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TM1000

PERIPHERAL INSTRUMENT SYSTEM

TM1000-BUS

TM1000 BASE UNIT STICK

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1.0 Introduction

The Data Design TM1000 system is an instrument component which provides simple digital I/O connectivity to a host computer through the Universal Serial Bus (USB). The design is optimized for the rapid development of small custom instruments such as laboratory instrumentation, data acquisition, and automated test. Data Design makes available the hardware and software interface specifications in this development kit and the associated TM1000-DK development kit.

With the disappearance of traditional computer interfaces such as ISA and even the serial and parallel ports, there is a void to fill in the area of a simple desktop computer interface. With today's complex operating systems, programming any desktop interface can be a daunting task. Gone are the days of fiddling bits from a two line DOS program. The TM1000 is designed to bring back this nearly painless computer interfacing experience. The base unit interface is easier to use and more forgiving than even ISA ever was and the simple function call I/O can be handled from any programming environment, including popular graphical environment such as Visual Basic and LabVIEW. There is no need to know any of the technical details of the USB or Windows drivers. Just plug in the TM1000, and start thinking about your project.

For the benefit of users with simple I/O requirements or TM1000 ideas which do not fit easily in the TM1000 package, Data Design has introduced the TM1000-BUS. The BUS version contains the TM1000 base unit interface functionality "on a stick". As an option specifically designed for developers, the TM1000-BUS allows a completely custom application to be built on the TM1000 framework without the cost and physical restrictions of the TM1000 base unit itself. If the desired functionality can be fit in the TM1000 base unit and takes advantage of its feature rich design, then the base unit is still the preferred approach. However, the TM1000-BUS offers cost savings and design flexibility to applications which do not fit easily in the TM1000 base unit or do not require many of the features of that platform.

This document presents the features of the TM1000-BUS as an addendum to the TM1000-DK base unit development kit manual. The TM1000-DK manual should be read first. All items in the TM1000-DK manual apply to the TM1000-BUS except those related to the power supply and mechanical layout as described here. **To install this kit, perform the installation as described for the TM1000-DK using the TM1000-BUS as the target base unit.**

1.1 What Is Included

The TM1000-BUS Development Kit is a simpler version to the TM1000-DK development kit built around the TM1000-BUS. It includes a TM1000-BUS, USB cable, and software CD. The intent of the development kit is to provide the tools and know how required to develop TM1000 hardware and the software to interface with it. Anyone who has ever done these things with other interfaces will find the TM1000 to be very easy.

2.0 TM1000-BUS Hardware

The TM1000-BUS serves the exact same function in the TM1000 system as the TM1000 base unit but is smaller and does not include packaging or power supply components. Every hardware and software aspect of the TM1000 base unit applies to the TM1000-BUS except in these areas.

2.1 Mechanical

The TM1000-BUS is designed to be used as an itegrated or “black box” module for use in a larger design. It can be thought of as a smart connector. The board measures 2 inches by 2.5 inches. It has a dual row male header on each side with 0.1 inch center pins. A USB type B female connector is mounted on the back edge. Figure 2.1 shows critical dimensions.

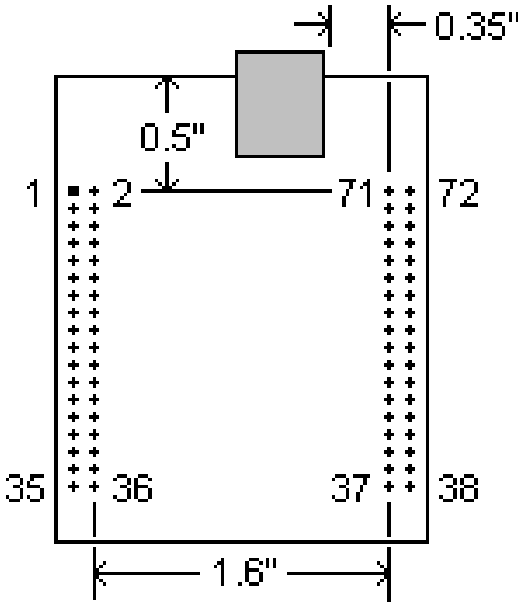


Figure 2.1 TM1000-BUS Critical Mechanical Dimensions

2.2 Electrical

The 96-pin DIN connector used as the TM1000 base unit module interface is replaced by 72 pins on the male header connectors of the TM1000-BUS. These pins include all of the same functionality as the TM1000 base unit with the exceptions described below. The pins are numbered counterclockwise around the module as shown in Figure 2.1 above and as identified in Figure 2.2 below.

1	GND	72	+5V
2	GND	71	+5V
3	SCL	70	OVER_TEMP
4	SDA	69	*POWER_FAULT
5	+3.3V	68	+5V_USB
6	FUNCT0	67	*PD
7	FUNCT1	66	*RESET
8	FUNCT2	65	*S1
9	FUNCT3	64	*S2
10	FUNCT4	63	*BUSY
11	FUNCT5	62	*LAM
12	FUNCT6	61	*X
13	FUNCT7	60	*Q
14	Reserved	59	CLK
15	Reserved	58	USR0
16	Reserved	57	USR1
17	Reserved	56	USR2
18	WDATA00	55	RDATA00
19	WDATA01	54	RDATA01
20	WDATA02	53	RDATA02
21	WDATA03	52	RDATA03
22	WDATA04	51	RDATA04
23	WDATA05	50	RDATA05
24	WDATA06	49	RDATA06
25	WDATA07	48	RDATA07
26	WDATA08	47	RDATA08
27	WDATA09	46	RDATA09
28	WDATA10	45	RDATA10
29	WDATA11	44	RDATA11
30	WDATA12	43	RDATA12
31	WDATA13	42	RDATA13
32	WDATA14	41	RDATA14
33	WDATA15	40	RDATA15
34	GND	39	GND
35	GND	38	GND
36	GND	37	GND

- Notes:
- 1) * = Active low signal
 - 2) Reserved pins should be left unconnected

Figure 2.2 TM1000-BUS Connector Pinout

The differences in the hardware interface on the TM1000-BUS versus the TM1000 base unit are as follows.

OVER_TEMP Input

The OVER_TEMP signal is a status input from the instrument hardware. This active high input provides a means to activate the over temperature status bit *T* in the TM1000 status byte. If left open, an on board pull down resistor makes this input inactive. This signal is provided in place of temperature monitor functionality found on the TM1000 base unit.

**POWER_FAULT Input*

The *POWER_FAULT signal is a status input from the instrument hardware. This active low input provides a means to activate the power fault status bit *C* in the TM1000 status byte. If left open, an on board pull up resistor makes this input inactive. This signal is provided in place of current monitor functionality found on the TM1000 base unit.

**PD Input*

The *PD signal is a status input from the instrument hardware. This signal takes the place of both signals *PD0 and *PD1 on the TM1000 base unit. An active low input to this pin will indicate that instrument hardware is connected by activating *P0* and *P1* status bits in the TM1000 status byte. This signal is typically grounded when the TM1000-BUS is connected to instrument hardware.

2.3 Power Supply

The TM1000-BUS is powered from the +5V pins. The required +5V can be supplied from the instrument hardware or it can also be supplied from USB bus power by connecting the +5V pins to the +5V_USB pin. In either case, it is recommended that the +5V pins be decoupled to GND with a capacitor of about 10 microfarads.

The TM1000-BUS generates an internal +3.3V power supply which is available to instrument hardware on the +3.3V pin. Because the +3.3V supply is derived from +5V through a low dropout linear regulator and the TM1000-BUS itself does not use +5V, the tolerance on the +5V input supply is fairly wide. Up to 50 mA is available from the +3.3V pin for use by the instrument hardware.

Upon connection to the USB bus, the embedded processor requests the use of up to 100 mA of bus power. The TM1000-BUS unit itself requires less than 50 mA. Therefore, if the TM1000-BUS is powered from the bus power pin +5V_USB, this leaves about 50 mA for use by instrument hardware, which is plenty for simple measuring instruments. This 50 mA is the sum total current which may be drawn in combination by the instrument hardware from the +3.3V pin and the +5V_USB pin. The +5V_USB pin is connected directly to the USB +5V power signal and therefore can be expected to be as low as about +4.6 volts. The USB bus current is limited to 100 mA total to maintain compatibility with the TM1000 system which is typically operated through a USB hub which may be bus powered.

The +3.3V and +5V_USB power pins should never be back fed. That is, other sources of power which might exist in the instrument hardware should not be connected to these pins. In many systems such a source of power will exist and will typically be switched. Generally, the TM1000-BUS module should not be left powered when the rest of the instrument hardware is turned off. However, if such a state is desirable, care must be taken to be sure that it will not have adverse effects.