Transducers Kit TK2942

The TK2942 introduces students to the concepts and understanding of common transducer devices and standard signal conditioning methods. The kit consists of a Measurement Package, Power Amplifier and Test Rigs, and three Transducer Kits covering:

Electro-Mechanical Transducers

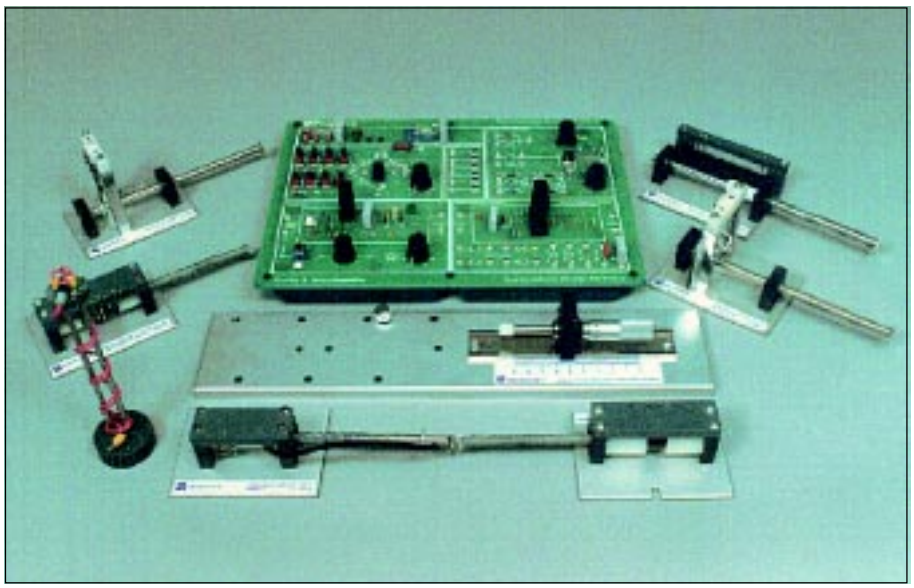
- Linear Variable Resistor
- Variable Area Capacitor
- Variable Distance Capacitor
- Variable Inductor
- Linear Variable Differential Transducer (LVDT)
- Strain Gauge

Heat Transducers

- Thermistor
- Platinum resistance
- Thermocouple
- Reed Relay
- Bimetalic switch

Light Transducers

- Photoconductive cell
- Photodiode
- Phototransistor
- Photovoltaic cell



Measurements Package

Wheatstone Bridge

With selectable ratio arms of 100W, 1kW, 10kW, & 100kW.

Operational (Differential) Amplifier

With switched gains of 1, 10, 100 & 1000 is used as a general purpose amplifier. The differential input allows it to be used with the Wheatstone Bridge.

Oscillator

Centre frequency 465kHz,used with the inductive and capacitive transducers.

Discriminator

FM discriminator used with the oscillator module. Also included are components for a phase-sensitive rectifier.

Power Amplifier

With unity gain and output capability of 4 watts.

Curriculum Coverage

Electro-Mechanical Transducers

1. Utilising variation in resistance:

- Wheatstone Bridge
- Amplifiers
- Liquid depth & resistivity
- Displacement
- Strain

2. Utilising variation in capacitance:

- Wheatstone Bridge for capacitance
- Variable area & distance capacitive
- Use with an oscillator and discriminator in FM systems

3. Utilising variation in inductance:

- Electromagnetic inductance
- Variable inductance transducer
- Mutual inductance transistor
- Linear variable differential
- Transformer
- Transducer circuits

Heat Transducers

- Heat distribution
- Thermocouples
- Thermistors
- Resistance thermometers
- Temperature control (on/off)
- Temperature control (continuous)

Light Transducers

- The nature of light
- Photoconductive cell
- Semiconductor photodiode
- Photovoltaic cells
- Phototransistor
- Spectral response

Automotive Transducer Kit

The Automotive Transducer Kit is designed to explore common transducer characteristics when applied to specific areas of automotive design. The bench mounted kit introduces the principle of embedded systems using a Controller Area Network Bus (CANBUS). The system connects to a host PC and is provided with the control software with system-ready programs to demonstrate the principles under investigation.

The kit comprises:

a motherboard,
a power supply,
and a number of modules that link to the motherboard as follows:

- **User I/O**
- **Microcontroller module (MCM)**
- **Stepper motor**
- **dc motor**
- **Temperature & speed control**
- **Suspension (axle)**
- **Liquid level (fuel tank)**
- **Lighting cluster**
- **Anti-knock (ignition)**
- **Anti-brake**

The kit starts with basic principles of Input/Output (I/O) and how to achieve digital data transfer to a variety of devices. Assignments then build on these principles to explore the use of the following basic automotive transducers:

- **optical**
- **resistive magnetic**
- **piezoelectric**
- **semiconductor**

Motherboard - provides the location for the Microcontroller Module (MCM), the user I/O interface and has four powered slots with digital I/O and access to the analogue to digital converter on board the MCM to accommodate the various sensor modules.

Microcontroller Module (MCM) - based on Intel 87C196CA (automotive) processor running at 16MHz, equipped with on-board Controller Area Network (CAN) and Analogue to Digital Converter (ADC). 128kB of flash ROM & 32kB of static RAM. Programmed in FORTH with Intel reduced instruction set monitor (RISM) for down load and debugging of C programs.

User I/O Interface Module - 3 LEDs, 4 single input function keys, 5x4 hex keyboard, 16x2 line LCD display and buzzer.
A variety of common automotive applications as listed above.

Curriculum Coverage

- Control of a single LED
- Control of multiple LEDs
- Digital input from a switch
- Operation of a buzzer alarm
- Character input from a keyboard
- Writing characters to a LCD display
- Integration of keyboad and display
- Control of a stepper motor
- Control of a dc motor
- Temperature control with dc motor, dc fan & heater
- Speed control
- Wishbone suspension with piezo-electric bimorph transducer
- dc cam rolling road
- Pop-up headlamp & flasher unit using servo control
- Diagnostic control
- Liquid level - use of rotary potentiometer, reed switch & Hall effect
- Anti-knock - vibration detection via piezoelectric crystals
- Air mass - Wheatstone Bridge to generate analogue voltage signals
- Anti-lock - optical sensor control of wheel speed

For further information on these and other equipment in the Feedback range please contact . . . . . .

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