

Sensor wiring must be shielded to ensure reliable performance. Shielding means that the metal sheath around the signal wires must have a low impedance path to the measurement instrument or the instrumented structure. Although this seems like a simple concept, there are several aspects of shielding that are often overlooked. The common problems stem from unterminated or improperly terminated cable shields.

Your TDAS system may function correctly with unterminated shields, but this is certainly not the intended use of the product nor generally appropriate and DTS cannot recommend testing with unterminated shields. With unterminated shields, the potential for damaging EMI/ESD noise or transients finding a path into critical circuitry is tremendously increased. Unterminated shields also increase the likelihood that common-mode voltages induced into the sensor wiring will exceed the common-mode input range of the input amplifiers (approximately ± 6 V) and result in unwanted noise and transients in the data.

As stated above, the cable shield must be terminated to the DAS shield connection or the structure to which the sensor is mounted, but NOT both. Connecting both ends of the cable shield creates the possibility for ground loops, which can cause current to flow through the shield and induce noise into the signal wiring.

Some shielding recommendations and comments follow.

1. Shield the sensor cables.

Shielding the sensor cables allows stray EMI/RFI energy to terminate and drain to the TDAS case before influencing the signal wiring. The cable shield should be connected to the shield pin on the connector or the backshell of the connector. Some sensors may have the shield tied at the sensor housing (certain 7264s.) In this case, the user must not connect the shield to the Lemo or must carefully disconnect the shield at or near the sensor. Connecting the shield at both ends could cause ground currents and high levels of noise in that sensor data. If external bridge completion is used for half bridge sensors, the completion resistors should be located within the shielded Lemo connector or within a material that is tied to the shield.

2. Shield the dummy from noise.

Metal structures of test dummies (such as the head) can act as receivers for the EMI/RFI/ESD. Most test labs we work with ground the dummy head and torso using a flexible grounding cable (12 AWG) to reduce these effects. The ground wire should be attached to the TDB ground block or to one of the bolts that is used for mounting the TDAS PRO rack.

3. Shield the cable which carries the high-current firing signal.

An unshielded cable carrying fast moving, high-current signals can act like a transmitting antenna. Using a shielded cable helps block EMI energy from receivers such as a test dummies. The cable shield should be attached to the TOM Lemo shield

Grounding and Shielding

(backshell) and continue as close to the device as possible. The cable should be routed away from sensor wires and pass over or under sensor leads at 90 degrees to reduce EMI effects.

4. Shield the TDAS PRO rack, TDB and crash battery.

Since all signal shields come back to the TDAS PRO SIMs, TOMs or DIMs to complete, the ground of each rack must be solid (less than 1 ohm to local ground.) DTS recommends running a 12 AWG or larger continuous cable from the bolts that mount the TDB, TDAS PRO racks and any crash-hardened batteries or power supplies to the vehicle body or sled that the devices are mounted to.

5. Clean off paint and anodize on all devices.

Since shielding relies on a good electrical path to ground, it is important that all ground wires and devices are free of paint, anodize or dirt before mounting bolts, ground wires or grounding lugs are attached.



A poorly prepared mounting area
(older style TDAS PRO rack)



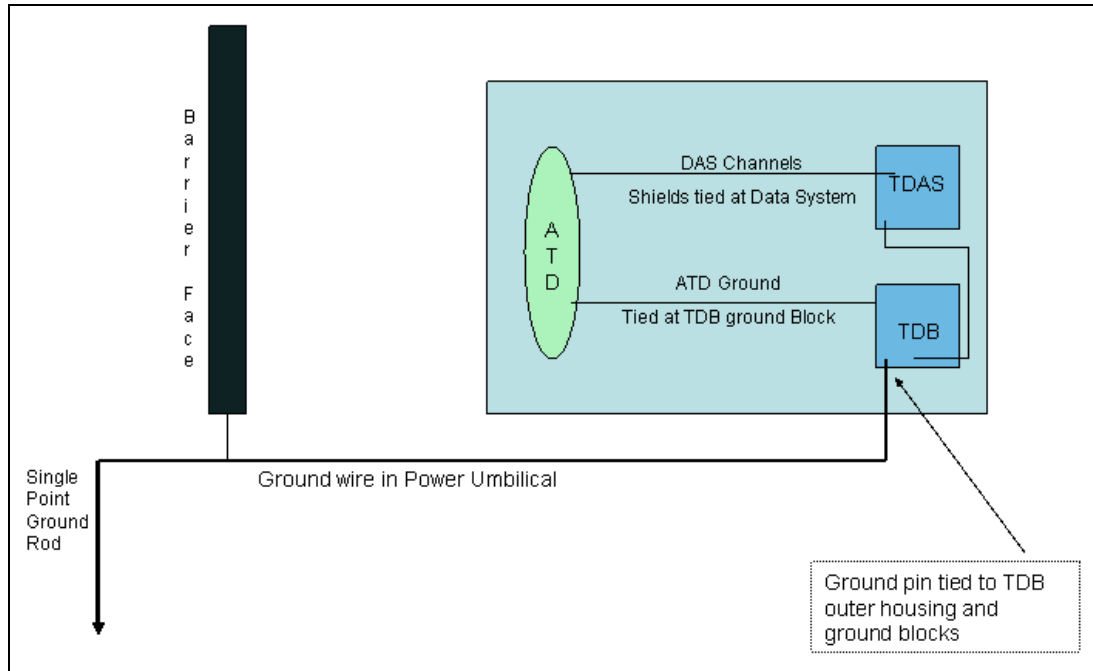
An adequately prepared mounting area
(TDAS PRO rack cleaned to produce a grounding area)



The preferred method for mounting area preparation
(all new TDAS PRO racks are shipped with no anodizing under the washer to produce the best grounding area)

Grounding and Shielding

When bolting a TDAS PRO rack, TDB or TDAS G5 Docking Station to a vehicle body or sled, any anodizing around the bolt head should be removed. The surface the rack is being mounted to should be cleaned of all paint and oils before the rack is mounted. More surface area for electrical current flow will create a more solid grounding system.



Typical Grounding

