

IMAC-XXV Smart Sensor & Instrumentation

PCB Group

PCB Piezotronics – gsmiley@pcb.com

The Modal Shop – mlally@modalshop.com

Larson Davis – gnovak@larsondavis.com

Oceana Sensor Technologies – rlally@oceanasensor.com



Smart Sensor Irony...

Late 60's/Early 70's

- Smart Sensors were 2 wire ICP[®] sensors

Late 90's/Early 00's

- Smart sensors are
 - TEDS
 - Digital
 - Wireless

The Problems

Temporary Installations

- Managing sensor ID, connection, calibration is complex
- Fast project setup & teardown required if troubleshooting
- Install, use & forget (do not remove) is impractical

Permanent Installations

- Desired points often remote or hard to access
- Cabling Is Expensive
 - \$2k-3k/foot, installed cost in nuclear plant
 - \$150/ft, documented in oilfield, incl trenching
- Walk-around approach requires manpower



The Options

Do Nothing (test/monitor few points)

Reduce cabling

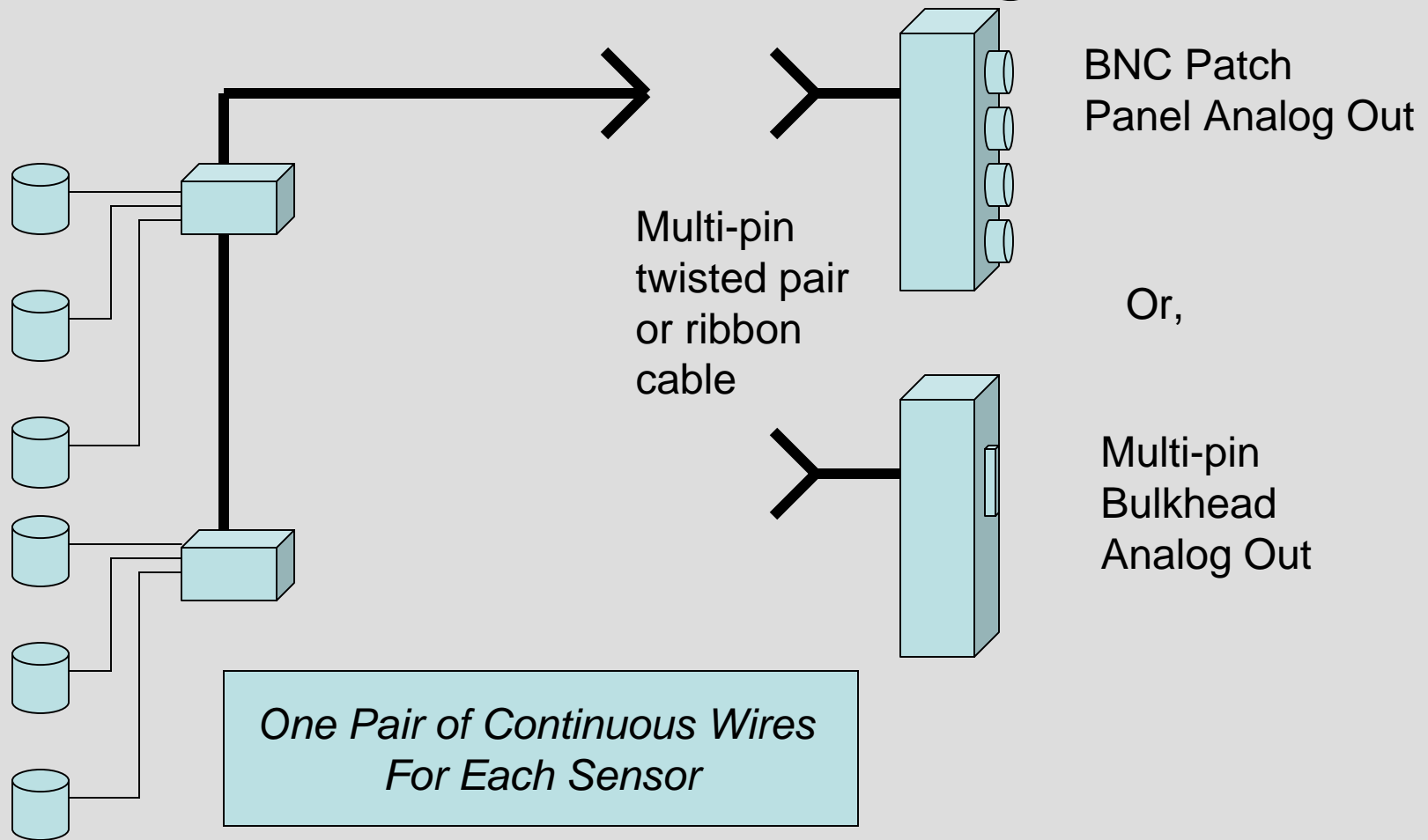
- Bulk, pre-configured analog cables
- Sensor bus
- Wireless

Compromise on Data

- Volume - channels
- Fidelity – bandwidth, resolution
- Timeliness



Traditional All-Analog ICP[®]



Example: Sensor Channel Management

PCB 440 Series Signal Conditioners

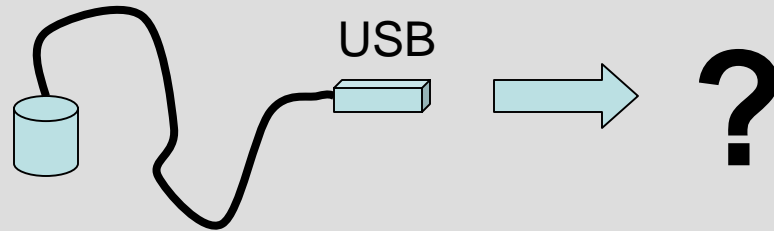


What About...

Digital Sensors?
Wireless?



Digital Sensors? Few Standards.



- Physical layer is Standard (USB-2, Ethernet, Firewire)
Chipsets available from multiple vendors
- Integration of sensor + communication layer, proprietary
- Software in sensor and receiver, proprietary
- Power management strategy, arbitrary
- Functionality, arbitrary
- Proprietary Sensors
- Proprietary Applications
- Proprietary Data transfer Format
- API source code not usually available
- Receiver development required by integrator or end user

Technology Drivers

PC Revolution

- Cheap microprocessors
- Low cost 24 bit sigma delta ADC

Network Expansion

- Wired Ethernet
- Wireless
 - WiFi 802.11
 - Cellular – CDMA/GPRS
 - BlueTooth

Structural Dynamics lags commercial/consumer progress

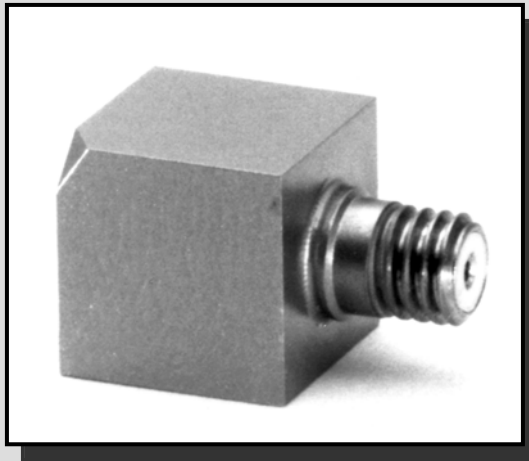


What is PCB Group doing?



Example: PCB[®]

Delivered over 30,000 TEDS sensors



Example: PCB/TMS

USB TEDS Support and Developer Kit



Infrastructure Friendly Sensing Solutions

Dynamic Measurements are SELDOM
routine!

Match the needed or present infrastructure

- TEDS
- Vibe limit switch, 4-20 current loop,
HART/Fieldbus/DeviceNet
- Ethernet, POE, WiFi
- BT, ZigBee, etc



Example: PCB bus power

USB-Powered ICP[®] Conditioner



Example: PCB/IMI - Current Loop

Industrial 4-20 Vibration sensor
+vibe limit switches



Example: Techkor - CBM

USB Accelerometer, Proprietary Software
PCB-supplied core PE sensing element



Example: OST - eDiagnostics[®]

Digital output, Ethernet

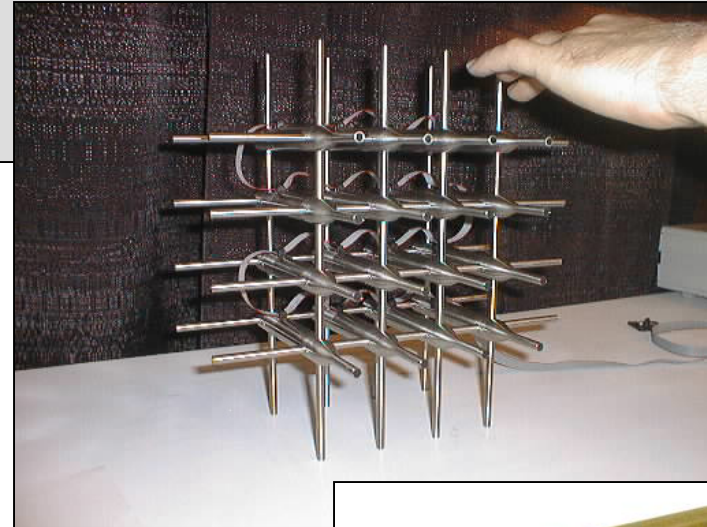
PCB PE sensing element, integrated RF
from 3rd party



Example: LD DSS[®]

“Wireless-on-a-Wire”

- dynamic multi-drop



Example: TMS & OST

LanSharc™ and ICHM®

- embedded measurement, analysis, communication and control



What is PCB Group doing?

Listening to our customers!

What is your application?

What are your answers to the tradeoffs?

