



Installation Guide

*For the Automotive Dynamometer
224-4WD Model Upgrade*

Dynojet[®] Research Inc.

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Dynojet Installation Guide for use with Dynojet's Automobile
Dynamometer model 248.

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Chapter 33 - 1

Installing the 224-4WD Dynamometer

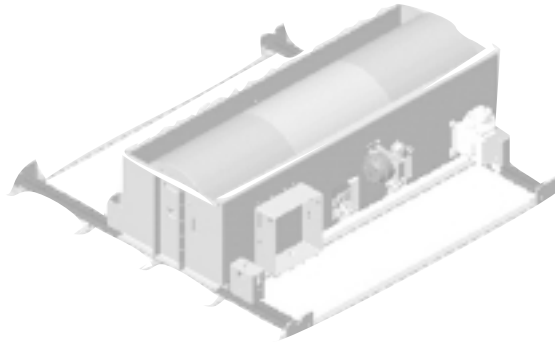
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Chapter 1

Initial Setup and Requirements



Thank you for purchasing the Dynojet Automotive Dynamometer. This document will give you the information you need to install the 224-4WD Dynojet Dynamometer (pit model). If you have any questions please call Dynojet at (800) 992-4993.

Introduction

Before installing your Dynojet Dynamometer, there are a few factors to consider. This chapter “Initial Setup and Requirements” is a brief overview of what you need to know to install your Dynamometer and an overview of the installation steps. Comprehensive instructions are included in the remaining chapters. “Initial Setup and Requirements” should help you decide where to place your Dynamometer, where to place the Dynojet electronics, what you need to unload your Dyno, how to prepare your Dynamometer pit and what must be provided for the Dynamometer.

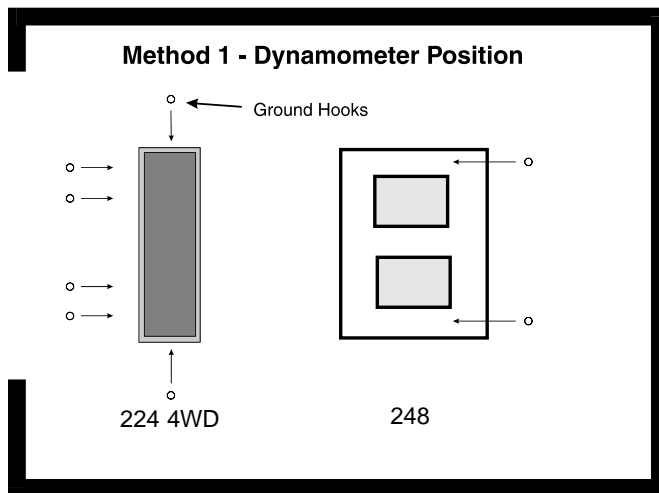
Dyno Placement

The first step to installing your Dynojet Dynamometer depends on the location of your existing 248 dyno. It can go in front of, or behind the 248 dyno.

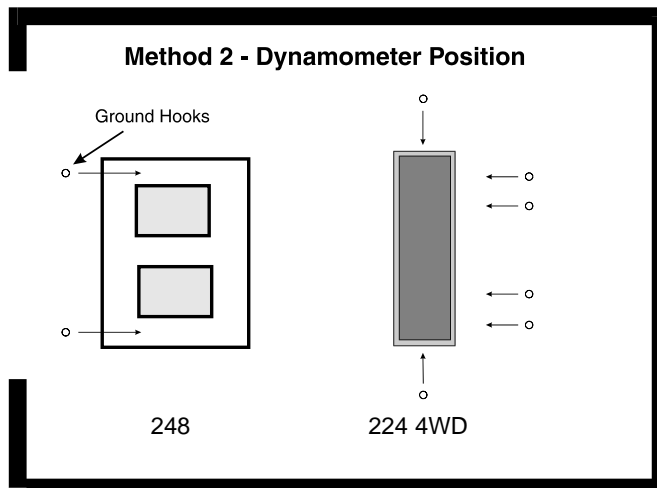
Note:

The Dynamometer drums can rotate in either direction

Choose the Dyno placement that best matches your shop.



This image represents a 224-4WD dyno near the garage door.



This image represents a 224-4WD dyno away from the garage door.

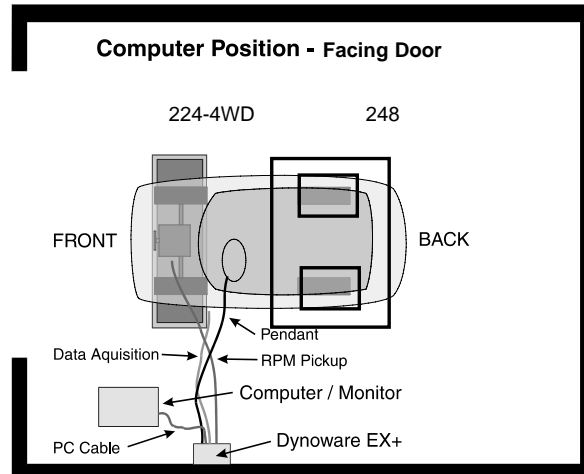
DynoWare EX+ Placement

The DynoWare EX+ system is comprised of four modules: the CPU module, the Dynamometer Input/Output module, the RPM module and the Atmospheric module. The Dynamometer Input/Output module connects to the 224-4WD dynamometer. (A 20 foot (6.1 meter) long cable is provided.) The CPU module connects to a personal computer. (A 12 foot (3.7 meter) long cable is provided.) RPM Pickups and a Hand Held Pendant also connect to the modules. These modules need to be located where they will be visible during a dyno run. It is recommended that they be mounted on a shelf on the wall or on a cart along side the PC. An optional extended Remote Pendant cable is available if needed.

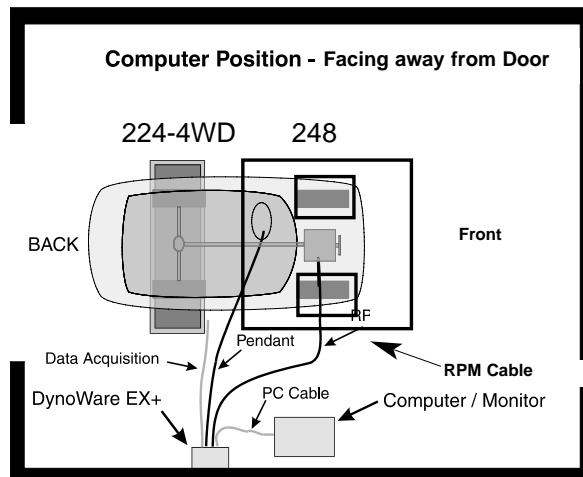


Computer Placement

The driver of the vehicle must be able to view the computer monitor and the DynoWare EX+ during a run. If you will be running both front and rear wheel drive vehicles you will need to find a way for the driver to see them both.



This image represents the location of the computer and DynoWare EX+ for a car that is backed into the dyno room.



This image represents the location of the computer DynoWare EX+ for a car driven straight into the dyno room.

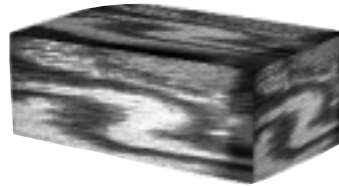
Note:

A possible solution would be to place the computer and the DynoWare EX+ modules on a movable cart.

Requirements to Unload Truck

When your dyno arrives, you must provide equipment to unload the dynamometer from the truck, with skids or forks a minimum of 6 inches wide by 6 feet long. It must be capable of lifting and moving at least 8000 pounds (3642 KG).

224-4WD Dyno



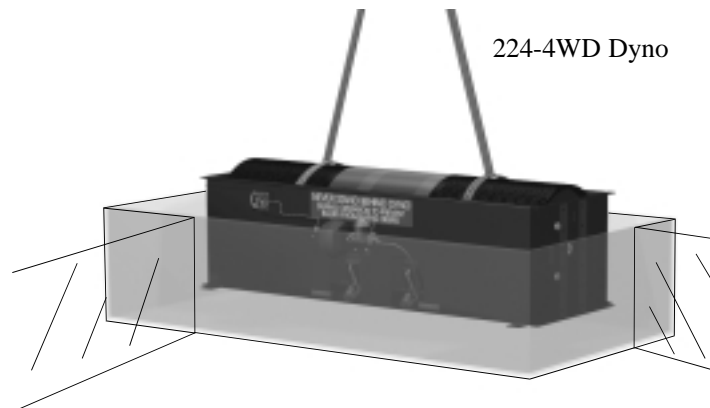
Pit Requirements

You must provide a dyno pit. Dyno pit dimensions are provided in the technical drawing 4WD Dyno Specifications. Be sure to contact your local contractor for code specifications before digging a pit. Follow the technical drawings 224-4WD CAR DYNO FINISHED PIT DIMENSIONS.

Your Sales Contact can provide you with these drawings if you don't already have them.

Requirements to Install the Dynamometer

When you install the dynamometer, you need equipment capable of lifting and moving at least 8000 pounds (1821 KG).



Other Requirements

Shop Air - The dyno air brake requires a $\frac{3}{8}$ " air hose with a minimum pressure of 100 psi.

- ◆ You must provide a $\frac{3}{8}$ " air line that will reach both the 224 and 248 Dynamometers.

Computer - You must provide a compatible computer and printer. The system must meet the following minimum requirements:

- ◆ Pentium P5-100 or faster Pentium computer
- ◆ Windows 95
- ◆ 800 megabyte HD
- ◆ Eight megabytes of RAM
- ◆ 640 x 480 (SVGA) 16k color video
- ◆ One high density floppy disk drive (3 1/2")
- ◆ Color Printer (HP Deskjet color series recommended)

Optional Accessories

Extended Pendant Cable

40 foot (12.2 meter) Pendant cable

Part Number: DC100-104L



Uncrating the Dynos

Step 1

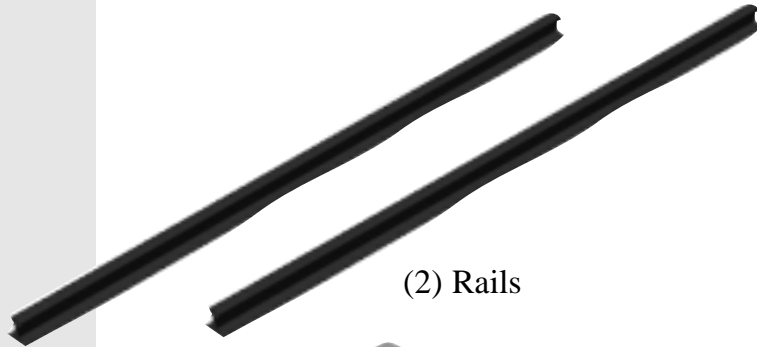
Use a crowbar or the like to remove the plywood shipping shell from the 224 Dynamometer.



- ◆ Remove the top of the crate.
- ◆ Remove the sides of the crate.

Contents

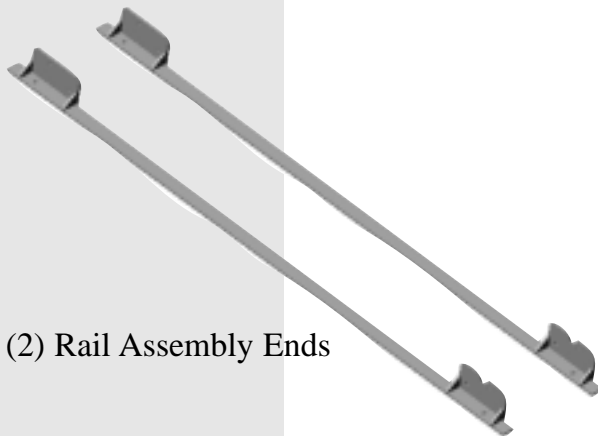
Railway Components:



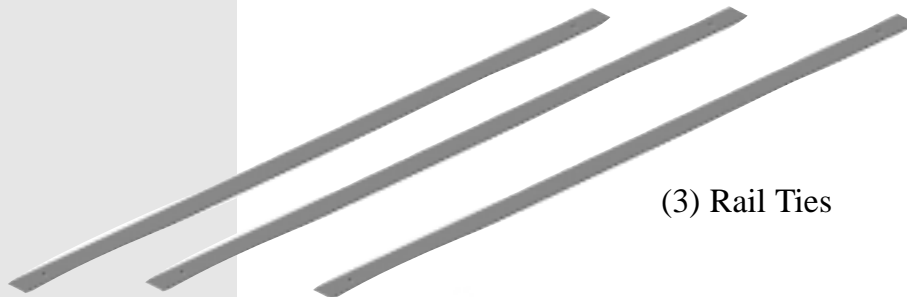
(2) Rails



(2) Sets, Grating Support Channels, Front and Rear



(2) Rail Assembly Ends



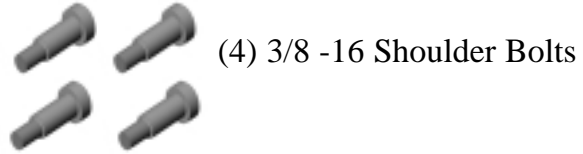
(3) Rail Ties



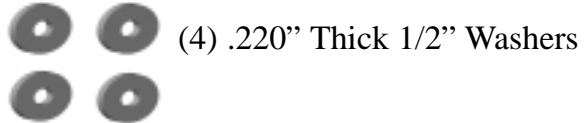
(10) Rail Tie Clips



(2) Rail Clamps

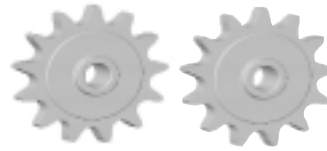


(4) 3/8 -16 Shoulder Bolts



(4) .220" Thick 1/2" Washers

(2) Idler Sprockets



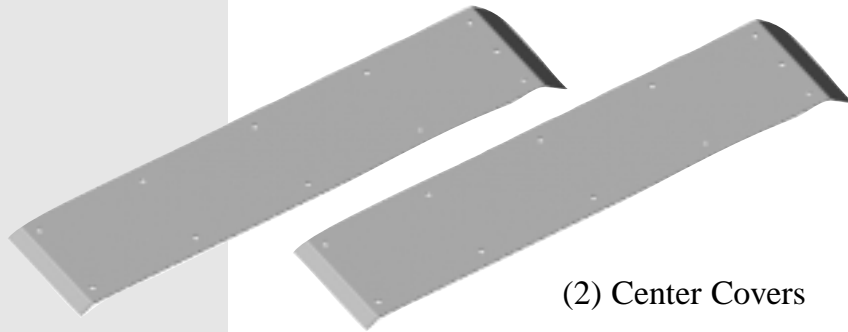
(2) 1/2"-13 x 1 1/2"
UNC Bolts



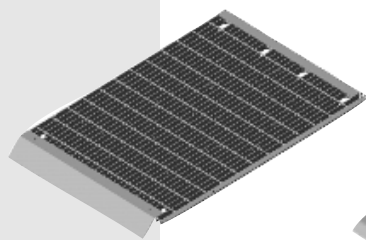
(2) .250" Thick 1/2"
Washers



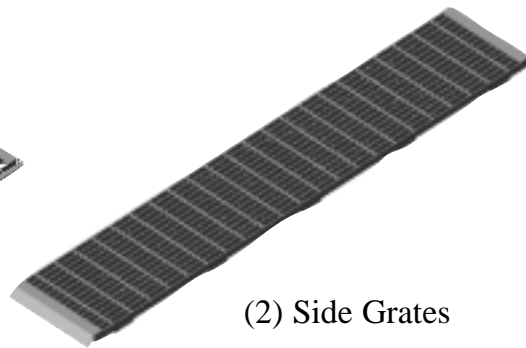
Grating Components:



(2) Center Covers



(4) Front / Rear Grates



(2) Side Grates

Boxes Containing:



- ◆ (4) Ratchet Straps w/ Sleeve
- ◆ (4) Axle Straps

Bolt Pack #1:

- ◆ (20) 3/8-16 x 1 Truss Head Bolts
- ◆ (6) 3/8-16 x 3 Truss Head Bolts
- ◆ (46) Concrete Anchors
- ◆ (34) 3/8-16 x 1 UNC Bolts
- ◆ (10) 3/8-16 x 1 1/2 UNC Bolts
- ◆ (10) 3/8-16 x 2 UNC Bolts
- ◆ (54) 3/8 Flat Washers
- ◆ (54) 3/8 Lock Washers

Ground Hooks:

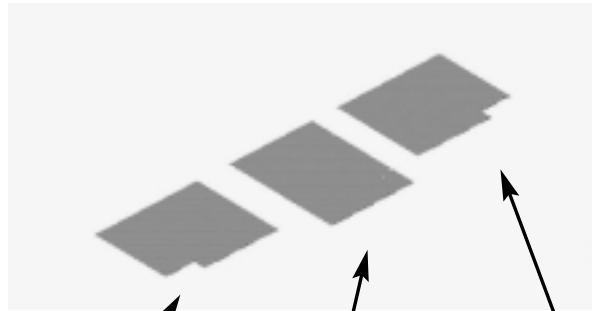
- ◆ (4) Ground Hook (Baseplate and Hook)
- ◆ (8) Concrete Anchors
- ◆ (8) 3/8" - 16 UNC x 1 Bolts
- ◆ (1) Anchor Instructions
- ◆ (1) Anchor Set Tool

Electronic and Miscellaneous Hardware:



- ◆ (1) Hardware Stack
- ◆ (1) Hardware Stack Mounting Kit
- ◆ (1) Sample / Brake Pendant
- ◆ (2) Power Cables
- ◆ (1) Power Supply
- ◆ (1) Power Supply (modified)
- ◆ (1) Primary Inductive
- ◆ (2) Secondary Inductives
- ◆ (1) Computer Cable, 9 Pin
- ◆ (1) Computer Cable, 25 Pin (installed)
- ◆ (27") Airline Hose
- ◆ (2) Barbed Fittings
- ◆ (1) Air Solenoid Assembly or Prop. Air Assembly
- ◆ (1) Air Regulator Mounting Bracket / Barbed Fitting

Pit Covers (248 Dyno) and Hardware:



- (1) Right Interface Plate
- (1) Center Interface Plate
- (1) Left Interface Plate

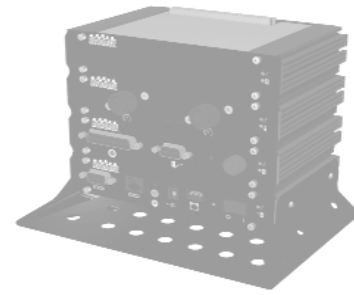
- ◆ (7) 3/8" UNC x 1" Truss Head Bolts



Notes:

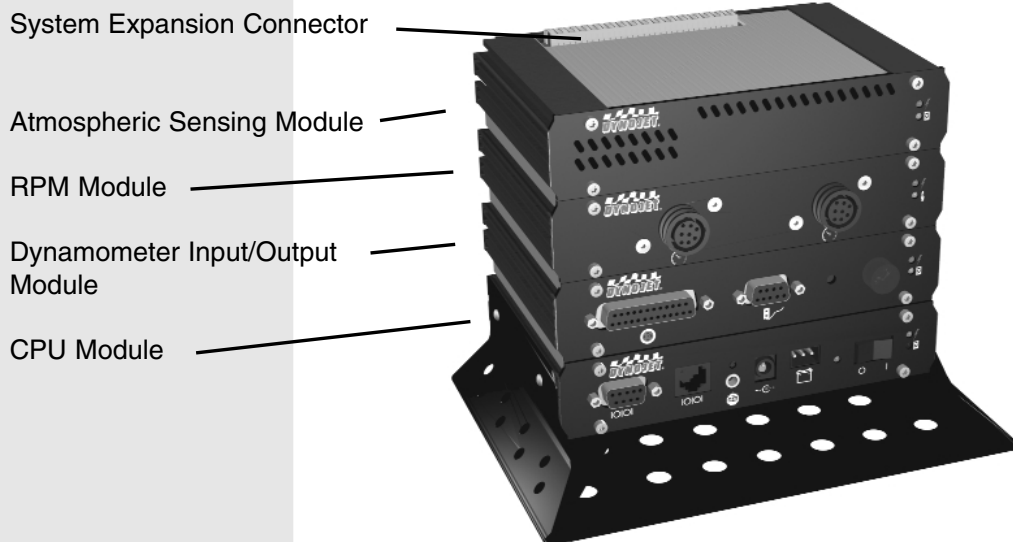
Chapter 2

Hardware Installation



DynoWare EX+

The standard dynamometer electronics package is comprised of 4 interconnected modules:



Atmospheric Sensing Module:

The atmospheric sensing module measures absolute pressure, air temperature and relative humidity. These measurements are used by WinPEP to correct power and torque measurements to standard atmospheric conditions according to a DIN, SAE or other formula.

The green LED glows when the atmospheric sensing module is receiving power.

The flashing amber LED indicates the module processor is operating properly.





RPM Module:

The RPM module receives and processes signals from up to 2 inductive pickups for measurement of engine RPM. Each input has an automatic gain circuit to compensate for a wide variance of ignition systems.



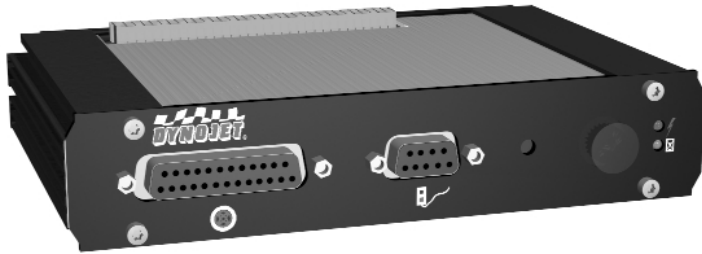
The green LED glows when the RPM module is receiving power.



The amber LED flashes when an RPM signal is detected. A steady flash rate, proportional to engine RPM, indicates a good RPM signal.



These connectors are the inputs for both primary and secondary inductive pickup clips. Either input may be used with a primary inductive pickup or a secondary inductive pickup on a single ended coil. Both inputs can be used for a wasted spark ignition.



Dynamometer Input/Output Module:

The dynamometer I/O module sends and receives data from the dynamometer and the hand held pendant. The module also contains a buzzer and light which are activated when either the vehicle or dynamometer speed limit is approached.



The green LED glows when the dynamometer input/output module is receiving power.



The amber LED flashes proportionally to dynamometer drum RPM.



This 25-pin receptacle connects to the shielded cable from the dynamometer.



This 9-pin receptacle connects to the hand held pendant which houses the button used to Start/Stop acquiring data. The pendant may also contain a brake switch.



CPU Module:

The CPU module contains a 32-bit processor which acquires data from the expansion modules and communicates to the main computer running the WinPEP software. The processor queries the expansion modules to determine their identity and capabilities.

The green LED glows when the CPU module is receiving power.

The blue LED is lighted when data from the modules is being acquired and saved.

One of these connectors is used to communicate to the main computer. The 9-pin receptacle (left) connects to the PC's RS-232 serial communications port. The 8-pin modular connector (right) provides communications according to the RS-422/485 specification.



CPU Module: Continued



This connector provides a synchronization signal to a 3rd-party data acquisition system.



This connector provides 12 Volt DC power to a 3rd-party data acquisition system.



This connector accepts 12 Volt DC power from a power supply or battery. The adjacent LED glows bright green when power is properly connected.



When this switch is on, power is supplied to all connected modules.

Connecting the DynoWare EX+

Use the cables that came in the DynoWare package to make the following connections:

- 9-pin shielded serial cable between the RS-232 connector of the *CPU Module* and a free COM (serial communications) port on the PC. A 9-pin to 25-pin adapter may be required at the PC.
- 25-pin shielded cable from the dynamometer to the *Dynamometer Input/Output Module*.
- 9-pin connector from the hand held pendant to the *Dynamometer Input/Output Module*.
- 3-pin plug from the power supply to the *CPU Module* with its flat side facing down.

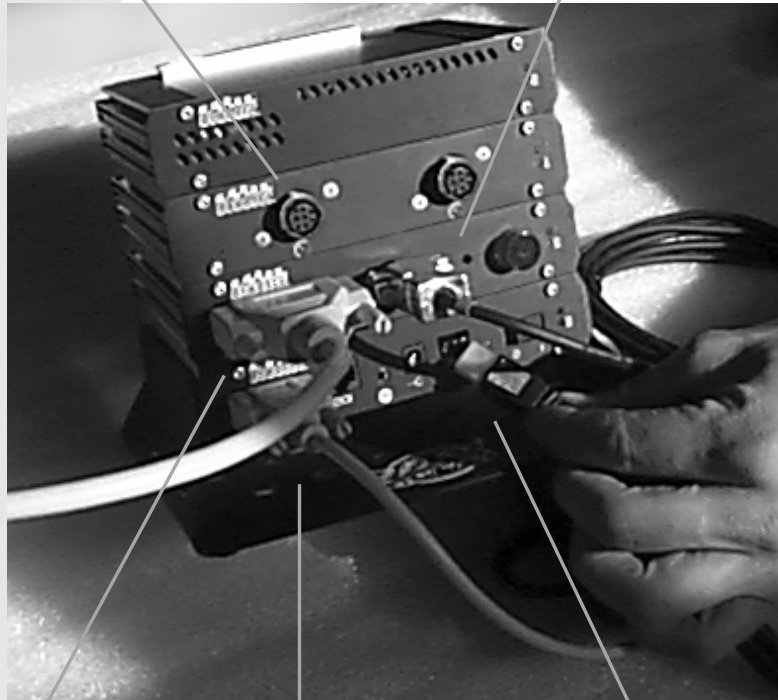
(Refer to the picture on the next page)

Note:

The DynoWare EX+ stack must be mounted in your shop so as to be easily seen while making dyno runs.

Primary Inductive Pickup Cable
(not shown)

Remote Switch

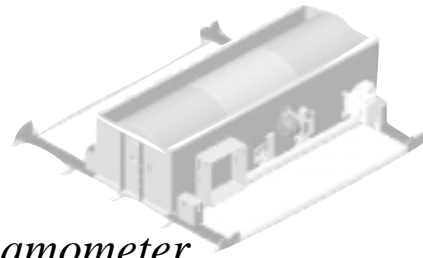


Breakout Board to
DynoWare Cable

Cord from Power Supply

Computer Serial Port Cable

Chapter 3



Installing the 224-4WD Dynamometer

Now that you have the Dyno unpacked, you may begin the installation of the Dynamometer.

Track Placement

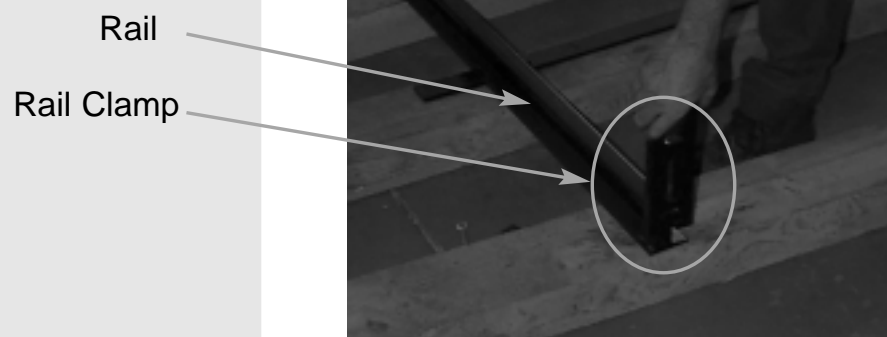
The dyno is designed to roll back and forth on the track. The track must be anchored to the floor using cement anchors.

Step 1

Lay out the track as shown in figure 1 (Appendix A).

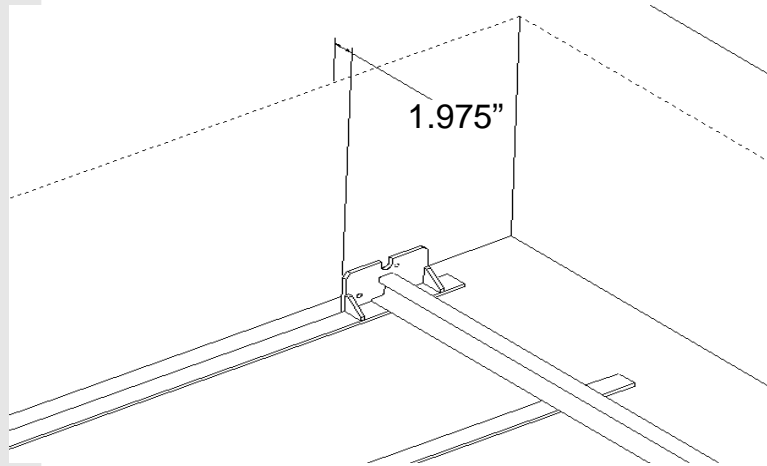
Step 2

Place the rail clamps over the rails before placing the two end rail supports.



Step 3

The track assembly should be 1.975" away from the pit wall. (closest to the 248 dyno)



Step 4

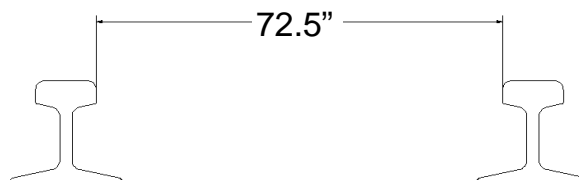
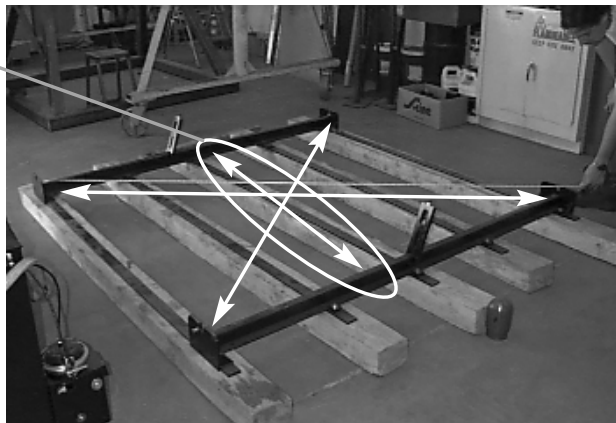
Line up the centerline of the track assembly with the centerline of Model 248 Chassis Dyno.

Step 5

Check the square of the track assembly (measure from corner to corner).

Note: *Be sure that the track is fully seated under the rail clamp. See Figure 2 in Appendix A.*

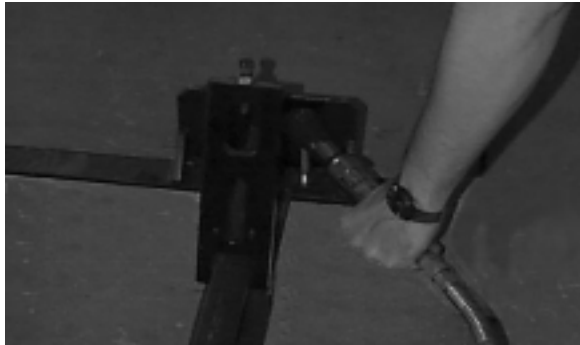
The distance between the inside of the rails should be:
72.5" + - 0.06"



Step 6

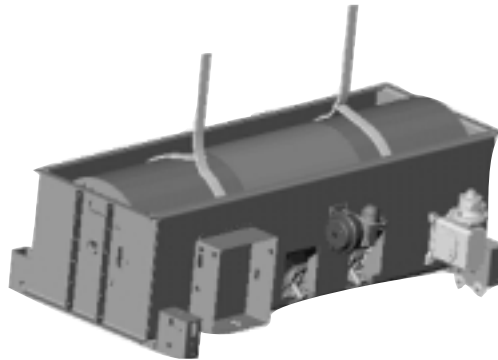
Install the cement anchors and 1¹/₂" bolts. The bolts should secure the track and track tie. When the bolts are tightened down, check the square of the track again. **See Figure 3 in Appendix A.**

Note: *See page 3-36 for anchor installation.*



Step 7

Place two straps (capable of supporting a minimum of 4000 lbs or 1820 KG) around the drums. Position the straps so that they are on the knurled surface of the drum away from the brake surface.

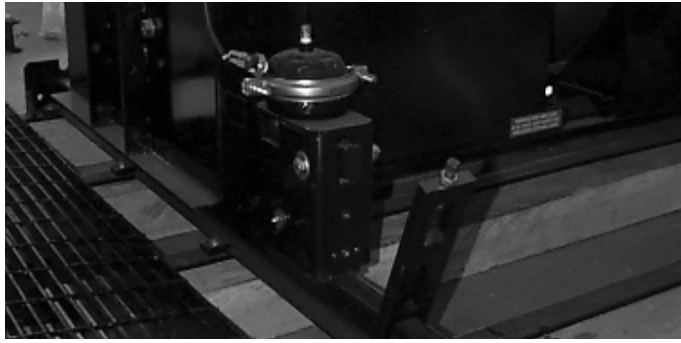


Step 8

Lower the dyno onto the tracks. Be sure that the wheel flanges are on the inside of the track.

Note: *The Rail Clamps should be positioned as shown in Figure 4, Appendix A.*

Note: *The motor side of the 224-4WD should be facing away from the 248 dyno. See Figure 5, Appendix A.*



Step 9

Install the two rail clamps with the 3/8" bolts and spacers.. Once the bolts are tight, roll the dyno back and forth to ensure the rail clamps are not binding.

Note:

Move the Rail Clamps up and down to ensure that they are free to move. If the clamps are binding ,you will need to loosen the allen head bolts. Be sure to add thread lock to ensure that the bolts are secure.



Step 10

Secure the cable carrier to the rail tie with two 1/4" button head screws and lock washers.

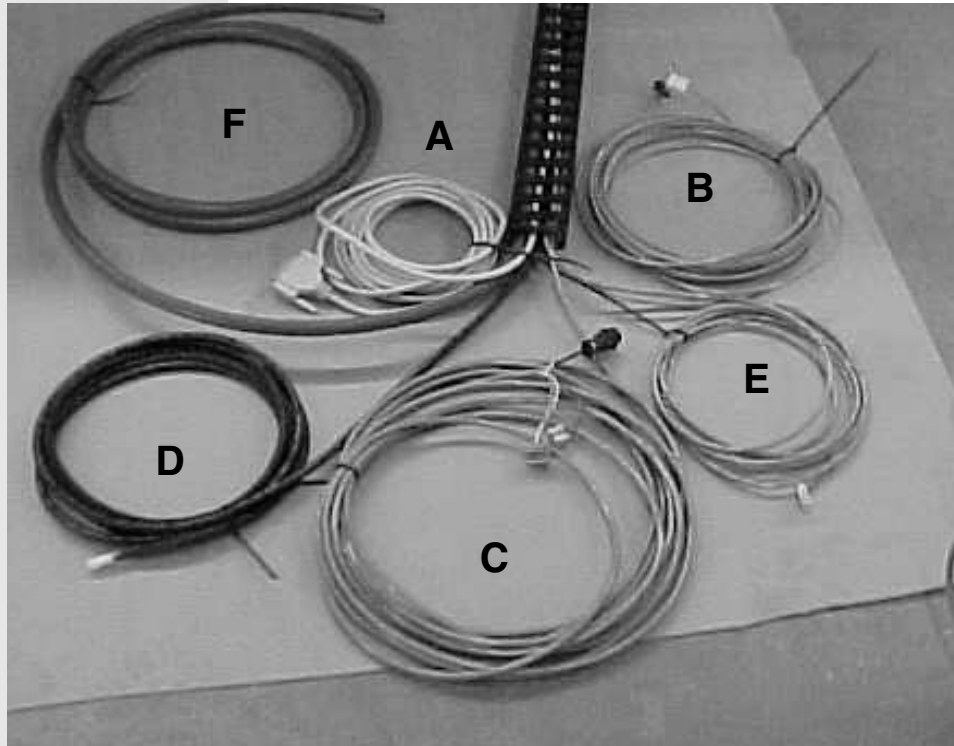


Wiring

Note: *The 248 Dyno comes with a “Standard” brake, but Dynojet does offer an optional “Prop-Air” brake. For convenience, both installation procedures are outlined in the next few pages. Follow each step carefully, some steps are designated as “Prop Air only”.*

Step 1

Lay out the cables to become oriented with their placement.



Note: *Run the cables / hose through the conduit to the outside of the pit.*

- (A) - **25 Pin Cable (20')** - Connect the 25 Pin Cable to the Hardware Stack.
- (B) - **Data Acquisition Cable (40')** - Connect the Data Acquisition Cable to the Pick Up Card on the 248 dyno. (Run into 248 pit)
- (C) - Multi-Purpose Wire
 - **Brake Power Cord (40')** - Connect to the spade connector on the new 248 air assembly.
 - **Prop Air Cable (40')** - optional for load control system, attaches to the EPR.
 - **Temp Sensor Cable** - optional, part of the Prop Air load control system.
- (D) - **224-4WD Power Cord (20')** - Plug the 224-4WD Power Cord into the Power Supply.
- (E) - **Control Pendant (20')** - Connect to the Control Pendant. The Control Pendant moves the 224-4WD dyno.
- (F) - **Air Hose (20')** - Connect the Air Hose to a 100 120 psi air supply with clean dry air.

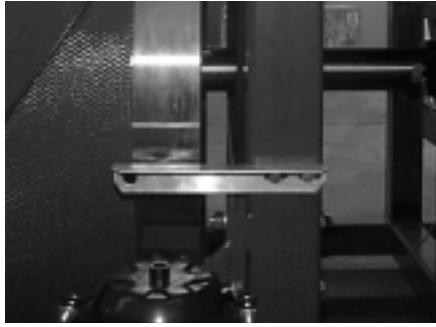
Step 2

Plug the two pin connector from the Model 224-4WD dyno (pg 3-22, letter C) into the (2) black wires on the air assembly of the 248 dyno.

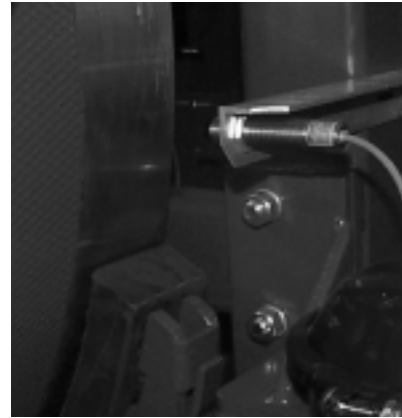
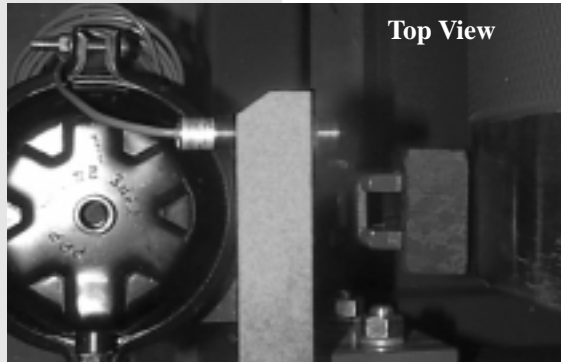
Step 3 (Prop - Air Only)

Install the Temperature Sensor on the left 4"X4" post.

- ◆ Locate the temperature sensor bracket on the left side 4"X"4 post.



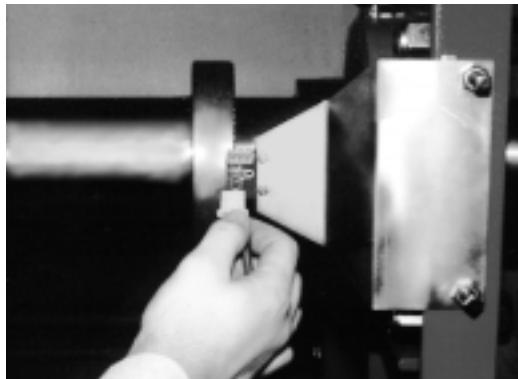
- ◆ Install the temperature sensor so it is approximately 3" from the surface of the drum.



- ◆ Run the Temperature Sensor Cable (pg.3-22, letter H) from the 224-4WD Dyno and plug it into the connector on the end of the Temperature Sensor.

Step 4

Run the data acquisition cable (pg 3-22, letter B) from the Model 224-4WD dyno, and plug it into the the pick-up card on the 248 dyno.



Connect the Air Supply

Step 1

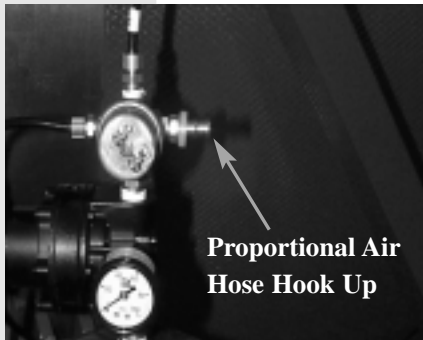
Connect your shop air to the dyno.

- ◆ Mount the Air Pressure Regulator on the wall in the shop with the bracket provided.
- ◆ Connect a supply air hose to the inlet of the regulator from your shop air supply.

Note:

Make sure the arrow on the regulator is the same as the direction of the air flow!

- ◆ Connect a $\frac{3}{8}$ " air hose to the outlet side of the regulator. Connect the other end of the air hose to the barbed inlet fitting on the Air Control Switch (Standard Air) or the Booster Valve Assembly (Proportional Air) on top of the right air canister on the dyno.



Note:

The regulator should be set to 60 psi.

Step 2

Connect the air hose (pg. 3-22, letter F) from the 224-4WD Dyno to full line pressure (100-125 psi).

Note:

Be sure that your air source supplies clean, dry air !

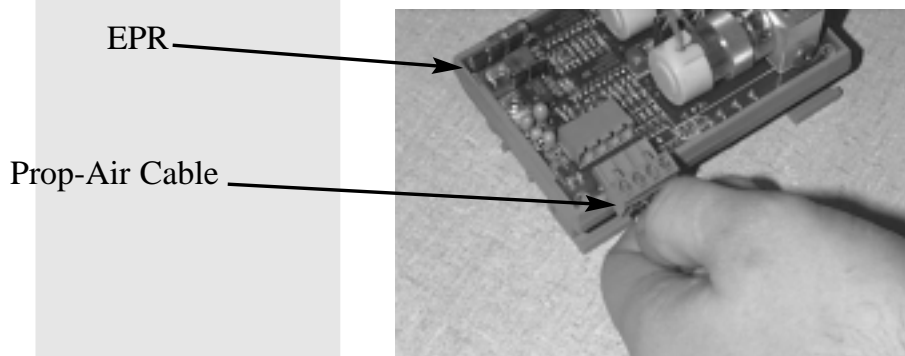
Prop-Air Wiring

This section is for the Prop-Air Braking System, Standard Brake customers should skip this section.

Step 1

Connect the Prop-Air Cable (pg. 3-22, letter C) to the EPR.

- ◆ You will need to remove the clear plastic cover from the EPR.
- ◆ Plug the Prop-Air Cable into the terminal block on the EPR.



Step 2

Connect the Modified Power Supply wire to the 224-4WD Power Cord (pg. 3-22, letter D) with the two pin connector.

Step 3

Connect the Control Pendant into the Control Pendant Cord (pg. 3-22, letter E) with the three pin connector.

Testing the Movement of the Dynos

Step 1

Connect the remaining wires to the Hardware Stack as described in Chapter 2, page 2-5.

Step 2

Turn the Hardware Stack on.

Step 3



Press the red button on the Pendant, it should light up, this indicates that the brakes are activated. Cycle the brakes a few times by pressing the red button to ensure that they work properly.

Note: *The red button will control the brakes on BOTH dynos.*

Step 3

While the brakes are on, press the “In” button on the Control Pendant (pg. 3-22, letter E).



You should hear air venting, and the the rail clamps releasing.

Keep holding the button down until you see the motor shaft begin to turn.

Repeat this procedure again, only this time hold down the “Out” button.

Note: *If the Control Pendant fails to activate the motor, see the “Trouble Shooting Guide” in Appendix A, Page 9.*

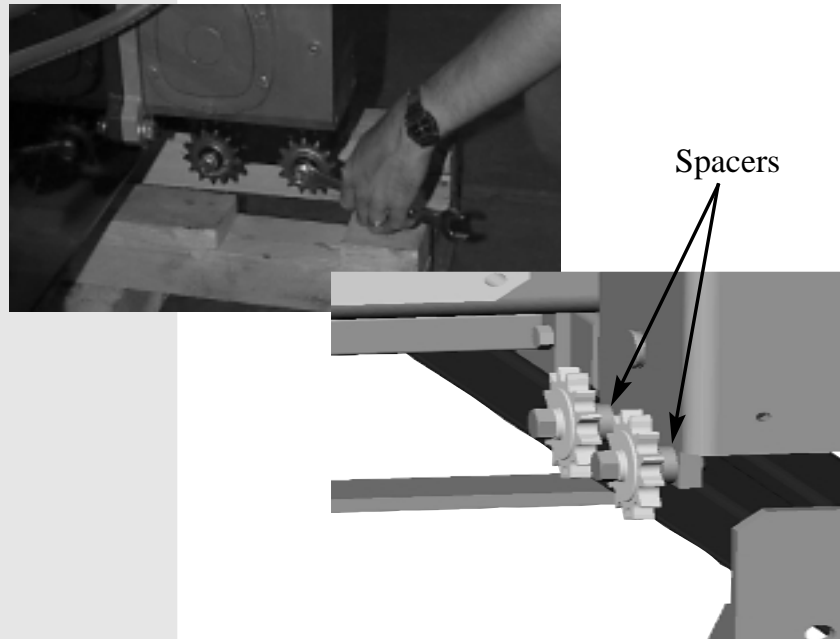
Final Assembly

Step 1

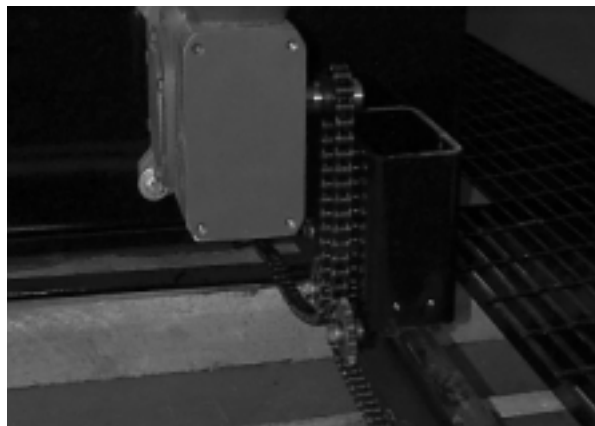
Install the sprockets with 1/2" bolts and spacers.

Note:

Be sure that you have the spacers oriented properly, see the picture below.

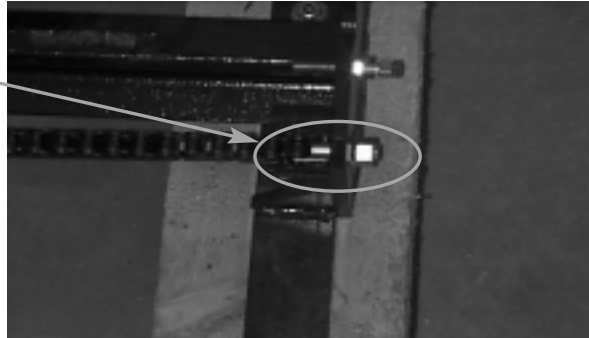


- ◆ Route the chain so that it wraps around the drive sprocket and under each idler sprocket.



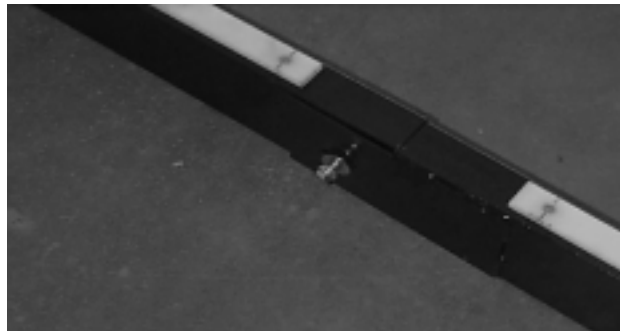
Step 2

Attach the chain to the end rail tie on the front and back. Secure the chains with $\frac{1}{2}$ " lock washers and nuts.



Step 3

Assemble the C-channel Cross Brace with $\frac{3}{8}$ "x1" bolts, but don't tighten them down yet.



Step 4

Place the two assembled cross members in the pit. See **Figure 6 in Appendix A**.

Note: *Move the dyno back and forth from front to back. The dyno should not touch the cross members, if it does, you'll need to move the cross members for clearance.*

Step 5

Adjust the width of the C-channel assembly until it is as wide as the pit. Secure the left and right sides of the C-channel with the cement anchors. When the sides are anchored, tighten down the center bolts.

Step 6

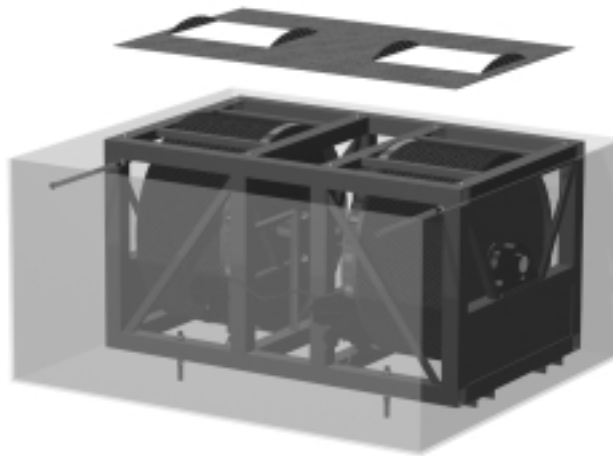
Move the dyno through its full range of motion. Be sure that the dyno is free to move and there are no obstructions. When you press the “in” or “out” button on the pendant you should hear the air release to unlock the rail clamps. After a few seconds the dyno should begin to move.

Install the Dyno Covers

Use the following steps to install the dyno cover(s):

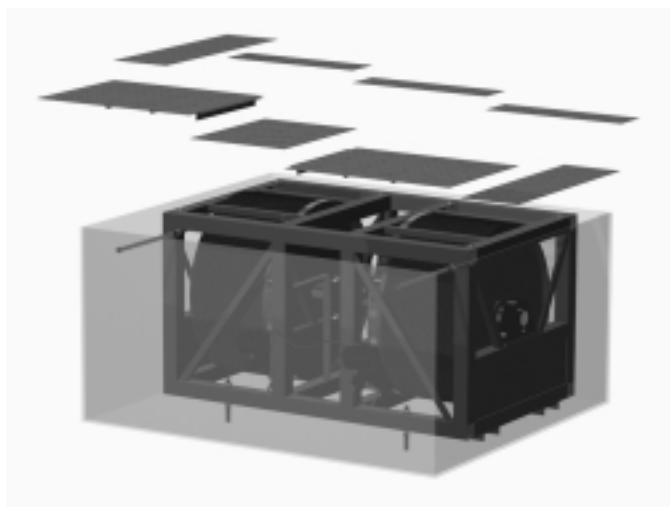
Step 1

Check the anchor bolts and lateral supports to make sure they are tight. Install the dyno cover.



Step 2

Install the pit cover plates over your dyno. A sample layout drawing for the auxiliary covers is provided in Figure 7, Appendix A.



Setting Up the 224-4WD Grating

Note: Refer to Appendix A, Figure 8 to become familiar with the layout of the grating.

Step 1

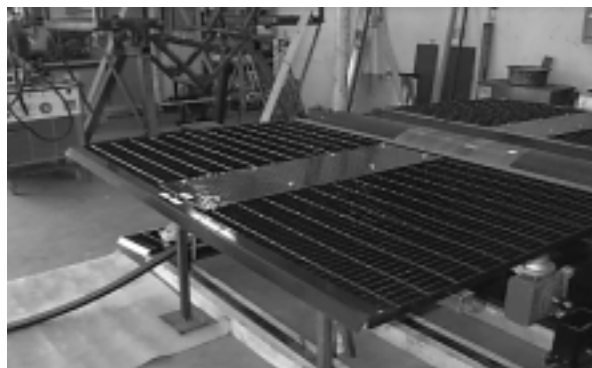
Place the Grates on the motor side of the dyno so the long lip is towards the drum. Secure the grates to the dyno with (2) 3/8" x 3" truss head bolts, but do not tighten yet.



Motor

Step 2

Place the Center Plate on the Grates and secure it with (8) truss head bolts (the Center Plate is secured to the dyno with (1) 3/8" x 3" truss head bolt). When you have the front Grate Assembly fitted, tighten down all the truss head bolts.



Step 3

Set up the “non-motor side” Grates in the same fashion as did for the “motor-side” grates. Also, attach the Center Plate, and then tighten everything down when complete.



Step 4

Set up the side grates.

- ◆ Lay the side grates on the side of the dyno with the bolt holes towards the outside. The side grates should be oriented with a 1” gap between the grates mounted to the dyno.
- ◆ Use concrete anchors to secure the side grates to the concrete surrounding the dyno.

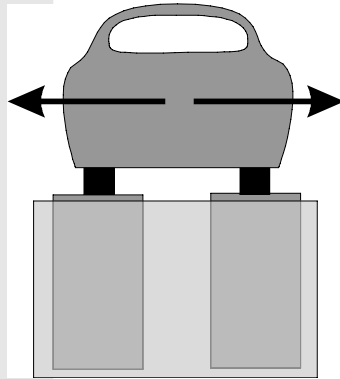
Note: *Be sure that the side grates do not touch the dyno or to the grates mounted to the dyno.*

Side Grate

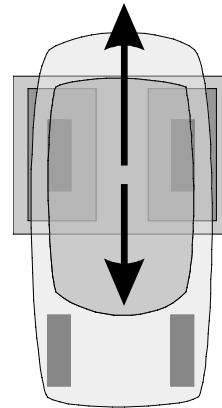


Ground Hooks

Ground hooks are points at which you can connect the straps that hold down the car that is being tested. This keeps the vehicle from sliding side to side or off the drum of the dyno during a run.



Side To Side



Forward and Back Shifting

Ground Hook Installation Hardware:

Ground Hook:

10 Rings

10 Ring Plates

Anchors:

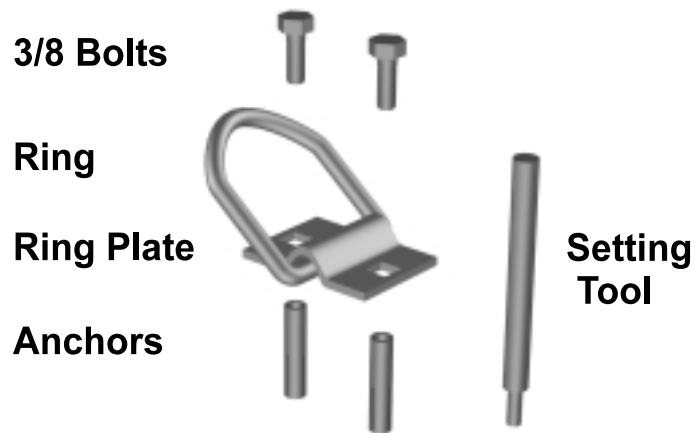
20 Drop-In Anchors

Bolts:

20 1" x 3/8" UNC Grade 5+

Setting Tool:

Used for expanding the anchors.



Drop-In Anchor

A drop-in anchor is a heavy duty internally threaded anchor used to bolt the ground hooks onto a concrete floor.

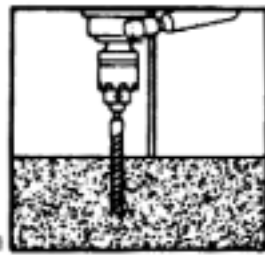
Ground Hook Placements

The placement of the ground hooks are provided with the “Pit Dimensions” drawing. Your Sales Contact can provide these for you.

Installing Ground Hooks

Step 1

Using an Impact Drill, drill the two holes in the cement at each location on the drawing in Appendix A. (Use a ring plate as a template for the precise hole placement.) You will need a 1/2" drill bit to drill a hole to a minimum depth of 1 5/8". Clean the cuttings and debris from the hole.



Clean out Debris

Note:

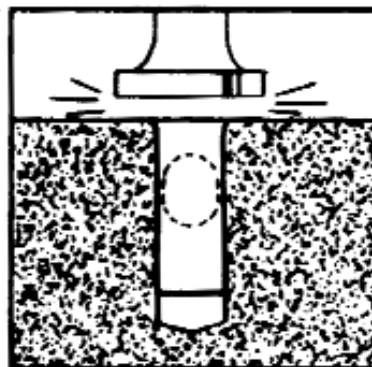
(1) The use of a carbide drill bit is recommended for the installation of this anchor.

(2) Do not use core drills to drill hole for this anchor.

(3) Always wear safety glasses and other necessary protective devices or apparel when installing or working with anchors.

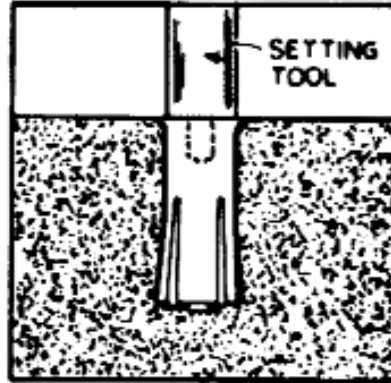
Step 2

Drive anchor into the hole flush with the surface of the concrete.



Step 3

Expand the anchor with the setting tool. The anchor is properly expanded when the shoulder of the setting tool is flush with the anchor.



Step 4

Bolt the ground hooks onto the anchors to complete the ground hook installation.





Notes:

Appendix A

Figure 1

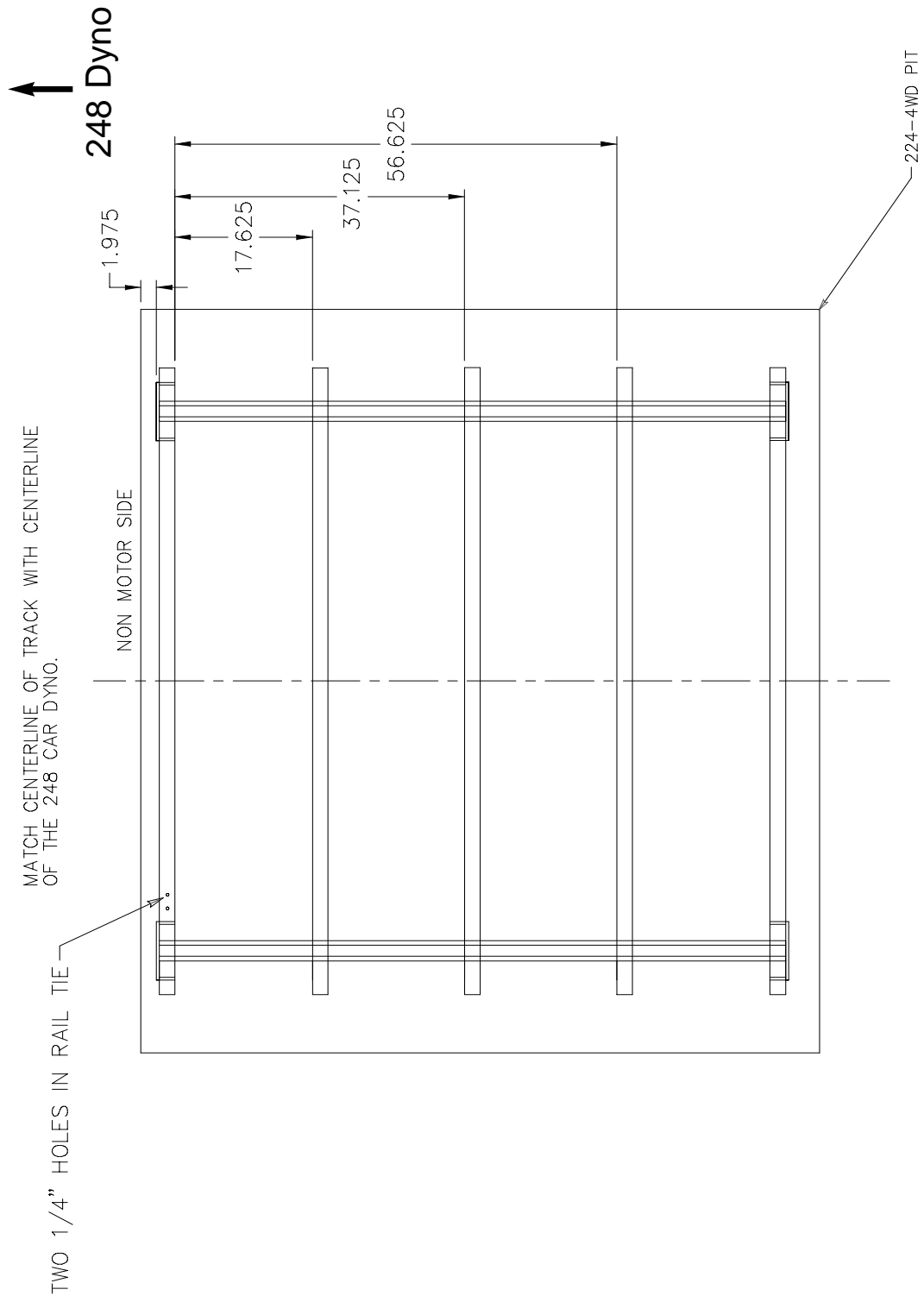


Figure 2

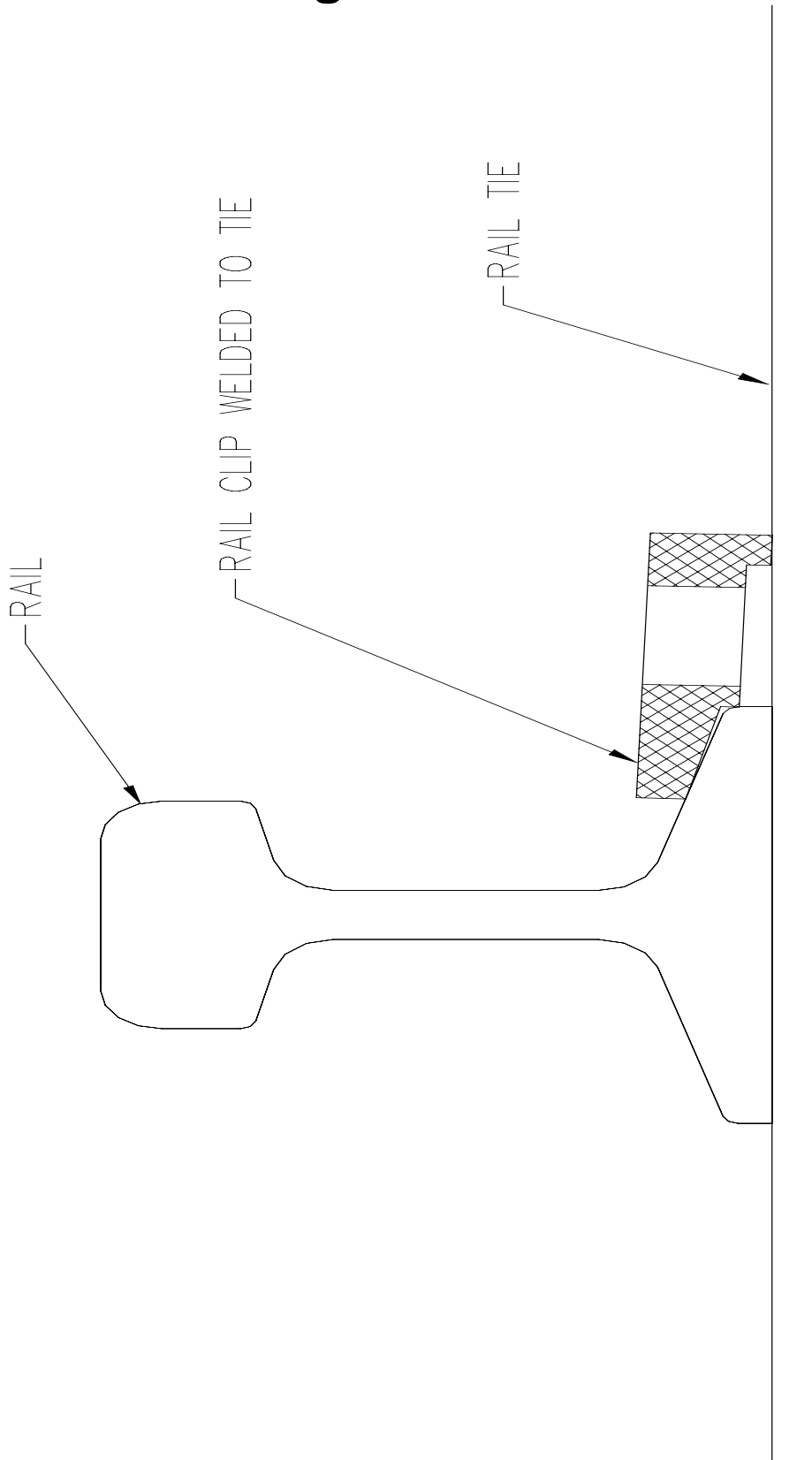


Figure 3

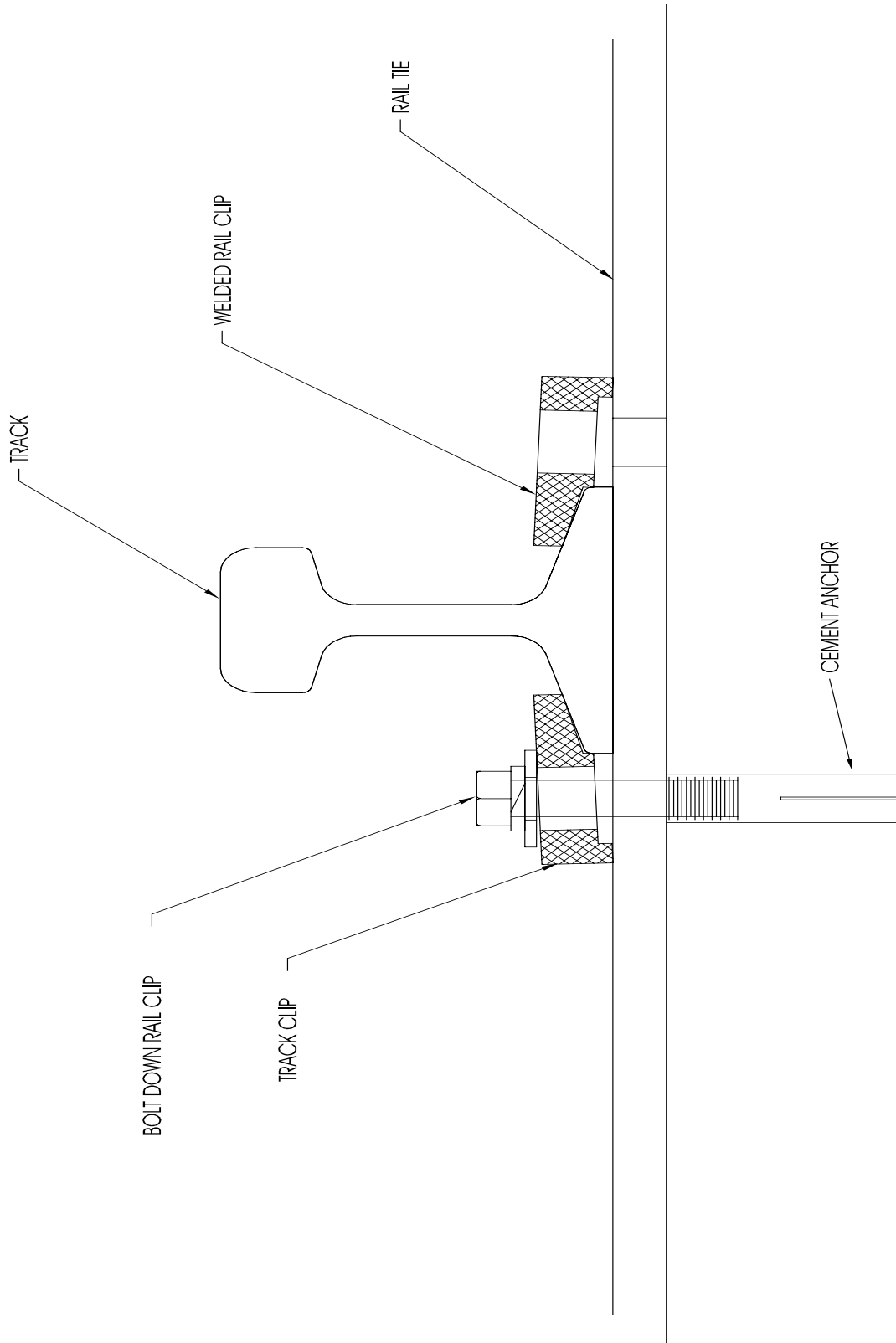


Figure 4

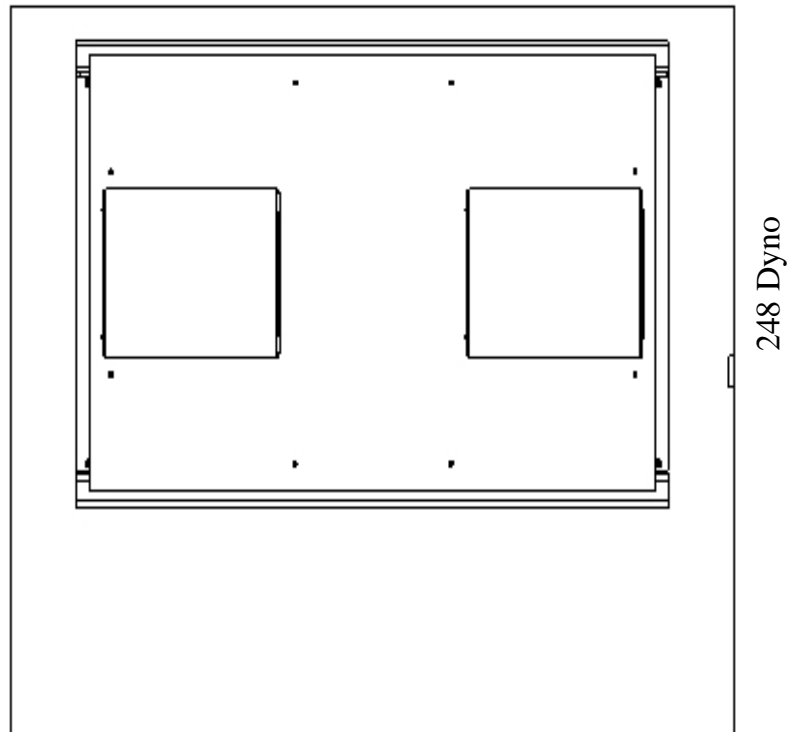
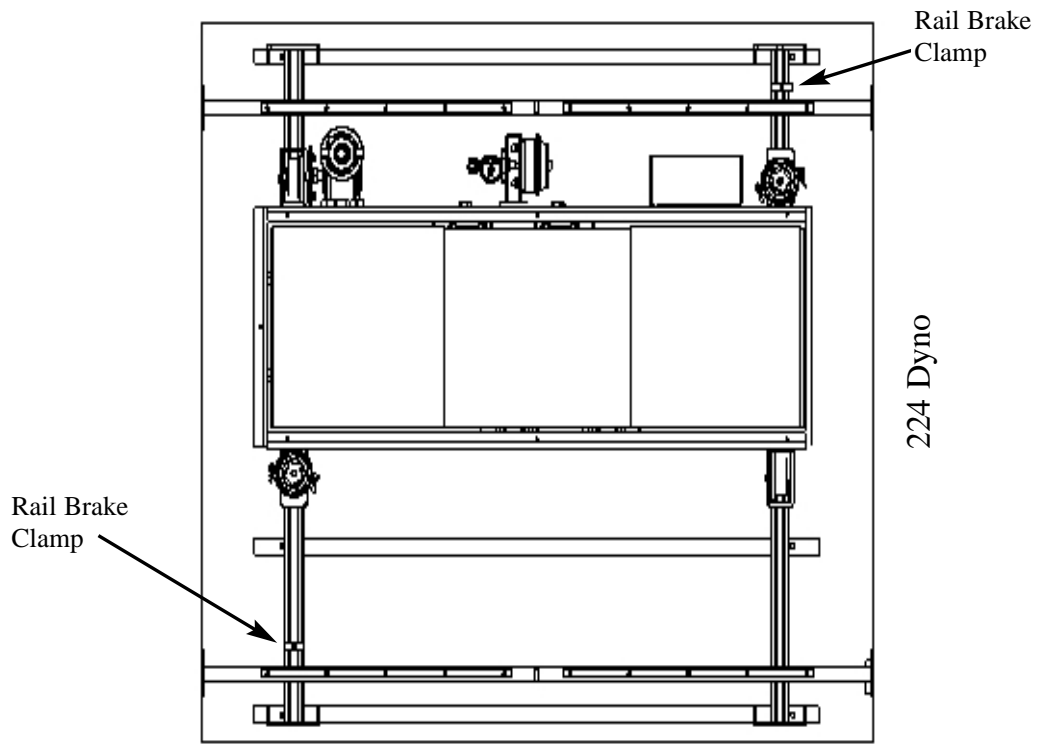
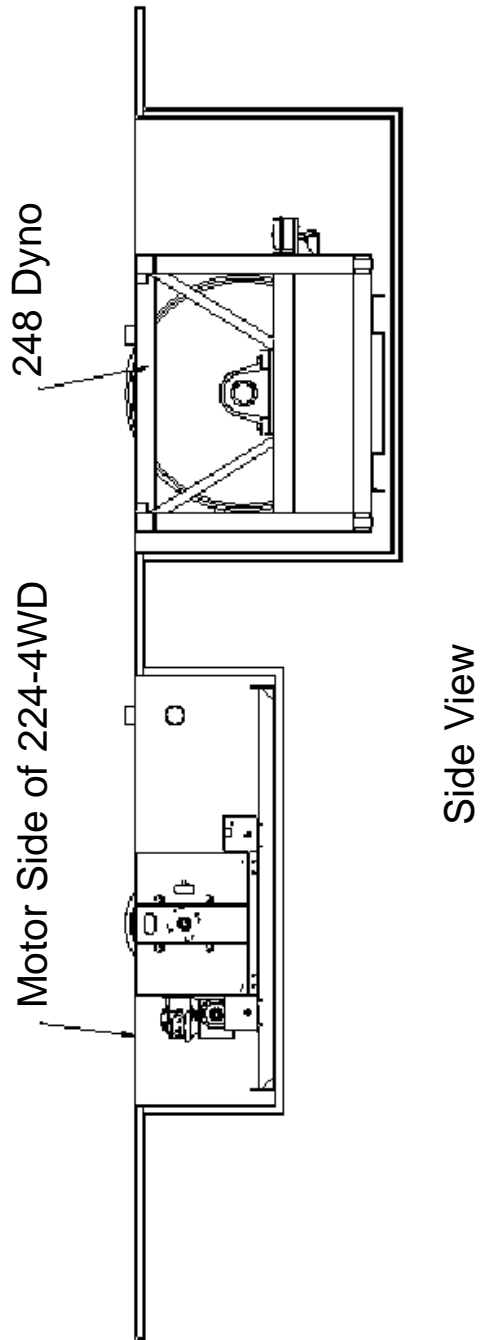


Figure 5



Side View

Figure 6

Side View

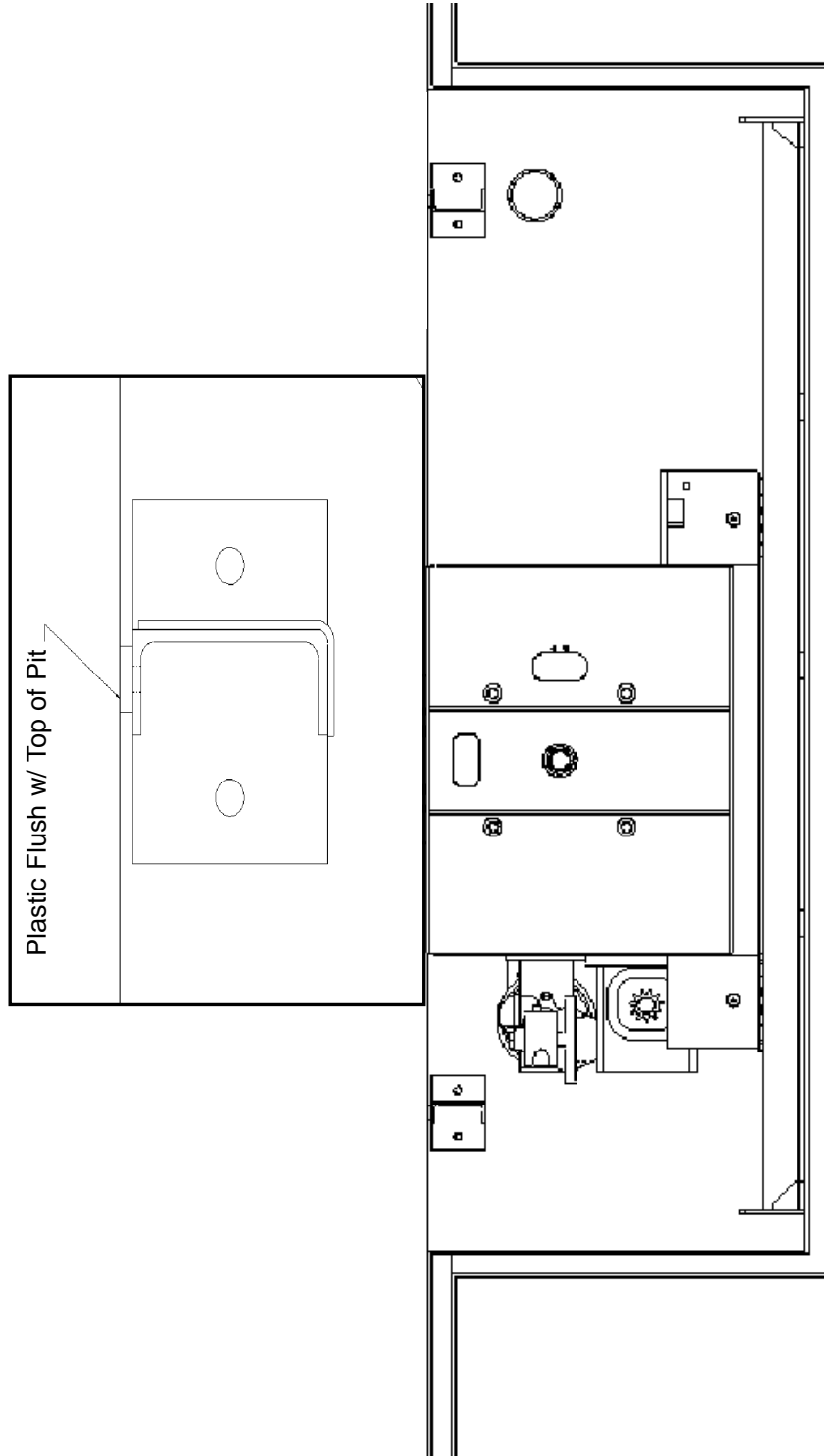


Figure 7

Pit Cover Layout

Top View

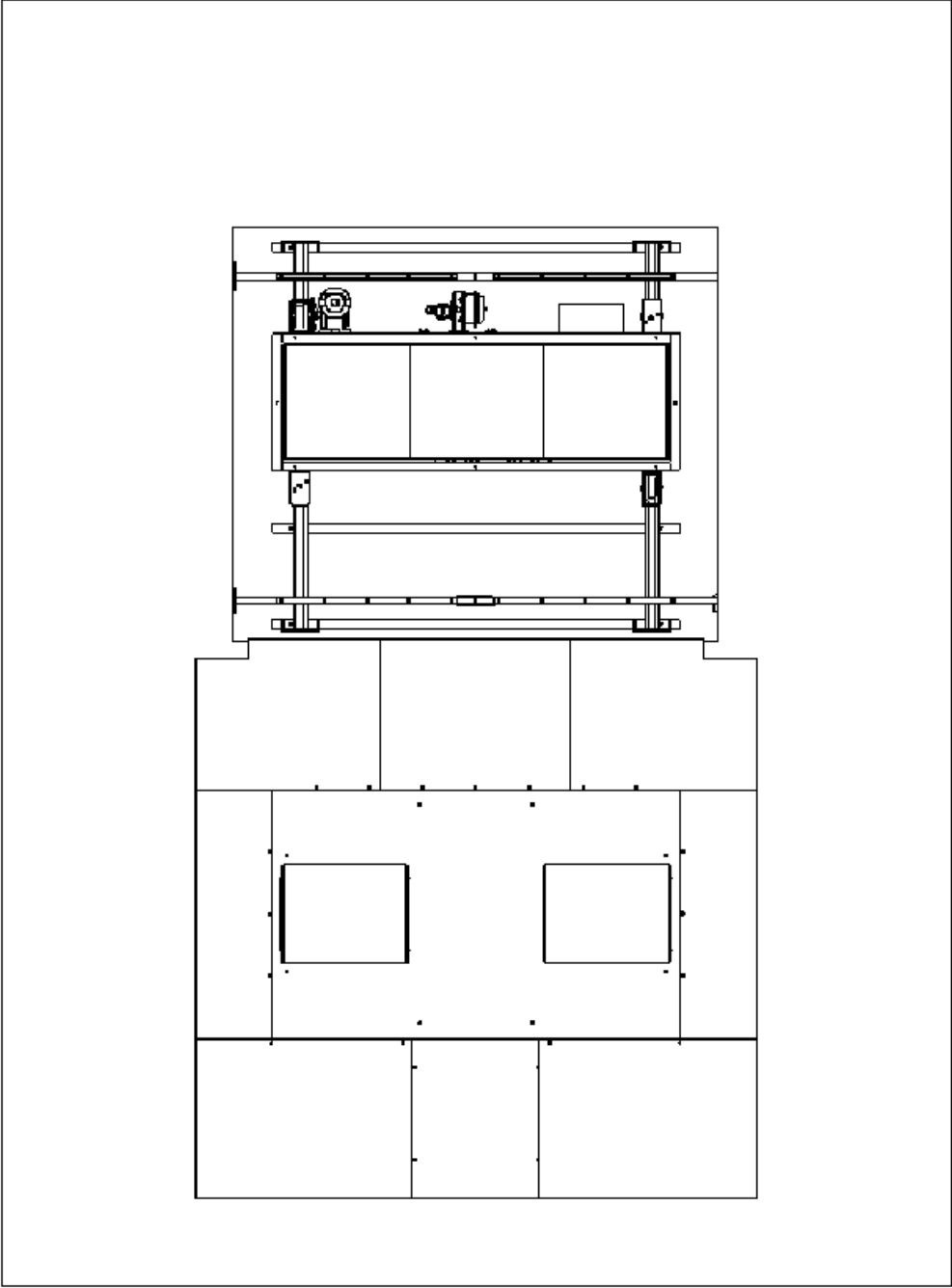
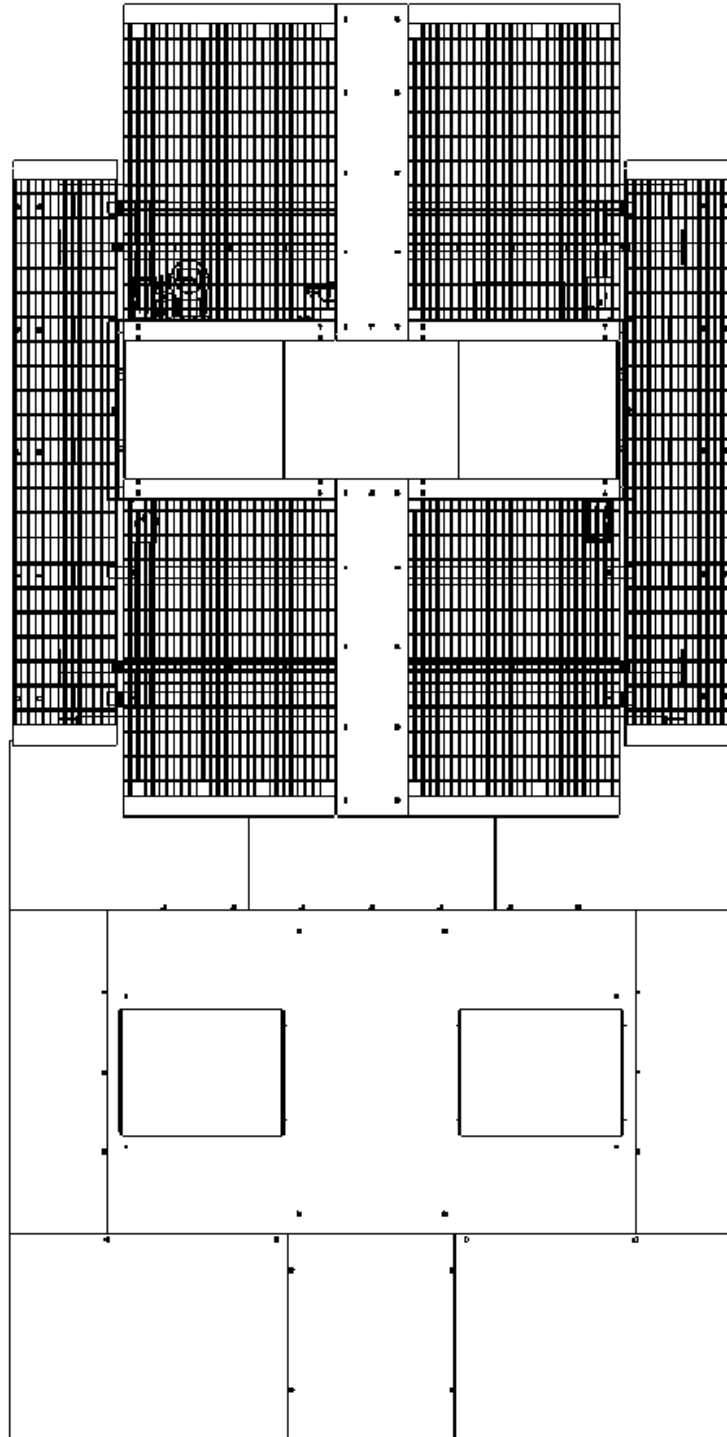


Figure 8

224-4WD Grate Layout

Top View



224-4WD TROUBLE SHOOTING GUIDE:

- 1) Make sure the following is turned on: Hardware stack EX+, Computer, Dyno brake (red button on pendant is on). Press IN/OUT button on movement pendant to see if dyno moves. If not proceed to step two

- 2) Check to see if relay is working. When the brake button on the dyno pendant (red lighted button) is turned off and on the relay should "click". If this does not happen go to step 2A, if this is happening go to step 3.
 - 2A) To verify if the relay is working use a multi-meter to check the continuity of the following: When the dyno brake is on (red light on pendant is on) Pin 30 and 87A of the relay are connected, When the dyno brake is off (red light on pendant is off) Pin 30 and 87 of the relay are connected.

 - 2B) If the relay is not working check to see if it is getting the 12VDC supply from the break-out board. Check the voltage between the "brake" pins on the break-out board. When the dyno brake is off (red light on dyno pendant brake button is off) there should be 12VDC across the pins, when the brake is on (red light on dyno pendant button is on) there should be 0VDC across the pins.

- 3) Check the continuity of the pressure switch (located on top of air can opposite the motor/control box side of dyno. When the rail brake is on (pressure going to air can) there should be no continuity. When the rail brake is off (no pressure to air can- give it a couple of seconds to bleed all the air pressure off) there should be continuity.