: HVAC

The RS21 remote sensor, along with thermostats and zone controllers are grouped into the **HVAC** class of network devices. This class can have a mix of sensors, thermostats or zone controllers for a **total** of 32 devices defined by WinEVM for use by the Network Control Units. RS21 sensors are configured as RS20 series devices.

To use the RS21/OS21 sensors with CommStar Network Control Units (NCU) you must setup and configure the sensors with the WinEVM PC software supplied with the NCU. This process is referred to as "Defining" devices.

1. Connect RS21 sensor to the CommStar NCU.
2. Connect the NCU Com 1 port to the PC. Power up the NCU.
3. Open/run WinEVM on the PC. Verify connection by selecting "**SYS INFO**" on menu bar.
4. Select "**Define**" in the WinEVM main menu bar. Under Define select "**HVAC**"
5. The **HVAC Setup** window will open.
6. In the "**Zone #**" field, select the next unused zone number by using the up/down arrows.
7. Enter a zone name in the "**Zone Name**" field. (Ex: "Outside")
8. Under "**Thermostat Type**" select "**RCS RS20**"
9. Set the "**RS-485**" address to the address selected for the RS21.
10. Click on "**OK**" to exit.

You can check that the NCU is communicating to the sensor by opening the MegaController window (see WinEVM manual for details of MegaController use) and clicking on the **HVAC** display button.

HVAC

This will show current data being reported by all defined and attached thermostats and sensors.

If the MegaController cannot communicate with the RS21 (or any other thermostat/sensor) it will show "zone name timeout" in the logging window. Double check the addressing setup.

Once defined, you can use the RS21 temperature data in CommStar schedule events or Macros.

RS21 Network Commands

RS485 Network Communications

The RS21 responds to RS485 network commands and returns the current temperature information when requested by the CommStar network host using the CommStar network protocol. Other data can be requested or set by network commands.

The RS21 uses a subset of the RCS CommStar RS485 network protocol. This protocol is a simple ASCII alphanumeric based protocol.

Message format is: A=a, O=o, Command <cr> (commas or spaces can be used, <cr> = carriage return)

A = Address of the sensor the message is being sent to, a = 1 to 254.

O= Originator address of the message. This can be up to 16 characters but is usually 0, which is reserved for the host address. **If host address is 0, you can leave this out of the message string.** Stargate and CommStar network control units use address 0 for the host address and thus do not need the originator address in the commands.

Examples: A=1, O=0, R=1 or A=1, R=1 or A=1 R=1 *These are all equivalent messages.*

RS21 Network Commands Summary

R=1 Request status (Generic HVAC device data, includes temperature, setpoints, HVAC mode and fan mode)
R=3 Request status: temperature only. (normal RS21 command)
R=6 Request status: firmware version number of sensor.
CNA=x Change sensor network address. Range: 1 to 254 (only works if sensor is in addressing mode)
CFM=F Set F/C mode to Fahrenheit
CFM=C Set F/C mode to Centigrade
CFM=? Request current sensor F/C mode setting.
SCAL=x Set sensor calibration offset to -10 to +10 degrees.
SCAL=? Request current sensor calibration offset setting.

REQUEST FOR STATUS COMMAND “R=”

The basic command for RCS HVAC devices like thermostats and sensors to return their current data is the request for status command, “R=”. These R commands return the operational data such as temperature, setpoints and modes. They can return groups of data or single data elements.

Command R=1 This is the RCS HVAC device generic request for data command that returns the complete device status including temperature, setpoints, HVAC mode and fan mode data. For compatibility with thermostat nodes in the same CommStar network, the RS21 will also respond to the R=1 request status command. It reports its current temperature data along with meaningless defaults for setpoints (70) and modes (Off) for conformity.

Format: A=1 R=1 <cr>
Returns: A=00 O=1 T=75 SP=70 M=0 FM=0

Command R=3 This is the preferred method of requesting temperature data from the RS21 and returns only temperature data.

Format: A=1 R=3 <cr>
Returns: A=00 O=1 T=75

Command R=6 This request will return the firmware version of the RS21.

Format: A=1 R=6 <cr>
Returns: A=00 O=1 RS21=067_v00.00.00

CHANGE NETWORK ADDRESS COMMAND “CNA=”

The sensor can be addressed from 1 to 254. This address is set or changed by the CNA network command. Address “0” is reserved for the default host address and address “255” is reserved for global commands. **These two addresses should never be used for sensor addresses.** The default network address for the sensor is 1.

Changing the sensor network address. Set the RS21 to the **addressing mode** by pressing the address select pushbutton SW1 on the PCB. The status LED (LD1) will start blinking rapidly and will remain blinking until a valid address change command is received **or** a timeout occurs (3 minutes) **or** pressing the pushbutton again to exit the addressing mode.

Change Network Address Command:

A=a, CNA=xxx <cr> where a=current sensor address or 255 if unknown, and xxx is new network address.

CAUTION: In networks with multiple sensors, be sure only ONE sensor is in addressing mode at a time, otherwise all enabled sensors will be set to the same address if global address of 255 is used.

TIP! You can find out an unknown sensor address by sending out the command: A=255, R=1. The unknown sensor will respond with A=00 O=xx, data, data, data. The O=xx is the current address setting for the sensor. This only works with one sensor on line.

CENTIGRADE OR FAHRENHEIT MODE COMMAND “CFM=”

You can set or check the temperature reporting mode via the network. Default setting is Fahrenheit.

Network Commands: (assume sensor address is 1)

To set the mode to Fahrenheit, send the command: A=1 CFM=F <cr>

To set the mode to Centigrade, send the command: A=1 CFM=C <cr>

To check the temperature mode, send the command: A=1 CFM=? <cr>

The sensor will respond with current mode setting: A=00 O=1 CFM=F

SENSOR CALIBRATION COMMAND “SCAL=”

You can set or check the calibration offset of the sensor via the network. The calibration offset is added or subtracted (+/- 10 degrees) from the sensor internal temperature data when reported on the network. This allows the sensor temperature reading to be adjusted as needed. The default setting is 0.

Network commands: (assume sensor address is 1)

To set a Calibration Offset, send the command: A=1 SCAL= xx <cr>, where xx is -10 to +10.

Note: Values outside of +/- 10 will be ignored.

To check Calibration Offset: send the command: A=1 SCAL=? <cr>

The sensor will return the current offset value. A=00 O=1 SCAL=xx

RS21 Specifications

Size: 2” W x 1.5” L x 1” H

Color: Off-white

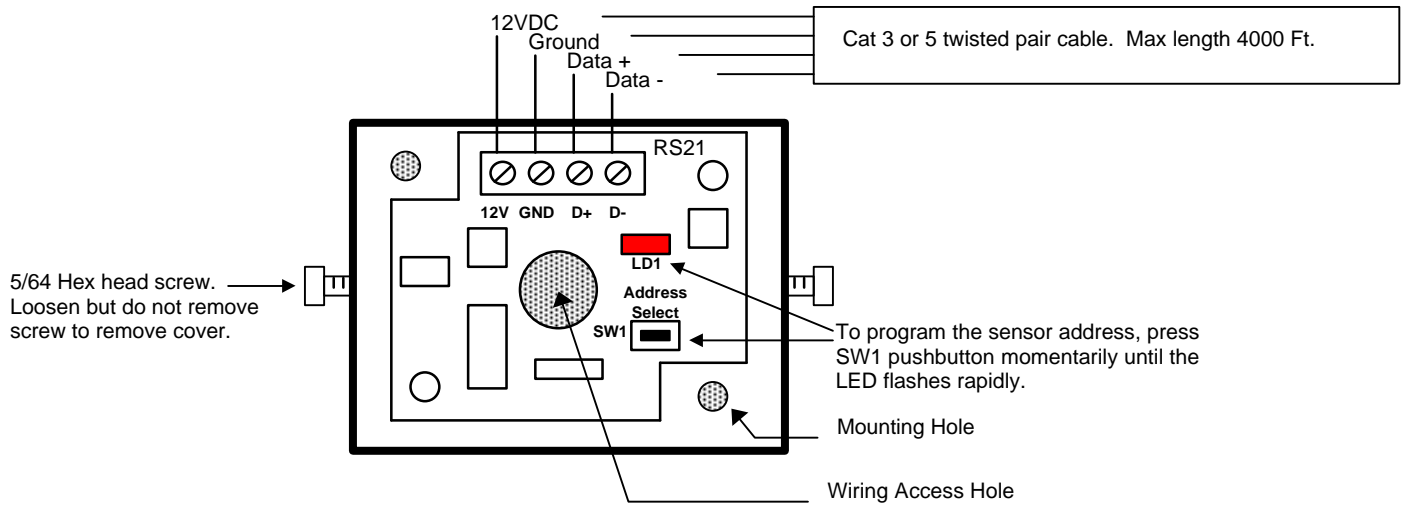
Wt: 10 oz

Power: 12VDC, 10ma supplied by the RS485 network.

Temp reporting range: -20 to 127 deg F

Network Specification: RS485, 2 wire half duplex, 9600 baud, 8 data bits, no parity, 1 stop bit, no flow control.

RS21 Wiring Diagram



RS485 Wiring Note.
 RS485 data connections can be labeled as D+/D-, TX+/RX- or B+/A-.
 Always wire RS485 data connections + to + and - to - regardless of the label names.