

SolidTrack Installation Manual



Manufacturing Version 1.0

Prepared By

Andian Technologies Ltd.

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Chapter 1

Overview

1.1 Recommended Equipment and Tool List

This list is meant to be a general list of the tools and shop capabilities in order to fabricate and install the frame extensions and mechanical gauge system as well as install and possibly troubleshoot the wiring and electrical system.

1.1.1 Recommended Shop Equipment

- Vehicle hoist (2 or 4 post capable of 10,000 lbs)
- MIG/TIG/Stick Welder (Milleromatic 211 or greater/equivalent)
- Drill Press (14" or greater)
- Assortment of metal fabrication tools (hand drill, band saw, grinder, etc..)
- Assortment of pneumatic tools (impact wrench, die grinder, etc...)
- Parts cleaner (solvent tank or equivalent)

1.1.2 Recommended Tools and Supplies

- Metric and imperial taps and dies
- Metric and imperial sockets and wrenches
- Needle nose, side cutting and locking pliers
- Metric and imperial hex keys
- Assortment of screwdrivers (Phillips, Robertson, etc...)
- Electrical wire strippers and cutters
- Assortment of electrical wiring accessories (butt connectors, heat shrink, relay tap, fuses, etc...)
- Digital Multimeter (Fluke 114 or greater/equivalent)
- Soldering iron/station (Hakko 936 or greater/equivalent)
- Medium and high strength thread lock (MG Chemicals Medium Strength Removable or equivalent)
- Anti-seize thread lubricant (Bostik Never-Seez or equivalent)
- Assortment of zip ties
- Black enamel spray paint (Krylon Rust Tough enamel or equivalent)

1.1.3 Optional Equipment

- Oscilloscope (Rigol 1054Z or greater/equivalent)
- Power supply (30V/2A)



1.2 General Installation Rules

1. Do not power the SolidTrack System until the entire installation is complete.
Pro tip: When you install the power cable, ensure the circuit breaker is tripped during the entire installation process.
2. Ensure all electrical accessory device return lines are not connected to chassis and are returned to battery negative through a dedicated cable.
3. Always remove the battery(ies) from the vehicle, or at minimum, disconnect the negative battery cable(s) when doing any electrical modifications.
4. All excess lengths of cabling should be coiled up and neatly strapped together at the SolidTrack Grey Box.
5. Wherever possible, use grommets for passing cabling through sheet metal and anywhere there are sharp edges.
6. Allow for a large radius when routing pneumatic tubing during installation.
7. Keep all cabling away from heat sources and moving parts such as the vehicles exhaust and driveshaft respectively.
8. Lastly, if you are unsure of anything regarding the installation or operation of SolidTrack please call the Andian office for assistance. The only stupid question is the one you do not ask!



Chapter 2

Mechanical Installation

2.1 Gauge Components

This section briefly outlines the different sub-assemblies you will be dealing with during the installation process.

It is preferable and beneficial, though not required, that the frame extensions and gauge assembly be installed together with the rail gear. Doing this will save time and resources as the alignment and fabrication can be done concurrently.

2.1.1 Frame Extension Tube Assembly

Our geometry systems are designed to be modular and fit on multiple vehicle brands and platforms; therefore, infeasible for Andian to supply frame extension tubes for every installation. Acknowledging this, we have made a set of design guidelines that must to be followed while manufacturing the frame extension tubes. These guidelines must be followed in order to have the system certified for revenue service and also to qualify for our warranty.

Design Guidelines

1. Andian will supply the gauge mounting plates (see Figure 1) with the appropriate countersunk 3/8" bolts, washers and nuts. These must be used to fasten the gauge mounting plates to main gauge plate.



Figure 1 - Gauge Mounting Plates, Clapper Boxes and Main Gauge Plate

2. The gauge mounting plates must be properly welded to the frame extension tubes.
3. The frame extension tubes must be manufactured out of 5/16" wall (or greater) standard steel tubing.
4. The frame extension tubes must be fastened to the frame of the vehicle with a minimum of three Grade 5 (or Grade 8) fasteners per side. These fasteners must be a minimum of 1/2" in diameter. The fasteners must cleanly pass through the vehicle frame and thread into the frame extension tubes via a welded nut or welded threaded insert.

5. In no section of the frame extension tubes shall be a cut 90 degree corner. All cuts within the tube (excluding the ends) must have a radius. If a 90 degree corner cannot be avoided a gusset plate needs to be manufactured and welded to the frame extension tube in the appropriate location for stress relief. See Figure 2 below for a picture of what not to do and what can occur if these guidelines are not followed.



Figure 2 - Stress Riser

6. Torque all bolts for the frame extension assembly according to the list below.

Torque specifications

- Gauge mounting plates to main gauge plate bolts: (countersunk 3/8" bolts)
 - dry torque: 45 ft-lbs
 - wet torque: 30 ft-lbs
- Vehicle frame to frame extension tube bolts: (1/2" diameter or greater)
 - dry torque: 85 ft-lbs
 - wet torque: 60 ft-lbs

Extension Tube Fabrication

1. Remove material from the steel tubes such that they clear the rail gear fasteners. Mark and drill the holes with which you will secure the tube as shown in Figure 3 below.



Figure 3 - Frame Extension Samples

2. Weld on ½" nuts for securing the extension, ensuring everything sits flush on the frame of the truck.
3. Deploy the rail gear on track and measure off the vertical cutoff required to make a flush mounting surface. The distance from the rail gear deployed rail sweep to the mounting surface of the frame extension should be approximately 9". This will ensure enough distance for the gauge shear mechanism without contacting the rail gear. See Figure 4 below.
4. If possible, mock up the mounting plate and gauge assembly where it will be in its final location to ensure the distance between the gauge wheel and the rail sweep is sufficient for the gauge wheel to shear and rotate without interfering with the rail gear (skip to the assembly section to see how to assemble the gauge parts supplied).



Figure 4 - Mounting Plate Reference

5. Make the cut and tack weld the frame extension to the adapter plate. Ensure that the adapter plates sit square and align with the holes on the main gauge plate. Remove tack welds as needed for adjustment and fitting. If the positioning is sufficient, weld the adapter plate and tube together. See Figure 5 and Figure 6 below.



Figure 5 - Frame Extension Model #1



Figure 6 - Frame Extension Model #2

6. Paint the frame extensions before final mounting to the frame and apply anti-seize compound to the fasteners for the bolts to the frame.
7. Install the main gauge plate using $\frac{3}{8}$ inch countersunk bolts. To ensure that the gauge is mounted the right way up, note that when the gauge is deployed, the height adjustment bolts are exposed and the cable harness loops underneath the gauge plate. When the rail gear is up, the bottom of the main gauge plate should be 14-17 inches above the ground. See Figure 7 below.



Figure 7 - Installation Reference

Important Notes

1. When installing the frame extension tubes, ensure the rail gear when in the road position does not come in contact with the frame extension tubes. If the rail gear axle contacts the frame extension tubes, review the rail gear geometry to check for errors paying close attention to height and over-centre adjustments. Consult your rail gear installation or service manual for more details.
2. When determining the length of the frame extension tubes, it is important to mount and deploy the gauge to adjust the distance from the gauge wheel to the front rail gear wheels. The distance between them should be minimal, but enough for the gauge wheel to shear and make a complete rotation without contacting the rail wheel or rail sweep.

If you have any questions or inquiries about manufacturing the frame extension tubes or supplied material, please call our office at 604-299-4900.

2.1.2 Mounting Plate Assembly

1. The mounting plate is the foundation for the gauge system and is mounted to the frame extension plates via the countersunk mounting holes described in Figure 8 below.

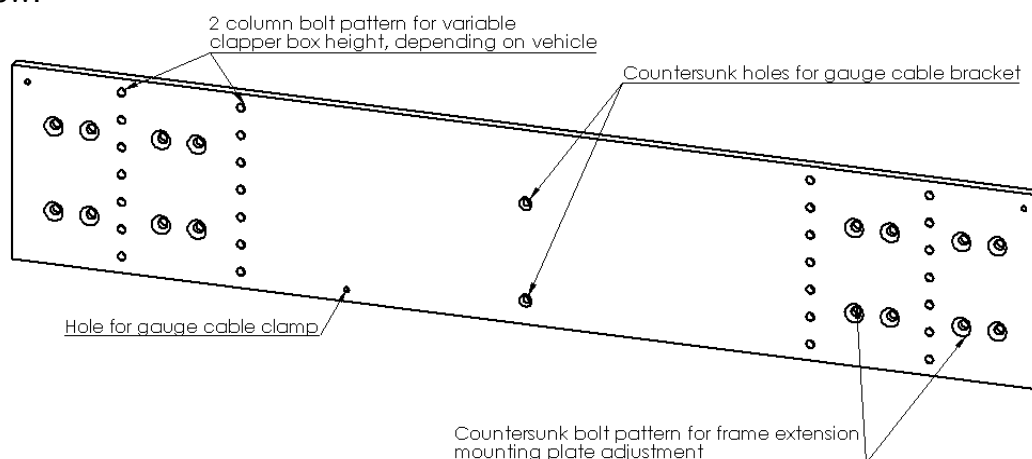


Figure 8 - Gauge Mounting Plate

2. The frame extension plates have horizontal slots to allow for slight adjustment if the frame extension tubes are not exactly centered to the rail gear.
3. When fastening the mounting plate to the frame extension plates, ensure it is centered with respect to the rail gear.

2.1.3 Clapper Box Assembly

1. The clapper box assemblies hold the gauge and provide a pivot for the stored and deployed positions of the gauge. See Figure 9 below.

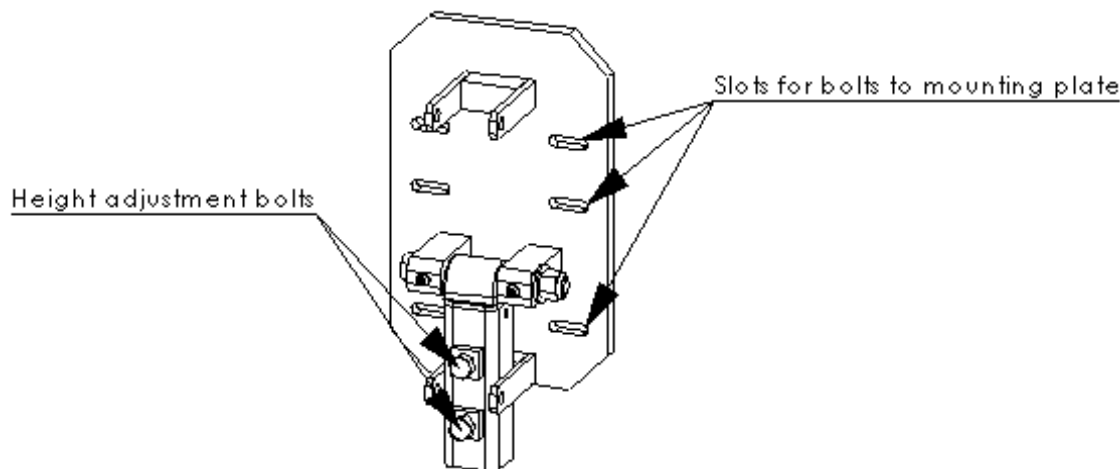


Figure 9 - Clapper Box

2. The mounting plate and clapper box assemblies may be shipped together and look like Figure 10 below.

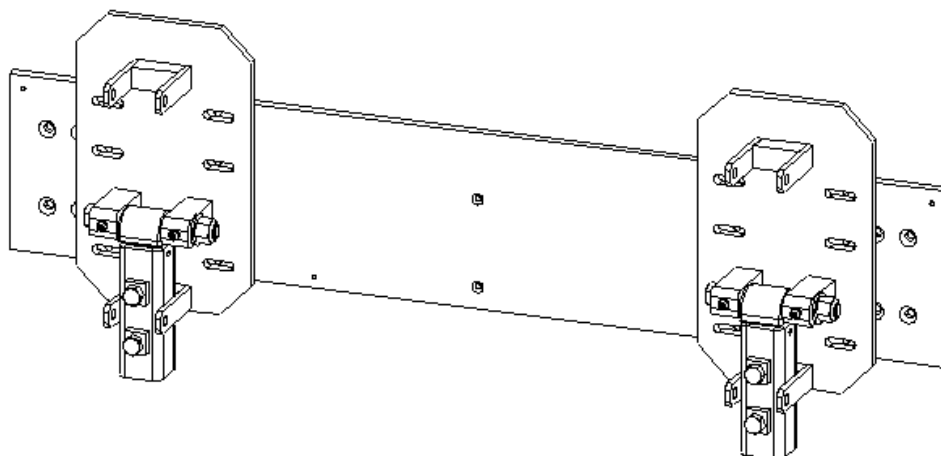


Figure 10 - Mounting Plate with Installed Clapper Boxes

3. The clapper boxes can be adjusted vertically on the column of bolt holes previously described in Figure 9 above if the height is not suitable for the vehicle.
4. If necessary, adjust the horizontal spacing between the clapper boxes to fit the width of the gauge assembly.

2.1.4 Remaining Gauge Assembly

The remaining gauge assembly consists of 3 subassemblies that should already be assembled when you receive your SolidTrack System.

1. The three assemblies already together are the Gauge Tube Assembly, Arm and Shear Mechanism and the Gauge Wheels. This can be seen in Figure 11 below.

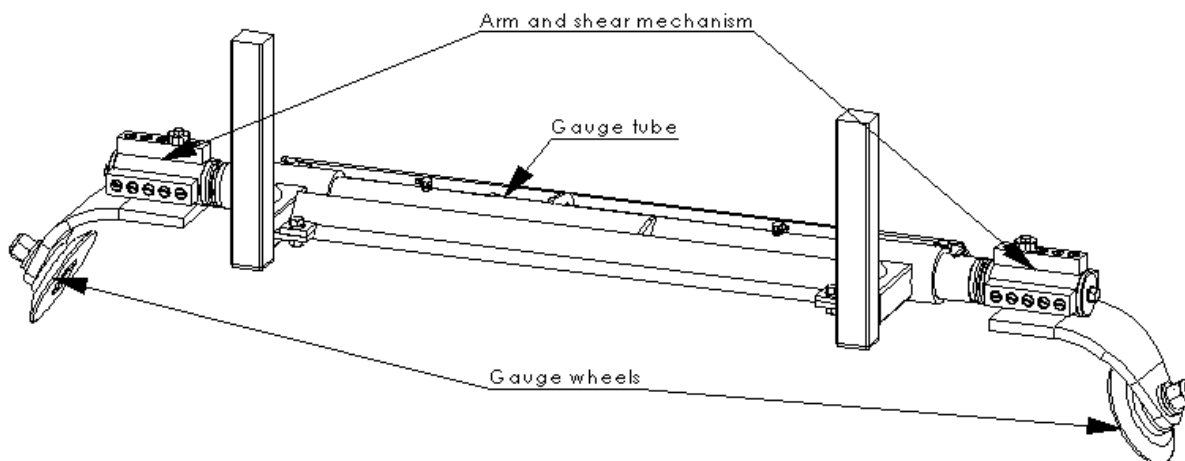


Figure 11 - Remaining Gauge Assembly

2. After the mounting plate and clapper boxes have been installed and aligned, the remaining gauge assembly can be put in place as described by Figure 12 below.

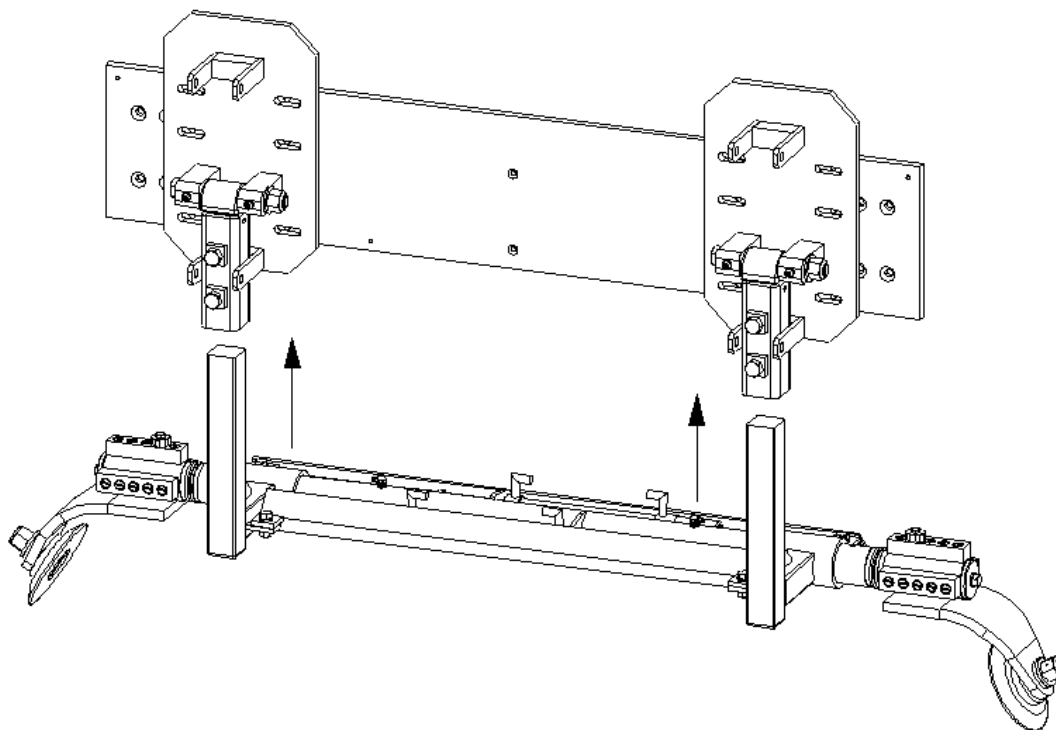


Figure 12 - Gauge Fitment

3. Once the gauge has been installed, the last step is the height adjustment. If the rail gear has not been completely set up, the height adjustment can be done at a later time. If the rail gear has been completed, adjust the gauge height so the gauge wheels contact the gauge point on the rail. Tighten the height adjustment bolts to the torque listed in Table 1.

2.2 Fastener List and Torque Specifications

This table is a guide for entire set of fasteners for the gauge assembly. If you are doing the installation, you will only need to be concerned with the Clapper Box and Mounting Plate assemblies as the other assemblies should come pre-assembled. If so inclined, it would be good practice to go through the other assemblies to confirm the fasteners are installed correctly and avoid any problems in the future.

Table 1 - Fastener List and Torque Specifications

Assembly		QTY	Fastener Size	Fastener Type	Torque (dry/wet)	
Clapper Box	Gauge height adjustment	4	1/2"-13x7/8"	Hex Cap Screw	43 ft-lb/35 ft-lbs ^[1]	
	Clapper box to mounting plate	8	3/8"-16x1-1/8"	Hex Cap Screw	45ft-lb/30ft-lb ^[1]	
		8	3/8"	Split Lock Washer		
		8	3/8"x0.812" OD	Flat Washer		
	Pivot	2	5/8"-1.312" OD	Flat Washer	85 ft-lb/70 ft-lb	
		2	5/8"-11x5-1/2"	Hex Cap Screw		
2		5/8"-11	Nyloc Nut			
Mounting Plate	Mounting plate to frame extension	8	3/8"-16x2"	Flat Socket Cap Screw	45 ft-lb/30 ft-lbs	
		8	3/8"	Flat Washer		
		8	3/8"	Split Lock Washer		
		8	3/8"x16	Nut		
	Cable bracket	2	5/16-18x1-1/4"	Flat Socket Cap Screw	11 ft-lb/8 ft-lb ^[2]	
		2	5/16"x18	Jam Nut		
	Arm and gauge pin retainer	2	5/16-18x5/8"	Hex Cap Screw	11 ft-lb/8 ft-lb ^[2]	
		2	5/16"	Flat Washer		
Arm and Shear Mechanism	Linear sensor coupler	2	3/8"-24x1-3/4"	Hex Coupling Nut	Hand tight ^[2]	
		4	3/8"x24	Jam Nut		
		2	3/8"x24-2"	Hex Cap Screw		
	Linear sensor connector	2	7/8"x14	Jam Nut		
	End cap	2	5/16-18x1-1/4"	Flat Socket Cap Screw		11 ft-lb/8 ft-lb ^[2]
	Key way fasteners	4	5/16"-18x2-1/2"	Flat Socket Cap Screw		11 ft-lb/8 ft-lb ^[2]
Gauge Wheel	Gauge wheel	2	1-7/8"	Internal Retaining Ring	70 ft-lbs / 55 ft-lb	
		2	3/4"x1.469" OD	Flat Washer		
		2	3/4"x10	Nyloc Nut		
		2	3/4"-10xXXX	Custom Bolt		
Gauge Tube	Linear sensor protectors	4	3/8"-16x1-1/4"	Hex Cap Screw	45 ft-lb/30 ft-lbs	
		4	3/8"	Split Lock Washer		
		4	3/8x16	Nut		

Notes

1. Anti-seize must be applied during assembly.
2. Light or medium strength thread lock must be applied during assembly.

2.3 Grey Box Orientation and Mounting

Positioning Guidelines

**THE POSITIONING AND MOUNTING OF THE GREY BOX
IS THE MOST CRUCIAL STEP IN THIS INSTALLATION.**

1. There are two recommended mounting options:
 - A canopy or truck cap can be installed in the flatbed area, and the system box can be bolted to a wooden or metal plate, and the plate bolted to the flatbed to secure it in place. A heater system to maintain the compartment at a constant temperature between 0 and 30 degrees Celsius is highly recommended.
 - The second-row passenger seat can be flipped up and the system box mounted on the seat rails. Extension rails or a platform will need to be built for this method.
2. Ensure that the box faces in the right direction as indicated by the "Forward" arrow on top of the box *and is level with the vehicle*. There are four corner feet attached to the grey box in order to mount it.
3. *The SolidTrack Grey Box must be squarely and securely mounted to the vehicle*. It is essential that the box is mounted as rigidly as possible since any vibration or rotation will be picked up by the inertial sensors, resulting in poor geometry readings.
4. The Grey Box cannot be cantilevered on any mount that is built. All mounting bolts and supports must be placed outside the footprint of the grey box so it is fully supported.

If you have any questions or inquiries about installing or mounting the SolidTrack Grey Box, please call our office at 604-299-4900.

2.4 Monitor Mount

The monitor for the SolidTrack System is mounted in the front passenger seat of the vehicle on a custom supplied mount. This setup is best shown as a picture in Figure 13.



Figure 13 - Front Monitor Mount

1. These mounts will be pre-assembled and will be packaged together in a single box for simplicity.
2. The base plate is the only vehicle specific piece of hardware which will come with installation instructions.



Chapter 3

Electrical Installation

3.1 System Layout

Figure 14 below is the basic system layout for the SolidTrack Kit for Ford and Chevy applications. The cables listed are supplied with the SolidTrack System and are labelled accordingly.

Please note, *Figure 14 is not a wiring diagram or schematic*, it is meant to be a simplified view of the system for layout purposes. Please see the figures below for wiring and ground requirements.

Installation Block Diagram

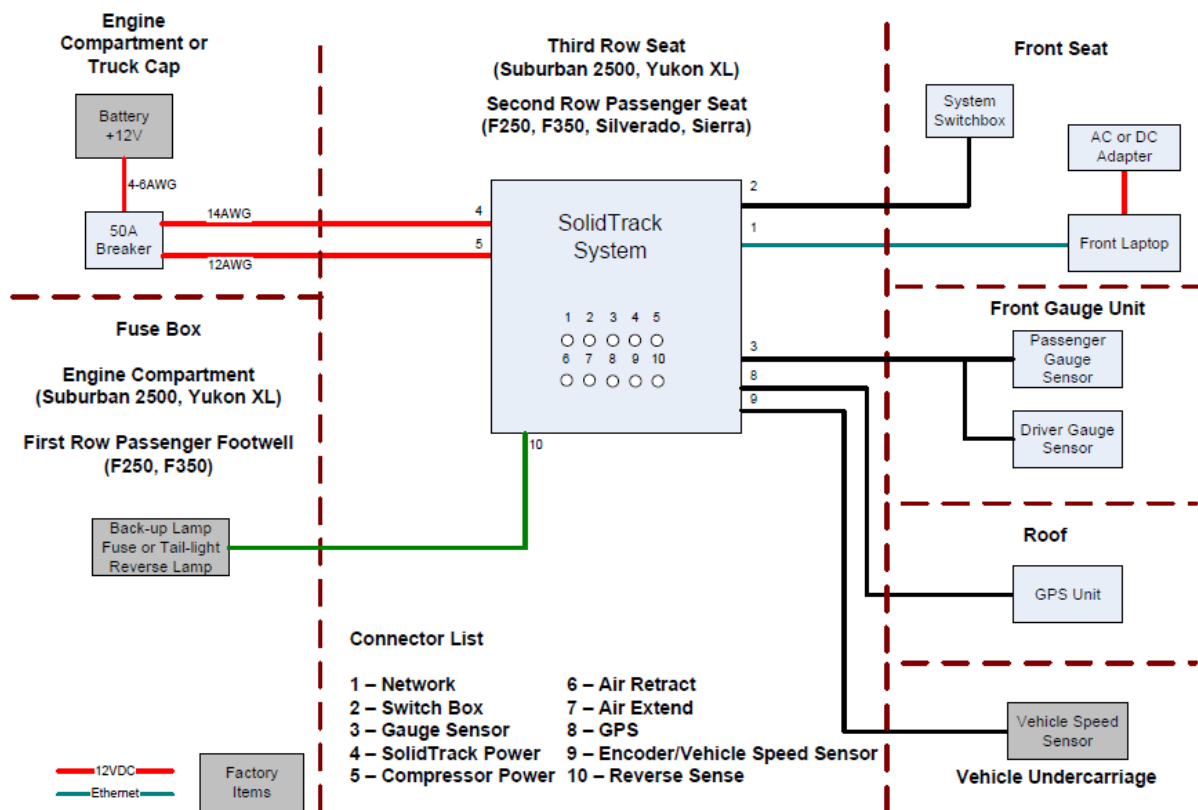


Figure 14 - Installation Block Diagram

3.2 SolidTrack Power Cable

SolidTrack Power cable consists of two cables for SolidTrack and compressor power.

1. The black connectors connect to ST PWR and CMP PWR on the SolidTrack System Box.
2. The ring terminals with red wires connect to the AUX terminal of the circuit breaker.
3. The ring terminals with black and green wires MUST connect directly to the battery negative terminal. See 3.2.1 below for your specific installation.

3.2.1 Dual Battery Vehicle

The SolidTrack System can be optionally installed into a vehicle with a dual battery system. This setup is for starting redundancy and/or power requirements. For this installation, the GND from the SolidTrack power harness will be loomed separately and must be wired back to the primary battery negative. See Figure 15 below for the complete installation diagram on how to wire the SolidTrack Grey Box.

Dual Battery Installation

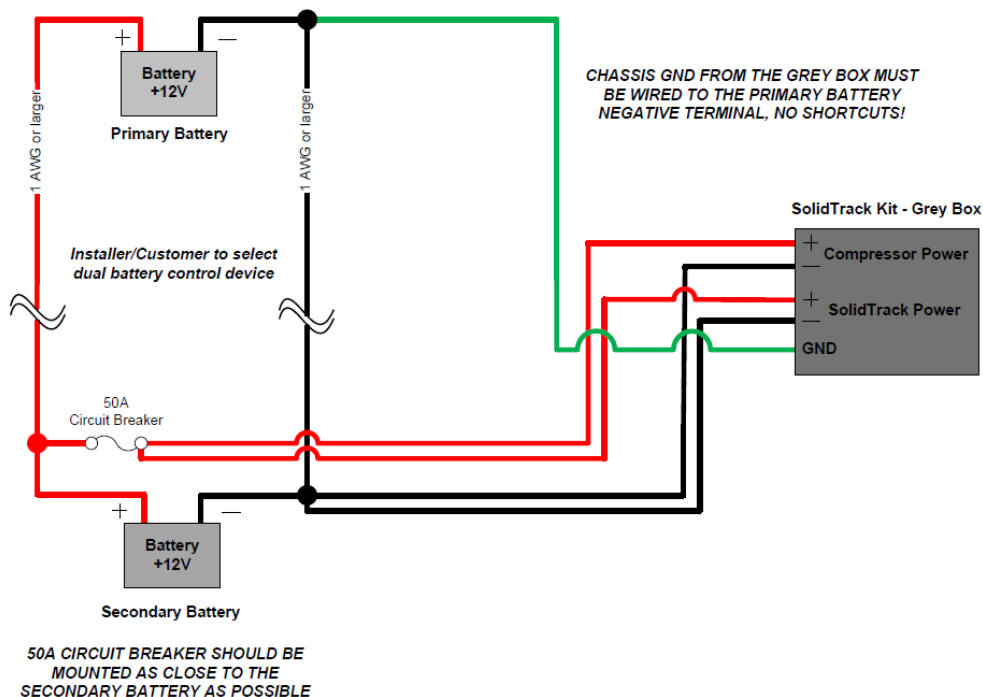


Figure 15 - Dual Battery Installation

It is important to follow basic electrical wiring/ground techniques for all electrical equipment, especially on systems that were not designed together.

3.4 Speed Sensor

If the vehicle you are installing the SolidTrack Kit into is not a Ford or Chevy, please contact Andian's office for assistance in wiring the speed sensor and/or to find out about other options available.

The two sections below describe how to install the Andian speed sensor harness into the vehicles speed signalling system. This is just a guide and we recommend that all installers verify vehicle specific wiring harnesses via factory service manuals or equivalent before install.

3.4.1 Chevy/GMC 2500/3500 (gas, automatic)

1. The black connector on Andian's speed sensor wiring harness connects to ENCODER on the SolidTrack Grey Box.
2. The pigtail end of the cable connects to the vehicles speed sensor wiring.
3. The Chevy speed signalling wires are located in the vehicles harness on the top of transmission as shown in Figure 17 below. This vehicle harness should be a simple 2-wire cable.
4. Unplug the connector from the transmission and carefully remove any electrical tape or loom.
5. Remove 1 inch of insulation from each of the vehicles speed sensor wires, being careful not to cut any of the conductors, as shown in Figure 17. Twist one of the speed cable wires around the exposed transmission harness wire and solder together as shown in Figure 18 below.

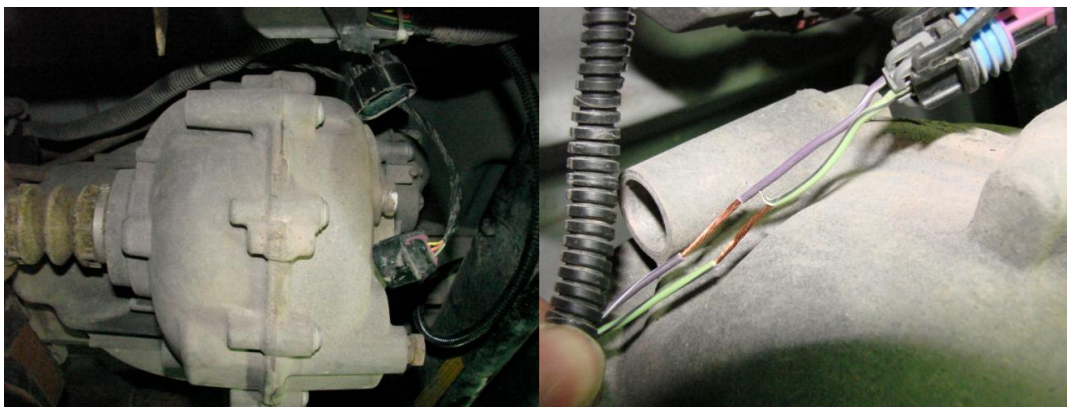


Figure 17 - Chevy Speed Sensor Harness

6. Wrap each connection with electrical tape.
7. Cover the entire bundle with loom and electrical tape as shown in Figure 18, then reconnect the connector.

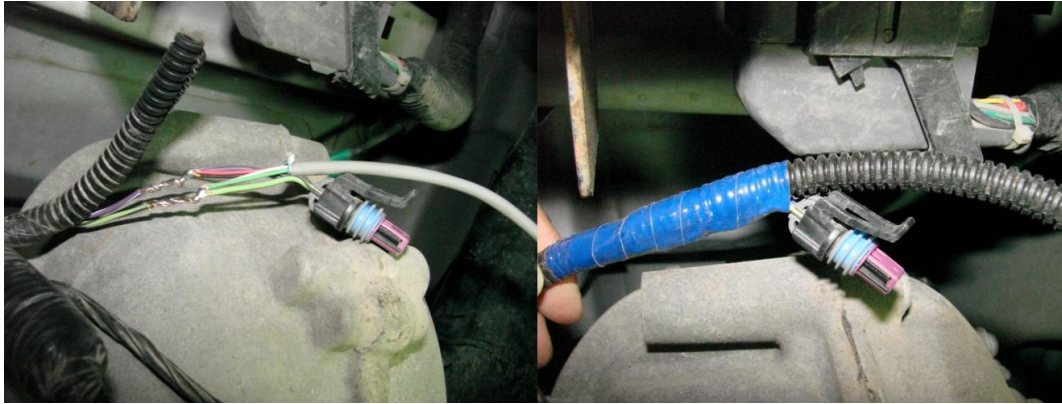


Figure 18 - Chevy Speed Sensor Wiring

3.5 Gauge Harness

The gauge harness consists of 3 separate cables, (1,2) the left and right pneumatic cable, and (3) the power cable. This harness goes from the SolidTrack Grey Box to the mounting plate on the gauge assembly. It joins up with the Gauge Cable which should already be installed on the remaining gauge assembly and attached to the gauge cable bracket.

3.5.1 Gauge and Air Line

1. The black connector connects to GAUGE on the SolidTrack Grey Box.
2. Push the air line wrapped in red tape into RETRACT push-to-connect fitting and push the blue-wrapped air line into EXTEND push-to-connect fitting on the SolidTrack Grey Box.
3. Remove the angle bracket from the other end of the gauge connector and wrap electrical tape around the connector and air lines to keep them intact and to prevent dirt and other contaminants from getting into the air line.

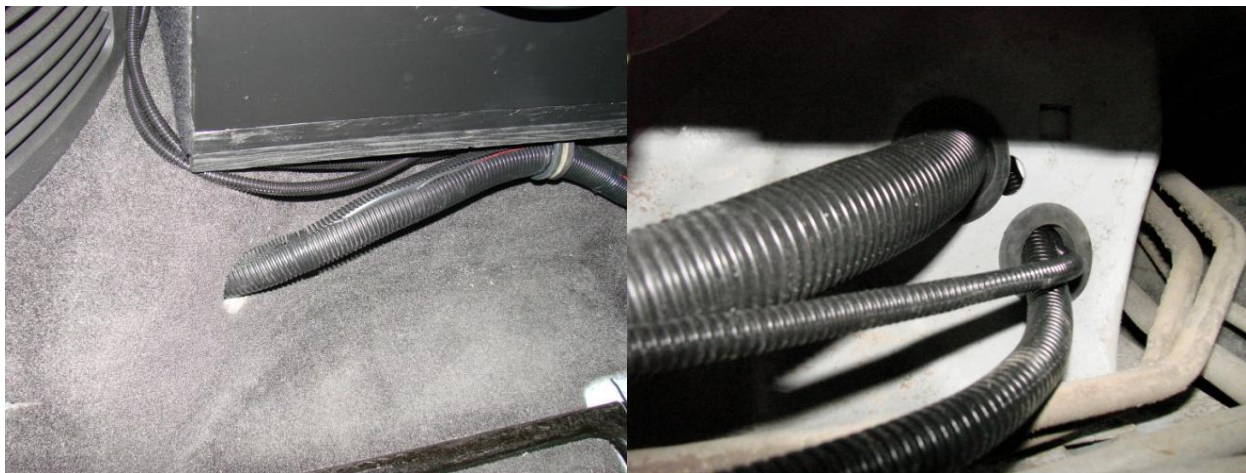


Figure 19 - Cable Management

4. Run the cable neatly inside and underneath the vehicle, along the frame where possible, to the gauge mounting plate. Do not tug or run into a location where the cables can be scraped, cut, or melted by vehicle components. See Figure 19 above for proper cable management.
5. Ensure that the cable placement does not interfere with deployment of the rail gear.
6. Re-attach the angle bracket to the connector and mount the bracket to the gauge plate using the ¼" x 20 countersunk bolts provided.
7. Push the air lines into the push-to-connect couplers on the bracket and ensure they match colours with the cable harness on the gauge itself.
8. Route the gauge cable through the ring clamp in the bottom of the gauge plate. See Figure 8 for a review of where the pre-drilled for the ring clamp hole should be located.
9. Connect the air lines and gauge cable from the gauge assembly to the bracket. When connecting the air lines, connect the red-taped lines to each other and the blue-taped lines to each other.
10. If you wish to cut some slack from the air line, ensure that you cut the air line flat and not at an angle, preferably with an air tubing cutter; otherwise, air may leak at the coupler.
11. Ensure that all cables and air lines are loomed and none of the cables interfere with deployment of the gauge or rail gear and comply with the applicable General Installation Rules.

3.6 Air Filter

The air filter assembly consists of clear pneumatic tubing and a grey filter.

1. Securely attach the air filter assembly upright in a dry location close to the SolidTrack Grey Box that enables access for periodic maintenance. Route the SolidTrack AIR OUT and AIR IN lines through the filter, observing the airflow direction markings.
2. If you wish to cut some slack from the air line, ensure that you cut the air line flat and not at an angle, preferably with an air tubing cutter.
3. Route the water drain line outside the truck with the included air tubing. Do the same with the SolidTrack System exhaust line.

3.7 GPS Cable

The GPS harness consists of a single cable with the magnetically mountable GPS module.

1. The GPS module has a magnetic mount and should be mounted to the roof of the vehicle.
2. The GPS module needs to be located directly above the SolidTrack Grey Box, free of any obstructions on the roof, preferred to be centrally located.
3. Once a suitable location has been decided for the GPS module, run the cable along a concealed path to the SolidTrack Grey Box. The black connector connects to GPS on the SolidTrack Grey Box.
4. Use cable ties and mounting pads to secure the GPS cable outside the vehicle.

3.8 Reverse Sense

The Reverse Sense harness consists of a single cable with a fused link at one end.

1. Connect the black connector on one end of the cable to REV SENSE on the SolidTrack System Box.
2. The other end of the cable can be connected to a few places, (1) the reverse lamp power wire at the closest tail-light or, (2) a reverse signalled fuse or relay in the fuse/relay box in the engine compartment. Option (2) is the recommended and usually the cleaner installation method.
3. Solder the in-line fuse wire or connect with a relay or fuse tap, depending on the option you choose.

3.9 Switch Box and Network Cable

The switch box harness consists of a cable with the SolidTrack and compressor switches. The network cable should be labelled at one end as LAPTOP and NETWORK on the other.

1. Run the network cable and switch cable, from the appropriate seat designated for the laptop, to the SolidTrack System Kit.
2. The black connector of the switch cable connects to SWITCH on the SolidTrack Grey Box.
3. The ferrite bead end of the network cable connects to NETWORK on the SolidTrack Grey Box and the other end plugs into the laptop.
4. Ensure the movement of the seats, consoles or other equipment does not interfere with the network cable.
5. Mount the switch box in a convenient location near the designated seat.