Purpose

This document gives a quick summary of the steps to set up and run the platform.

Preparation

1. There should be four stand-offs in one of the serial cable bags. Attach these to the four corners of the Motor Node.
2. Orient the three boards as shown in Figure 1. Place them on your work surface so that the System Monitor board is at the left, the Sensor board in the middle, and the Motor board on the right.
3. Connect the two DB9 "CAN" cables between the three boards (labeled "CAN" in the diagram).
4. Connect the power supply jumper cable as shown in the diagram.

   Note: It is important to connect the power supply jumper cable as shown to allow the CAN transceivers on the motor and sensor boards to be de-powered as part of the demonstration.
5. Connect the RS232 cable (looks the same as the CAN cables) between a COM port on the laptop and the System Monitor board.
6. Connect the 5V power supply to the Sensor board and plug into AC power. LED's on all the boards should light up.

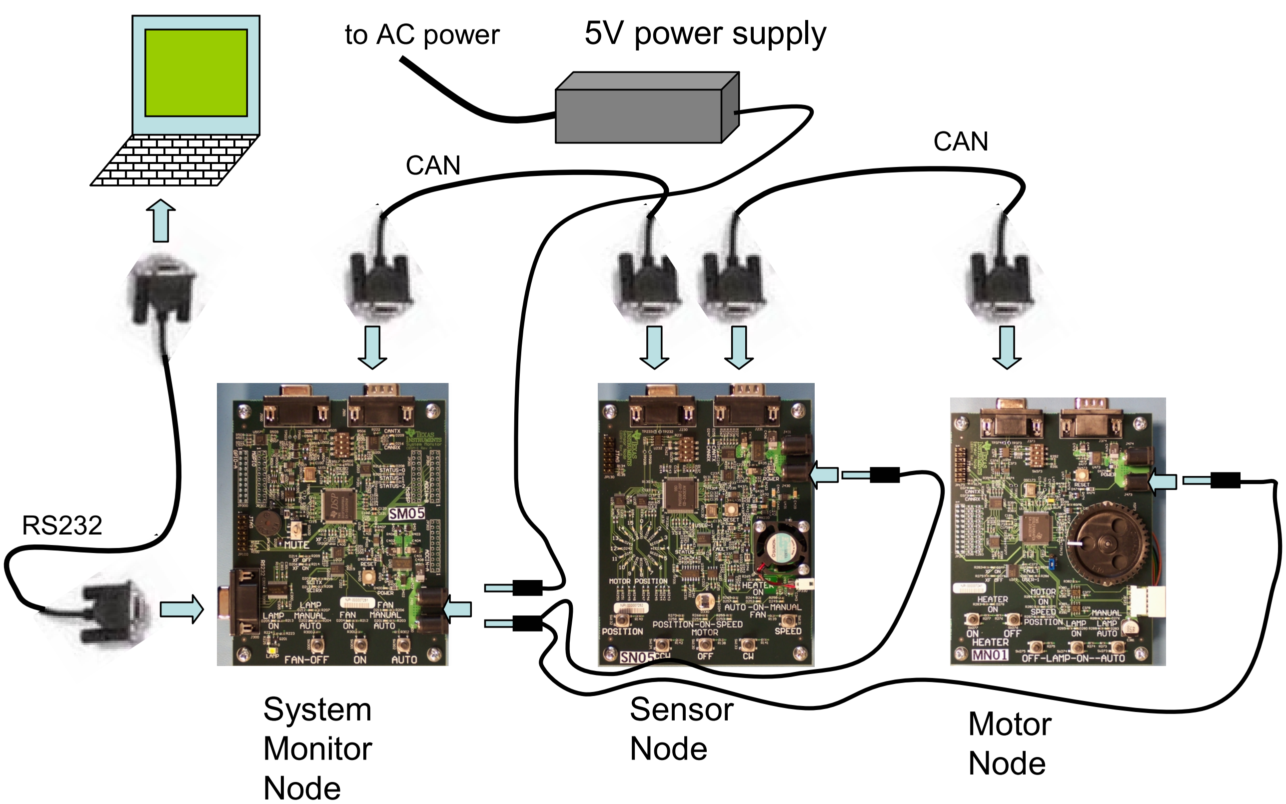

Figure 1. Typical connection of platform

Installing the Control Software

The platform can be run with or without the laptop being attached. Using the laptop gives a more complete demonstration. The control software need only be installed once. The setup program is found in the CD's D:\GUI directory. Install the software by double-clicking the V1R5.EXE file in the D:\GUI directory. Unzip the files to this directory: **C:\CAN**. Several files will be copied into the specified directory.

If you do not have Matlab® Version 6.0 or later, you will also need to install the Matlab® libraries by double clicking on the mglarchive.exe file found in the C:\CAN directory after unzipping. The mglarchive.exe program will install two subdirectory trees called BIN and TOOLBOX and place the necessary Matlab® library files (DLL's) in them.

Running the Software

1. Double-click on CAN_Control.bat icon (shortcut) or run manually the file CAN_Control.bat from the \CAN subdirectory using the RUN menu.
   A DOS panel pops up, followed by the GUI.
2. The first time the CAN_Control program is run, a window will pop-up and request a choice of COM PORT. By pressing the button for the COM PORT where the serial cable is attached, the initial COM PORT is selected. The active COM port can be changed at any time by using the "Configure Com Port" Menu Item at the top of the CAN_Control program window.

   If pressing the "Monitor" button gives an error message, check that the RS232 cable is connected and that the power is connected to the platform board. Try to change the COM port to find the correct one for your computer. Please note that COM ports may be used by other applications on your PC (e.g., Palm Pilot synchronization programs) or may be disabled in your BIOS.

   If the program indicates that certain files cannot be found, ensure that the program was installed in the proper directory. The batch file expects the program to be installed in the C:\CAN directory. See the "Industrial Automation using the CAN Bus Getting Started Guide" for more information.
3. Clock on "Monitor" to start plotting the selected item (TMP101, thermistor or photodetector) and monitoring board status.

Controlling the platform subsystems using CAN messages

Motor Node

1. Use the LAMP ON/OFF buttons to control the lamp on the System Monitor node.
2. Press the LAMP AUTO button to put the lamp in automatic mode. Now cover the photo-detector on the Sensor node with your hand and watch the lamp respond to changes in photo data on the CAN bus. The photo data can be plotted on the software GUI.

Sensor Node

1. Press the SPEED button to put the stepper motor in speed mode on the Motor Node. Now press the CW button a few times to increase the motor speed in the clockwise direction. Note that the MOTOR POSITION LEDs indicate the motor position based on motor status messages on the CAN bus. Use the CCW to slow down the clockwise motion of the motor and to make the motor rotate counter-clockwise. On the GUI note that the number of CAN message per second increases with motor speed.

2. Press the POSITION button to have the motor change to position mode and go to the "home" position. You can step the motor 1/16 of a revolution now by pressing CW or CCW.

System Monitor Node

1. Use the FAN ON/OFF buttons to control the fan on the Sensor node. It will take a moment for the fan to stop when you press the FAN OFF button due to the inertia of the fan's motor.
2. Press the FAN AUTO button and note that the heater turns on. Shortly, the fan should turn on and the heater turns off. This occurs when the temperature exceeds a threshold temperature around 35C (a deadband was created to give the fan time to stop between cycles). The fan and heater should cycle on and off while in AUTO mode. On the GUI you can monitor the temperature by selecting either the TMP101 temperature sensor or the thermistor and pressing MONITOR.

Software GUI

Note that the software GUI duplicates all of the subsystem control buttons from the three electronics boards (i.e. Fan control, Lamp control, Motor control, etc). On the GUI there are four other functions that can be demonstrated; data plotting, CAN bus corruption, CAN bus statistics (as seen by the System Monitor node) and flood message rate control.

1. The data plot can be used to show temperature data from either the TMP101 Digital Temperature Sensor or a thermistor connected to the INA330 amplifier. Also the plot can be used to show the output voltage from a photo-detector connected to the LOG102 amplifier.
2. The Bus Corruptor Mode popup menu can be used to demonstrate a number of CAN bus failure modes. These include termination problems (missing or extra terminator), line shorting (shorting CANL and CANH together or to Vcc or to ground), and line breakage (CANH or CANL open). A number of these failure modes will cause the CAN bus to be unable to send or receive data, but none of the modes will permanently damage the CAN transceivers. For example, you can set the failure mode to CANL SHORT TO VCC and this will cause the CANL line to be shorted to 5 volts. When this occurs no messages will be correctly send on the bus and if the monitor is running you should see a number of error counters incrementing. Also, if the speaker on the System Monitor node is turned on you will hear a buzzing. The bus will resume working once you return to NORMAL mode.
3. Flood data messages are generated on the Sensor node as a means to increase the traffic on the CAN bus. Use the Flood Message Rate popup menu to control the number of Flood Data messages sent per second by the Sensor Node. By default the CAN bus is configured to run at 1Mbps. At this setting you can set the Flood Message Rate at 8000 message per second. If the motor is stopped, you should see that little or no missing Flood packets. Now put the motor into SPEED mode and increase the rotation to maximum (146RPM). The Motor node will now be putting an additional 800 messages per second onto the CAN bus. This should cause a number of Flood Data messages to be delayed, because of CAN bus arbitration, long enough to be aborted by the Sensor node. The Sensor node was designed to abort Flood Data messages if they are delayed by longer than one control period. Please see the "Industrial Automation using the CAN Bus Platform Software Architecture" document for more information. The System Monitor node should occasionally click the speaker to indicate a missing Flood Data message. Even when the bus is heavily loaded, the higher priority messages can get delivered in a timely manner. Turn the lamp on and off and notice that it responds quickly even though the bus is heavily loaded. Now reduce the Flood Message Rate to 16Hz (default) and notice that number of missed Flood packets does not increase.

Finishing the demo

Unplug the power to the Motor node, but leave the CAN bus cable connected, and note that the System Monitor and Sensor node still function properly even though the CAN transceiver on the unplugged board is not powered (un-powered CAN transceivers don't short out the CAN bus). Plug power back into the Motor node and note that the Sensor node once again tracks the motor position as the Motor node does its index calibration. Repeat for the Sensor node. Since the Sensor node has a 3.3V CAN transceiver and the Motor node has a 5V CAN transceiver, this shows that the bus can continue to operate even when an un-powered 5V or 3.3V transceiver is on the bus.

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services at any time and to discontinue any product or service without notice. Customers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All products are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its hardware products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by government requirements, testing of all parameters of each product is not necessarily performed.

TI assumes no liability for applications assistance or customer product design. Customers are responsible for their products and applications using TI components. To minimize the risks associated with customer products and applications, customers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any TI patent right, copyright, mask work right, or other TI intellectual property right relating to any combination, machine, or process in which TI products or services are used. Information published by TI regarding third-party products or services does not constitute a license from TI to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. Reproduction of this information with alteration is an unfair and deceptive business practice. TI is not responsible or liable for such altered documentation.

Resale of TI products or services with statements different from or beyond the parameters stated by TI for that product or service voids all express and any implied warranties for the associated TI product or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

Following are URLs where you can obtain information on other Texas Instruments products and application solutions:

Products		**Applications**	
Amplifiers	amplifier.ti.com	Audio	www.ti.com/audio
Data Converters	dataconverter.ti.com	Automotive	www.ti.com/automotive
DSP	dsp.ti.com	Broadband	www.ti.com/broadband
Interface	interface.ti.com	Digital Control	www.ti.com/digitalcontrol
Logic	logic.ti.com	Military	www.ti.com/military
Power Mgmt	power.ti.com	Optical Networking	www.ti.com/opticalnetwork
Microcontrollers	microcontroller.ti.com	Security	www.ti.com/security
		Telephony	www.ti.com/telephony
		Video & Imaging	www.ti.com/video
		Wireless	www.ti.com/wireless

Mailing Address: Texas Instruments
Post Office Box 655303 Dallas, Texas 75265