Test Bench I User Manual

EI00002

Rev: A01

Cem Eden

2019–09–02

Contents

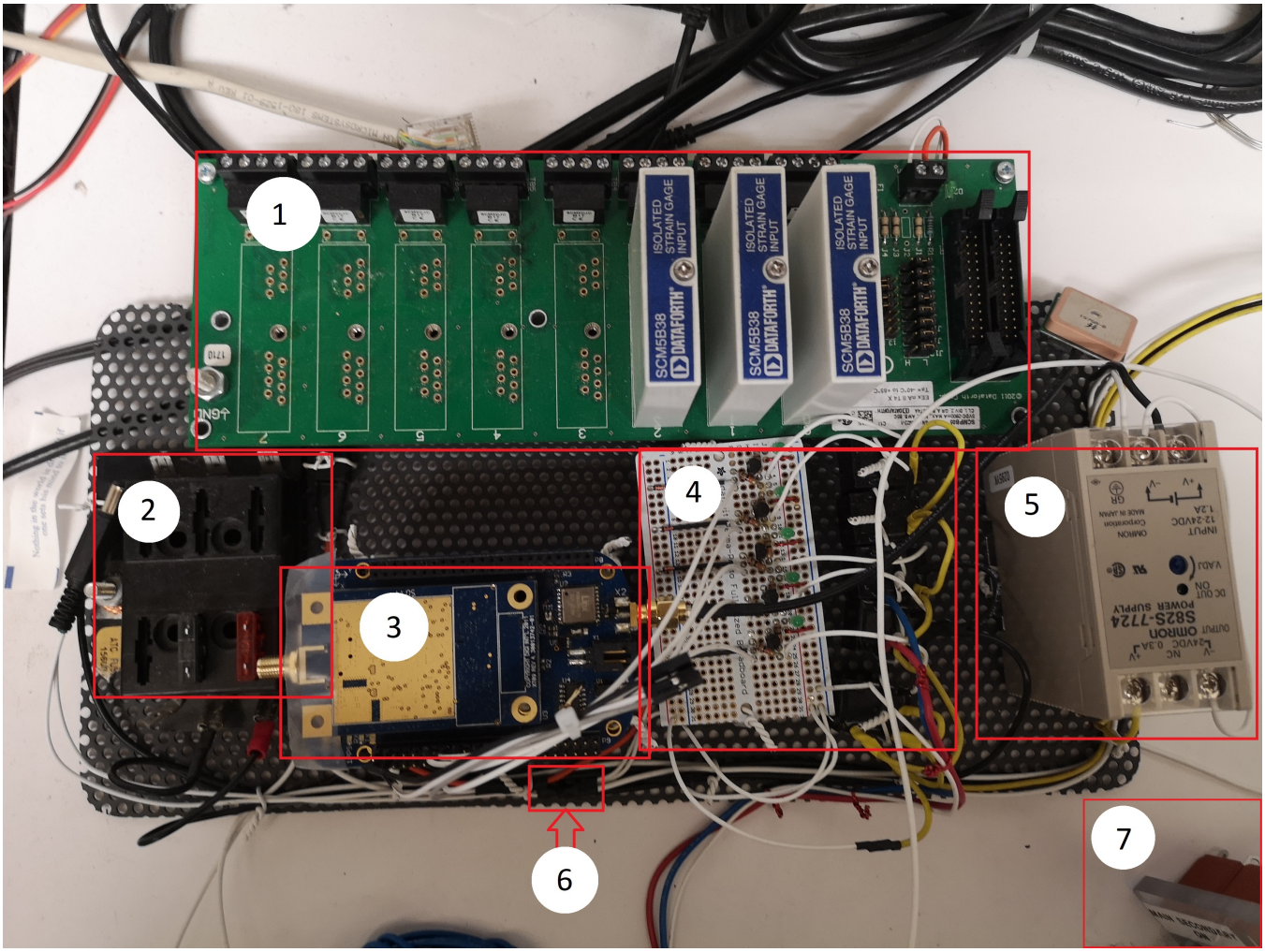
1 Introduction

1.1 Scope

A quick overview of the electronics test bench.

2 Overview

2.1 Main Parts



1. DAQ board. Allows for pressure transducers and other resistive measurement devices to be converted to a usable analog signal. Used with the National Instruments ADC (USB-6000).

2 Fuses. Provides separate fuses to parts of the system. Namely, one fuse to drive high-load circuitry (ignition and solenoids) and one to drive the remaining system.

3. Beaglebone Black Stack. The main computational stack that will be tested and programmed.

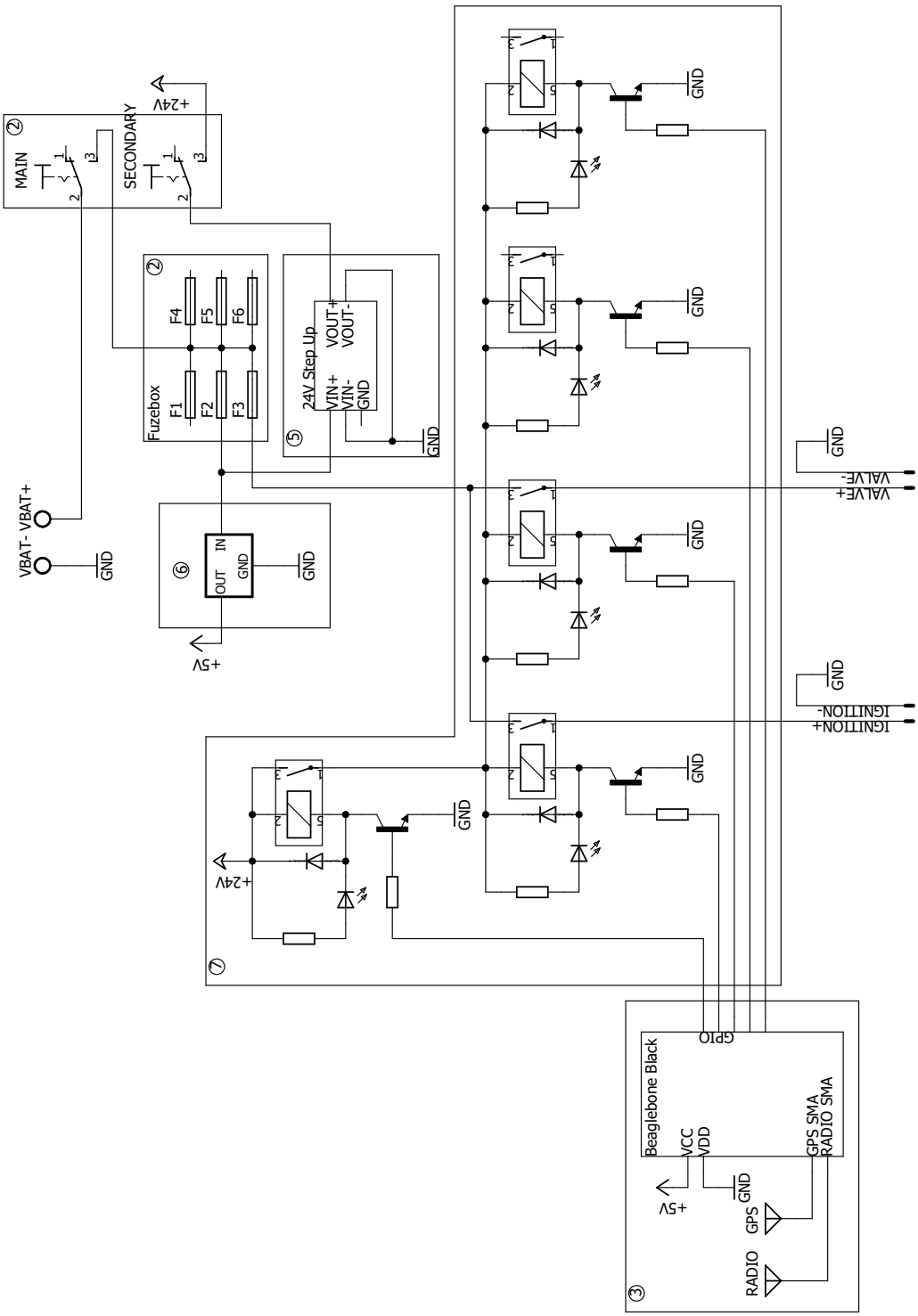
4. Relays and Relay-Drivers. A temporary installment that allows the Beaglebones' GPIO pins to directly drive a high load through a relay.

5. DC-DC 24V Step-up Converter. A DIN-rail device that will step up the battery voltage (12V) to the a higher 24V used by the relays (I bought the wrong ones).

6. DC-DC 5V Power Regulator. A through hole 5V step mode power regulator to provide 5V power to various systems.

7. Power Switches for main and secondary power.

2.2 Circuitry



2.3 Usage guide

The test bench as it is currently is built to allow for actuation of a solenoid valve and an ignition coil, with the ability to add more high-power devices to the empty relays. It also provides signal conditioners for 2 force transducers and a pressure transducer.

To utilize the relays, the corresponding GPIO pin on the Beaglebone has to be driven high (or low, I don't remember). However, the first relay is meant as an enable for the remaining relays (see circuit diagram above) to allow for a safety interlock. In addition, the switch labeled SECONDARY must be enabled to allow for relay actuation to allow for manual override.
NOTE: When using the relays, make sure to set the pin mode to OUTPUT (i.e. run the script BEFORE turning on SECONDARY power) as a floating output may cause false triggers.

To utilize the signal conditioners, attach the National Instruments ADC to a computer running LabVIEW (namely the Japanese "still better than a mac" laptop). Run the LabVIEW program on that computer to start recording data.

2.4 Additional notes

The two fuses in the fuse box are rated loosely to protect the remaining circuitry. The higher rated fuse is meant to provide power to high-power devices (Ignition & solenoid). The lower rated fuse provides power to the rest of the system. Note that these fuses have not been tested, and a short on the ignition coil will cause all systems to crash.

CAUTION: All information contained in this documentation may be inaccurate or wrong. The test bench is not meant to be a final device and is built crudely at best.

DO NOT USE IN CRITICAL APLICATIONS

2.5 Revision History

Rev	Author	Approver	Changes	Date
A01	Cem Eden	-	Initial draft	2019-09-02

Table 1: Summary of Revision History