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A 1-Wire Serial Interface

TEMP08



Figure 1 TEMP08

TEMP08 User Guide Version 2.15
June 30, 2008

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1.1. List of Tables

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2. Introduction

Thank you for your purchase of the TEMP08 1-Wire Serial Interface. The following instructions will assist you in configuring and operating the product.

TEMP08 is a stand-alone 1-Wire™ interface providing standard serial commands to control the Dallas/Maxim 1-Wire bus and the devices used on it. Sensors can be polled on a regular basis (from 1 to 99 minutes), or manually interrogated.

In a typical application, TEMP08 is connected to a serial port on a PC. Serial interface software is then used to gather the data received from TEMP08 and process it. Many users have interfaced TEMP08 into the [HomeSeer](#) product, which can be used to automate lights, HVAC, sprinklers, and other devices, based on the sensor readings from TEMP08.

The TEMP08 can provide a serial interface for the following devices:

- Multiple DS2438-based Humidity Sensors, including, of course, the Midon Design MD3020E Humidity Sensor.
- Multiple DS2438 based Barometric Sensors
- Multiple DS2438 general purpose sensors for analog voltage input
- Multiple DS18S20, DS18S20-PAR, DS18B20, DS1822, DS1920 temperature sensors as well as temperature reading from any DS2438
- One DS2450 based Weather Station for wind speed and wind direction
- Multiple DS2450 voltage sensors
- Multiple DS2423 based rain gauges
- Multiple DS2423 general purpose counters (for use with Lightning sensors and other types of counter inputs)
- Multiple DS2401 or DS1990 1-Wire serial numbers (only presence will be reported)
- Up to 20 1WIO relay interface modules (or equivalent DS2408 based relay module) available from Midon Design
- Up to 10 1WIO LED modules (available from Midon Design)

TEMP08 has the following features:

- On-board voltage or temperature (provisionable) sensor with an option for an on-board humidity sensor.
- Jumper-less provisioning - all configuration settings are stored in non-volatile memory
- Up to 60 1-Wire are sensors supported

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- Simple instruction set with a Help prompt for recalling command names
- Easy to delete sensors, if they are no longer required, using the DEL command
- 1-Wire bus errors are flagged when they occur
- Support for software serial flow control (Control-S, Control-Q) to permit inspection of long lists without scrolling beyond your terminal's page length
- Continuous poll for ALL sensors - TEMP08 will notify you when any sensor is connected or disconnected, providing that they have been previously recognized by TEMP08 via the **INI** command. Very useful for locating intermittent 1-Wire bus problems or for real-time polling of contact sensors.
- Manual Poll of sensor readings. While TEMP08 is normally used for continuous (from 1 to 99 minute intervals) polling of sensor readings, it may also be used manually to take sensor readings on command from the serial interface.

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3. Installation

To complete this project, you will need to connect a 12 to 16 Volt (AC or DC) transformer to the terminal J1 (see Figure 3 or 4 for the location of J1). If you intend to power 1WIO relay units from the 12V output of TEMP08, the transformer needs to supply at least 350mA (250mA for 1WIO and 100mA for TEMP08) per 1WIO relay unit, up to a maximum of 800mA, or 2 1WIO relay units. Beyond that, supplemental powering will need to be provided for the off-board units. Otherwise, any 12 to 20 Volt adapter capable of at least 100mA will do.

If you are using a sensor network of 1-Wire devices, connect them now to either connector J3 or J5. Please note that adding 8 or more sensors at a time may be problematic for TEMP08. If possible, add sensors one at a time to ensure correct operation.

If you are using DS18S20 or DS18B20 temperature sensors, only 2 pins of each sensor needs to be connected, however a connection is required between the VDD and GND pins of the sensor if you are using parasitic powering. If +5VDC local power is being used to power the sensor, connect the VDD terminal to it. See Figure 2 for device connections.

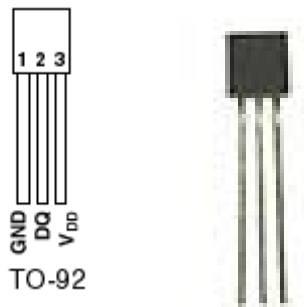


Figure 2 DS18S20/DS18B20 Pin-out

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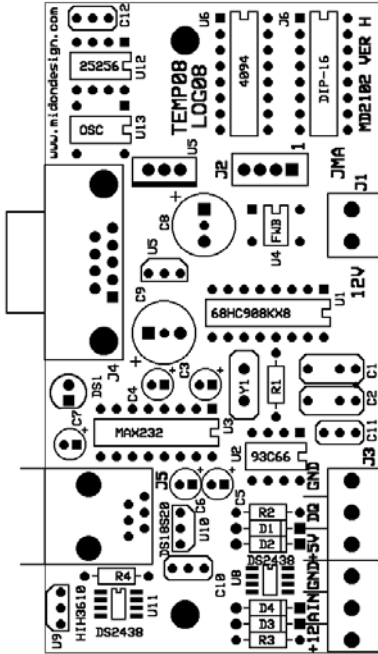


Figure 3 Parts Placement (ver H PCB)

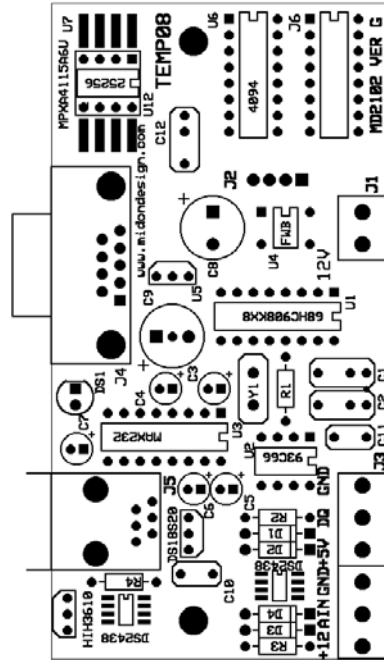


Figure 4 Parts Placement (ver G PCB)

4. Using the TEMP08

Connect up a straight-through serial cable between TEMP08's J4 connector and your PC. Open up HyperTerminal (or equivalent terminal emulator program) on your PC. Configure it to 9600 BPS, No parity, 8 bits, 1 start bit and NO hardware handshaking (very important!). Power up the TEMP08 and configure the unit for the devices that you have connected.

We recommend that you next use the **ERA** command **for first time use**, to erase the EEPROM. This will remove any previous information that may have been stored in the EEPROM. Next use the **INI** command to search for any 1-Wire devices connected to the 1-Wire bus. If you get any error messages, it is most likely a result of a bad connection to the devices. Verify them. Typically, a "OW bus error" message indicates that a sensor has been installed in reverse, or that there is a short on the bus.

Note: an ERA command is not required every time that an INI command is issued. It should only be required for first time use.

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If a DS2423 or DS2438 is detected by the **INI** command, you may get an error message that requests you to input the unit **TYPE**. See the table 2 for details for the valid inputs. In v1.11 or later, if nothing is entered for 1 minute in this field for a DS2423, then the sensor TYPE will be defaulted to “L” (Lightning counter). A DS2438 will not default to any specific type.

Now program the configuration by using the **SET** command. Just type **SET** and the program will prompt you for the required settings; logging interval, F/C display, wind direction reverse setting, and finally the real time clock setting.

You might also want to establish the option settings at this time. Please review section 5.6 for options that are available and the commands that are used to change those.

To verify that your setup is working properly, you should next use the **TMP** command to perform an immediate sensor reading. The output of the **TMP** command should look like the sample below (the exact output will depend on what type of sensors and how many you have installed).

```
>
WED 21:51:13
Reading Sensors...
Humidity #01[9F000000037555326]=60%
Barometer #01[A9000000037621A26]=28.21 inHg
Voltage #01[0200000002B2CB326]=02.60V 05.03V
Wind Dirn[9F00000001087320]= NNW
Wind Speed[8E00000001562C1D]=00 MPH, Gust = 00
Rain #01[8E00000001562C1D]=003.32 Inch
Lightning #01[D4000000045C621D]=00029 24592
1WIO Status = On,Off,On,Off
Temp #01[9900080049199310]=79.80F
Temp #02[5C00080009242E10]=75.80F
Temp #03[9F000000037555326]=79.00F
Temp #04[A9000000037621A26]=78.77F
Temp #05[21000000032E4E22]=76.66F
Temp #06[0200000002B2CB326]=76.10F
>
```

If there are no apparent errors, you are ready to use TEMP08. Enjoy!

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5. TEMP08 Commands

These commands are valid for the versions of TEMP08 software shown in the table.

Table 1 TEMP08 Command List

Minimum S/W RLS	Command	Description	Syntax
2.01	DAD	Disable on-board ADC voltage display during poll output	DAD<on off> Note 3
1.00	DEL	Delete a sensor that was previously installed via the INI command	DEL<sensorid> Note 1
1.00	DIS	Display serial numbers of all configured 1-Wire devices	DIS
2.01	DTI	Disable Once-Per-Minute Time Display	DTI<on off>
2.01	DWN	Disable Wind Direction display for DS2450 sensors	DWN<on off>
1.00	EEP	Display and change specific EEPROM memory locations	EEP <start location><cr>
2.01	EIN	Enable polling of 1WIO sensors for input status	EIN<on off>
1.00	ERA	Erase the EEPROM	ERA
1.00	HLP	Display a list of available commands	HLP
1.00	INI	Search for a list of available 1-Wire sensors.	INI
1.11	INP	Display the status of bits 4-7 of the first connected DS2408 (See 1WIO sensor for details)	INP
2.11	LED	Actuate a specific LED on a 1WIO LED unit or equivalent DS2408 LED interface	LED <LED number> <on off> Where <LED number> = 01 to 80 or A for All (the leading zero is

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Minimum S/W RLS	Command	Description	Syntax
			required for LED numbers less than 10)
1.00	MEM	Display and change specific memory locations	MEM <start location><cr>
1.00	NOR	Set North for a 1-Wire Weather Station	NOR
Not available in V2.01 or higher	RLB	Actuate all relays at once via binary input	RLB x Where x = an 8 bit binary number representing all relays. The MSB is relay 8. A 1 turns on a relay.
Not available in V2.01 or higher	RLT	Set the Relay Off Timer	RLT xx Where xx is a decimal number from 00 to 99. 00 will disable the relay off timer.
1.00 to 1.13	RLY	Actuate a specific relay	RLY <relay number> <on off> Where <relay number> = 1 to 8 or A for All RLY S (displays status of all relays)
2.01	RLY	Actuate a specific 1WIO relay	RLY <relay number> <on off> Where <relay number> = 01 to 80 or A for All (the leading zero is required for relay numbers less than 10)
1.00	RST	Reset any DS2423 counter	RST<sensorid>
1.00	SCK	Set Clock	SCK dd, hh, mm, ss<cr> dd = 01 to 07 (Sunday = 01) hh = 00 to 23 mm = 00 to 59 ss = 00 to 59 Note 2
1.00	SET	Configure all system parameters	SET
1.00	SID	Show the Serial Number ID for the 1-Wire Devices	SID <on off>

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Minimum S/W RLS	Command	Description	Syntax
1.00	SPT	Set the polling interval	SPT xx Where xx is a decimal number from 00 to 99. 00 will disable polling.
1.00	STD	Set Temperature Display	STD <F C>
1.00	TIM	Display Time from Real Time Clock	TIM
1.00	TMP	Display sensor readings of all connected 1-Wire Devices in either verbose (includes serial numbers) or non-verbose manner	TMP
1.00	TYP	Select the type of DS2438 or DS2423 device. See table 2 for valid parameters.	TYP<sensorid>
1.00	VER	Displays the current version of the software loaded	VER
1.00	WDR	Wind Direction Reverse (in case your Wind Direction PCB is installed upside down, or in case you want to show the FROM direction instead of the TO direction)	WDR <on off>
Not available in V2.09 or higher	WND	Start continuous display of wind direction. Exit this function by entering any character from the terminal keyboard.	WND
1.00	ZZZ	Performs a soft reset of TEMP08	ZZZ

Notes

1. The <sensorid> parameter in some commands above refers to the sensor number as shown via the DIS command. See the DIS command explanation below.
2. Most commands do not require a Carriage Return (enter) following the parameter or command input. One exception is the SCK command. Commands requiring a sensor number input will require a CR if the sensor number is only a single digit.
3. Command parameters are shown in angled brackets "<>". Where only certain options are permitted, they are indicated with a vertical pipe character "|".

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5.1. Using the SET Command

The SET command has multiple parameters. All parameters are also adjustable via discrete commands.

Update Interval

This parameter determines the time between sensor readings. Set to 00 to stop polling. Enter the time in decimal minutes. Use the **SPT** command to adjust only this parameter.

Relay Off Timer

This parameter determines how much time to wait between turning on ANY relay and turning them ALL off. Enter the time in decimal minutes. Enter 00 to disable this function. Use the **RLT** command to adjust only this parameter.

Note: the RLT command and setting is not applicable with software versions 2.01 and higher.

F or C Display

This parameter determines how temperature readings are displayed. Enter F for Fahrenheit or C for Celsius. Use the **STD** command to adjust only this parameter.

Serial # Display

Set this to On if you want TEMP08 to display the 1-wire ID of all sensors. Use the **SID** command to adjust only this parameter.

Wind Dirn Reverse (Wind Direction Reverse)

This parameter is normally set to Off. Set this to On if you accidentally installed the wind direction PCB upside down in your weather station OR if you want to display wind direction as the FROM direction instead of the TO direction. Use the **WDR** command to adjust only this parameter.

Set Clock

Enter the current time here as Day of week (01 = Sunday) followed by Hour, Minutes, and lastly, Seconds. Use the **SCK** command to adjust the clock at any time. Time is entered and displayed in 24 hour (military) format.

5.2. The DIS Display Output

Sample DIS Output

```
01 9F00000001087320 DS2450 OK P
02 8E00000001562C1D DS2423 OK P R
03 D6000000221D1512 DS2407 OK P
04 9900080049199310 DS1820 OK P
05 5C00080009242E10 DS1820 OK P
06 9F00000037555326 DS2438 OK P H
```

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```
07 D4000000045C621D DS2423 OK P L
08 A900000037621A26 DS2438 OK P B
09 21000000032E4E22 DS1822 OK P
10 020000002B2CB326 DS2438 OK P V
11 FF00FF00FF00FFEE ????? NG M
```

```
Update interval = 01 minutes
Relay off timer = 00 minutes
Temp display = F
Serial # display = On
Wind dirn reverse = Off
Qty of DS1820=02
Qty of DS1822=01
Qty of DS18B2=00
Qty of DS2438=03
WED 19:05:19
>
```

5.2.1. DIS output explanations

Sensor numbers do not necessarily match up with the output from the regular sensor output readings. **This is intentional.** The sensor numbers in the **DIS** output are the memory locator and are used by the **DEL**, **RST**, **ONA**, **ONB**, **OFA**, **OFB** and **TYP** commands. The sensor numbers in the scan output are sequential numbers for each type of sensor.

The Sensor numbers from the **DIS** display are also used for displaying when a sensor is removed or added to the 1-Wire bus. For instance:

```
>MON 09:52:34
Missing Sensor #04 [9900080049199310]
```

Would indicate that the 4th sensor in the **DIS** display was disconnected.

```
>MON 09:57:01
Restored Sensor #04 [9900080049199310]
```

Would indicate that the 4th sensor in the **DIS** display had been re-connected.

An OK will be displayed following the sensor type to indicate that the Cyclic Redundancy Counter (CRC) checksum of the sensor's serial number is good. If the serial number has a bad CRC, an **NG** will be displayed. The checksum is validated during the output of the sensor display.

Following the CRC status, a **P** or **M** will be displayed to show the connectivity of the sensor. A **P** is displayed if the sensor is present, and an **M** when it is missing from the 1-Wire bus.

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Letters following the **P** or **M** for DS2423 and DS2438 sensors indicate the **TYPE** of sensor equipped. This is a one-time manual input and will be set following first discovery of the sensor via the **INI** command, and also following a power-up of the TEMP08 for the DS2423 sensors that do not have built-in battery backup. The letters designate the sensor type per the following table (*Note: Type “T” is only available with v1.07 or higher software*).

Table 2 Sensor Type Descriptions

Designation	Description	OW Device
B	Barometric Sensor	DS2438
H	Humidity Sensor	DS2438
L	Lightning Sensor	DS2423
R	Rain Sensor	DS2423
T	Temperature only from DS2438	DS2438
V	Voltage Sensor	DS2438
W	Wind Speed Sensor	DS2423

Following a display of the sensors installed, the output of the **DIS** display then shows the TEMP08 settings that you entered via the **SET** command.

Following that display the **DIS** output proceeds to show how many temperature sensors are installed, by type. The DS18B2 type indicates a DS18B20 sensor. The DS1820 type is valid for DS1820, DS18S20 and DS1920 sensors.

5.3. Using the EEP and MEM Commands

These two commands provide direct access to the memory of TEMP08 and, as such, should be used with extreme caution. After entering the command, TEMP08 will display the contents of memory. Use the “;” key to advance to the next memory location, and use the “/” key to go to the previous memory location. Both commands will wrap around at the appropriate memory boundaries.

To change a memory location using the MEM command, enter a hexadecimal value after the memory contents are displayed. Valid inputs are from “00” to “FF”. If the memory location is read-only, an “? Entry Error” error message will be displayed.

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To change a memory location using the EEP command, enter a double hexadecimal value after the memory contents are displayed. Valid inputs are from “0000” to “FFFF”.

In both commands, a carriage return (enter) following display of the memory contents will terminate the command.

Obviously, these commands can be potentially harmful to the operation of TEMP08 if not used properly. Midon Design recommends that the **EEP** and **MEM** commands only be used under guidance from our support staff.

5.4. TMP Output Display

The **TMP** output and polled output displays are identical. An example is shown below.

```
>
WED 21:51:13
Reading Sensors...
Humidity #01[9F00000037555326]=60%
Barometer #01[A900000037621A26]=28.21 inHg
Voltage #01[020000002B2CB326]=02.60V 05.03V
Wind Dirn[9F00000001087320]= NNW
Wind Speed[8E00000001562C1D]=00 MPH, Gust = 00
Rain #01[8E00000001562C1D]=003.32 Inch
Lightning #01[D4000000045C621D]=00029 24592
lWIO Status = On,Off,On,Off
Temp #01[9900080049199310]=79.80F
Temp #02[5C00080009242E10]=75.80F
Temp #03[9F00000037555326]=79.00F
Temp #04[A900000037621A26]=78.77F
Temp #05[21000000032E4E22]=76.66F
Temp #06[020000002B2CB326]=76.10F
>
```

The output starts with a time reading, followed by humidity, barometer, voltage, wind direction, wind speed, switch status, counter readings, and ending with all temperature sensors. All DS2438 temperature readings will be displayed in addition to the other temperature sensors.

The first voltage reading displayed for a DS2438 voltage sensor is always the external voltage from the DS2438 input. This is followed by the VDD voltage. Changing a humidity or barometric sensor type to a voltage type may be useful for trouble-shooting problems with a sensor.

Wind direction is expressed via the 16 cardinal points of the compass:

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N
NNE
NE
ENE
E
ESE
SE
SSE
S
SSW
SW
WSW
W
WNW
NW
NNW

In order for these cardinal points to line up to correct North, you must initialize the TEMP08 first by manually setting the Wind vane to point to North and then use the **NOR** command to save that direction in memory.

Wind speed is shown as an average of the speed over the previous polling interval. The Gust speed is the maximum speed in any 1-minute period of any polling interval. If the polling interval is one minute, then the gust speed will always be the same as the wind speed.

Note: the time is always displayed once per minute, on the minute, except during a polling interval or TMP display. See the section on “Hidden Options” or the DTI command to disable this display.

5.5. Missing Sensor Display

TEMP08 continuously polls for the presence of all sensors that have been **INI**'d, in other words, for sensors that are known to TEMP08. If any of the sensors are detected as missing, the following display will result:

```
>MON 09:52:34  
Missing Sensor #04 [9900080049199310]
```

When the sensor is re-connected, the display will look like this:

```
>MON 09:57:01  
Restored Sensor #04 [9900080049199310]
```

Polling of sensors is done sequentially and very fast (milliseconds per sensor). The more sensors that are equipped, however, the more time it will take for TEMP08 to recognize a missing or re-added sensor.

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5.6. Hidden Options

There are 4 "hidden" options available in V1.13 and higher, up to V2.01. All of them require a manual edit of the EEPROM option register except in V2.01 and higher where these options are available via discrete commands, shown below.

These options are "hidden" only in the sense that they do not appear in the normal **DIS** status display.

5.6.1. On Chip Voltage Display (DAD)

The first option is to enable or disable the on-chip voltage sensor (Voltage #00). It is available as bit 5 of the Option register. A 1 disables the Voltage #00 display, and a 0 enables it. In software versions 2.01 and higher the command **DAD on** disables the display.

Please note that the secondary ADC is not the same one as that of the on-board DS2438. The secondary on-board ADC is available on pin 3 of J2. Be careful with connections to this ADC input. **Note: you are connecting directly to the processor, and input voltages greater than 5 volts, or less than -0.6 volts, will damage the processor pin and possibly the processor itself.**

Activating the display results in the following kind of display during a Polling interval:

```
>
WED 21:51:13
Reading Sensors...
Humidity #01[9F00000037555326]=60%
Barometer #01[A900000037621A26]=28.21 inHg
Voltage #00 =00.95V
Voltage #01[020000002B2CB326]=02.60V 05.03V 0.02mV
Wind Dirn[9F00000001087320]= NNW
Wind Speed[8E00000001562C1D]=00 MPH, Gust = 00
Switch #01[D6000000221D1512]=Off
Rain #01[8E00000001562C1D]=003.32 Inch
Lightning #01[D4000000045C621D]=00029 24592
lWIO Status = On,Off,On,Off
Temp #01[9900080049199310]=79.80F
Temp #02[5C00080009242E10]=75.80F
Temp #03[9F00000037555326]=79.00F
Temp #04[A900000037621A26]=78.77F
Temp #05[21000000032E4E22]=76.66F
Temp #06[020000002B2CB326]=76.10F
>
```

Note: the on-board ADC voltage display will only occur if at least one other sensor is configured as a voltage device in software releases below V2.01.

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5.6.2. Once Per Minute Time Display (DTI)

The second option is to enable or disable the once-per-minute time display. It is available as bit 6 of the Option register. A 1 disables the once-per-minute time display and a 0 enables it. In software versions 2.01 and higher, the command **DTI on** disables the display.

5.6.3. Display Raw Voltages from DS2450 (DWN)

The third option, bit 7, allows you to display the raw voltages from all connected DS2450's. If disabled, the first connected DS2450 will be assumed to be a Weather Station wind direction sensor and other DS2450's will be ignored. If enabled, only voltages will be displayed from DS2450's. In software versions 2.01 and higher, the command **DWN on** will disable the display of wind direction and only voltages will be displayed from DS2450's.

With **DWN** set to **off**, the polled output (or TMP output) will look like this:

```
Wind Dirn[9F00000001087320]= NNW
```

With **DWN** set to **on**, the polled output will look like this:

```
Voltage #01[05300000CD2C1220]=02.60V 05.03V 1.38V 4.25V
```

5.6.4. Enable DS2408 Input Poll (EIN)

The fourth option enables or disables a regular poll of a DS2408 connected on the 1-Wire bus. This is generally only required for users of MD2088 LED displays since the normal poll of a DS2408 will set the high order bits (4 to 7) of the DS2408 and corrupt the LED display for those bits. This is done to permit reading of the input ports (4 to 7) of the 1WIO sensor since clearing those bits would normally result in false readings. This option has no affect on the **INP** command and as a result, user's with MD2088 displays will experience corruption of their LED displays if the **INP** command is used. In software versions 2.01 and higher, the command **EIN on** will enable regular polling of the 1WIO inputs during a poll cycle.

5.6.5. Changing the Hidden Options

All options are normally set to 0 at the factory.

While the commands shown above can be used to change the Hidden Options in software versions V2.01 and above, the following instructions also apply for consistency with releases prior to V2.01.

To change these values do the following commands (your input is in **blue**):

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```
>EEP FF
FF FF 05 FFx5<cr>
>DIS
...
```

Replace the "x" with the correct value for the options per the following table. Note that the "5" following the "X" may be different in your setup and that the "FF" preceding that digit may also be different – do not change that byte. Ensure that you do not change that digit. **The "DIS" command is required to ensure that the option change is made.**

Table 3 Hidden Option Settings

Value of X	Enable Voltage 0 Display	Enable Once Per Minute Time Display	Enable DS2450 Voltage Display	Enable DS2408 Input Poll
0	Yes	Yes	No	No
1	Yes	Yes	No	Yes
2	No	Yes	No	No
3	No	Yes	No	Yes
4	Yes	No	No	No
5	Yes	No	No	Yes
6	No	No	No	No
7	No	No	No	Yes
8	Yes	Yes	Yes	No
9	Yes	Yes	Yes	Yes
A	No	Yes	Yes	No
B	No	Yes	Yes	Yes
C	Yes	No	Yes	No
D	Yes	No	Yes	Yes
E	No	No	Yes	No
F	No	No	Yes	Yes
Equivalent command in s/w 2.01 and higher				
DAD ON	No			
DTI ON		No		
DWN ON			Yes	
EIN ON				Yes

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5.7. DS2408 Based Relay and LED Usage

V1.09 and higher software has the ability to actuate relay modules based on the DS2408 port expander chip from Dallas/Maxim. One such module is the Midon Design 1WIO.

5.7.1. Older Software

In software versions 1.09 through 1.13, when a 1WIO relay module is connected to TEMP08, the **RLY** and **RLB** commands work on that module, as well as any connected RELAY05, however, only one is required for this command to work and if both are connected (1WIO and RELAY05) then both will be acted on. The 1WIO relay board will only respond to commands for relays 1 to 4.

5.7.2. Current Software

In software version 2.02 and higher, the process is different. V2.02 does not support the RELAY05 module but instead supports up to 40 1WIO relay modules (MD2083) and the **RLY** command input then actuates those relays (numbered from 01 to 80). Relay numbers 01 to 04 are for the first connected 1WIO module, relay numbers 05 to 08 are for the second, and so on. Note that the leading zero for the relay number is required.

In version 2.11, the ability to work with 1WIO LED's was added. The **LED** command works the same way as the **RLY** command except that there are 8 LED's per 1WIO acted on instead of 4 relays per 1WIO. Up to 10 1WIO LED units are supported for a total of 80 LED's.

The **RLYA<on|off>** command will affect all connected 1WIO relays. Lastly, the **RLB** command is no longer available and the **RLYS** variant is not functional.

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6. J5 Usage

J5 is an RJ-12 connector, which is equivalent to a phone connector, except that it has 6 pins instead of just 4 (or 2). J5 is connected to the One Wire bus and can be used for adding connectivity to One Wire busses configured for RJ-11/12 connection.

The pin-out of the J5 connector is shown in Figure 5.

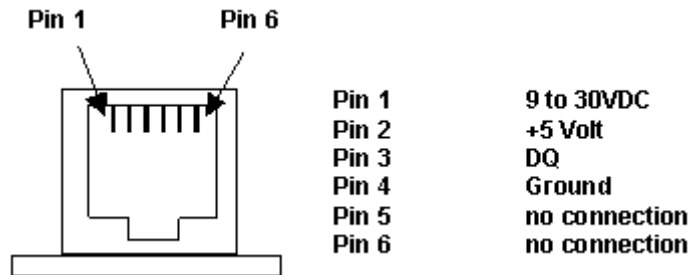


Figure 5 Connector J5 RJ-12 Pin-out

Pin 1 is derived from the power supply feeding TEMP08. It is DC rectified, so it will not matter if your power supply is AC only.

Please note that this pin-out may be different than that of your 1-Wire sensors. At one time, there was no established standard pin-out for the RJ-12 wiring and, as a result, different manufacturers have chosen to use the pins in various ways. The common pins (DQ and Ground) have remained the same for all manufacturers, however, as of the time of writing this manual. These pins are shown **in color** in the table below. Some of the published pin-outs available today are shown in the table below. **Please take caution in connecting up your 1-Wire sensor to TEMP08 to avoid damaging the sensor.**

Table 4 RJ-12 Pin-outs in use

Device	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6
Dallas/Maxim wiring standard (published Oct 2001)	+5VDC	GND	DQ	GND	N/C	DC Supply
Midon Design MD2004 TEMP05	N/C	+5VDC	DQ	GND	N/C	N/C
Midon Design MD2104 TEMP08	DC Supply	+5VDC	DQ	GND	N/C	N/C
Midon Design MD2204 LOG08	DC Supply	+5VDC	DQ	GND	N/C	N/C
Midon Design MD3009 Temp Sensor	N/C	+5VDC	DQ	GND	N/C	N/C
Midon Design MD3020x Temp and Humidity Sensor	DC Supply	+5VDC	DQ	GND	N/C	N/C

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Device	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6
Midon Design MD208x Relay and LED Sensor (1WIO)	DC Supply	+5VDC	DQ	GND	N/C	N/C
Simon Atkins' Hub (shown for reference only. TEMP08 does not support this device)	+5VDC	DC Supply	DQ	GND	DC Supply	GND
AAG TAI8550 Combo Switch	+5VDC	GND	DQ	GND	N/C	N/C
AAG TAI8520 Temp Sensor	+5VDC	GND	DQ	GND	N/C	N/C
AAG V3 1-Wire Weather Station	N/C	+5VDC	DQ	GND	GND	N/C
AAG TAI8540A Humidity Sensor	N/C	N/C (GND?)	DQ	GND	N/C (+5VDC?)	N/C
AAG TAI8555 Latch Relay	N/C	GND	DQ	GND	N/C	N/C
AAG TAI8585 Counter Kit	N/C	N/C	DQ	GND	N/C	N/C
AAG DS9097U-S09-X	N/C	GND	DQ	GND	+5V	N/C

The table entries shown in red above indicate pin configurations that may damage TEMP08 or the connected sensor.

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7. Software Change History

Table 5 TEMP08 Software History

Version	Date	Major Changes from Previous Loads
1.00	8/1/2003	<ul style="list-style-type: none"> Final production version of software
1.02	10/25/2003	<ul style="list-style-type: none"> Bug fix to DS18S20 temperature reading Robustness improvements On-chip voltage sensor readout displayed AAG TAI8555 sensor support added
1.03	11/28/2003	<ul style="list-style-type: none"> Added recognition of a DS2408 device fixed CMDONA/OFA function for DS2406's fixed a small bug in DS18S20 temperature display added a hidden option to display (or not) the voltage from the secondary on-board ADC
1.04	2/13/2004	<ul style="list-style-type: none"> fixed minor bug where only the results of the first sensor of a DS2423 or DS2438 type were being displayed via the polling function
1.05	4/4/2004	<ul style="list-style-type: none"> Added more error checking for invalid readings on humidity sensors Added Hidden option for not displaying the once-per minute time Changed ZZZ to perform a hard reset rather than a soft reset fixed a minor bug with time display
1.06	4/15/2004	<ul style="list-style-type: none"> Added capability for DS2438's to be used as only a temperature sensor removed verbose Enter Type... description from the TYP command and associated calls.
1.07	4/22/2004	<ul style="list-style-type: none"> fixed an elusive bug that caused the sensor display to stop and the LED to remain in red mode. Was only present with poll time set to 0 and TMP was repeatedly used to obtain sensor readings.
1.08	6/21/2004	<ul style="list-style-type: none"> an interim release with a debug setting added
1.09	8/8/2004	<ul style="list-style-type: none"> Added ONB and OFB commands Added capability to use DS2408 based Relay outputs instead of, and in addition to, RELAY05.
1.10	8/9/2004	<ul style="list-style-type: none"> final release of new 2408 functionality
1.11	9/11/2004	<ul style="list-style-type: none"> Added INP command for 1WIO use Changed method of polling to bypass sensor types not previously detected by the DIS command

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		<ul style="list-style-type: none"> • Changed temperature conversion algorithm to speed up display • Added third “hidden option” for displaying DS2450 as voltage only • Added default TYPE parameter for DS2423’s on power up. Will now default to “L” if no selection made prior to 1 minute timeout of the Type error message • Added error check for improper use of OFB/ONB commands
1.12	9/18/2004	<ul style="list-style-type: none"> • Added debounce in missing sensor poll to prevent false "missing" displays.
1.13	11/7/2004	<ul style="list-style-type: none"> • Added Hidden Option 4 to enable/disable polling of 1WIO sensor inputs
2.02	8/1/2005	<ul style="list-style-type: none"> • MAJOR CHANGE to RLY command functionality to assure operation with multiple 1WIO relay modules. See notes above for the RLB, RLT, and RLY commands. • Added discrete commands (DAD, DTI, DWN, EIN) to replace the hidden option manual settings • Added “P” option to the DIS display
2.03	1/2/2006	<ul style="list-style-type: none"> • Bug fix – DS2405 sensors intermittently will not respond to ONA/OFA commands
2.04	7/3/2006	<ul style="list-style-type: none"> • Bug fix – intermittent errors when first sensor is polled
2.05	12/23/2006	<ul style="list-style-type: none"> • Added ability to display voltage readings from multiple DS2450’s.
2.06	12/30/2006	<ul style="list-style-type: none"> • Bug Fix – issue when temperature is at zero Celcius
2.07	2/12/2007	<ul style="list-style-type: none"> • Added display of second counter on DS2423’s
2.08	3/30/2007	<ul style="list-style-type: none"> • Internal revision – not released
2.09	4/5/2007	<ul style="list-style-type: none"> • Major changes to temperature reading calculations to ensure high accuracy at below zero temperatures. • Bug Fix for DS2405 and DS2406 status readings
2.10	N/A	<ul style="list-style-type: none"> • This version was not released.
2.11	5/1/2007	<ul style="list-style-type: none"> • Added the LED command for working with 1WIO LED units. • Added reset of both DS2423 counters using one RST command. • Removed the DEBug command
2.12	11/5/2007	<ul style="list-style-type: none"> • Fixed issues with DS2450 readings and added CRC check.

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2.15	6/28/2008	<ul style="list-style-type: none">• Added “current” reading (actually displayed in milliVolts) from DS2438 sensors• Added increased validity check for readings from any DS2438
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Note: Midon Design will no longer provide support for software version 1.13. Unless specifically requested, TEMP08's will be shipped with the current version of software as listed in our web pages.

7.1. Upgrading TEMP08 Software

Midon Design strives to continue to add value to the TEMP08 product and, as result, we release new features to the TEMP08 software from time to time. Upgrading TEMP08 is easy. Software updates can be ordered from our web pages. Upon receipt of your new chip containing the upgraded software, return the original chip to Midon Design and cite the order number. If we receive the device back within 30 days of the upgrade order, we will credit your PayPal account with half the price of the upgrade, less shipping costs. Alternatively, you can apply that credit towards a future purchase from Midon Design.

7.2. Upgrade Instructions

- 1. Remove power from the TEMP08!**
2. Using a small screw-driver, or similar tool, gently remove U1, the 68HC908KX8 micro-controller, by inserting the screw-driver between the micro-controller and the DIP socket that it is inserted to. The location of U1 is shown in Figure 6.
3. Making sure that you are grounded, or adequately static free, insert the new micro-controller into the socket. Care should be taken to observe correct polarity. The end of the micro-controller with a small notch, or a dot in the left corner, should be positioned to be close to the J1 connector as per the diagram below.
4. Make sure that all micro-controller pins are seated in the socket. Check for pins that may have bent inwards.
5. Restore power to TEMP08.
6. Enjoy your new features.

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8. Upgrading the TEMP08 Hardware

The TEMP08 1-Wire Serial Interface is available with many options as shown in Table 5 below. The basic TEMP08 can be upgraded, by the user, with the addition of some simple components, all of which are available from Midon Design. Others are available as well from your local electronics dealer.

Table 6 TEMP08 Ordering Options

MD2102	The blank PCB
MD2103	The processor with the latest software installed for TEMP08
MD2104	An assembled and tested unit equipped with the basic functionality.
MD2105	As MD2104 but with the addition of an on-board humidity sensor
MD2107	As MD2104 but with the addition of the components required for interfacing to the Midon RELAY05 relay driver (NOTE: RELAY05 is not supported with V2.01 or higher software)
MD2110	A case for the TEMP08 or LOG08, all options.
MD2111	A front panel for the MD2111 case
MD2112	A case and front panel for the TEMP08 or LOG08.

Users wishing to construct their own TEMP08 should order the MD2102 and MD2103. Alternatively, experimenters wishing to integrate the 1-Wire Serial Interface to another project directly could consider just ordering the MD2103 Processor and supplying the remainder of the components themselves.

Typically, users will order the MD2104 basic TEMP08. To upgrade TEMP08 to add the additional options, see Table 6 below.

Table 7 TEMP08 Upgrade Kit Options

Upgrading from	Upgrading to	Adding functionality	Order Kit #
MD2104 or MD2107	MD2105	Humidity Sensor	MD2205
MD2104 or MD2105	MD2107	RELAY05 Driver (NOTE: RELAY05 is not supported with V2.01 or higher software)	MD2207
MD2104 or MD2105 or MD2107		On-board temperature Sensor	MD3003

Of course, adding these options will require soldering skills. If you are not comfortable with soldering, you may return your TEMP08 unit to Midon Design for upgrade at a minimal charge.

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9. Trouble-Shooting Problems with TEMP08

The most common problems associated with using TEMP08 are listed in the following table. If these instructions do not result in better results with your TEMP08, please feel free to contact Midon Design at support@midondesign.com. We would be more than happy to assist you.

Table 8 Common TEMP08 Problems and Resolutions

Problem	Possible Causes
I cannot display TEMP08 output on my PC	Ensure that you are connected with the proper settings (9600 bps, no parity) and that you are using a straight-through, not a null-modem, serial cable
I cannot see what I type on Hyperterm	This is normal for Hyperterm versions that come pre-packaged with Windows. Upgrade to a commercial version of Hyperterm or use different terminal emulator software.
I added a new sensor and now all I get is "OW Bus Error" messages	Your sensor is probable reversed on the 1-Wire bus, OR, there is a short on the bus. Check your wiring.
I was able to add a new sensor but all I get is "???" readings from it.	Check your 1-Wire bus wiring. You may need to add a 100 ohm resistor in series with a new leg of bus that you added.
I removed a sensor from my wiring and now all I get is "???" readings from it.	Delete the sensor (use the DEL command).
I added a DS2405 (or 2406 or 2407) sensor and I cannot see the state change when I change the input to it.	DS2405, 6 & 7 sensors are no longer supported by TEMP08 as of V2.15. Please check the Midon Design website for a product that is compatible with these sensors.
I tried to add a bunch of sensors via the INI command and only some of them showed up.	The algorithm used in the INI routine is limited in the number of new sensors that can be added at one time due to small amount of RAM available to the TEMP08. We recommend that you INI less than 8 new sensors at a time. In rare cases, this number may need to be lower.
I have a MD2088 LED display and LED's 5 to 8 turn on by themselves	Disable DS2408 input polling via Hidden Option 4 (see Hidden Options

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Problem	Possible Causes
and will not turn off	section for details) or EIN OFF command in software 2.01 or higher.
I have a RELAY05 connected to TEMP08 and it will not work with the RLY command.	Software version 2.01 and higher no longer supports the RELAY05 option. Downgrade to v1.13 or replace RELAY05 with the 1WIO Relay module.

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10. Error Messages

Table 9 TEMP08 Error Messages

Message	Description
? Entry error	You have made a syntax error in entering a command or a parameter
? WDT Expired	This indicates that the Watch Dog Timer reset and would typically mean that the software was spending too much time processing a function. Please contact Midon Design and report the conditions that this occurred in. Note: this error message is not present in v1.06 and higher software releases.
! Memory is full	You tried to add more than 60 1-wire devices via the INI command. TEMP08 has sufficient memory for only 60 unique 1-Wire device ID's. Note: this functionality is not present in v2.09 and higher software.
Not installed	TEMP08 could not communicate to the device that you were trying to access. Check your 1-Wire bus wiring, or make sure that you are specifying the correct sensor number.
Try again	This error is specific to the NOR command and indicates that TEMP08 could not write to the DS2450 device that controls wind direction. Check your wiring.
OW bus error	Common to any 1-wire bus read operation. This error indicates that something is preventing the bus from changing state. Typical causes include shorts on the bus, or a reversed sensor.
? Input Timeout	A parameter was not received in response to a command within 1 minute.

Table 10 Reset Type Messages

Reset Type (hex)	Cause of Reset
02	Low voltage – the power supply fell below spec
04	Monitor Mode reset entry – should never be seen
08	Illegal Address – something in the software caused access to an illegal address. Contact Midon Design
10	Illegal Op Code reset – something in the code happened. If this was not the result of a ZZZ command, contact Midon Design
20	Watchdog timeout. The software was busied out with something. If this occurs too frequently, contact Midon Design
40	User reset – you issued a ZZZ command
80	Power on reset – a normal entry

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Binary combinations of the types above are possible and normal. For example, a power up reset will usually result in a type 82 message (Power on reset plus low voltage reset) and a ZZZ reset will result in a type 50 message.

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11. TEMP08 Parts List (complete)

Table 11 TEMP08 Parts List

Qty	Designations	Part Number	Description	DigiKey Part Number	JameCo Part #	Other Source
2	C1, 2	22pFd	Capacitor, 22pFd	1358PH-ND	15405	
2	C10, 11	0.1uFd	Capacitor, 0.1uFd (or 0.01uFd)		151116	
5	C3, 4, 5, 6, 7	10uFd	Capacitor, electrolytic, 10uFd	P975-ND	94211	
1	C8	1000uFd	Capacitor, electrolytic, 1000uFd	P6243-ND	158377	
1	C9	100uFd	Capacitor, electrolytic, 100uFd	P6239-ND	94289	
4	D1, 2, 3, 4	1N4148	Signal Diode		36038	
1	DS1	LED	Bipolar LED		34711	
2	J1	2 Term	PC Mount terminal strip, 2 pin		152346	
1	J2	Term 1x4	Optional 1x4 0.100 Header strip			
2	J3A, J3B	3 Term	PC Mount terminal strip, 3 pin		152354	
1	J4	DB-9	DB-9 Female PC Mount connector	A2100-ND	104951	
1	J5	RJ-12	6 pin RJ-12 PCB mount socket	A9043-ND		

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Qty	Designations	Part Number	Description	DigiKey Part Number	JameCo Part #	Other Source
1	J6	DIP	16 pin DIP socket		37372	
1	R1	10M	Resistor, 10M, ¼ W	10MEBK-ND	29938	
1	R2	1.5K	Resistor, 1.5K, ¼ W	1.5KQBK-ND	29760	
2	R3, 4	100K	Resistor, 100K, ¼ W		29997	
1	U1	68HC908KX8	Programmed Micro-Controller			Midon MD2103
3	U1, 3, 6	DIP	16 pin DIP socket		37372	
1	U2	93C66	Serial EEPROM	NM93C666EN-ND	200598	
1	U2	DIP	8 pin DIP socket		51570	
1	U3	MAX232	RS232 Interface		24811	
1	U4	FWB	Full-wave Bridge Rectifier	DF01MIR-ND	103000	
1	U5	LM78L05	Voltage Regulator	LM78L05ACZ-ND	51182	
1	U6	4094	Optional 8 bit Serial in Parallel Out Shift Register		13426	P/o Midon MD2206
2	U8, 11	DS2438	1-Wire Voltage sensor (U11 is optional)			P/o Midon MD2206
1	U9	HIH3610	Optional Humidity Sensor			Midon MD2206
1	U10	DS18S20	Optional 1-Wire Thermometer			Midon MD3003

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Qty	Designations	Part Number	Description	DigiKey Part Number	JameCo Part #	Other Source
1	Y1	4.9152 MHz	Crystal		14621	
1	PCB	TEMP08 PCB				Midon MD2102

Option kits are available for upgrading the basic MD2104. They include the following components.

Table 12 Upgrade Kit Parts List

Upgrade Kit	Parts Contained	Functions added
MD2205	U9, U11, R4, C10	On-board humidity sensor
MD2207	J6, U6	RELAY05 driver
MD3003	U10	On-board DS18S20 sensor

Accessories are also available for TEMP08. A case with a professional front panel is available, as is as a power supply. Also available are a variety of 1-Wire sensors. Please check the Midon Design web ordering page for more information.

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12. 1-Wire Bus Wiring

Additional information about 1-Wire bus wiring may be found in Dallas Semiconductor's Application Note AP108 "Microlan in the long run". For a full copy of this article, please check Dallas' web site. A copy is also available via the Midon Design web site under our "Documents" link.

The principles of wiring devices on the 1-Wire bus are very simple, however, care must be taken when wiring long busses. Bus types may be characterized as follows:

Description	Length of Bus	Topology	Cabling Required
Small	Up to 15 feet (5m)	Straight run	Not critical
Simple	Up to 75 feet (25m)	Straight run	Unshielded twisted pair (UTP), CAT-3 or better
Long	Up to 300 feet (100m)	Straight run	UTP, CAT-5
Complex	Up to 300 feet (100m)	Straight run with 1 to many branches (star)	UTP, CAT-5

Small busses are simple to configure and generally suffer no signal degradation problems.

UTP wiring is recommended for any type of 1-Wire bus other than a small bus. In addition, CAT-5 wiring is preferred for all busses. Use a pair of the CAT-5 wires that is twisted together. If wiring power along with the 1-Wire bus in the same cable, use a different pair for the power.

Complex busses require special attention and may sometimes require the addition of a 100 ohm resistor in series with the DQ lead of branch legs. The resistors should be placed so that one end connects to the main leg and the other end to the branch leg. See the figure below for an idea as to when and where to do this.

The intent of the resistor is to compensate for the branch circuit's impedance and thus reduce signal reflections and bus capacitance, which would result in poor signal performance.

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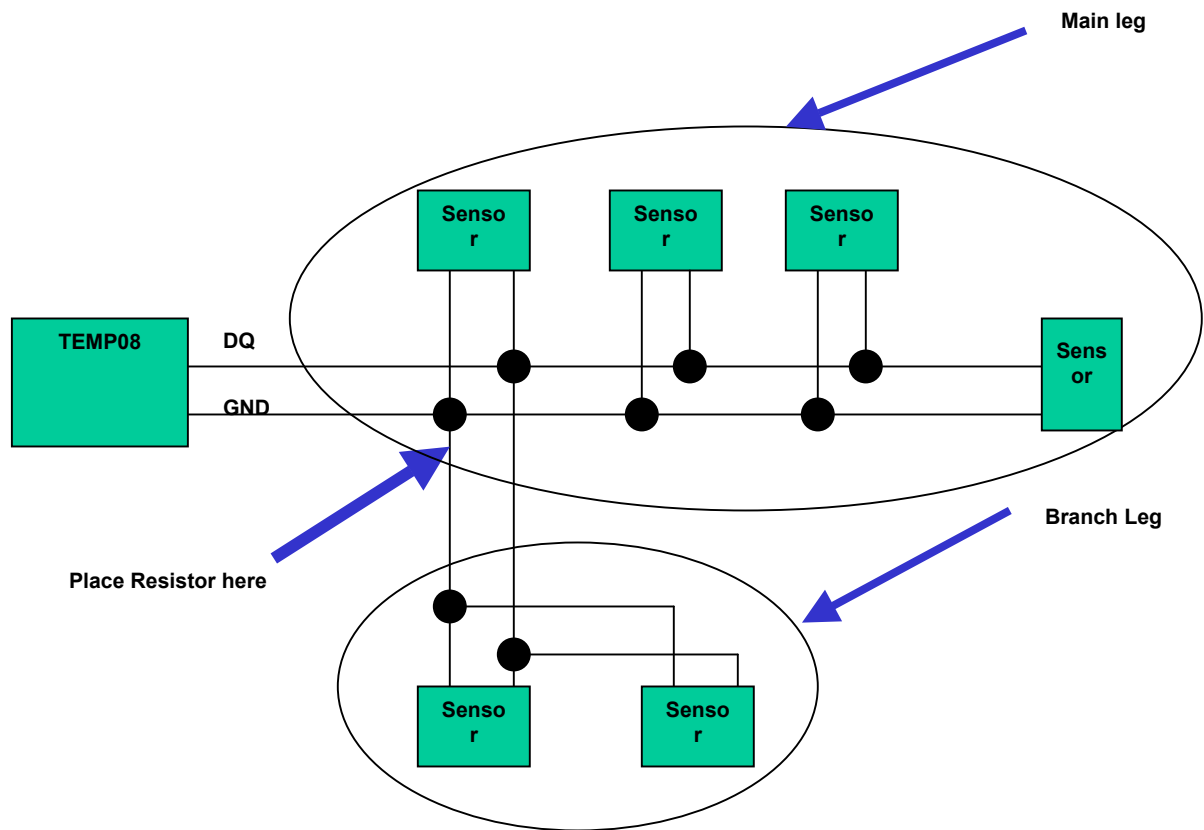
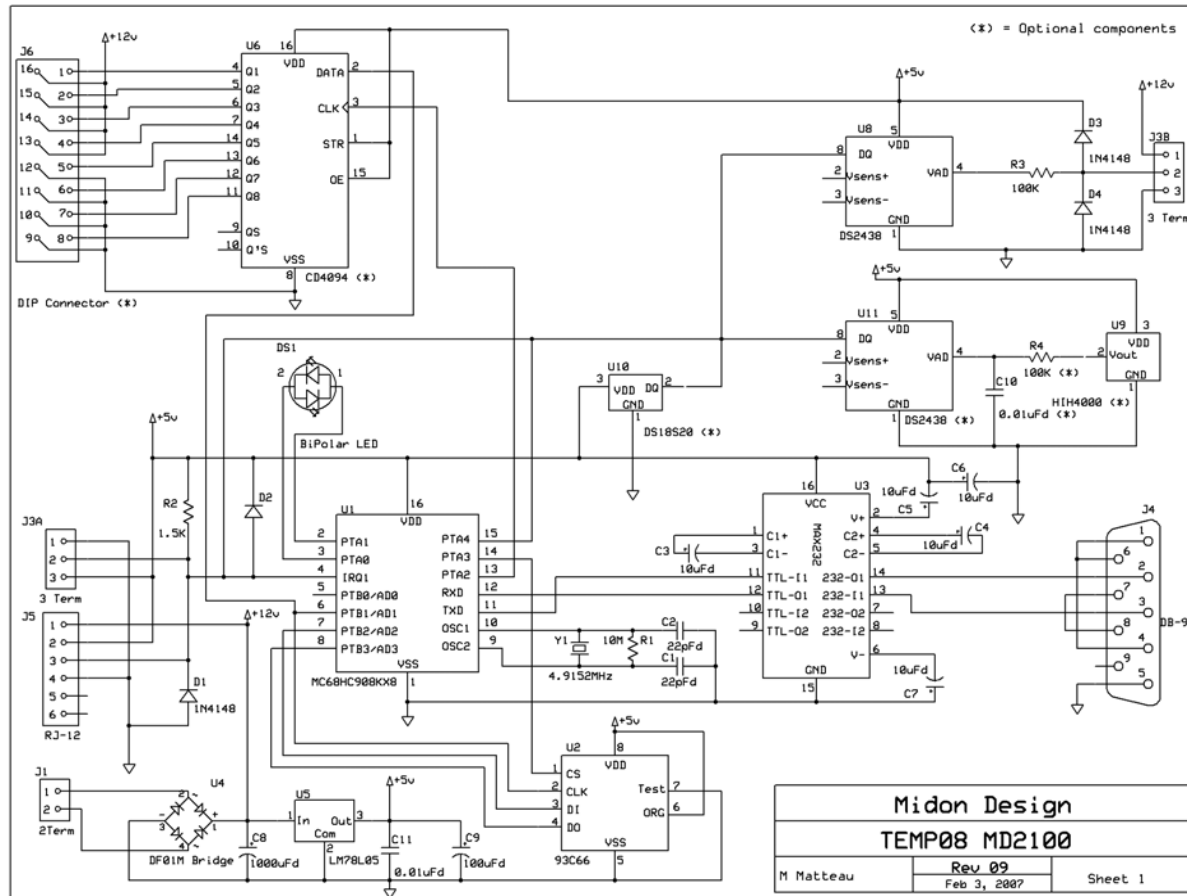


Figure 7 1-Wire Bus Wiring

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13. TEMP08 Schematic



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14. Conclusion

Your comments are appreciated. If you would like to submit feature requests or product recommendations, please e-mail us.

Please also check the **Frequently Asked Questions** link on the TEMP08 web page for more up to date information.

15. Legal Disclaimer

YOUR USE OF THIS PRODUCT IS AT YOUR OWN RISK. YOU ASSUME FULL RESPONSIBILITY AND RISK OF LOSS RESULTING FROM THE USE OF THIS PRODUCT. MIDON DESIGN WILL NOT BE LIABLE FOR ANY DIRECT, SPECIAL, INDIRECT, INCIDENTAL, CONSEQUENTIAL OR PUNITIVE DAMAGES OR ANY OTHER DAMAGES WHATSOEVER, WHETHER IN AN ACTION BASED UPON A STATUTE, CONTRACT, TORT (INCLUDING, WITHOUT LIMITATION NEGLIGENCE) OR OTHERWISE, RELATING TO THE USE OF THIS PRODUCT.

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