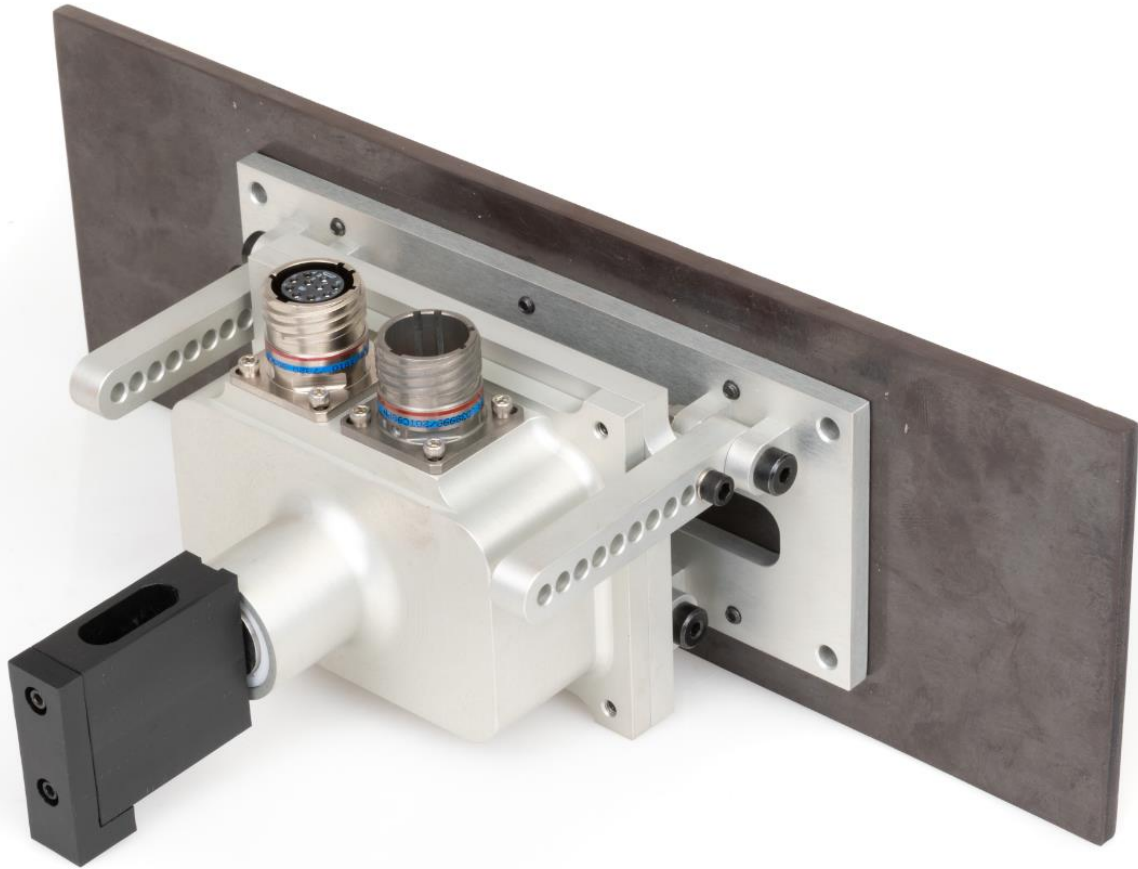


MICHIGAN SCIENTIFIC CORPORATION

STATOR ANGLE CORRECTOR (SAC)



MODEL: SAC

*FOR SLIP RING WHEEL FORCE TRANSDUCER
APPLICATIONS*



MICHIGAN SCIENTIFIC
corporation

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Technical Support

For technical support, contact Michigan Scientific Corporation.

Michigan Scientific Corporation

Milford, MI Location

321 E. Huron St.

Milford, MI 48381

ph: 248-685-3000

fax: 248-684-5406

Charlevoix, MI Location

8500 Ance Rd.

Charlevoix, MI 49720

ph: 231-547-5511

dfax: 231-547-7070

<http://www.michsci.com/>

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Introduction

One of the issues with utilizing a slip ring based wheel force transducer (WFT) on a vehicle's steered wheels is that the slip ring encoder stator rod tips when the wheels are steered and the rod is restrained at the fender. The stator rod is the encoder position reference for the WFT system, so it is crucial that it stays consistent throughout testing. This stator rod tipping results in the CT2 outputting erroneous force, moment, position, velocity, and acceleration values in vehicle coordinates. In order to remove the error associated with the encoder reference moving, traditionally custom over the wheel brackets were used. A second traditional option was using an additional external sensor that requires on site calibration to the stator rod tipping angle used along with calculated channels. Both of these options have their drawbacks and require extra set-up time. The Stator Angle Corrector (SAC) is the third and best option for preventing these errors.

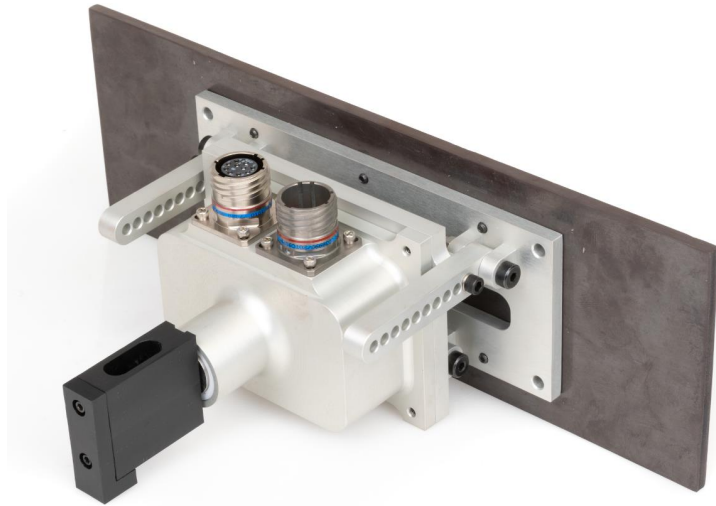
The SAC intercepts the digital signals from the WFT amplifier and slip ring, measures the stator rod angle with an internal absolute rotational encoder, adds the measured stator rod angle to the wheel rotational position and velocity signals, and then transmits the WFT signals to the CT2. Thereafter, coordinate transformation is performed in the CT2 as usual with the corrected wheel rotational position signal, preventing any error. The SAC adds no delay to the WFT system, no over-the-wheel brackets, additional sensors, or post processing is required to accurately measure the forces, moments, position, velocity, and acceleration of the wheel force transducer.

The SAC mounts onto the vehicle front fenders either with a magnet, tape, or screws.

System Components

The SAC system requires several different components.

SAC Assembly



Stator Angle Corrector

Signal Cable



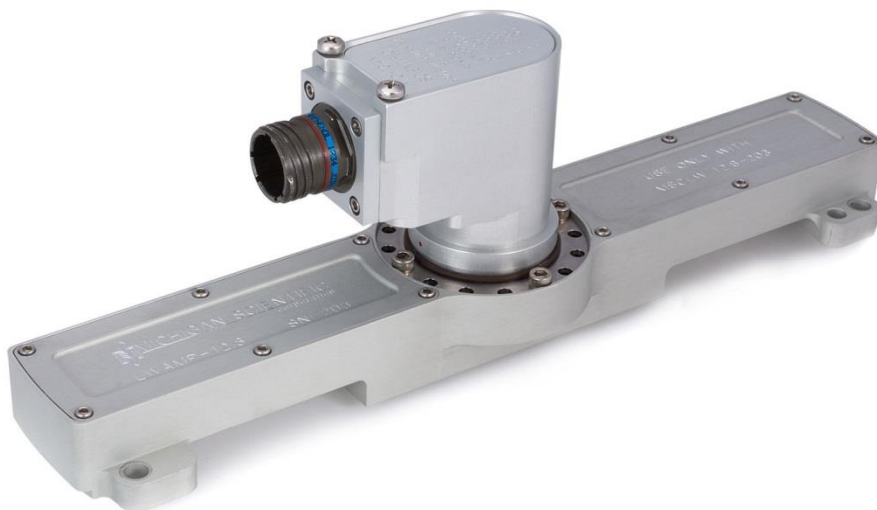
Signal Cable connects the SAC to the CT2 Electronics (20ft/6m length).

SAC Cable



SAC Cable 2 connects the SAC to the WFT slip ring (4ft/1.2m length).

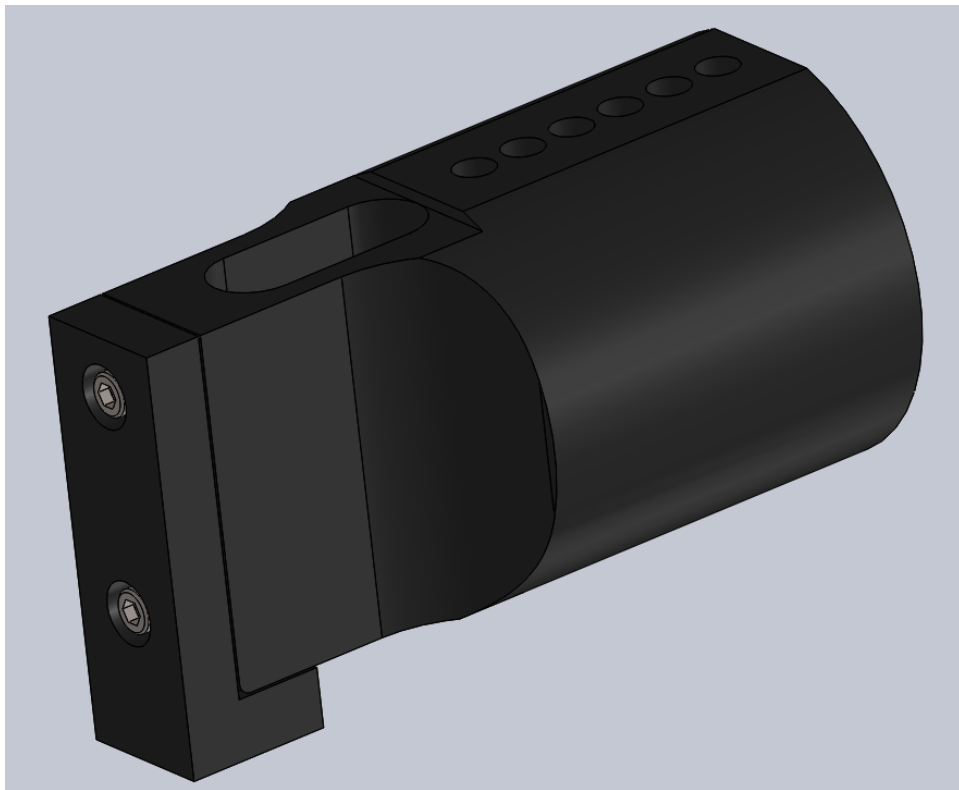
Amplifier and Slip Ring



Stator Restraint Rod



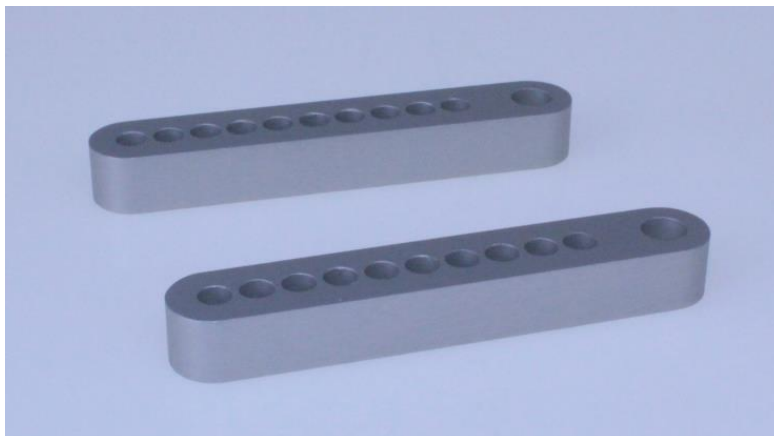
Stator Restraint Rod Coupler



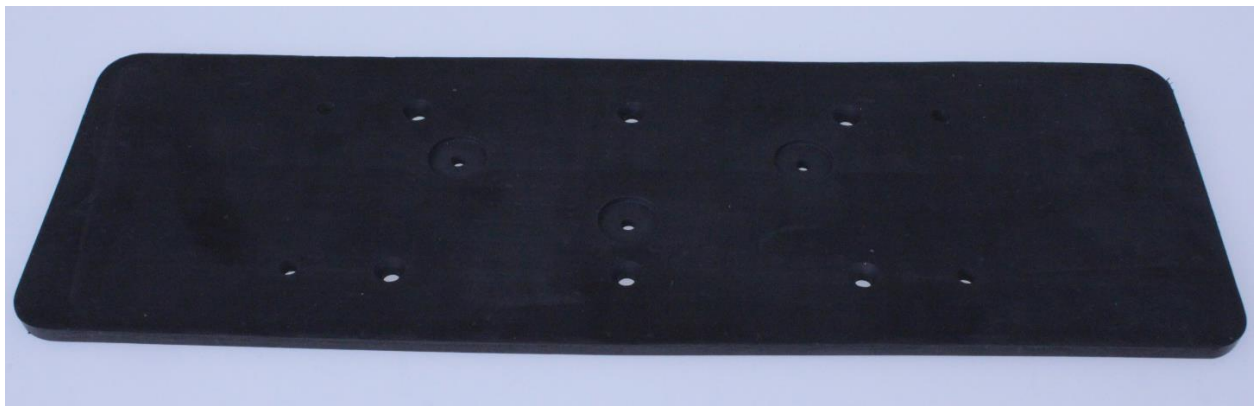
Gaffer's Tape



Angle Adjustment Linkages



SAC Magnet



CT2



Coordinate Transformation Electronics

Installation Instructions

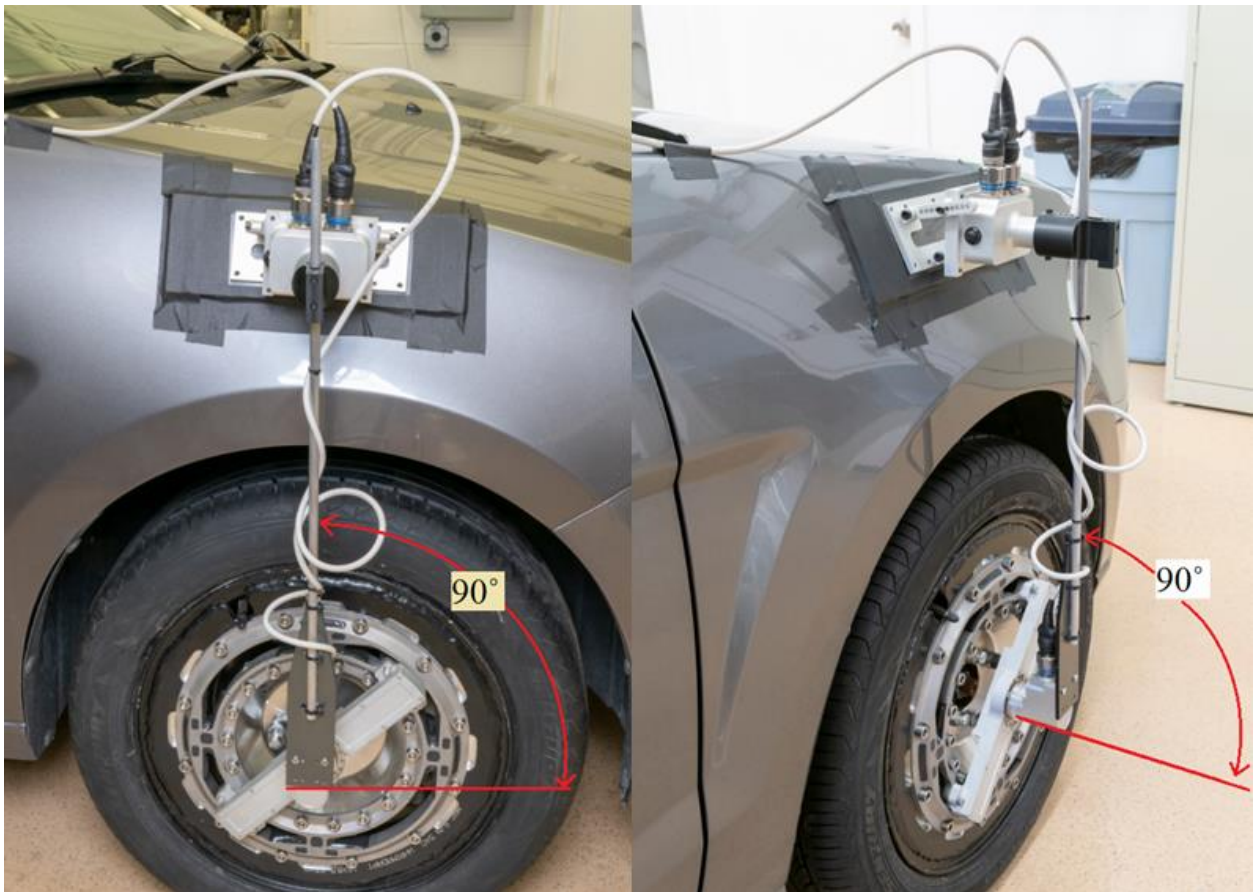
This section of the manual describes the installation of the SAC onto a vehicle.

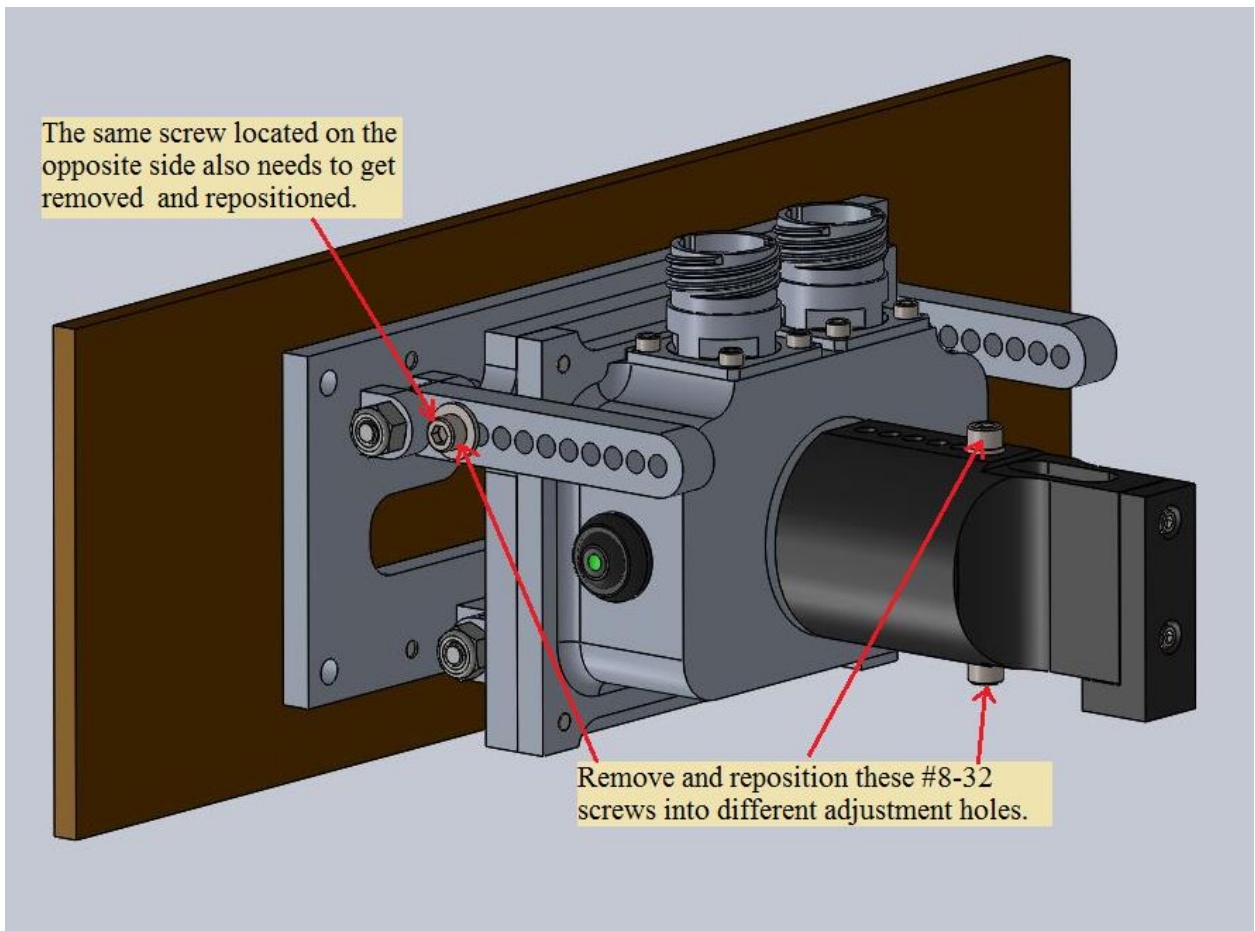
Before Assembly

- Be sure that the vehicle fenders are free of dirt.
- Use care when assembling the SAC to avoid damage to any part of the system.
- Make sure the vehicle is sitting on level ground.

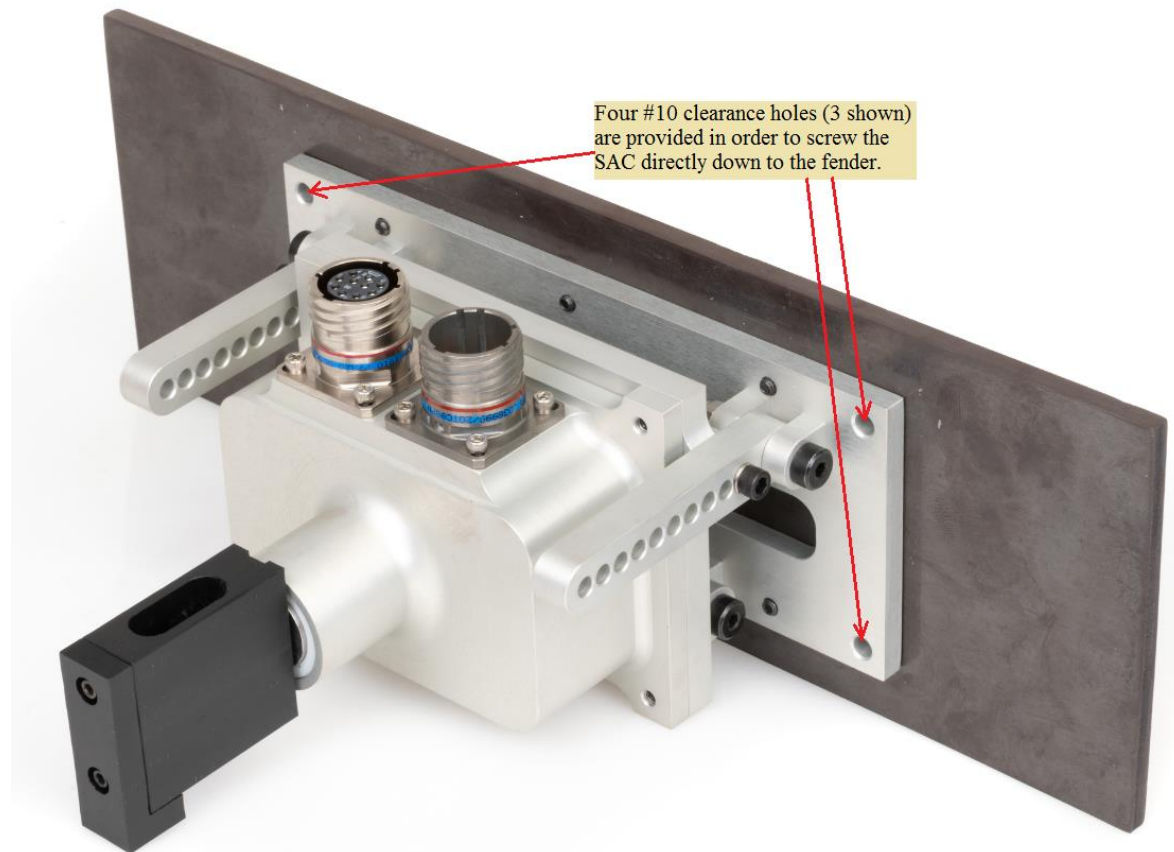
SAC Installation

- Insert the Stator Restraint Rod into the Stator Restraint Rod Coupler.
- Place the SAC magnet onto the vehicle fender above the wheel.
- Position the SAC so that the Stator Restraint Rod is perpendicular to the ground in the vehicle's XZ and YZ planes (SAE vehicle axis system). In order to make the Stator Restraint Rod perpendicular to the ground, you may need to reposition the angle adjustment linkages along with the Stator Restraint Rod Coupler. In order to adjust these parts, remove the #8-32 socket head screws that fasten these components to the SAC assembly and reinstall them in different holes. The photos below illustrate this setup condition:





- Once the SAC is properly positioned, the SAC magnet should be taped to the vehicle body using Gaffer's Tape to ensure it is rigidly attached. There is a provision for screwing it down to the fender using #10 screws. For the strongest SAC to fender mounting, it is recommended to screw the SAC down to the fender. The following photo shows where to bolt down the SAC to the fender:

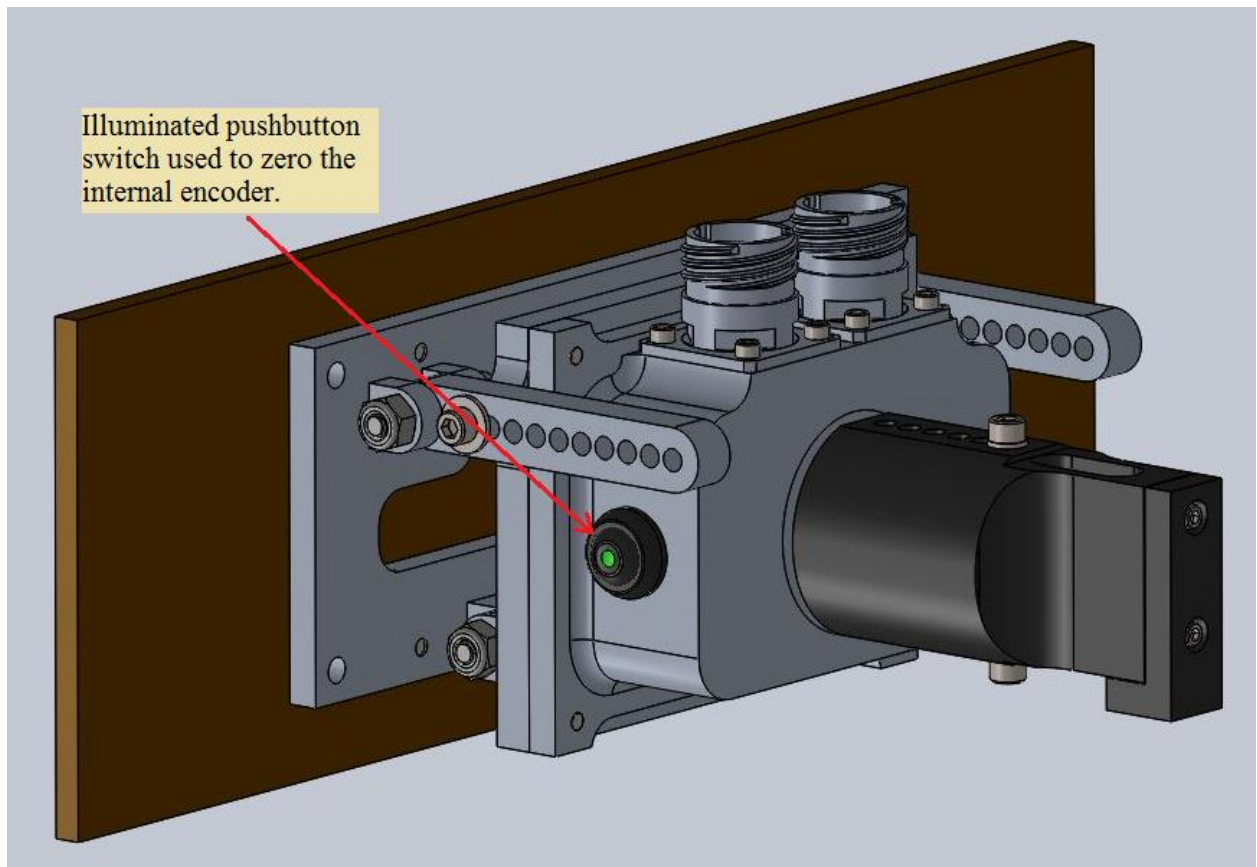


- Torque all four of the #8-32 adjustment screws to 31 in*lb (3.5 N*m). Apply temporary thread locker (e.g. blue Loctite) to these threads when performing strenuous testing.
- Before installing (or disconnecting) the Signal Cable and SAC Cable, make sure the CT2 is powered OFF.
- Connect one end of the Signal Cable to the male connector found on the SAC and the other end of the Signal Cable to the female connector on the CT2 box. Use Gaffer's Tape to attach the Signal Cable to various locations along the vehicle body until it is brought inside the vehicle.
- Connect one end of the SAC Cable to the female connector found on the SAC and the other end to the male connector found on the slip ring. Wrap excess cable length around the stator restraint rod. Make sure that none of the excess cable length will rub against the vehicle's tire. Clamp the SAC Cable to the stator restraint rod at various locations using zip ties. Leave sufficient cable slack near the SAC so that when the wheel moves relative to the body during suspension travel, SAC cable will not be loaded. The photo below shows proper signal cable installation.



Zeroing the SAC

Once the SAC is properly installed it needs to be zeroed in order for the CT2 to output accurate data in vehicle coordinates. There is an illuminated pushbutton switch located on the SAC housing. The light on the SAC pushbutton switch will stay solid green during normal operation. To zero the SAC, hold down the switch for 2-3 seconds. During the zeroing process the green light will flash. In addition the CT2 red fault light will also begin flashing during the SAC zeroing process. Once the zero process is complete, the SAC green light will turn solid again and the CT2 fault light will turn off. The following photo illustrates where the zeroing pushbutton switch is located:



Once the SAC and its associated wheel force transducer is properly setup and zeroed, the vehicle may be driven and data can be logged.