TableTalk™ – The Power to Configure

Truculence™ Platform Variations

Overview

Automated instrumentation requires computerized control systems that execute dedicated system software. The instrument software needs to be aware of, and be able to communicate with & control, the various hardware within the instrument. When hardware changes, or is reconfigured, the system software must be changed.

This need to rewrite system software to accommodate hardware additions, changes, replacements, upgrades, expansions, options, etc. is maddening and it consumes inordinate amounts of technical resources…and precious time.

There MUST be a better way…and there is a better way….It is **TableTalk™**

Short Description

TableTalk™ is a simple, yet incredibly useful, kernel of code that interprets simple tables that describe hardware types and their presence, user interfaces and their displays, operating sequences, calculations, data types, data storage areas and more.

TableTalk™ is especially useful for systems that feature extensive distributed processing, where each functional piece of hardware has its own onboard microprocessor (µP) or microcontroller (MCU). Types of products with distributed processing include cars, trucks & automotive systems, robotics and properly designed ***instrumentation***. The **Truculence™** instrument platform from AU relies heavily on distributed processing. Adding, removing or changing hardware in the system only requires editing simple tables. The same core piece of software, the **TableTalk™** kernel, doesn't change. The tables do the talking.

Instrument Hardware Types

Hardware used in instrumentation is readily designed with inexpensive MCUs. Common types of functional hardware for instrumentation include:

- Sensor modules
- Detector modules
- Flow control hardware
- Temperature control hardware
- Valve drivers
- Switching logic
- Analog outputs
- Digital inputs,
- Relay outputs
- Flash heat/cooling devices

Tables

Tables are easily produced and/or edited using a simple spreadsheet by following basic rules that are easy to understand. Or they can be created and written via a utility program that creates tables using a friendly graphical user interface. Utility programs can also be used to analyze externally produced tables, run lexical analysis and verify cohesive integrity of a set of tables.

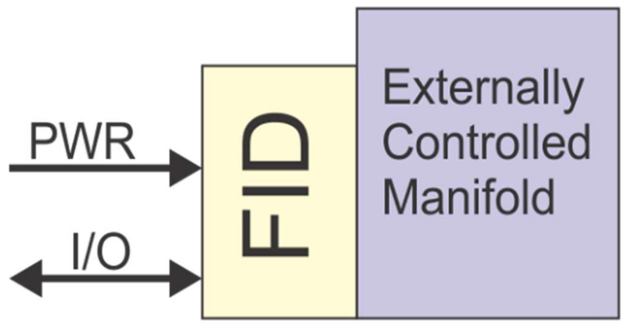
Truculence Platform Examples – TableTalk™ Enabled

TableTalk™ was conceived and developed specifically to provide simple reconfigurable automated control and communications for the Truculence Instrument Platform. This platform allows an extraordinary degree of flexibility in mixing and matching hardware modules that may be grouped to create specific instrument applications. Following are several examples of HW configurations that can easily be brought to life by **TableTalk™** and its simple tables.

Simple Smart Sensor

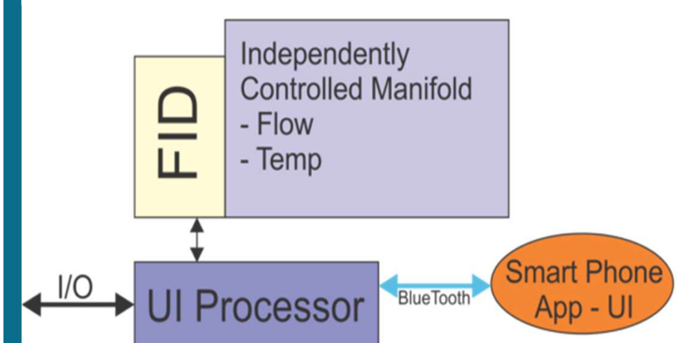
A simple standalone smart sensor (SASS) consisting of an MCU paired with a sensor and attached to a sample manifold with external support is the most basic instrument implementation using Truculence hardware modules.

In fact, it is so simple it doesn't require **TableTalk™** to support any functions at all.



This SASS has no user interface. As such, it doesn't require inter-module communications to achieve automation. It includes only one processing device, the MCU aboard the **Fireworks II™** module. All control and data presentation must be facilitated by an external system.

The remainder of the examples here rely on **TableTalk™**



Simple Total Hydrocarbon Analyzer

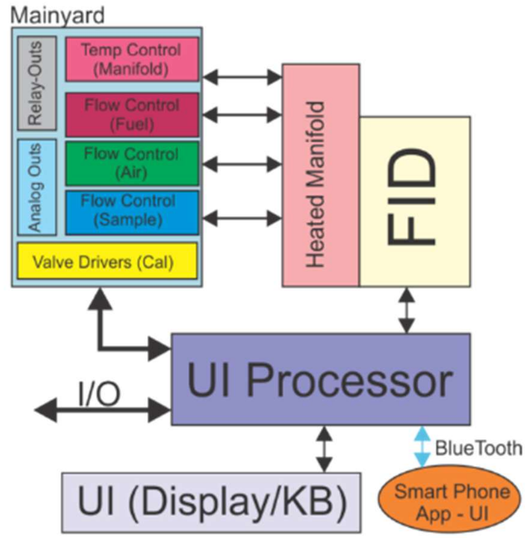
A very simple total hydrocarbon analyzer can be produced combining a **Fireworks II™** Smart Sensor, mounted on an externally controlled manifold, with a Raspberry Pi and a smart phone. The Raspberry Pi acts as the UI processor and communicates with an external data/control system while a smart phone act as the user interface I/O device via a Blue Tooth connection to the Raspberry Pi.

In this example, as well as the previous configuration, the total hydrocarbon analyzer is mounted to a manifold that must be controlled externally. There is no hardware available in the system to control temperatures or to control flows of either the support gasses or the sample.

Automated Total Hydrocarbon Analyzer

A more typical hydrocarbon analyser has several automated functions in addition to the detector and the user interface. This example includes several smart modules that provide specific support functions including:

- Temperature Control of the sample manifold
- Flow control for:
    - Fuel Gas
    - Combustion air
    - Sample
- Relay Outputs
- Analog Outputs
- Valve driver to support calibration functions



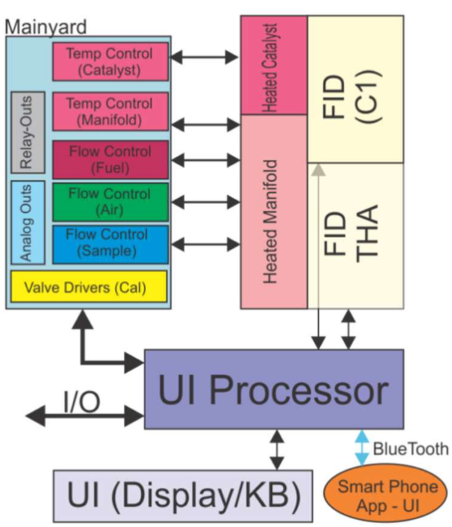
TableTalk™ runs on the UI processor which act as the master controller in the system. The UI can be a keyboard & monitor or touchscreen or other device. Additionally, the Pi can support the use of a smart phone to act as the user interface I/O device via a Blue Tooth connection.

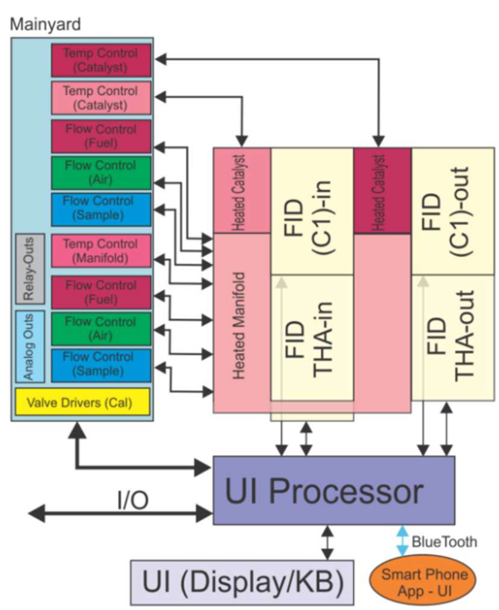
Dual FID
Total Non-Methane Hydrocarbon Analyzer

Total non-methane analysis via (TNMHC) selective catalytic oxidation requires determination of total hydrocarbons and the measurement of methane only (one heave HCs are oxidized).

Quad FID
Abatement System Efficiency Analyzer

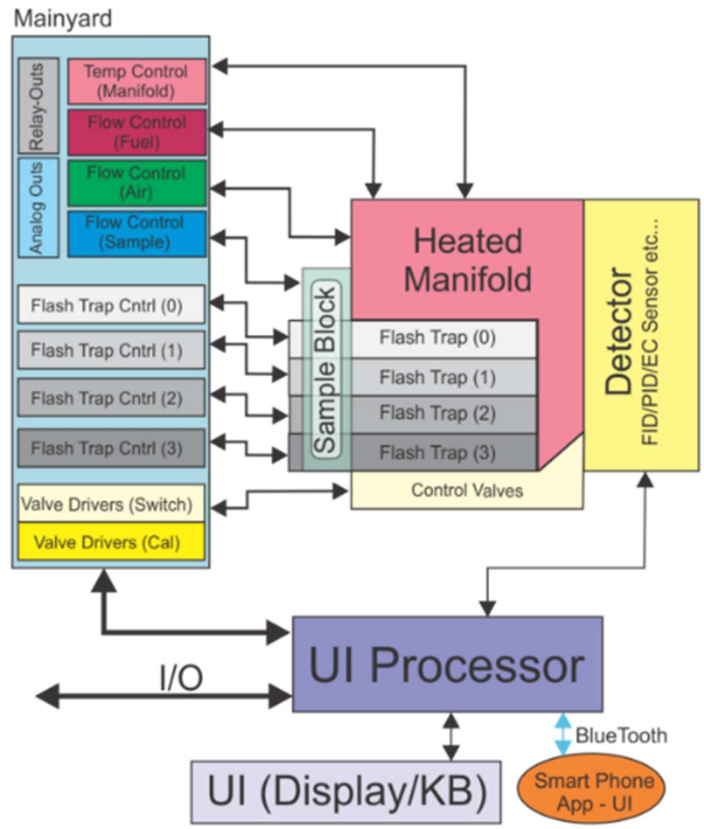
Adding a second TNMHC analyzer in the system produces an instrument that can monitor the inlet and the outlet of an abatement system and provide real time system efficiency data





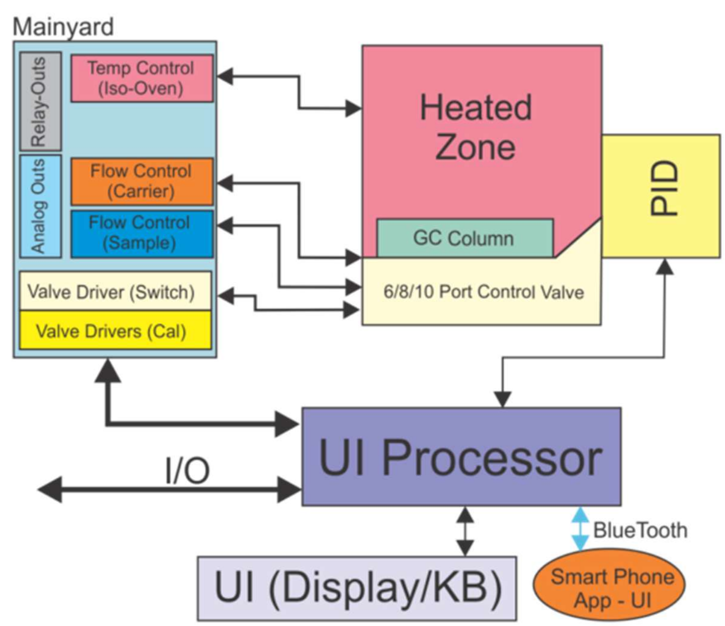
Pseudo-GC Analyzer

Systems can be built incorporating various sorbents which can be used to trap various compounds and then flash heated to produce unique levels of selectivity.



Traditional On-Line GC Analyzer

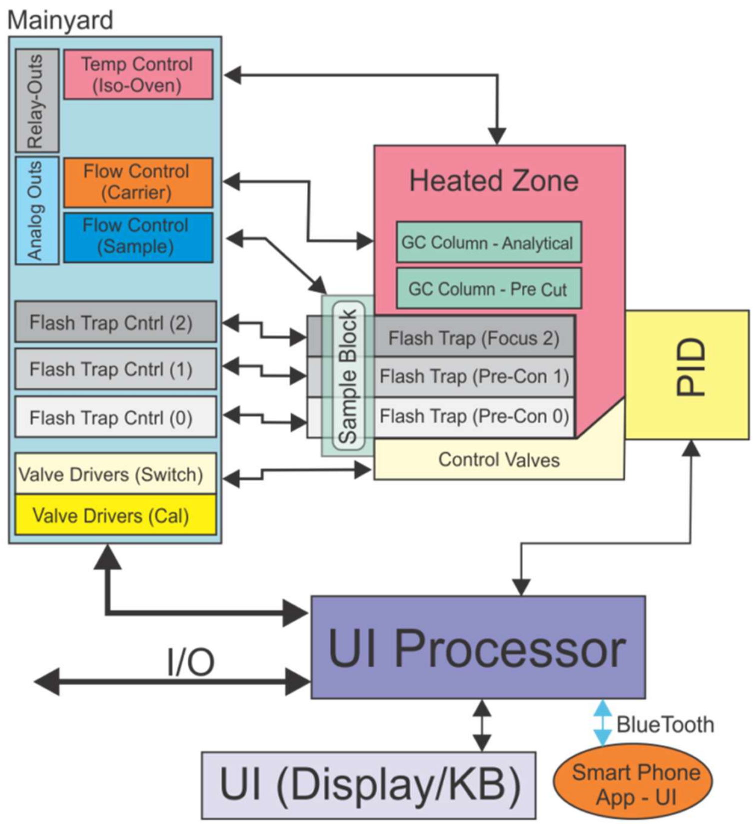
Automated process gas chromatographs can be configured with heated oven(s), GC columns, any type of GC detector and various options for signal handling, sample handling, calibration options etc.



Hybrid GC Analysis System

Combining various sorbent in flash cooled/heated trap configurations with GC columns and valve switching configurations can produce very complicated types of analyses.

Though the complexity of this type of system is very high, distributed processing makes the automation work smoothly and **TableTalk™** makes its configuration and control simple.



Project Names:

The project names mentioned in this document are derived from WWII Allied code words for various places and operations as follows:

- ***Truculence*** - Efate Island, New Hebrides	AU Instrument Platform
- ***Cyclone*** - Leyte Island, Philippines	Flame Ionization Detector
- ***Ringbolt*** - Tulagi Island, Solomon Islands	FID Support Electronics
- ***Fireworks*** - Oyamba, Solomon Islands	FID Smart Sensor Module
- ***Mainyard*** - Guadalcanal, Solomon Islands	Smart Module Support PCB
- ***Tabletalk*** – Manus Is, Bismarck Archipelago	Table Based System Software

Revision History:

Rev AA - Creation and initial Release – 24 May 2026