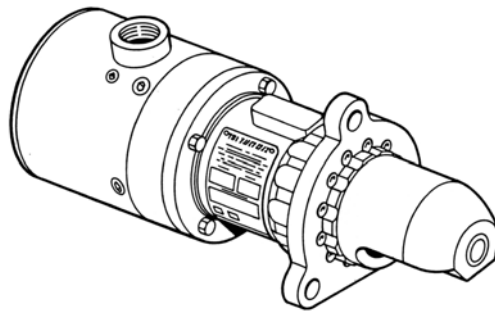


INSTALLATION AND OPERATING MANUAL



MODEL: T30-I **TURBOTWIN** Engine Air Starter

1.0 GENERAL INFORMATION

This manual provides instructions for the installation and operation of the TDI TurboTwin™ Model T30-I air starters. If there are questions not answered by this manual, please contact your TDI TurboTwin™ distributor or dealer for assistance.

The T30-I model is a turbine driven air starter with inertia engaged drive. They are best suited for diesel engines up to 20 Liters (1220 CID) or gasoline engines up to 28 Liters (1709 CID). The T30-I is designed for installation on engines which use an SAE 3 mounting pad.

The T30 Series starters are suited to operate within a wide range of inlet air pressures and ambient temperatures. The engine size and parasitic loading will determine the exact minimum pressure that will ensure reliable starting.

The T30 Series starters are designed for operation with compressed air or natural gas. Moderate amounts of foreign matter or liquid in the air stream will normally not adversely affect T30 Series starters. As with all other TDI TurboTwin™ models, **no lubrication** is required in the supply air.

You need to review the rest of this manual before installing your TDI TurboTwin™ T30 Series starter.

1.1 WARNINGS, CAUTIONS, & NOTES

Throughout this manual, certain types of information will be highlighted for your attention:

WARNING - used where injury to personnel or damage to the equipment is possible.

CAUTION - used where there is the possibility of damage to the equipment.

NOTE - used to point out special interest information.

1.2 INSTALLATION and SERVICE

The TDI TurboTwin™ T30 Series starters provide distinct advantages of size and efficiency compared to electric motor, vane-type, or other turbine-type air starters. It is important to properly install the starter to receive full benefit of these advantages. Repair technicians or service organizations without turbine starter experience should not attempt to repair this machine until they receive factory approved training from TDI, or its representatives. Proper operation of your TDI TurboTwin™ T30 Series starter will assure continued reliable and superior performance for many years.

WARNING

The TDI TurboTwin™ T30 Series starter must be installed and operated in accordance with the instructions given in this manual. Failure to properly install the starter, or failure to operate it according to these instructions may result in damage to the starter or the engine, or cause personal injury.

NOTE

THIS STARTER IS TO BE SERVICED ONLY BY AUTHORIZED TDI TURBOTWIN™ DISTRIBUTORS, DEALERS, AND REPAIR STATIONS. DO NOT OPERATE THIS STARTER UNLESS IT IS PROPERLY ATTACHED TO AN ENGINE.

2.0 ORIENTATION OF THE STARTER

If the factory orientation of the starter's mounting flange (drive housing) assembly, or optional exhaust port does not fit your engine installation, these components can be re-oriented.

2.1 MODEL T30-I ORIENTATION

A. Determine the required orientation of the mounting flange assembly and any optional exhaust port.

B. Note that the mounting flange assembly can be rotated to twelve different positions relative to the gearbox and the gearbox housing assembly can be rotated to four

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positions relative to the inlet port. Additionally, the optional exhaust housing can be rotated to eight positions relative to the inlet port.

CAUTION

All screw threads are treated at the factory with a fastener retention compound. Every screw and tapped hole must be clean and have a drop of Loctite 290 applied to the threads before being reinstalled.

2.1.1 Drive Housing / Mounting Flange Re-Orientation

Remove the twelve mounting flange attachment socket head cap screws.

Rotate the mounting flange to the desired position and reinstall the twelve socket head cap screws. Torque the twelve screws to **9.4 Lb-Ft. (12.7 Nm)**.

CAUTION

Ensure that the O-ring on the drive housing remains in position and is not cut.

WARNING

Do not remove the five radial screws that connect the inlet and turbine housing. The inlet and turbine housing assembly must remain in the same position relative to each other.

3.0 INSTALLING THE STARTER

The T30 Series installation is shown in Figures 2 & 3. The components illustrated may vary in shape, but there must at least be a start initiation switch, air supply, and a starter relay valve to correctly install and operate a T30 Series starter.

NOTE

Mounting the air piloted relay valve on the starter is preferred in installations where the space is available.

TDI recommends mounting the air piloted relay valve no more than 3 meters (10 feet) from the starter's inlet port, and as close to the starter as possible. If the starter is being installed on a vehicle where the air tank is within 3 meters (10 feet) of the starter, then the relay valve may be mounted on the tank.

A turbine driven starter does not require lubrication in the supply air. Therefore, if a vane-type starter motor is being replaced, TDI recommends that all lubrication devices and lines be removed to minimize flow restrictions.

WARNING

If a fuel (pulse) lubricator has previously been installed in the system, disconnect and plug the line to eliminate spraying diesel fuel on the engine.

Liberal grease the starter's pinion teeth with chassis lube and then mount the T30 Series starter on the engine. Tighten all mounting hardware as appropriate.

After mounting the starter to the engine, attach the supply air line from the tank, any control air lines, and solenoid to the ignition system and/or palm valve to the air piloted relay valve.

TDI recommends installation of a "Glad Hand" / quick disconnect for auxiliary pressurization of the air tank.

Because turbine starters are sensitive to flow restrictions, care must be taken to use uniform sized hose or tubing and fittings for connection of the supply air line. Tees, elbows, and line length must be kept to a minimum. TDI recommends that hose or flex couplings be installed to eliminate possible leakage caused by strain on the supply air line.

Normally an air strainer is not required. In dirty environments, use of a #40 mesh Y-strainer is recommended.

Only type approved metallic hose assemblies are approved in permanently pressurized compressed air lines of starters.

Non-metallic hose assemblies are allowed only in case the piping system will be emptied after the starting procedure.

Pipe unions must be type approved by GL. Downstream of the pressure regulator a pressure relief valve is to be provided.

WARNING

Recheck all connections for tight fit.

Fill the air system tank. The T30 Series starter is now ready to operate.

4.0 STARTER OPERATION

The maximum operating pressure limit is that pressure measured at the starter inlet pressure check port during the crank cycle. In order to check the starter inlet pressure, an 1/8" NPT pipe tap connection is provided just below the main inlet for attaching a pressure gauge. Refer to Figure 1. IN NO CASE SHOULD INLET OPERATING PRESSURE EXCEED 10.3 BAR (150 PSIG).

WARNING

Do not operate the TDI TurboTwin T30 Series air starter with air pressure greater than the pressure rating on the nameplate. This pressure is to be measured at the starter inlet while the starter is running.

The static supply pressure will always be higher than the operating pressure. As a guideline, the maximum pressure limit (proof pressure) that the T30 Series starter may be subjected to is 300 PSIG (20.7 Bar).

System pressure that exceeds the maximum operating limit must use a pressure reducer device to ensure operating pressure limit to the T30 Series starter is maintained.

System pressure that exceeds the 300 PSIG (20.7 Bar) limit must, in addition to a pressure reducer device, incorporate a pressure relief valve, set below 300 PSIG Bar (20.7), in the supply air line.

All appropriate local pressure codes and pressure limitations on other system components must be adhered to and supersede guidelines given in this manual.

Follow the engine manufacturer's instructions for starting the engine.

WARNING

Do not engage the starter while the engine is running.

If the starter fails to function properly when first operated, or its performance deteriorates with use, refer to the Operator's Trouble Shooting Guide, Section 6.0. If you cannot solve the problem, or repair is necessary, contact your local TDI TurboTwin™ distributor or dealer.

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5.0 WARRANTY

TDI TURBOTWIN ENGINE STARTER WARRANTY

Tech Development Inc. (TDI) warrants to the original user of the TDI TurboTwin™ Model T30 Series air starters to be free from defects in material and workmanship for a period of one year from date of purchase by such user. The warranty period shall begin on the actual delivery date to the original user or twelve (12) months from the date of shipment from TDI, whichever comes first. The conditions of this warranty are: **a)** TDI is notified within this period by return of such product to TDI or its authorized distributor or dealer, transportation prepaid by user; **b)** such product has been installed according to TDI's specifications; **c)** such product has not been misused, abused or improperly maintained by user; **d)** the defect is not the result of normal wear and tear; and **e)** such starter product has not been repaired with parts not manufactured or authorized by TDI, and TDI installation and repair procedures as outlined in the appropriate manual were properly followed.

Tech Development Inc. shall, at its option, either repair or replace, without charge, any such starter product found by TDI's examination to be defective, or by mutual agreement, refund the user's purchase price in exchange for such starter product. Repairs or replacements are warranted for the remainder of the original warranty period.

Tech Development Inc. makes no other warranty, and IMPLIED WARRANTIES INCLUDING ANY WARRANTY OR MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED.

This warranty constitutes the entire obligation of Tech Development Inc. relating to the sale and use of such product, and TDI's maximum liability is limited to the purchase price of such product at the date of purchase. In no event shall TDI be liable for incidental, indirect, consequential or special damages of any nature arising from the sale or use of such engine starter product.

6.0 OPERATOR'S TROUBLESHOOTING GUIDE

| TROUBLE | PROBABLE CAUSE | SOLUTION |
|---|--|--|
| 1. Air always flow through exhaust | A. Relay valve improperly installed. | A. Check typical installation diagram and correct |
| | B. Relay valve not sealing properly. | B. Check for damaged sealing ring, replace relay valve or damaged parts. |
| | C. Control valve not sealing, pressure remains in APP port of relay valve. | C. Check control valve and replace if necessary. |
| 2. Starter engages but does not run. | A. Bad relay valve | A. Replace relay valve. |
| 3. Starter does not run, small air flow from turbine exhaust. | A. Nozzle blockage. | A. Remove blockage or obstruction from nozzles. |
| 4. Starter does not run. Normal air flow from exhaust. | A. Excessive bends in the supply line. | A. Shorten length or straighten supply air line. |
| 5. Pinion does not engage | A. Air pressure is too low | A. Increase air pressure to 40 -150 psig. |
| | B. Damaged pinion teeth. | B. Replace pinion or starter drive as necessary. |
| 6. Starter runs but engine cranks slowly or not at all. | A. Air pressure too low | A. Increase air pressure to 40 -150 psig. |
| | B. Excessive back pressure. | B. Increase inlet pressure or reduce back pressure. |
| | C. Worn or broken starter drive. | C. Replace starter drive. |
| | D. Worn Starter Drive | D. Replace Starter Drive |
| | E. Nozzle blocked or damaged. | D. Remove blockage or replace damaged parts. |
| 7. Starter continues to operate after start button is released. | A. Control valve is not sealing correctly. | A. See 1C. above |
| | B. Relay valve is not sealing correctly. | B. See 1B. above |
| 8. Air tank pressure decays after extended shut down. | A. Air connections are too tight. | A. Tighten loose fittings. Repair or replace damaged fittings. |
| | B. Damaged air lines: crushed, frayed, kinked. | B. Replace damaged lines. |
| | C. Relay valve is not sealing correctly. | C. See 1B. above |
| | D. Control valve is stuck open. | D. See 1C. above |

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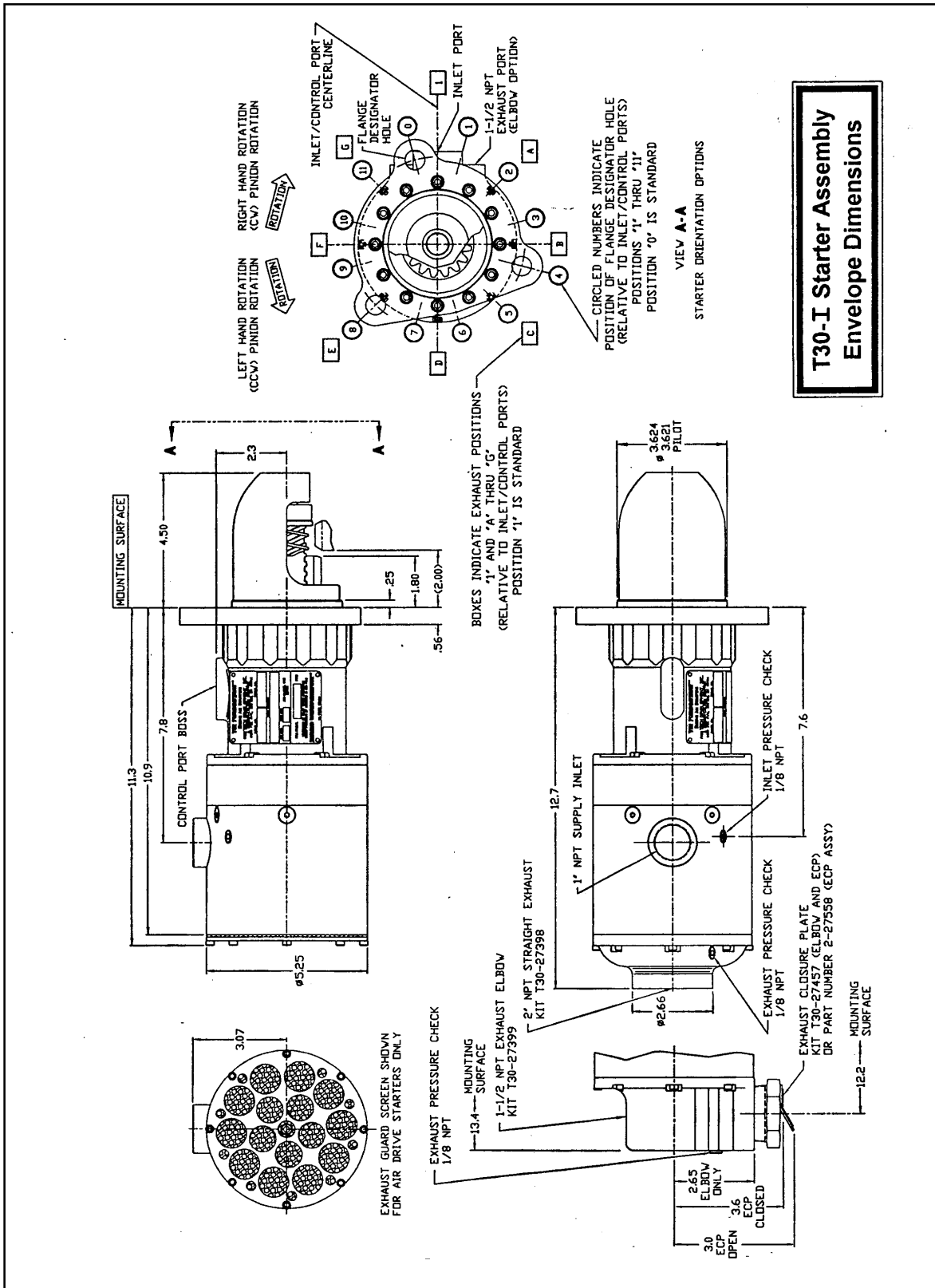


Figure 1. T30-I TurboTwin Air Starter Envelope Drawing

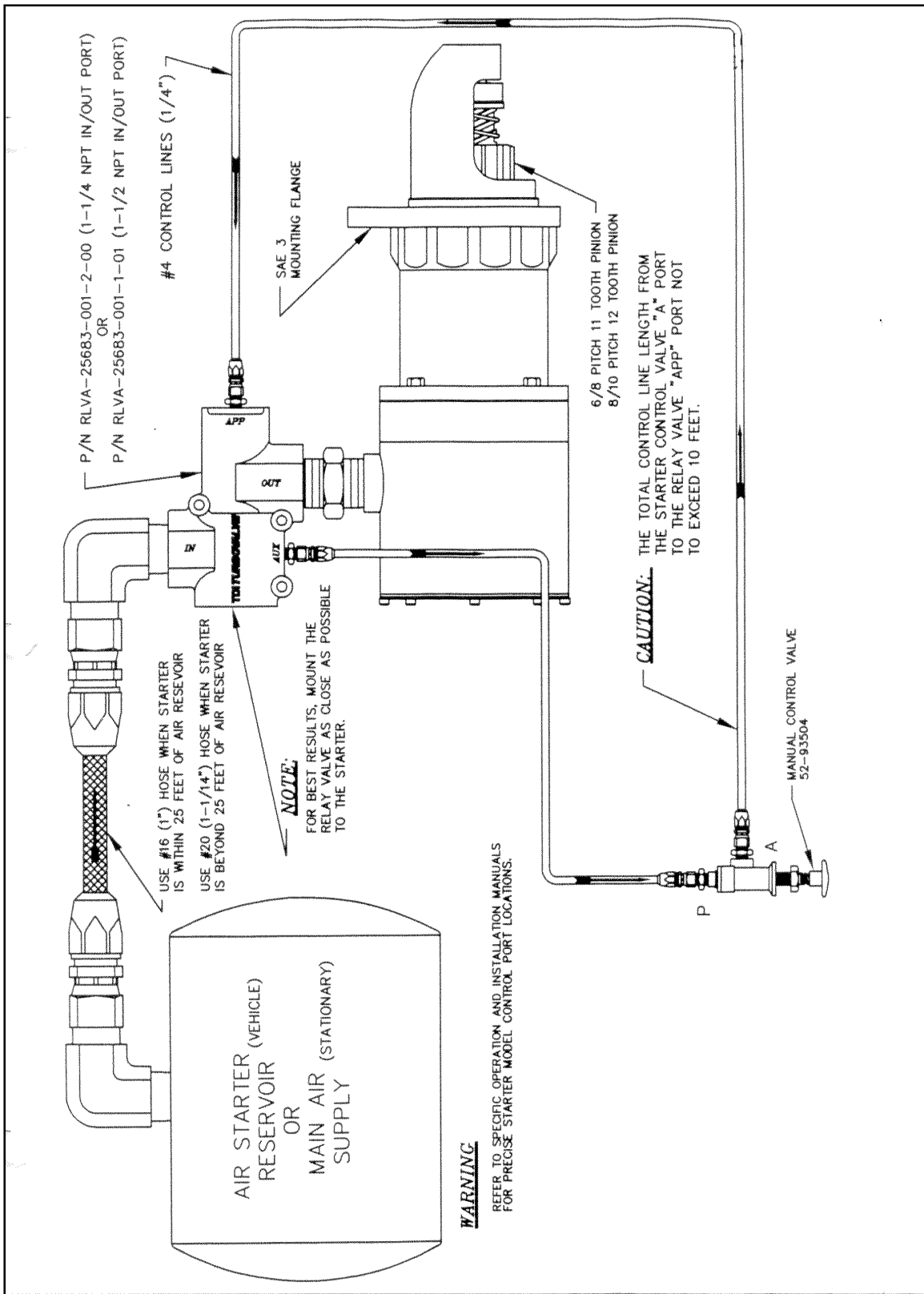


Figure 2. T30-I TurboTwin Air Starter Installation Diagram (Mechanical)

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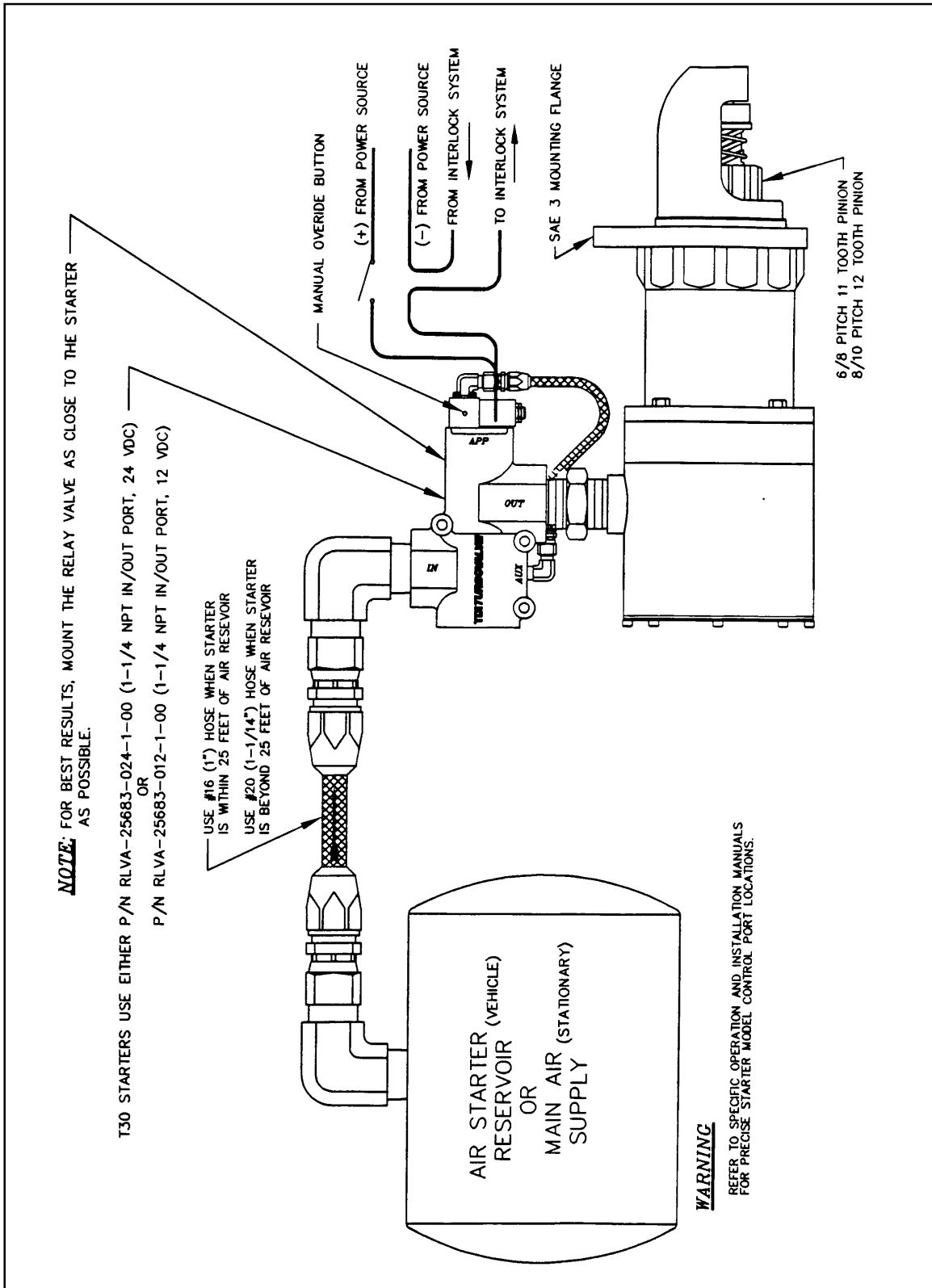
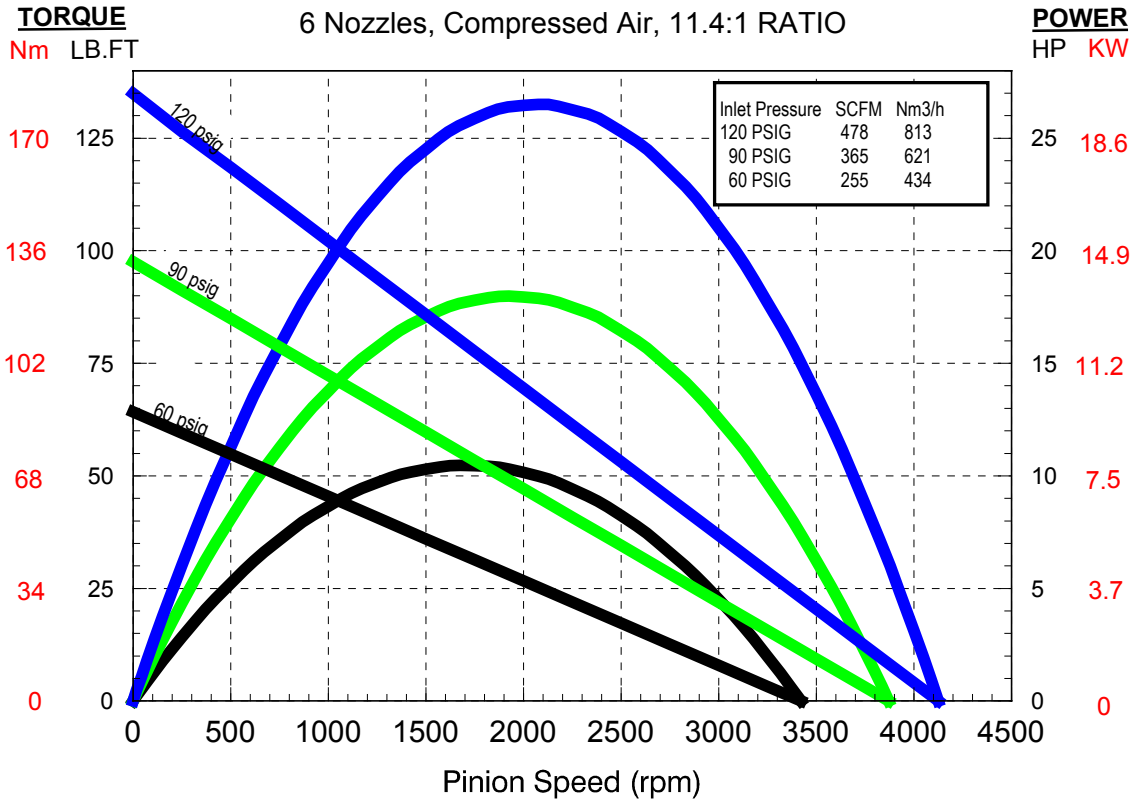


Figure 3. T30-I TurboTwin Air Starter Installation Diagram (Electrical)

T306 Performance Curve



T306 Performance Curve

