mDI001
Digital Input Module

Document No. 11141, Revision A

March 2010

This page intentionally left blank.

Table of Contents

Table of Figures

Revision Notes

First Release – May 12, 2009

Revision A – March 4, 2010

- Correct failsafe resistor values

1. Overview

The mDI001 Digital Input Module provides 4 self-powered digital inputs. A switch allows the inputs to be set as either simple open/closed inputs or monitored failsafe inputs. The inputs are self-powered for direct connection to switches or dry relay contacts. A programmable input sample delay is provided.

Each module 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 module is supplied by the bus system.

The modules are packaged in a fully potted plastic housing with a pluggable terminal strip for the inputs. Each module 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. In order to preserve the Intrinsic Safety of the inputs, the field devices connected to the inputs must be physically isolated from any line or battery powered devices.

This page intentionally left blank.

2. Description of Indicators and Switches

Figure 1 - Illustration of Indicators

The module 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

There is a single input mode selector switch. The switch settings are described below:

Mode	Input Type
Standard	Inputs are simple open/closed inputs
Failsafe	Inputs use series resistors and can detect open or shorted input loops

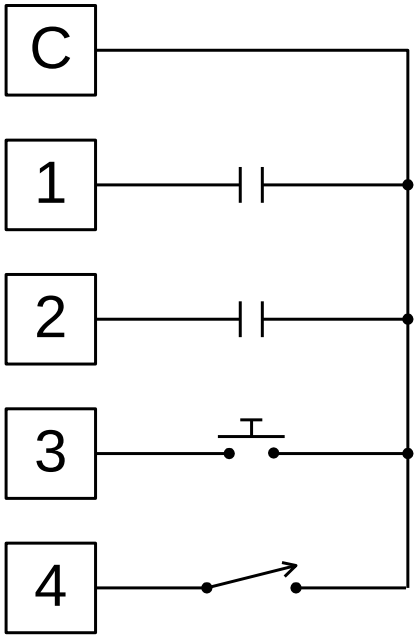
This page intentionally left blank.

3. Installation

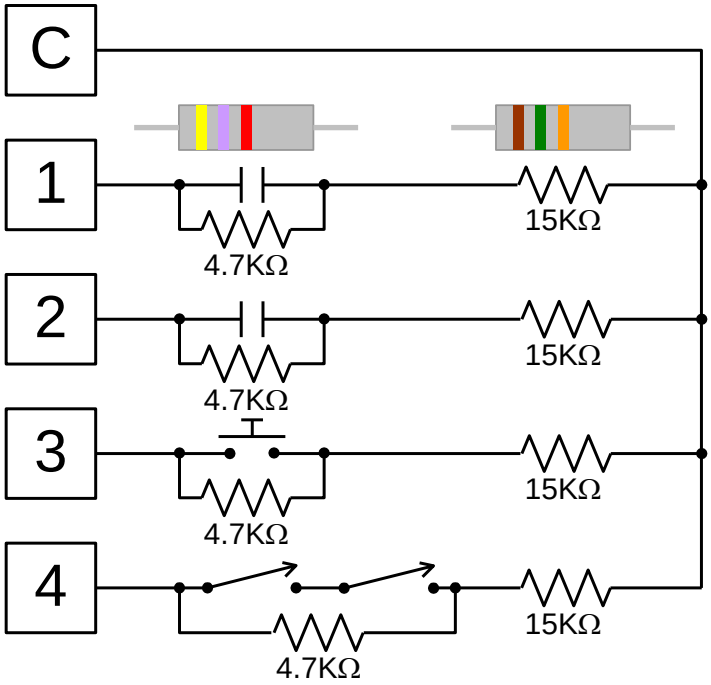
The module should be mounted in a dry clean environment. Do not mount the module where it can be exposed to liquids or corrosive liquids or gases. Mount the module using the 2 mounting holes on the case tabs. Care should be taken not to damage the housing by over-tightening the mounting screws. Connect the cable to a field interconnect using the RJ-11 connector provided. Do not modify the cable. Protect the cable and module from physical damage.

Note that the inputs are self-powered and no external voltage should be applied to the inputs. Each input can source a maximum of 220μA at 3.3VDC.Use switch and relay contacts that are designed to operate reliably with very low DC current. The use of reed relays and gold plated bifurcated switch and relay contacts is recommended. Standard silver contacts can corrode over time and the module supplies insufficient current to clean these contacts.

The input can be configured as standard open/closed inputs or failsafe inputs that can detect an open or shorted switch loop. The input type is switch selected on the module. The wiring for each configuration is shown below:



Standard Open/Closed Mode



Failsafe Mode

When using failsafe inputs to detect multiple switches, the switches are connected in series and a 4.7KΩ resistor is connected across the entire string. The second 15KΩ resistor is located at the last device or end of line.

This page intentionally left blank.

4. Communications

The mDI001 Digital Input Module is a fully compliant Dallas 1-Wire® device. The module is supplied with 2m of cable terminated with a RJ-11 plug. The module connects to the CMCIEL wiring system through a CMCIEL Field Interconnect.

The output of the module is a single 16 bit word. There are 3 bits for each digital input. In standard on / off mode, the fault bits are disabled and will read as “0”. The bit assignments are shown below:

Bit	Description
0	Input 1, 0 = switch open, 1 = switch closed
1	Input 2, 0 = switch open, 1 = switch closed
2	Input 3, 0 = switch open, 1 = switch closed
3	Input 4, 0 = switch open, 1 = switch closed
4	Input 1 = 0 = OK, 1 = loop shorted
5	Input 2 = 0 = OK, 1 = loop shorted
6	Input 3 = 0 = OK, 1 = loop shorted
7	Input 4 = 0 = OK, 1 = loop shorted
8	Input 1 = 0 = OK, 1 = loop open
9	Input 2 = 0 = OK, 1 = loop open
10	Input 3 = 0 = OK, 1 = loop open
11	Input 4 = 0 = OK, 1 = loop open

The module can be configured using the CMCIEL Configuration Tool. The module has a single configuration register the “Input Sample Time”. This register allows the setting of the input sample time, default is 1.0 second, from 0.5 seconds to 409.5 seconds to reduce false transitions in some applications.

The module 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 input bit mapped value is represented as a single word in the Bus Converter Modbus register map. The Bus Converters will automatically acquire the serial number of the module on request.

As a Dallas 1-Wire® device, the module value is returned using the read scratch function as 3 bytes, the first 2 bytes a signed word containing the input data and the 3rd byte the Dallas 1-Wire® - 8 bit CRC. The family code for the module is 165 decimal or A5 Hex. The module 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.

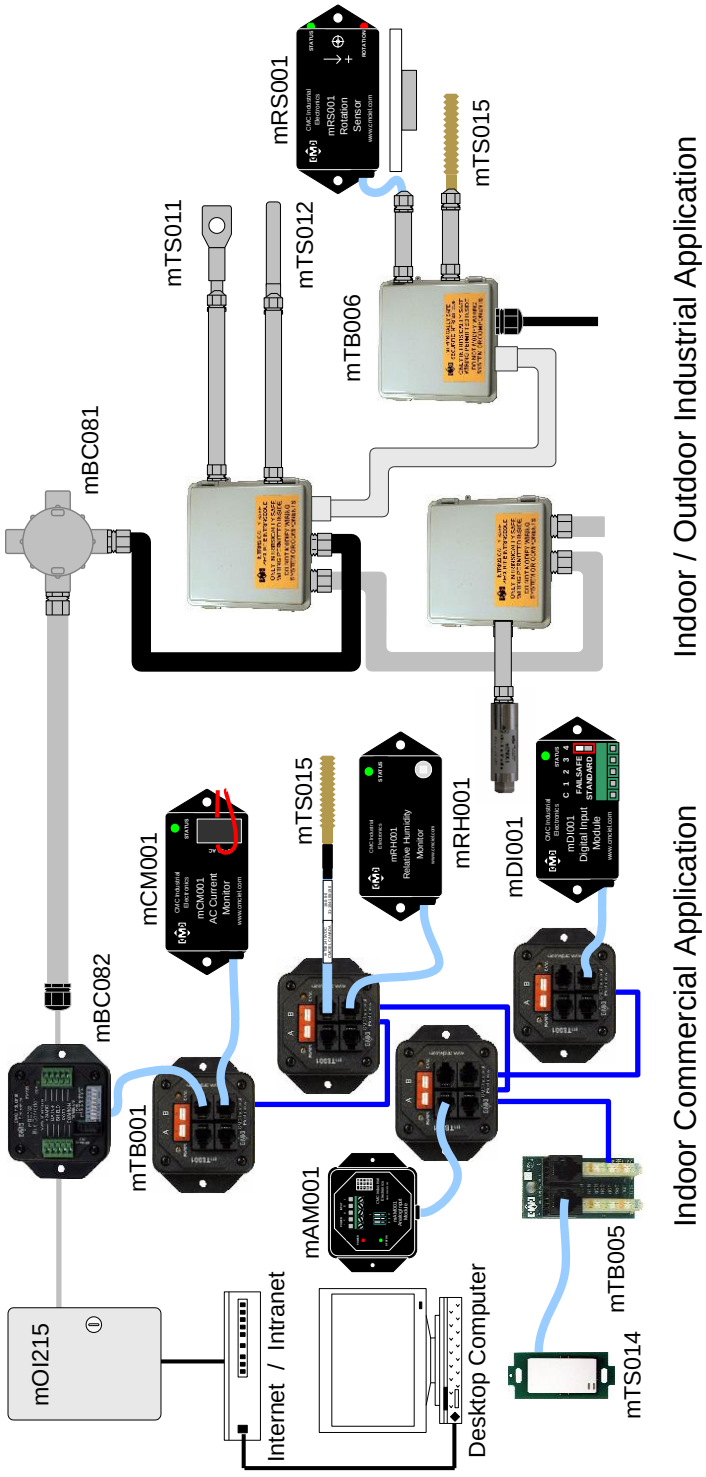


Figure 2 - Typical Network Layout

5. Specifications

Description	Characteristic
Sensor bus	
Voltage	5 VDC
Current	3.0 mA max
Communications	1-Wire® Bus
Inputs	
Voltage	3.3VDC
Current	220 µA
Delay	State change delay 1 second (default)
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	30mm (1.15in)

This page intentionally left blank.