# R-DAS Tiny User's Manual

## Scope

This document is an addendum to the R-DAS manual and is specific to the R-DAS Tiny (hardware V4.x). For general concepts about the R-DAS, please see the R-DAS Manual.

## New features

The new R-DAS has an exiting set of new features. The most important ones are:

- Four independent igniter output ports with two event-programmable outputs
- Dual axis accelerometer
- Small printed circuit board (28x80mm / 1.1"x3.15"). Fits in 29mm rockets!
- USB interface: super-fast data download
- Reduced power usage
- More storage memory
- 16x more processing power than the Classic/Compact

## Specifications

The specifications of R-DAS Tiny are summarized in Table 1.

*Table 1: R-DAS Tiny Specifications*

| | | |
|---|---|---|
| **Processor** | | |
| Type | Atmel AVR Risc processor | |
| **Memory** | | |
| Flash memory size | 1024 | kB |
| **Acceleration transducer** | | |
| Type | Analog Devices | |
| Range | -50 to + 50 | g |
| Resolution | 0.1 | g |
| **Pressure transducer** | | |
| Type | Motorola | |
| Range | 20 to 105 | kPa |
| Resolution | 0.09 | kPa |
| **External analog inputs** | | |
| Nr. of channels | 6 | |
| Input span | 0 to 5.0 | V |
| Input impedance | 10 to 50 | kΩ |
| **Digital inputs** | | |
| Nr. of inputs | 4 | |
| Input specifications | compatible with TTL/HCT drivers | |
| **Triggering** | | |
| G-switch | >2.5 g for 0.25 sec | |
| Breakwire | make or break contact | |
| **Igniter output stage** | | |
| Nr. of output stages | 3 (drogue and main) | |
| Current | Max. 2.5 | A |
| Igniter supply options | Capacitor 2200µF and/or External power supply | |
| Continuity test current | < 1 | µA |
| **Power supply** | | |
| Voltage | 9 to 15 | V |
| Current | 30 – 50 | mA |

| Physical | | |
|---|:---:|---|
| Dimensions | 28 x 80mm / 1.10" x 3.15" | mm$^2$ / inch$^2$ |
| Weight | tbd / tbd | gram / oz. |
| Temperature range | 0 to 70 | °C |

# User interface

The R-DAS Tiny requires at least GUI V4.0 or later.

**To install the GUI:**

1. Download the latest version from our website at http://www.aedelectronics.nl/rdas/download.htm.
2. Open the archive (.zip file).
3. Run 'setup.exe' file in the zip file.
4. When the pop-up window appears that warns for a non-signed driver select 'continue anyway' (twice).

**Next configure and upgrade the R-DAS:**

1. Connect the R-DAS to the PC using the supplied USB cable.
2. The PC will recognize the R-DAS and after some time the drivers will be run for the first time. After the installation of the drivers a re-boot might be requested. Please reboot if needed.
3. Configure the GUI to use the USB for communication with the R-DAS: Configure->Serial Port Setup and select 'RDAS board on port USB'.
4. Download the latest firmware (.upg) file from http://www.aedelectronics.nl/rdas/download.htm and upgrade the firmware from the menu: Configure->Upgrade firmware and follow the instructions on the screen.

# Connectors

The R-DAS Tiny has three connectors, of which two are new (see Fig. 1).
   1. **Expansion connector:**
      14-pin connector for expansion boards. 100% compatible with the expansion connector found on the R-DAS Compact/Classic.
   2. **USB Connector (new):**
      To connect the R-DAS Tiny to the PC for downloading flight data, configuration and firmware upgrades.
   3. **Power/Igniter Connector (new):**
      This is an 8-pin connector to supply processor and igniter power and 4 igniter outputs. For a detailed description see further.
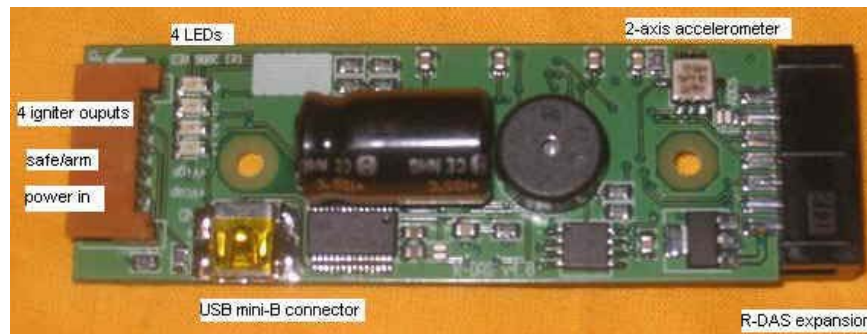


**Figure 1:** *R-DAS Tiny connectors.*

# Mounting

Two holes are provided to mount the R-DAS inside the rocket. The unit is supplied with stand-offs with metric M3 screw thread. If required these can be replaced by user supplied mounts. Make sure the unit is mounted with the arrow labeled 'UP' pointing upwards to the nose cone.

# Buzzer

The R-DAS Tiny has a buzzer with status signaling that is very similar to the R-DAS Compact and Classic. The only difference is the signal for igniter discontinuity. A discontinuity in any of the for igniters is now reported by two buzzes. In case of a continuity error, use the red LED's to find out what igniter has a continuity error.

*Table 2: Summary of different acoustic signals.*

**BEEPS (high frequency)**

| | | |
|---|---|---|
| ▬▬▬▬▬▬▬▬ | long beep | bootloader running (at start-up) |
| • • • • • • • • • • • • • • • | fast beeps (continuous) | uploading firmware |
| • • • • • | short beep (every second) | R-DAS standby, ready for launch |
| • • • | short beep (every three seconds) | R-DAS in monitor mode (during download and configuration) |
| •• •• •• •• | two short beeps | R-DAS detected lift-off, data acquisition busy |

**BUZZES (low frequency)**

| | | |
|---|---|---|
| ▬▬▬▬▬▬▬▬ | long buzz | at start-up: memory error |
| •• •• •• •• | two buzzes | igniter discontinuity error |
| ••• ••• ••• ••• | three buzzes | breakwire error (breakwire triggering disabled) |
| •••• •••• •••• •••• | four buzzes | external hardware error; hardware that was configured is not found |
| ••••• ••••• ••••• | five buzzes | pressure transducer out of range at power-up (offset) |
| •••••• •••••• •••••• | six buzzes | accelerometer out of range at power-up (offset and/or self-check), g-switch disabled |

# Power/Igniter connector

The power/igniter connector has the following functions:
1. Power supply to the board.
2. Power supply to the igniter output stages.
3. Igniter Safe/Arm.
4. Igniter outputs.
5. Break wire connection.

The power/igniter connector allows for the quick installation of an R-DAS in each of the owner's rockets by simply leaving the wiring loom (connector with pigtail) inside the rocket. The looms can be ordered from us or from an electronics supply company such as Conrad (part# 74 31 00-89).

Simple 3-step wiring instructions (see Fig. 2):

**Step 1 – Power supply:** Connect a 9-15V battery to pin 1 (+, purple wire) and pin 2 (-, blue wire). An extra switch can be installed between pin 1 and the battery to switch the unit on/off.

**Step 2 – Safe/Arm and igniter supply:** Pin 3 (green wire) and Pin 4 (yellow wire) have the same function as connector J13 on the R-DAS Compact (safe/arm connector).  A safe/arm switch should be installed to remotely arm the igniter output stage. Note that the igniter output stage is not powered (and will not fire igniters) without a connection between pin's 3 and 4! Like the R-DAS Compact a separate igniter power supply can be connected to Pin-4.

**Step 3 – Connect igniters:** The igniters are connected to Pin's 5 through 8. To save pins, all igniters have a common return to the ground (-) of the power supply. If not all igniters are used, replace them with 10k-Ohm resistors to prevent wrong continuity signals. If a breakwire is needed, simply replace igniter 4 with a breakwire and configure the R-DAS for breakwire triggering. In case of breakwire triggering only 3 igniter outputs are available.
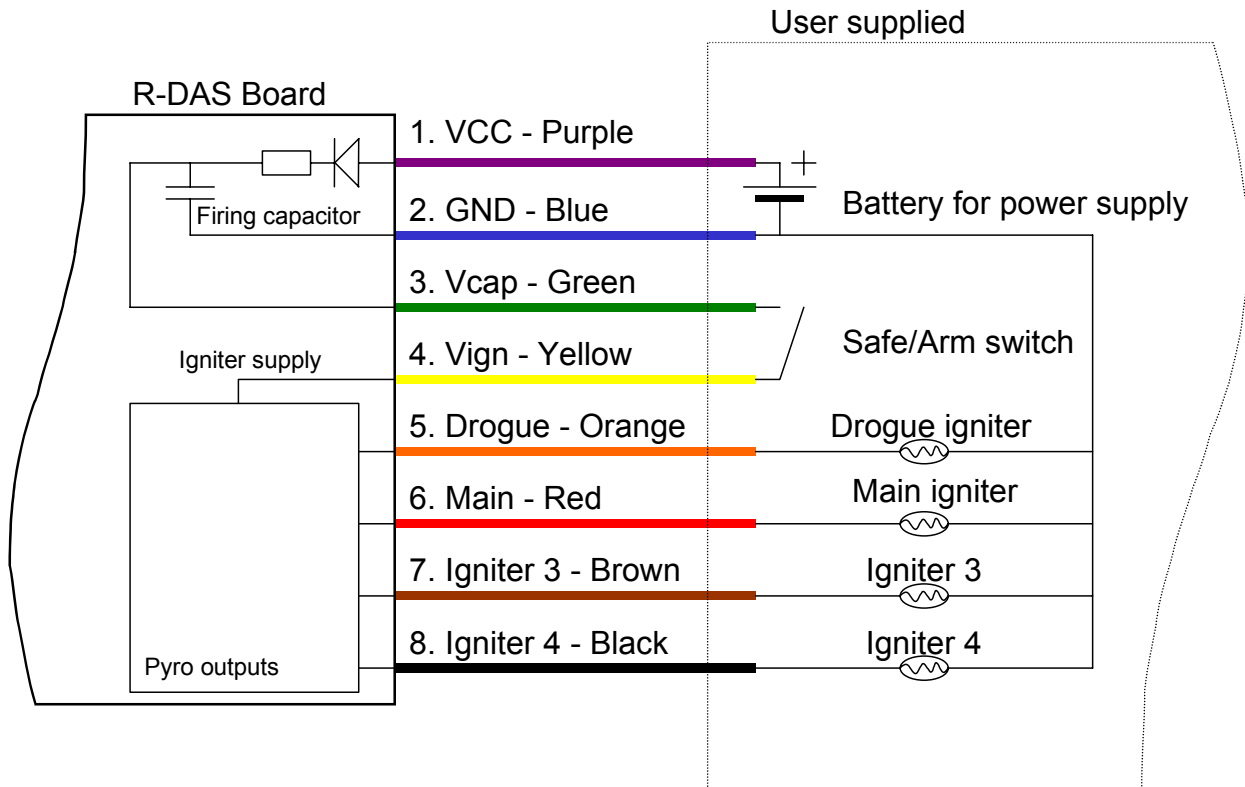


**Figure 2:** *Standard R-DAS Tiny wiring.*

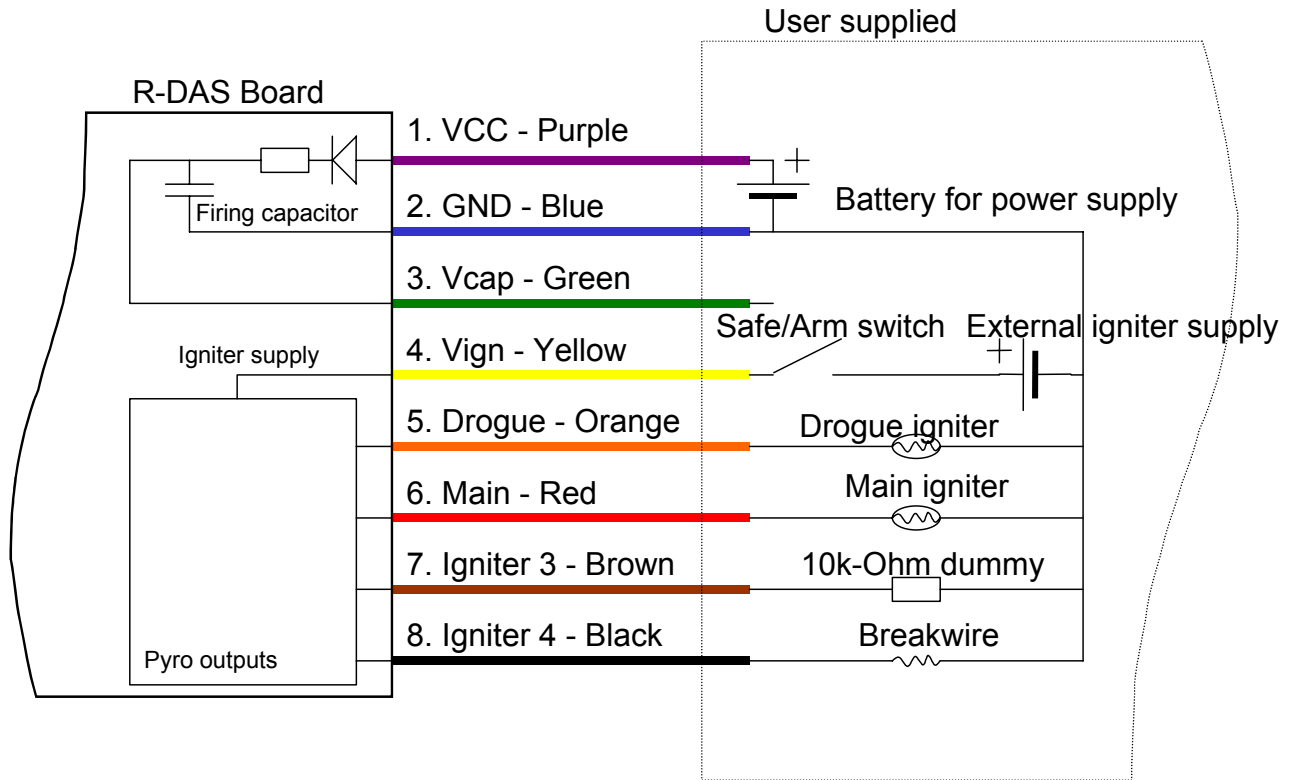Optionally, the user can supply an external igniter supply as shown in Fig. 3.



Figure 3: *R-DAS Tiny wiring with optional igniter power supply, breakwire, and un-used Pyro 3 output.*

**Note:** Earlier versions of the wiring loom had a white #1 wire color.

# LED's

There are four red LED's on the R-DAS board. These LED's are used to indicate continuity of the igniters. When a breakwire is selected the LED for igniter #4 will flash once every second to indicate that this pin is configured as a breakwire input. When the breakwire is triggered the LED will be on for one second. After this it will remain off.

# X-acceleration

The R-DAS is factory configured for dual axis acceleration measurement. The acceleration in the Z-axis is always enabled and cannot be switched of by the user. The acceleration in X-direction is connected to ADC5 by means of a solder jumper. If storage of the X-acceleration is desired, ADC5 should be selected in the sampling section of the R-DAS configuration menu. If ADC5 is to be used as a regular analog input, the solder jumper should be set to E (external) instead of A (acceleration).

# Tech tips

**Buzzer volume**
The buzzer volume can be set with the following command: c buzz x<enter> where x is 0 for no buzzer, 1 for mid-lo volume, 2 for mid-hi volume and 3 for maximum volume (factory default). The buzzer volume preference is stored in non-volatile memory. The command can be entered in the terminal window of the user interface.