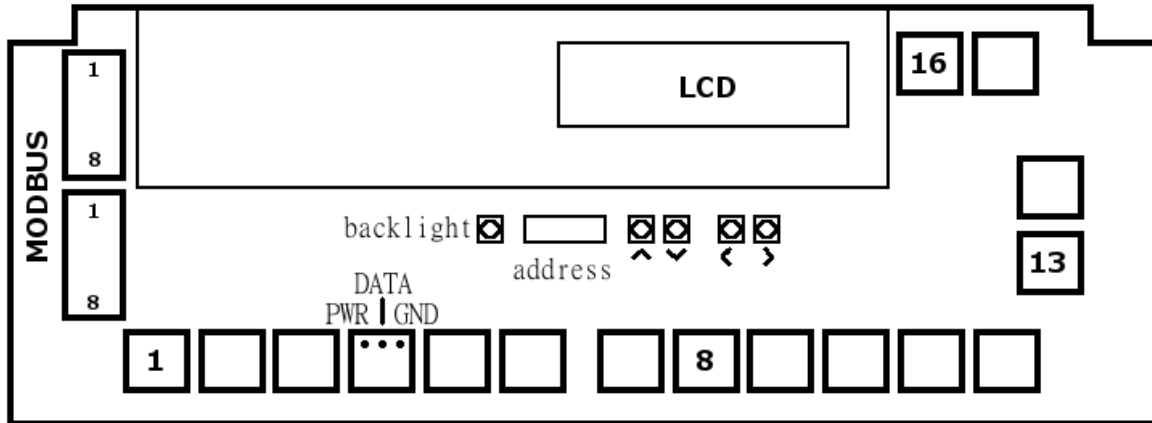


TTCS-Concentrator

Temperature control system concentrator device



TTCS-Concentrator is an outdoor (IP65) device that reads temperature data from up to 8 or 16 temperature probes, each consisting of up to 30 DS18B20 digital temperature sensors and exposes the collected data through MODBUS over RS422.

The device has an operating temperature range of -40 to +85 Celsius.

Probe connection:

TTCS-Concentrator supports both 3 and 2-terminal probe connection. In 3-terminal mode, each probe has GND, Data and POWER connections. In 2-terminal mode POWER is not provided and temperature sensors are powered parasitically through the Data terminal. In order to achieve this, TTCS-Concentrator provides strong pull-up condition during temperature conversion according to Dallas-Maxim 1-wire protocol specifications.

Power connection:

TTCS-Concentrator draws power through its data connection cable (Cat.5 UTP) and requires no additional power connector. The typical power consumption of one TTCS-Concentrator device with probes is about 20mA @ 24V.

MODBUS data connection:

TTCS-Concentrator is a MODBUS slave device, designed to work in a point-to-multipoint system. This means that several TTCS-Concentrator devices can be connected in parallel to form a network, where the master can query any slave device by its MODBUS address.

In order to make the point-to-multipoint connection easier to set up, two identical connectors for the UTP data cable, internally connected in parallel, are present on the device, so the cable from the MODBUS master device can connect to one and the cable to the next concentrator device can be connected to the other.

Configuration interface:

TTCS-Concentrator has a built-in LCD display to help initial configuration and possible troubleshooting. The display shows the health status of all probes plus detailed information for one probe and one sensor from it. The first displayed line contains the general status – one character for each of the 16 probe slots. '*' means OK, '-' means no probe detected on this slot, '!' means a probe

was detected but is not functioning properly. The second line contains the detailed information – the number of detected sensor for a probe and the readings of one of them. The probe number is selected by the left / right buttons and the sensor number – by the up / down buttons.

When probe configuration has changed, a “search” command should be issued so the probes can be auto-detected. This is achieved by simultaneously pressing any 3 out of the 4 configuration buttons. The text “search” is displayed on the screen and then the probes are automatically detected and the configuration – saved to flash.

Data protocol:

TTCS-Concentrator responds to 2 MODBUS commands, both of them non-standard. Even though the commands are non-standard, the encapsulation, CRC computation etc. complies with MODBUS protocol specifications which also makes the device protocol MODBUS compliant.

- **Search command**

This command triggers probe discovery. All probe slots are queried for probes and probe/sensor information is stored in flash memory. Format:

Request:

Slave Address	1 byte	
Code	1 byte	104
CRC	2 bytes	

Response:

Slave Address	1 byte	
Code	1 byte	104
CRC	2 bytes	

- **Read command**

This command requests the current temperature readings.

Request:

Slave Address	1 byte	
Code	1 byte	103
CRC	2 bytes	

Response:

Slave Address	1 byte	
Code	1 byte	103
Probe Readings		
CRC	2 bytes	

Where probe readings consists of one probe info struct for each detected probe. Probe reading format:

Slot Index	1 byte
Sensor Count	1 byte
Sensor Readings	2 x Sensor Count bytes