mTS017
Non-contact
IR Temperature Sensor

Document No. 11128, Revision A

March 2012

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Revision Notes

First Release – March 19, 2009

Revision A – August 15, 2012

- Fix multiplex scheme description

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1. Overview

The mTS017 Non-contact IR Temperature Sensor allows the measurement of an objects temperature without the sensor itself touching the object. The sensor uses a dual thermopile type sensor to fully compensate for ambient temperature changes. The sensor is supplied with either a a 10^{o} or 30^{o} field of view and can measure a broad range of object temperatures from -70^{o} C to 380^{o} C.

Each sensor has a unique digital serial number and will be automatically recognized by CMCIEL Bus Converters. Communications utilize the Dallas 1-Wire® bus standard. Power for the sensor is supplied by the bus system.

The sensors are packaged in a plastic housing utilizing a fully potted construction. Each sensor comes complete with 2 meters of heavy-duty industrial cable rated for use in direct sunlight. The cable is terminated with an RJ-11 connector for direct connection to CMCIEL wiring accessories.

When used with the mBC081 Bus Converter the device is Intrinsically Safe.

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2. Description of Indicators

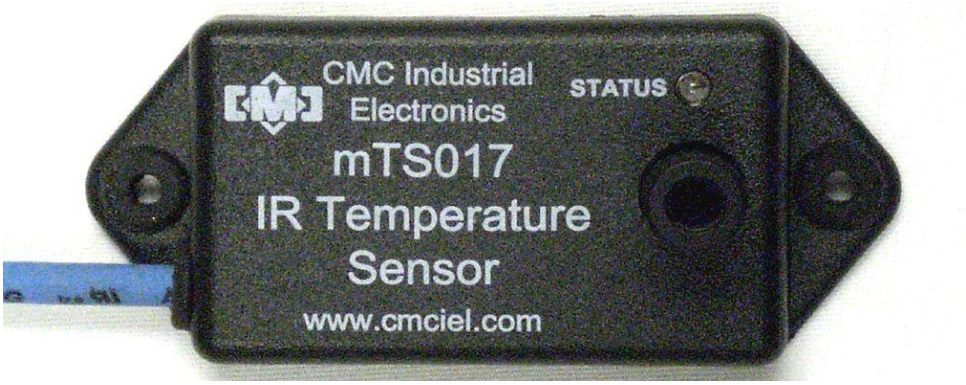

Figure 1 - Illustration of Indicators

The sensor requires no settings. There is one indicator lamp:

Description	Color	Flash Rate	Operation
Status	Green	1	Ok, no communications
		2	Ok, communication active
		3	Power on self test fault
		4	Calibration parameter fault
		5	Firmware fault
		6	Serial number fault

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3. Installation

The IR sensor has a 10° or 30° field of view from the front of the sensor lens body.

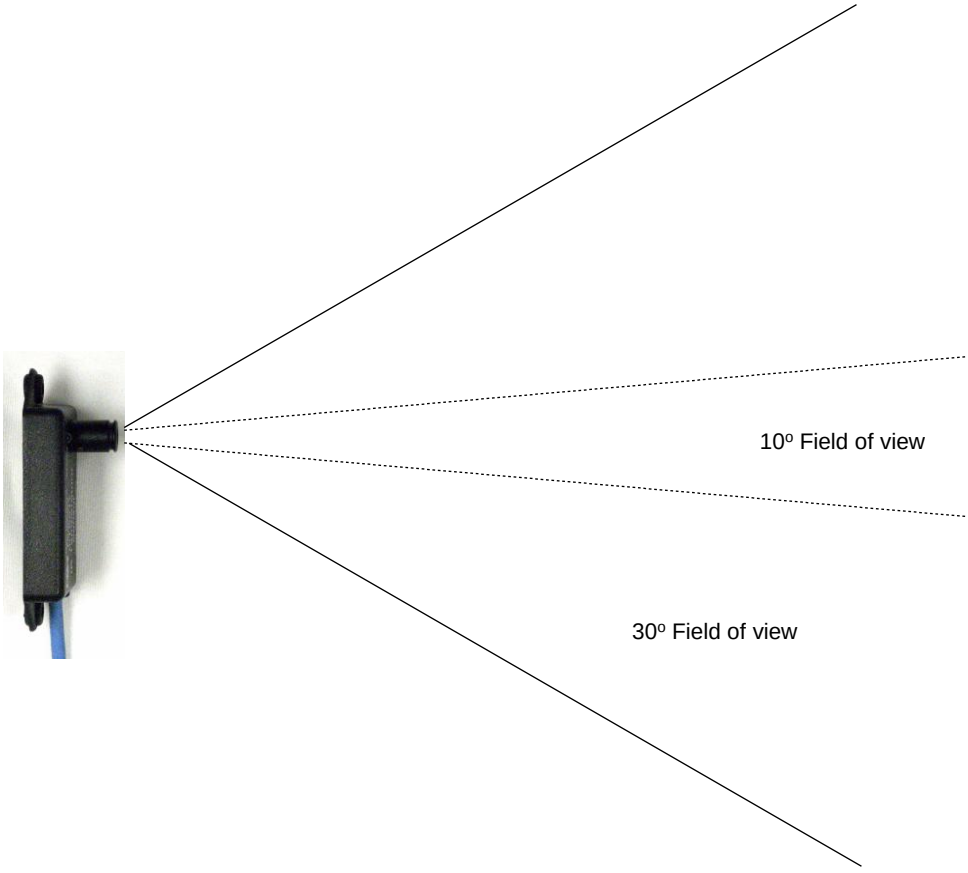

Figure 2 – Field of View

The sensor mounts with 2 x 4-40 screws to any surface. Use the included mounting kit with washers to mount the sensor. The ambient temperature of the sensor body should be held as constant as possible to avoid temperature gradients within the sensor assembly. The assembly is potted and most ambient temperature changes will be correctly compensated. It is not recommended that air be circulated over the sensor body as this my cause temperature gradients decreasing the sensors accuracy. The lens area of the sensor must remain free of dust and other contamination for proper operation.

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4. Signal Processing

The sensor is able to provide both the ambient and object temperatures. Both temperatures are fully compensated and provided in ^{o}C with 1 implied decimal point. The data is provided as a single 16 bit integer. A value of 1000 would represent 100.0^{o}C. The sensor is configurable using the CMCIEL sensor configuration tool. The following sensor parameters can be set using the tool:

Parameter	Function	Factory Default
Emissivity	Adjust for the degree of emissivity of the surface of the object being measured	100%
Data Mode	1 = Object temperature only 2 = Ambient temperature only 4 = Multiplexed object and ambient temperatures	1

When the data mode is set to multiplex, the upper 3 bits of the data word are used to decode the ambient and object temperatures.

Value	Bit 15	Bit 14	Bit 13
Object	1	0	0
Ambient	1	0	1

If bit 15 is 0, then the sensor is configured for non-multiplexed output in either object or ambient temperature output.

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5. Sensor Accuracy

The following table describes the sensor accuracy. The vertical axis is the object temperature and the horizontal axis the case temperature of the sensor. The chart describes the accuracy of the sensor over the various combinations of object and sensor body temperature.

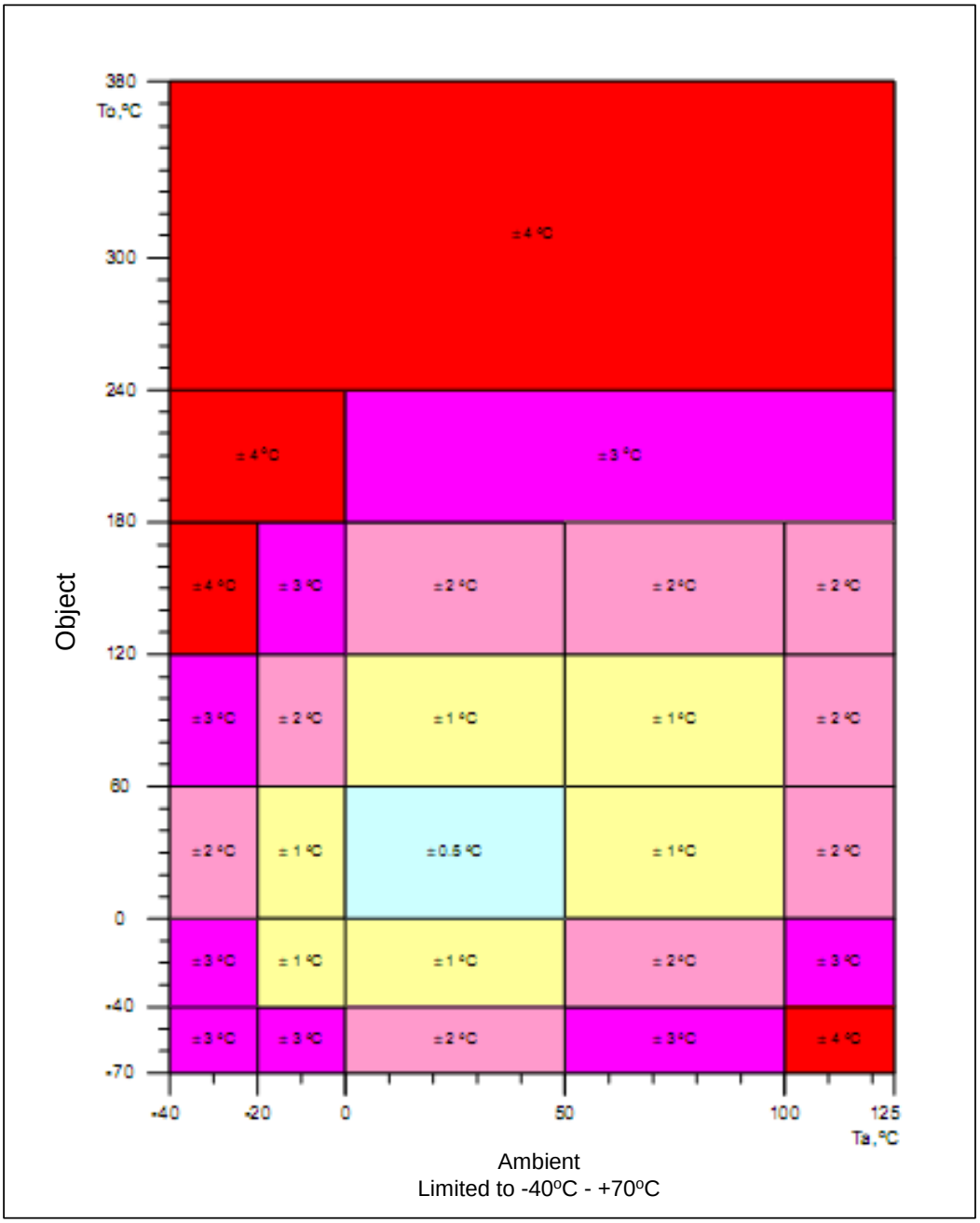
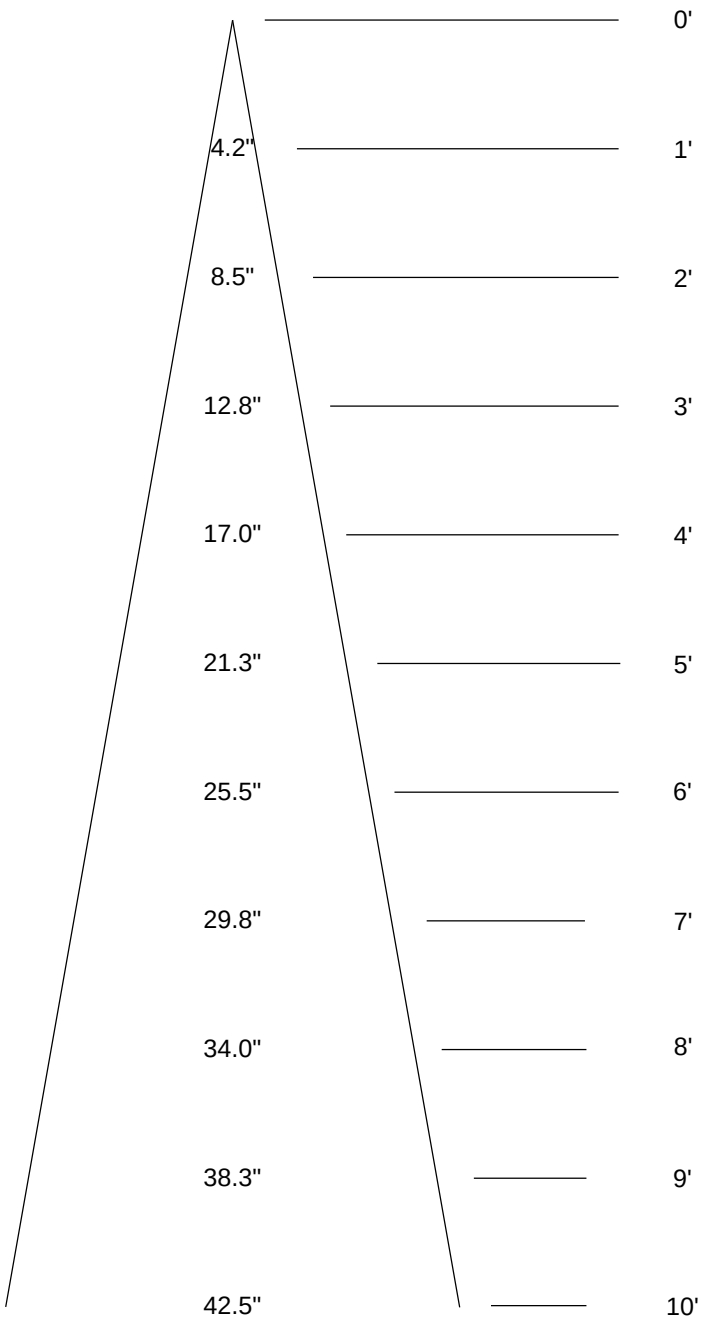
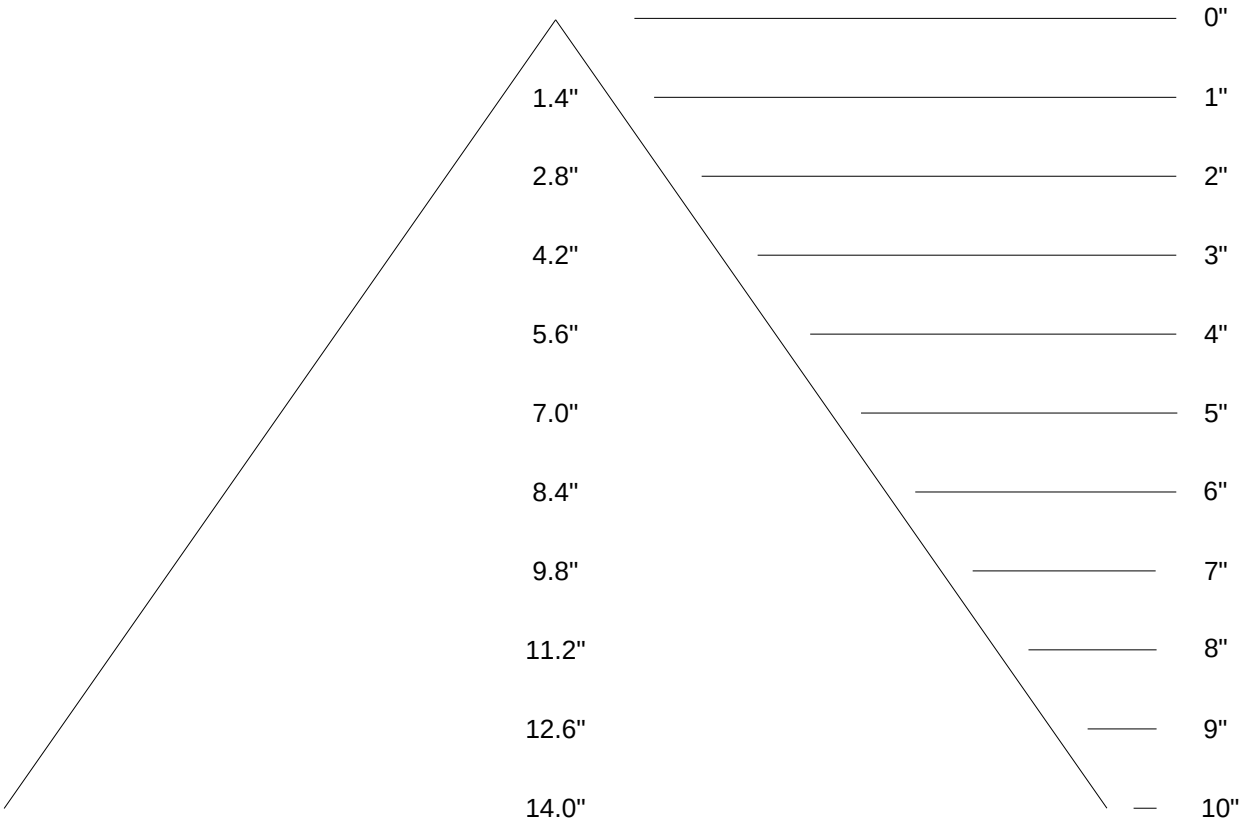


Figure 3 – Sensor Accuracy Diagram

The sensor is available with a 10° and 35° field of view. At 10° the spot formula is 4.25”/foot of distance. Spot sizes for the 10° sensor are:



At 35° the spot formula is 1.4”/inch of distance. Spot sizes for the 35° sensor are:



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6. Communications

The mTS017 IR Temperature Sensor is a fully compliant Dallas 1-Wire® device. The sensor is supplied with 2m of cable terminated with a RJ-11 plug. The sensor connects to the CMCIEL wiring system through a CMCIEL Field Interconnect.

The output of the sensor is a single signed 16 bit word. The output of this sensor can be multiplexed. See Section 4 – Signal process for further details.

The sensor requires a bus converter to convert the Dallas 1-Wire® signaling system to a system recognized by commercial programmable controllers. The Bus Converters provide a Modbus485 RTU interface. CMCIEL manufactures Bus Converters for both commercial and hazardous areas. The vibration value in inches per second, with 2 implied decimal places, is represented as a single signed word in the Bus Converter Modbus register map. See section 4 for information on the values presented. The Bus Converters will automatically acquire the serial number of the sensor on request.

As a Dallas 1-Wire® device, the sensor value is returned using the read scratch function as 3 bytes, the first 2 bytes a signed word containing the %RH and the 3rd byte the Dallas 1-Wire® - 8 bit CRC. The family code for the sensor is 161 decimal or A1 Hex. The sensor responds to the following Dallas function codes:

Code Decimal	Code Hex	Function
240	F0	Search ROM
85	55	Match ROM
15	0F	Read ROM
51	33	Read ROM
204	CC	Skip ROM
190	BE	Read Scratch, 3 bytes, low byte + high byte + Dallas 8 bit CRC

Refer to Dallas Semiconductor documentation for complete details on the operation of the Dallas 1-Wire® signaling system.

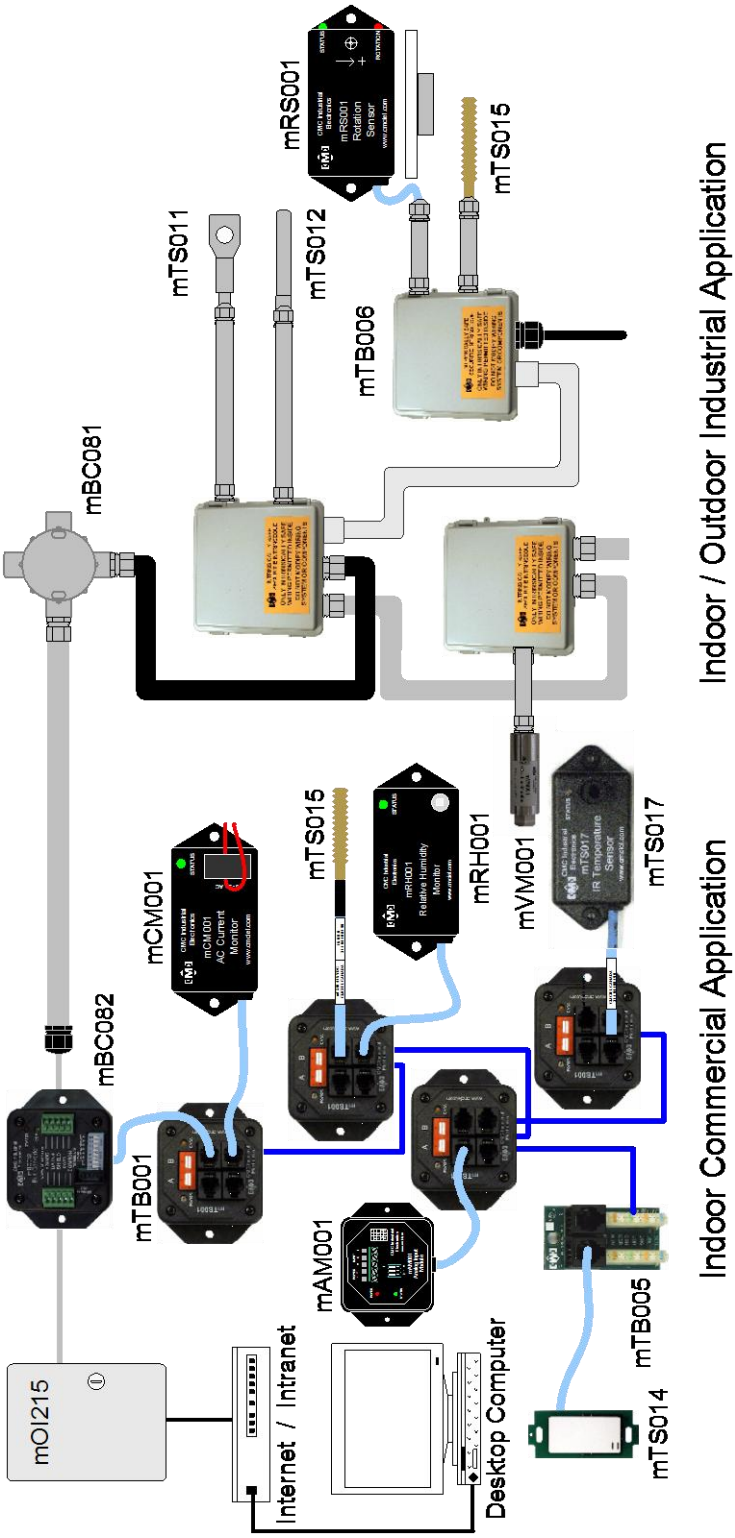

Figure 4 - Typical Network Layout

7. Specifications

Description	Characteristic
Sensor bus	
Voltage	5 VDC
Current	3.0 mA max
Communications	1-Wire® Bus
Output	
Ambient	-40°C to +70°C
Object	-70°C to +380°C
Emissivity	Adjustable, default 100%
Accuracy	0.5% , Ambient 0°C - 50°C, Object 0°C - 60°C See accuracy table for further details
Environment	
Temperature	-40 to 70°C (-40 to 165°F)
Relative Humidity	0 to 100% non-condensing
Dimensions	
Length	74mm (2.9in)
Width	33mm (1.3in)
Depth 10°	30mm (1.10in)
Depth 30°	15mm (0.55in)

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