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TM-7 Truck Mounted Valve Operator User's Manual



E.H. Wachs Part No. 17-MAN-00
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Chapter 1

About This Manual

PURPOSE OF THIS MANUAL

This manual explains how to operate and maintain the TM-7 truck mounted valve operator. It includes instructions for set-up, operation, and maintenance. It also contains parts lists, diagrams, and service information to help you order replacement parts and perform user-serviceable repairs.

Before operating the TM-7, you should read through this manual and become familiar with all instructions. At a minimum, make sure you read and understand the following chapters:

- Chapter 1, About This Manual
- Chapter 2, Safety
- Chapter 3, Introduction to the Equipment
- Chapter 5, Operating Instructions

If you will be performing service or repairs, make sure you read and understand these chapters:

- Chapter 1, About This Manual
- Chapter 4, Assembly and Disassembly
- Chapter 6, Routine Maintenance
- Chapter 7, Service and Repair.

You will also want to refer to Chapter 8, Schematics, and Chapter 9, Parts Lists and Drawings.

In This Chapter

PURPOSE OF THIS MANUAL
HOW TO USE THE MANUAL
SYMBOLS AND WARNINGS
MANUAL UPDATES AND
REVISION TRACKING

Throughout this manual, refer to this column for warnings, cautions, and notices with supplementary information.

HOW TO USE THE MANUAL

This manual is organized to help you quickly find the information you need. Each chapter describes a specific topic on using or maintaining your equipment.

Each page is designed with two columns. This large column on the inside of the page contains instructions and illustrations. Use these instructions to operate and maintain the equipment.

The narrower column on the outside contains additional information such as warnings, special notes, and definitions. Refer to it for safety notes and other information.

SYMBOLS AND WARNINGS

The following symbols are used throughout this manual to indicate special notes and warnings. They appear in the outside column of the page, next to the section they refer to. Make sure you understand what each symbol means, and follow all instructions for cautions and warnings.



WARNING

A WARNING alert with the safety alert symbol indicates a potentially hazardous situation that **could** result in **serious injury or death**.



CAUTION

A CAUTION alert with the safety alert symbol indicates a potentially hazardous situation that **could** result in **minor or moderate injury**.



This is the **safety alert symbol**. It is used to alert you to **potential personal injury hazards**. Obey all safety messages that follow this symbol to avoid possible injury or death.

This is the **equipment damage alert symbol**. It is used to alert you to **potential equipment damage situations**. Obey all messages that follow this symbol to avoid damaging the equipment or workpiece on which it is operating.



CAUTION

A CAUTION alert with the damage alert symbol indicates a situation that **will** result in **damage to the equipment**.



IMPORTANT

An IMPORTANT alert with the damage alert symbol indicates a situation that **may** result in **damage to the equipment**.

NOTE

This symbol indicates a user note. **Notes** provide additional information to supplement the instructions, or tips for easier operation.



NOTE

A NOTE provides supplementary information or operating tips.

MANUAL UPDATES AND REVISION TRACKING

Occasionally, we will update manuals with improved operation or maintenance procedures, or with corrections if necessary. When a manual is revised, we will update the revision history on the title page.

You may have factory service or upgrades performed on the equipment. If this service changes any technical data or operation and maintenance procedures, we will include a revised manual when we return the equipment to you.

Current versions of E.H. Wachs manuals are also available in PDF format. You can request an electronic copy of this manual by emailing customer service at sales@ehwachs.com.



Chapter 2

Safety

The E.H. Wachs takes great pride in designing and manufacturing safe, high-quality products. We make user safety a top priority in the design of all our products.

Read this chapter carefully before operating the TM-7. It contains important safety instructions and recommendations.

OPERATOR SAFETY

Follow these guidelines for safe operation of the equipment.

- **READ THE OPERATING MANUAL.** Make sure you understand all setup and operating instructions before you begin.
- **INSPECT MACHINE AND ACCESSORIES.** Before starting the machine, look for loose bolts or nuts, leaking lubricant, rusted components, and any other physical conditions that may affect operation. Properly maintaining the machine can greatly decrease the chances for injury.
- **ALWAYS READ PLACARDS AND LABELS.** Make sure all placards, labels, and stickers are clearly legible and in good condition. You can purchase replacement labels from E.H. Wachs.
- **KEEP CLEAR OF MOVING PARTS.** Keep hands, arms, and fingers clear of all rotating or moving parts.

In This Chapter

OPERATOR SAFETY

SAFETY LABELS



Look for this symbol throughout the manual. It indicates a personal injury hazard.

Always turn machine off before doing any adjustments or service.

- **SECURE LOOSE CLOTHING AND JEWELRY.** Secure or remove loose-fitting clothing and jewelry, and securely bind long hair, to prevent them from getting caught in moving parts of the machine.
- **KEEP WORK AREA CLEAR.** Keep all clutter and nonessential materials out of the work area. Only people directly involved with the work being performed should have access to the area.

Safety Symbols



This icon is displayed with any safety alert that indicates a personal injury hazard.

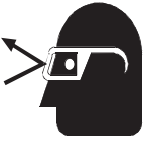
WARNING

This safety alert indicates a potentially hazardous situation that, if not avoided, **could** result in **death or serious injury**.


CAUTION

This safety alert, with the personal injury hazard symbol, indicates a potentially hazardous situation that, if not avoided, **could** result in **minor or moderate injury**.

Protective Equipment Requirements

	<p>WARNING</p> <p>Always wear impact resistant eye protection while operating or working near this equipment.</p>
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For additional information on eye and face protection, refer to Federal OSHA regulations, 29 Code of Federal Regulations, Section 1910.133., Eye and Face Protection and American National Standards Institute, ANSI Z87.1, Occupational and Educational Eye and Face Protection. Z87.1 is available from the American National Standards Institute, Inc., 1430 Broadway, New York, NY 10018.

	<p>CAUTION</p> <p>Personal hearing protection is recommended when operating or working near this tool.</p>
--	---

Hearing protectors are required in high noise areas, 85 dBA or greater. The operation of other tools and equipment in the area, reflective surfaces, process noises, and resonant structures can increase the noise level in the area. For additional information on hearing protection, refer to Federal OSHA regulations, 29 Code of Federal Regulations, Section 1910.95, Occupational Noise Exposure and ANSI S12.6 Hearing Protectors.

SAFETY LABELS

The following safety labels are on TM-7 units mounted on swivel trailers or vehicles.

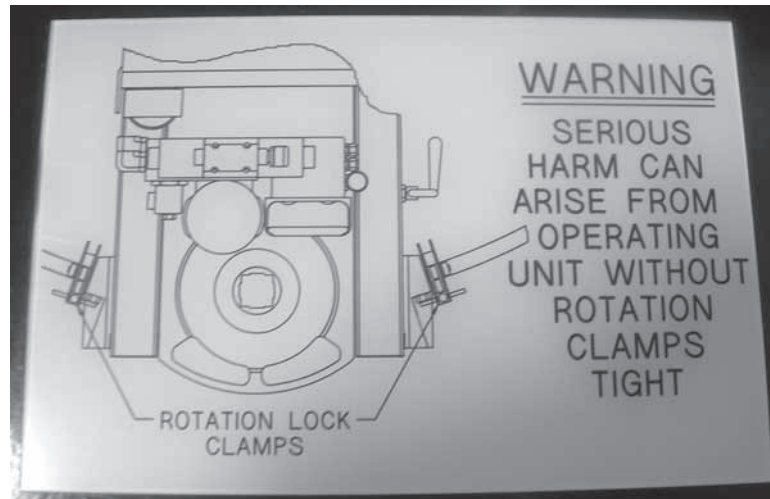


Figure 2-1. The rotation clamps on the swivel rail must be tightened securely before operating the TM-7.



Figure 2-2. Keep hands clear of the swivel rail when positioning the TM-7.

Chapter 3

Introduction to the Equipment

.....

The TM-7 truck mounted valve operator is a permanently mounted, heavy duty, hydraulic valve turner. It is designed to make valve turning easy for all utilities and assures maximum valve protection.

The TM-7 allows computer-controlled or manual exercising of valves. Computer control is provided with the Wachs Vitals HC-100 controller, which can store valve activity data and transfer it to the Vitals Desktop program on your PC for analysis.

EQUIPMENT FEATURES

Base Machine

The following items are included with all configurations.

- Valve turning power head on extension slide.
- Computerized operation and torque control.
- Power head position locking lever.
- Valve key and socket.

For features specific to your TM-7 machine, refer to the appropriate section in **TM-7 Configurations** in this chapter.

In This Chapter

EQUIPMENT FEATURES

TM-7 CONFIGURATIONS

Hydraulic and Electric Supply

All TM-7 machines require a hydraulic supply to operate. The recommended flow rate is 8 gpm at 2,000 psi (9 gpm maximum).

All TM-7 machines require a 12 VDC electrical power supply. Current requirement vary with model; see Table 1 on page 27 for details.

Some build configurations of the TM-7 include a gas engine with hydraulic and electrical power sources.

TM-7 Controller

The TM-7 is operated using the Vitals HC-100 controller, a hand-held computer for machine control and valve activity data storage. The controller is a rugged, handheld computer running the Windows Mobile operating system. It features a touchscreen interface for data entry and machine control.

All machine controls and settings are performed using the Vitals Mobile program on the controller. (Manual machine control is available on the 17-000-30 configuration, used on VMS systems.)



Figure 3-1. The Vitals HC-100 controller is used to operate the TM-7 and other E.H. Wachs valve operators. The controller stores valve exercising data for valve logging and analysis using the Vitals Desktop software program.

VITALS Mobile Software

The controller runs the Vitals Mobile software for managing valve activity data and operating the TM-7. Figure 3-2 shows the interface of the Wachs Controller program, used for valve operator control.



NOTE

See the detailed instructions for using Vitals Mobile in the *Vitals Reference Manual*. You can open an electronic version of the manual in Vitals, or download it from the turn-valves.com website.

Vitals Mobile		Tap to connect GPS
Torque 0	Highest 0	Limit 200
Count: 0.0 Direction: ? Mode: EXER		
START		Jog LH
		Jog RH
Back	Reset	Settings
Waiting to connect		

Torque—Displays current operating torque. Touch to change torque limit

Highest—Displays maximum torque during current activity

Count—Displays valve rotations during current activity.

START/STOP—Touch to start or stop the valve exerciser. (Displays **STOP** if the exerciser is operating.)

Back—Touch to return to Vitals Mobile program.

Reset—Touch to start a new activity.

Limit—Displays current torque limit. Touch to change torque limit.

Direction—Displays current turning direction. Touch to set turning direction.

Mode—Displays current operating mode (Exercise or Manual). Touch to change mode.

Jog LH—Touch and hold to jog left-hand (counter-clockwise).

Jog RH—Touch and hold to jog right-hand (clockwise).

Settings—Touch to change valve operating settings.

Waiting to connect—Displays current operating status (reads **Connected to TM-7** when startup is complete).

Figure 3-2. The illustration describes the features of the Wachs Controller program.

Connecting the Controller

The Vitals HC-100 controller is connected to the TM-7 with a specialized cable, part no. 79-302-10.

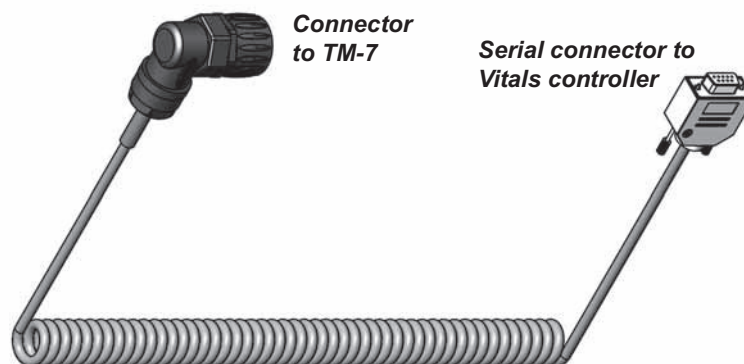


Figure 3-3. The photo shows the controller cable.



Figure 3-4. To connect the controller cable to the TM-7, unscrew the connector cap and then screw on the cable connector.

TM-7 CONFIGURATIONS

The TM-7 valve operator is available in 5 configurations. These are summarized in Table 1 and described in the following subsections.

Table 1: TM-7 Configurations



P/N	17-000-22	17-000-24	17-000-27	17-000-29	17-000-30
MAX Torque Output	1,500 ft-lb	2,500 ft-lb	1,500 ft-lb	1,500 ft-lb	2,500 ft-lb
Gas Engine	Optional	Optional	No	No	No
Use with Swivel Plate	Yes	No	Yes	Yes	No
Includes Reservoir	Yes	Yes	No	Yes	No
Hydraulic Cooler	Optional	Optional	N/A	Included	N/A
HD Plus Manual Mode	No	No	No	No	Yes
For Custom Truck Installs	Yes	Yes	Yes	Yes*	Yes**

*17-000-29 typically installed on Grand LX Trailer. Custom Truck installation will require additional components.

**17-000-30 typically installed on Valve Maintenance Skid. Custom Truck installation will require additional components.

TM-7 Standard Duty VITALS-Ready (PN: 17-000-22)

Standard duty (1,500 lb-ft torque) hydraulic drive system with VITALS computer control. Electronic control for torque and direction of rotation, electronic revolution counter, integral 2,000 psi auxiliary hydraulic circuit (optional HTMA Class II cooler available, part no. 17-401-00), pressure gauge, 8' long valve key with 2" universal socket, operating manual and installation instructions.

The TM-7 requires a controller to operate the machine and log data. Typically, this controller/data logger is the HC-100, part no. 79-422-0 (North America) or 79-422-02 (EU/Australia).

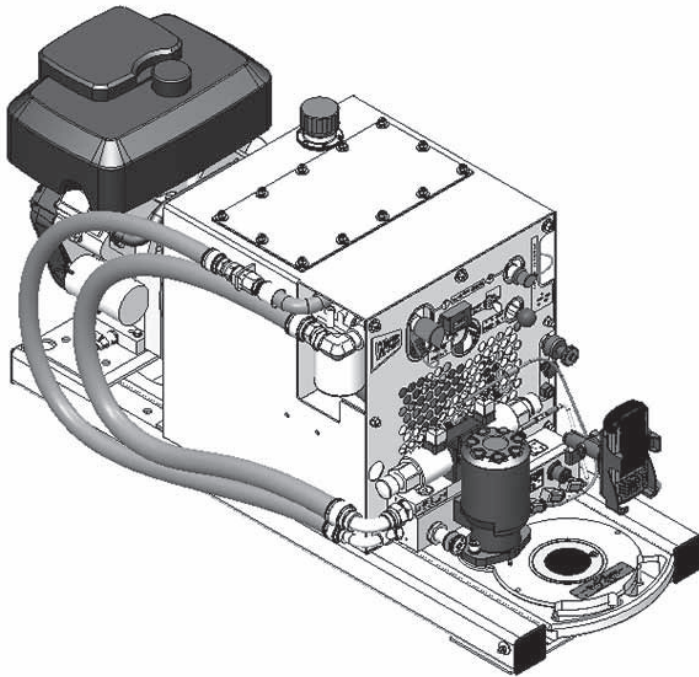


Figure 3-5. The drawing shows the 17-000-22 TM-7 configuration. (17-000-22 and 17-000-24 machines have the same physical configuration.)

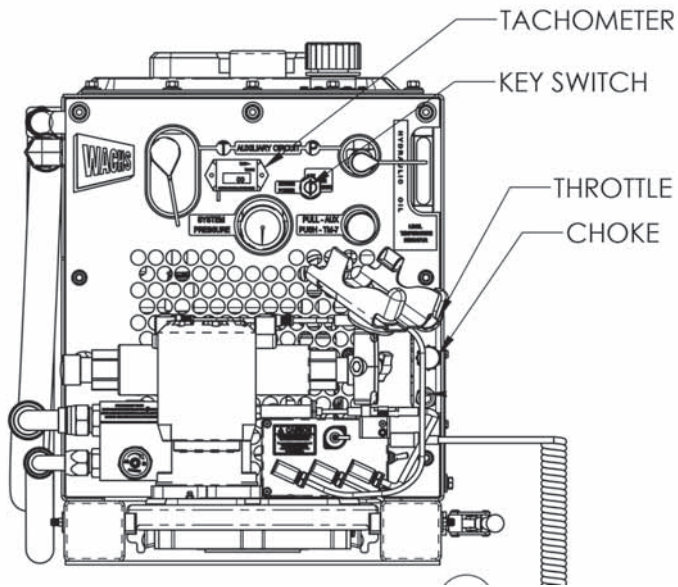


Figure 3-6. The drawing shows the primary controls of the 17-000-22 TM-7 configuration. (Controls are the same for the 17-000-22 and 17-000-24 machines.)

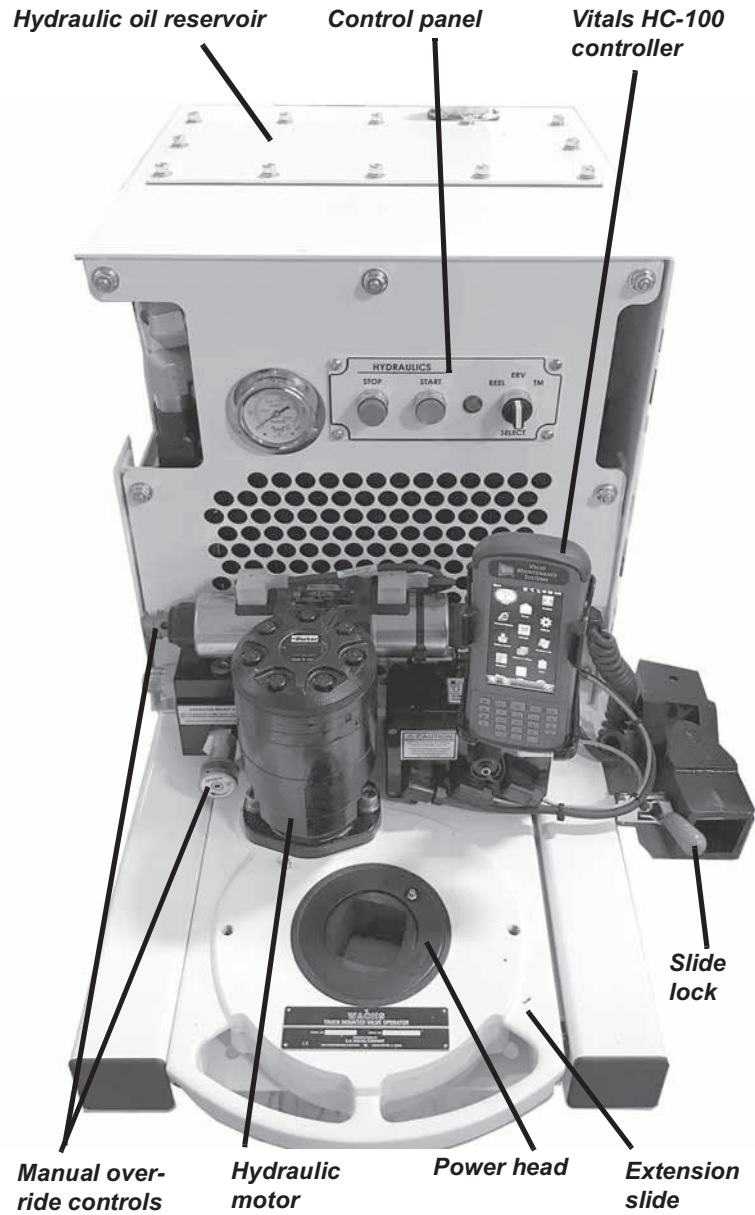


Figure 3-7. The photo illustrates major components of the TM-7 valve operator (engine not shown).

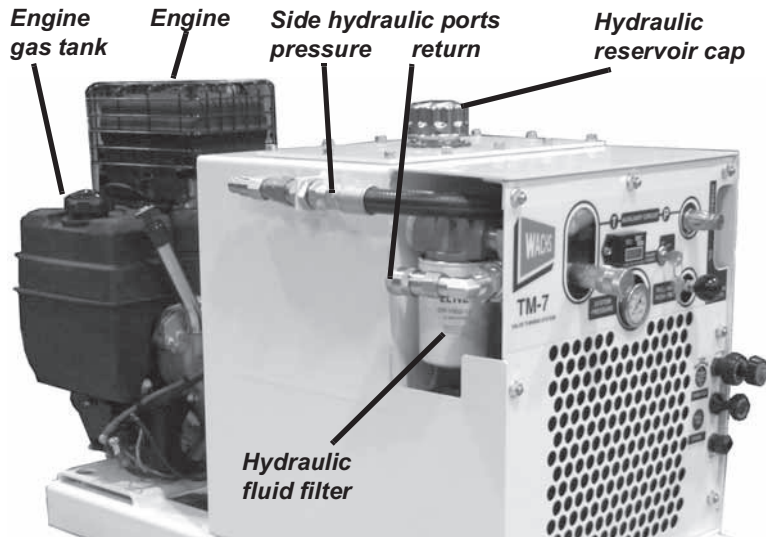


Figure 3-8. The photo shows the TM-7 configured with a gas engine, configurations 17-000-22 and 17-000-24. (Shown with TM-7 hoses disconnected from side hydraulic ports.)

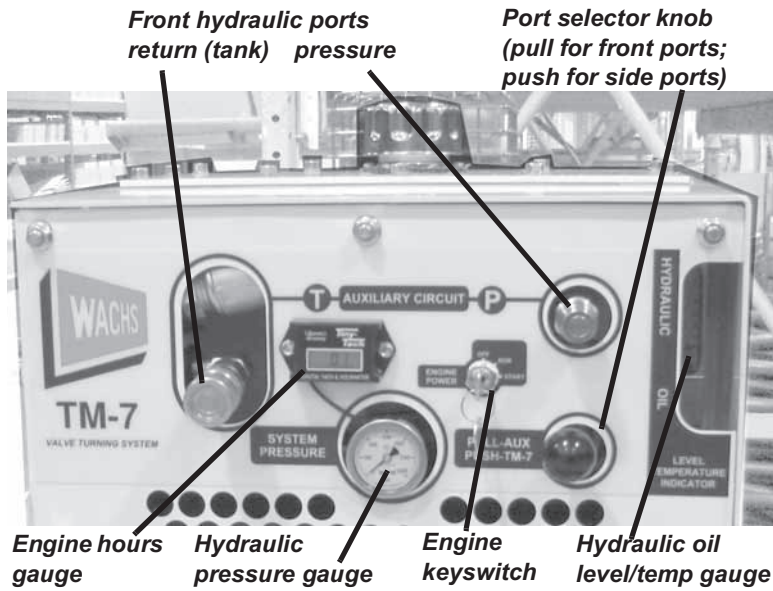


Figure 3-9. The photo shows the panel controls, configurations 17-000-22 and 17-000-24.

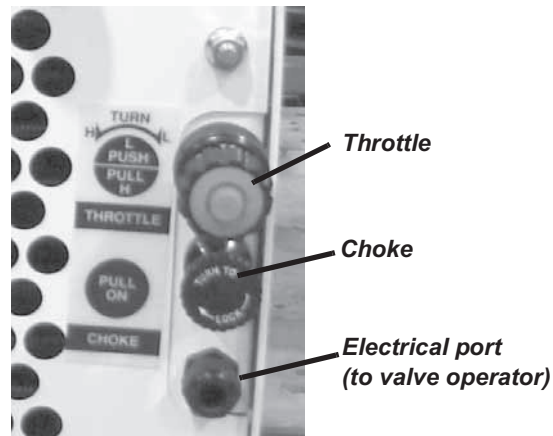


Figure 3-10. The photo shows the front panel engine controls.

Gas Engine Option. 17-402-00

The gas engine option is available on TM-7 configurations 17-000-22 and 17-000-24. It includes the following:

- 16 HP gasoline engine.
- Panel controls for engine (Off/Run/Start), throttle speed, and choke.

Operating and maintenance manuals are provided with the engine. Before using the TM-7, read these manuals to familiarize yourself with the engine's features and operation.

TM-7 Heavy Duty VITALS-Ready (PN: 17-000-24)

Heavy duty (2,500 lb-ft torque) hydraulic drive system with VITALS computer control. Electronic control for torque and direction of rotation, electronic revolution counter, integral 2,000 psi auxiliary hydraulic circuit (optional HTMA Class II cooler available, part no. 17-401-00), pressure gauge, 8' long valve key with 2" universal socket, operating manual and installation instructions.

The TM-7 requires a controller to operate the machine and log data. Typically, this controller/data logger is the HC-100, part no. 79-422-0 (North America) or 79-422-02 (EU/Australia).

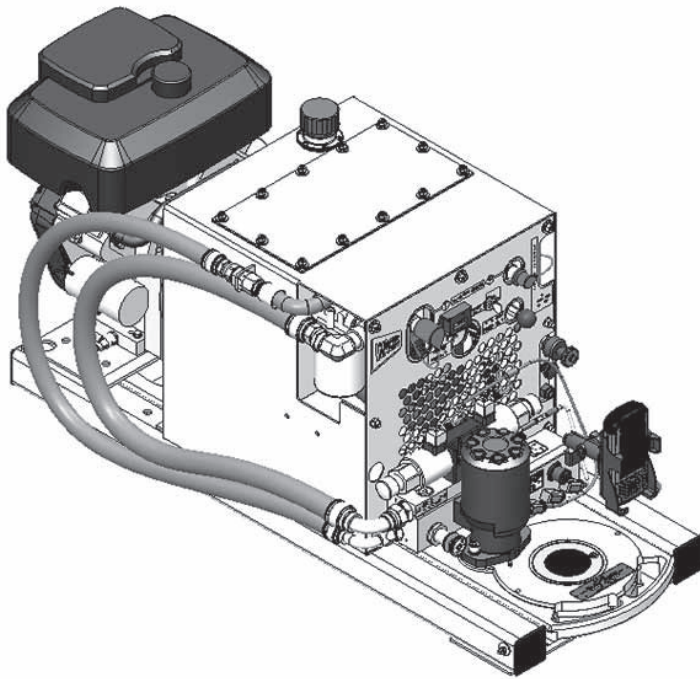


Figure 3-11. The drawing shows the 17-000-24 TM-7 configuration. (17-000-22 and 17-000-24 machines have the same physical configuration.)

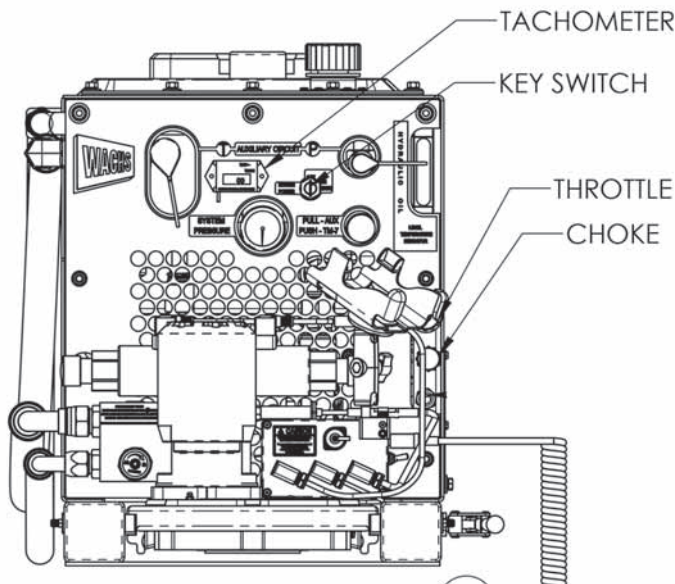


Figure 3-12. The drawing shows the primary controls of the 17-000-24 TM-7 configuration. (Controls are the same for the 17-000-22 and 17-000-24 machines.)

Gas Engine Option. 17-402-00

The gas engine option is available on TM-7 configurations 17-000-22 and 17-000-24. It includes the following:

- 16 HP gasoline engine.
- Panel controls for engine (Off/Run/Start), throttle speed, and choke.

Operating and maintenance manuals are provided with the engine. Before using the TM-7, read these manuals to familiarize yourself with the engine's features and operation.

TM-7 Trailer Mount VITALS-Ready (PN: 17-000-27)

Standard duty (1,500 lb-ft) TM-7 configured as an upgrade for VMT-1 or Grand LX valve maintenance trailer systems originally supplied without a TM-7. May be used with the optional swivel plate, part no. 77-405-00. Hydraulic drive system with the VITALS-capable computer control. Electronic control for torque and direction of rotation, with electronic revolution counter. Requires 8 gpm/2,000 psi hydraulic supply (9 gpm maximum).

The TM-7 requires a controller to operate the machine and log data. Typically, this controller/data logger is the HC-100, part no. 79-422-0 (North America) or 79-422-02 (EU/Australia).

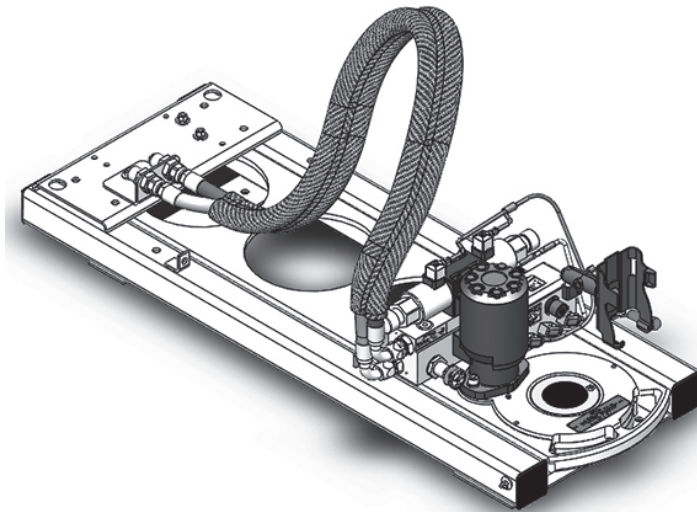


Figure 3-13. The drawing shows the 17-000-27 TM-7 configuration. This unit is controlled with the HC-100 handheld controller.

TM-7 Grand LX Trailer Mount VITALS-Ready (PN: 17-000-29)

Standard duty (1,500 lb-ft) TM-7 configured for Grand LX valve maintenance trailer systems. Hydraulic drive system with the VITALS-capable computer control. Electronic control for torque and direction of rotation, with electronic revolution counter. 10 gallon reservoir with oil cooler. Three-circuit hydraulic manifold provides switching of operating functions: TM-7/ERV/hose reel (controls not included). Requires 8 gpm/2,000 psi hydraulic supply (9 gpm maximum).

The TM-7 requires a controller to operate the machine and log data. Typically, this controller/data logger is the HC-100, part no. 79-422-0 (North America) or 79-422-02 (EU/Australia).

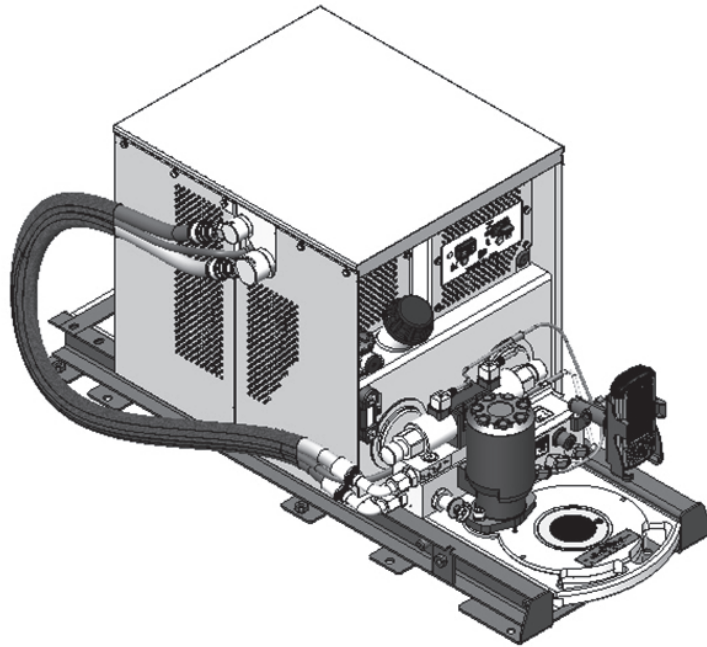


Figure 3-14. The drawing shows the 17-000-29 TM-7 configuration.

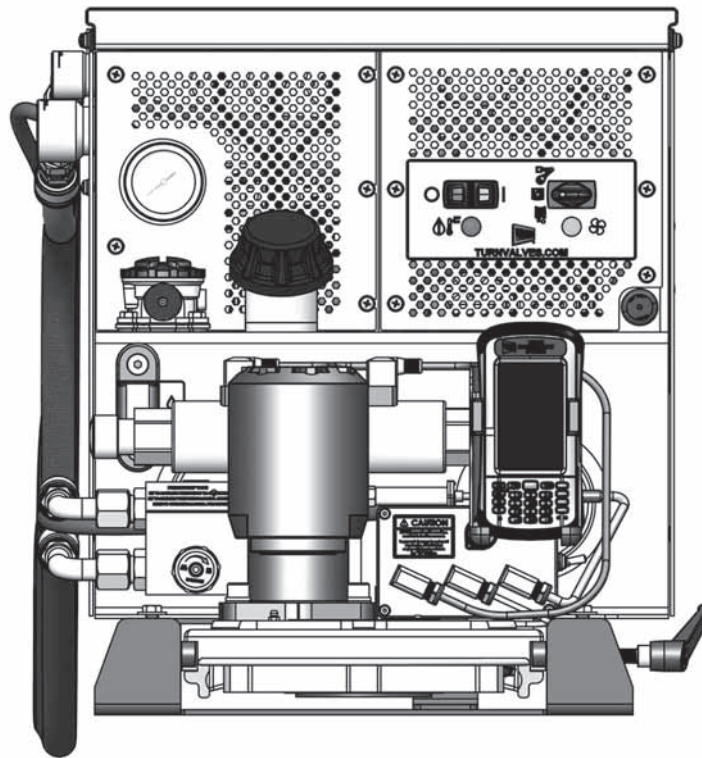


Figure 3-15. The drawing shows the primary controls of the 17-000-29 TM-7 configuration.

TM-7 HD Plus Skid System Mount VITALS-Ready (PN: 17-000-30)

Heavy duty (2,500 lb-ft) TM-7 configured for valve maintenance skid-mounted systems. Hydraulic drive system with the VITALS-capable computer control. Electronic control for torque and direction of rotation, with electronic revolution counter. 10 gallon reservoir with oil cooler. Three-circuit hydraulic manifold provides switching of operating functions: TM-7/ERV/hose reel (controls not included). Requires 8 gpm/2,000 psi hydraulic supply (9 gpm maximum).

The TM-7 HD Plus can operate without a controller. However, this manual control does not provide any valve exercising data or data logging functions. Typically, the TM-7 HD Plus uses the HC-100 controller for machine operation and data logging—part no. 79-422-0 (North America) or 79-422-02 (CE/EU, AUS).

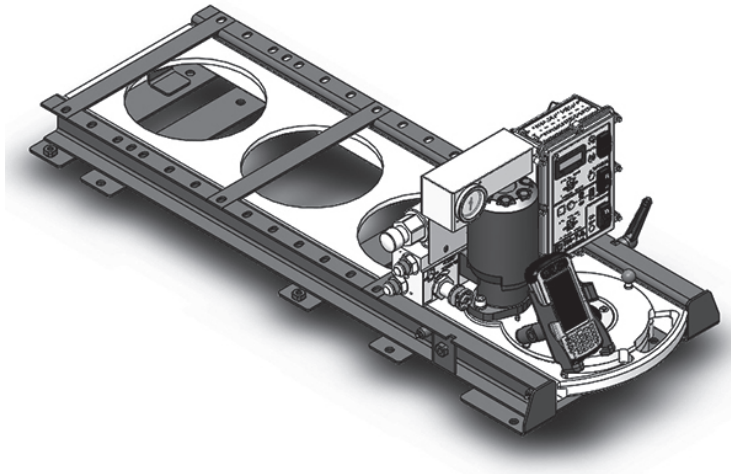


Figure 3-16. The drawing shows the 17-000-30 TM-7 configuration.

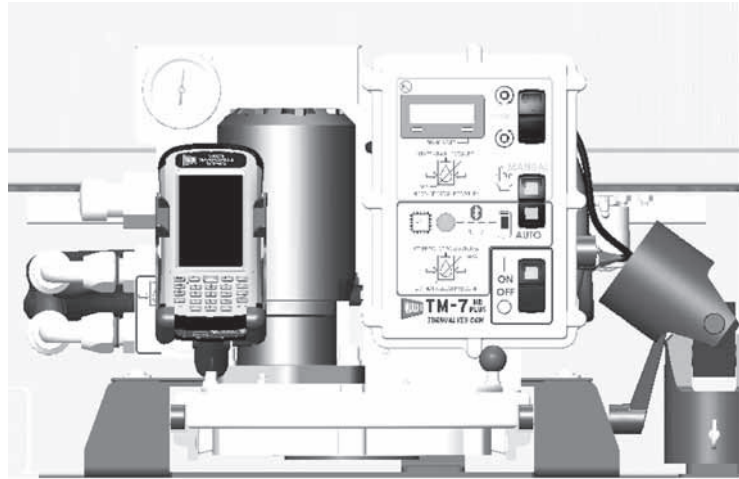


Figure 3-17. The drawing shows the primary controls of the 17-000-30 TM-7 configuration.

Chapter 4

Installation

This chapter includes instructions for installing the TM-7 on a customer-supplied vehicle and preparing it for first-time use.

INSTALLING THE TM-7

When preparing to install your TM-7 system, read and refer to the following information:

- The **General Installations Guidelines** section below.
- The section for your TM-7 configuration in the **Installation Diagrams** section in this chapter.
- The electrical schematic for your TM-7 configuration in Chapter 8.
- The hydraulic schematic for your TM-7 configuration in Chapter 8.

General Installation Guidelines

Vehicle and Fastener Requirements

The TM-7 can produce up to 2,500 ft-lb of torque. **A solid vehicle structure is required to react this torque.** Vehicle mass plays a role as the transmitted forces are eventually carried to the tire-road interface.

- The vehicle must be capable of withstanding the max torque output of the TM-7.

In This Chapter

INSTALLING THE TM-7

PREPARING FOR USE

- It is the responsibility of the TM-7 installer to ensure the vehicle and its structure are adequate for this purpose.

The bolted connection between the TM-7 frame and the vehicle structure is critical for safe installation.

- The installer is responsible for making the connection using appropriate fasteners and torque specifications.
- Minimum guideline is 6x ½” Grade 5 bolts through suitable frame members—4x at the head and 2x at the back of the TM-7.

Door Opening Requirements

The TM-7 has a limited reach with the pull-out slide.

- Mount the TM-7 near the vehicle side and as close to the driver compartment as possible. This will maximize the TM-7 reach and provide the operator good visibility to align the vehicle mounted TM-7 to the valve.

If a door is provided in the vehicle for TM-7 access, the installer is responsible to make the opening large enough to allow the TM-7 head to slide out, along with ancillary equipment such as the machine controller and GPS.

Refer to the Installation Diagrams in the section for your TM-7 configuration for minimum opening size. Ancillary equipment may require more. Installer is responsible for making sure the opening is sufficient for the customer’s TM-7 installation.

Electrical Connections and Requirements

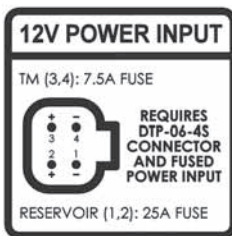
For TM-7 machines without an engine and battery, an adequately fused +12 VDC supply must be provided. Refer to the TM-7 electrical schematics in Chapter 8 for hook-up information.

Table 1: TM-7 Configuration Electrical Requirements

Installation	Circuit Size	Recommended Wire Size*
17-000-22 (TM-7 Only)	7.5 A	16 AWG
17-000-22 w/17-401-00 Cooler	25 A	12 AWG
17-000-24 (TM-7 Only)	7.5	16 AWG
17-000-24 w/ 17-401-00 Cooler	25 A	12 AWG
17-000-27 – TM-7 Only	7.5 A	16 AWG
17-000-29**	25 A + 7.5 A	12 AWG + 16 AWG
17-000-30 (TM-7 Only)	7.5 A	16 AWG

*Recommended wire size based on amperage and a TM-7 location approximately 13' from supply. Use electrical best practices to adjust as needed.

**17-000-29 requires a 4 cavity DTP-06-4S connector to supply power:

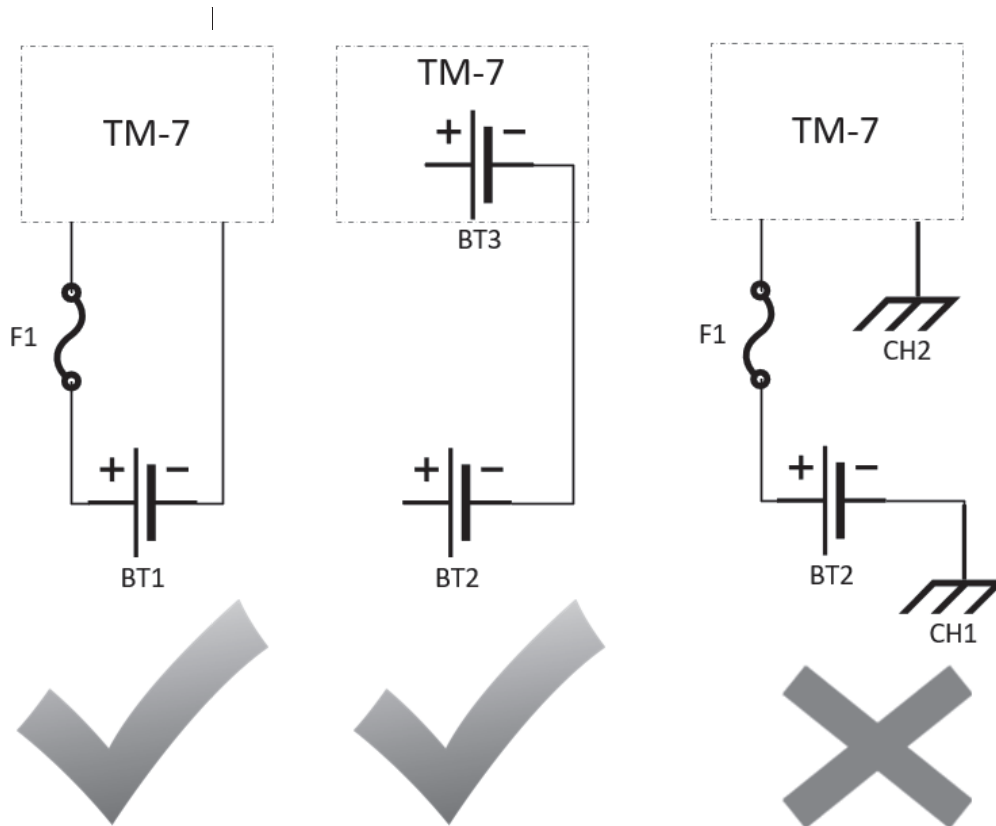


Recommended wire size may need to be increased for long wire runs.

- Installer is responsible for determining wire ampacity and insulation type based on the vehicle wire routing.

The ground wire of the TM-7 installation must be connected to the vehicle negative battery terminal.

- On a TM-7 with built-in battery, the negative battery terminals must be wired together. A chassis ground or floating ground will create issues with the TM-7 controller digital communications.



Hydraulic Connections and Requirements

The hydraulic supply for the TM-7 must be capable of 2,000 psi working pressure and should not exceed 9 GPM hydraulic flow. **8 GPM @ 2,000 psi supply is recommended.**

Refer to the Installation Diagrams in the section for your TM-7 configuration for specific information on hydraulic connections.

Serviceability

Serviceability is important to customer satisfaction. Ease of serviceability for regularly scheduled maintenance will reduce overall warranty expense.

The installer is responsible for making sure the TM-7 installation does not hinder the customer's routine maintenance. When planning and performing the installation, consider the following service requirements:

- Make sure the installation configuration allows for regularly required maintenance items.
- Make sure that maintenance can be performed with common shop tools.
- Provide adequate access.

Installation Diagrams

TM-7 Standard Duty, 17-000-22

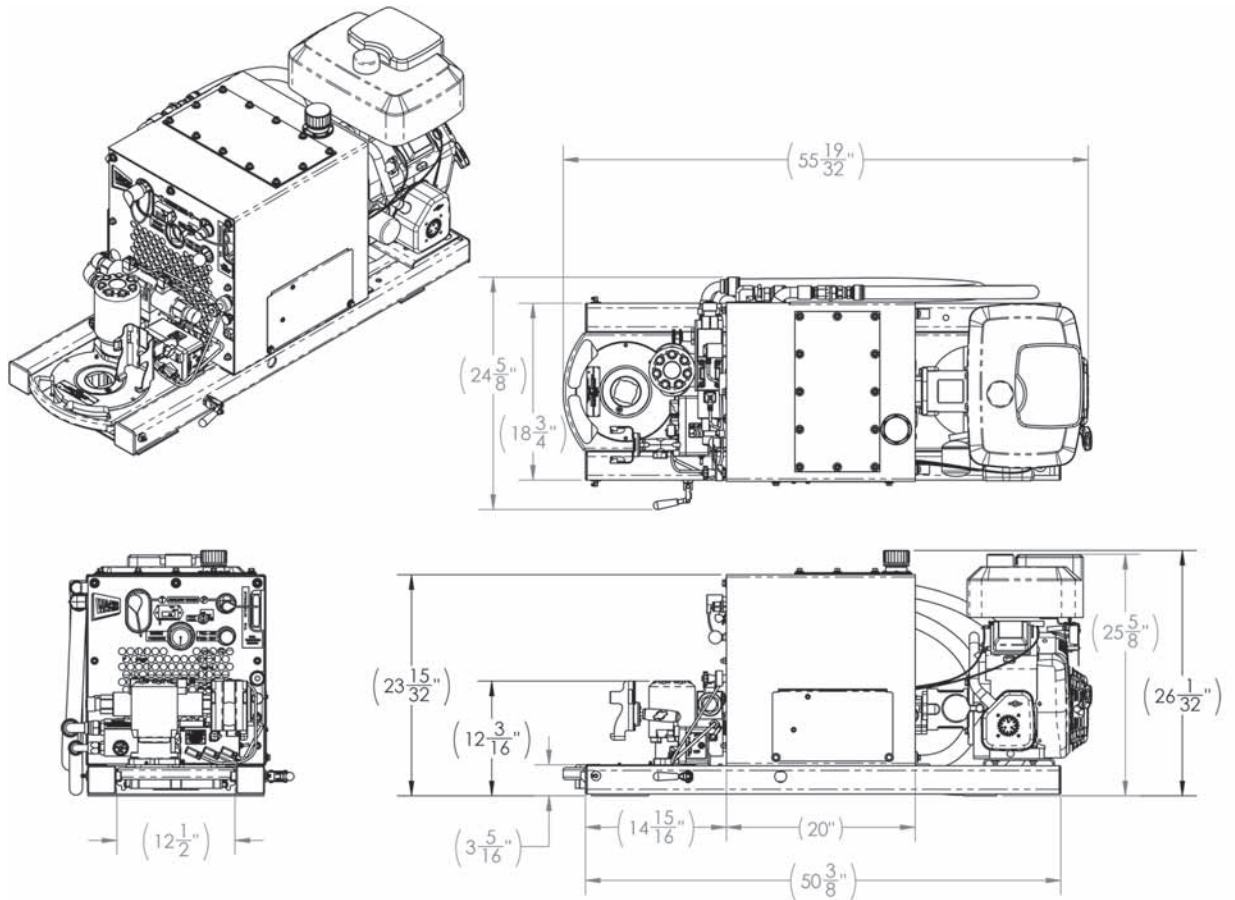


Figure 4-1. Overall dimensions for TM-7 configuration 17-000-22.

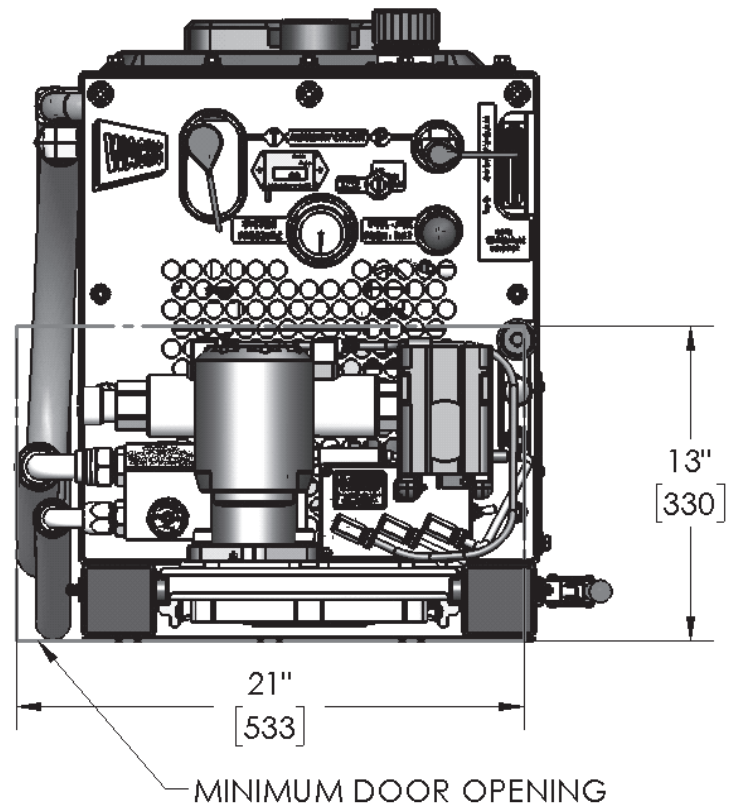


Figure 4-2. Minimum door opening for 17-000-22. (Same for 17-000-24, 17-000-27, and 17-000-29.)

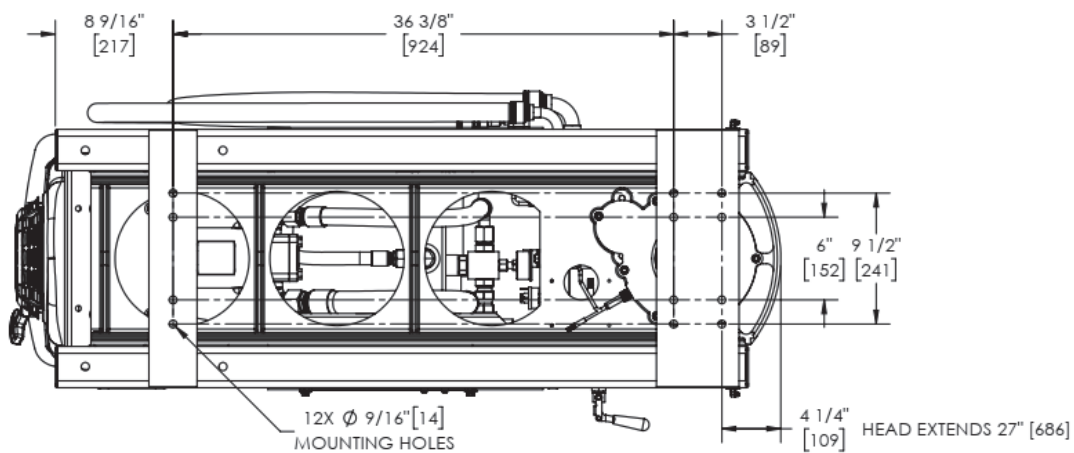


Figure 4-3. Mounting holes for 17-000-22. (Same for 17-000-24 and 17-000-27.)

For a 17-000-22 machine without the hydraulics/gasoline engine option, there are 2x hoses for hydraulic hookup.

- Refer to the hydraulic schematics in Chapter 8 for more details.

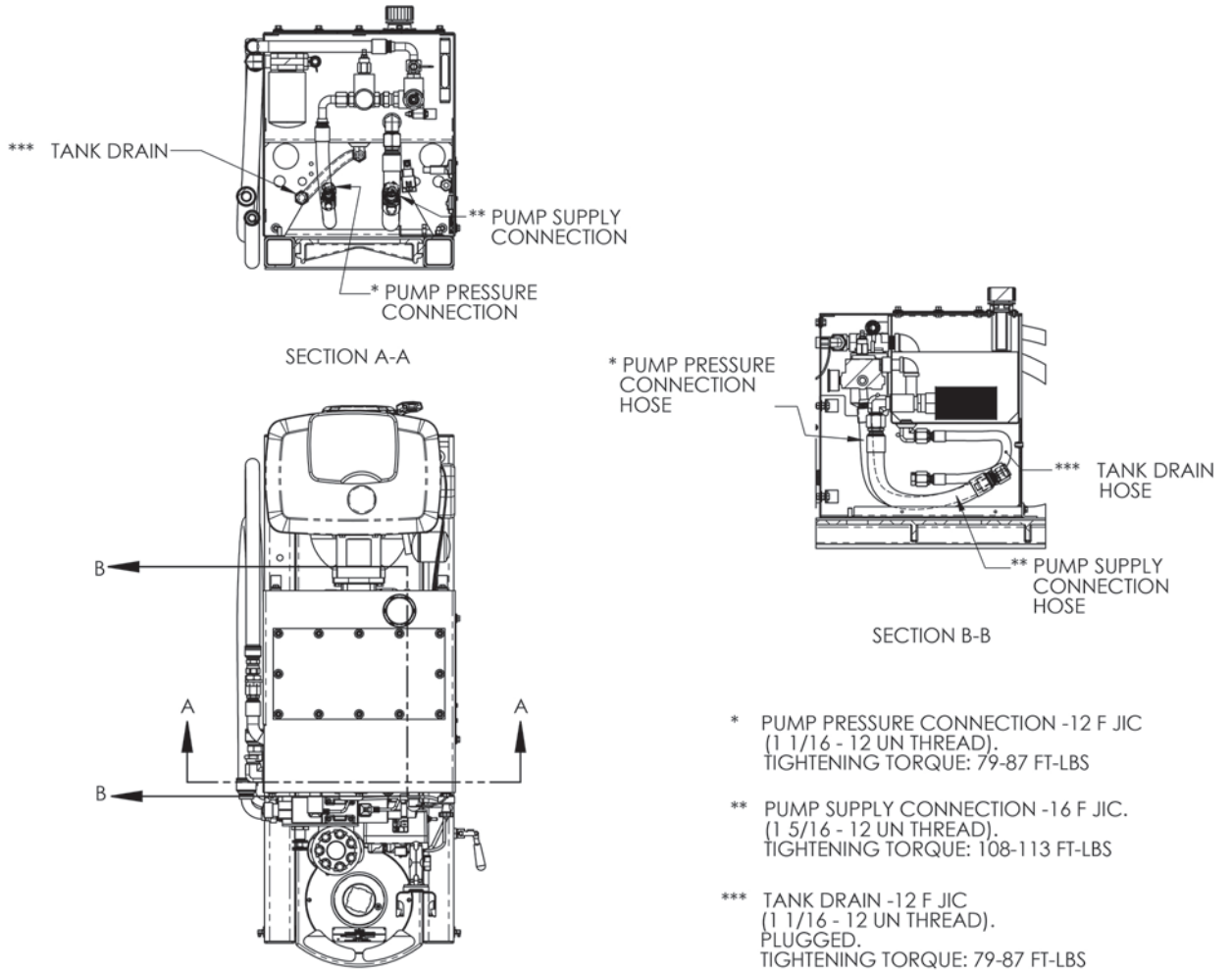


Figure 4-4. Hydraulic connections, 17-000-22.

Electrical. See Table 1 on page 27 for electrical specifications. See the electrical schematic in Chapter 8 for detailed electrical information.

TM-7 Heavy Duty, 17-000-24

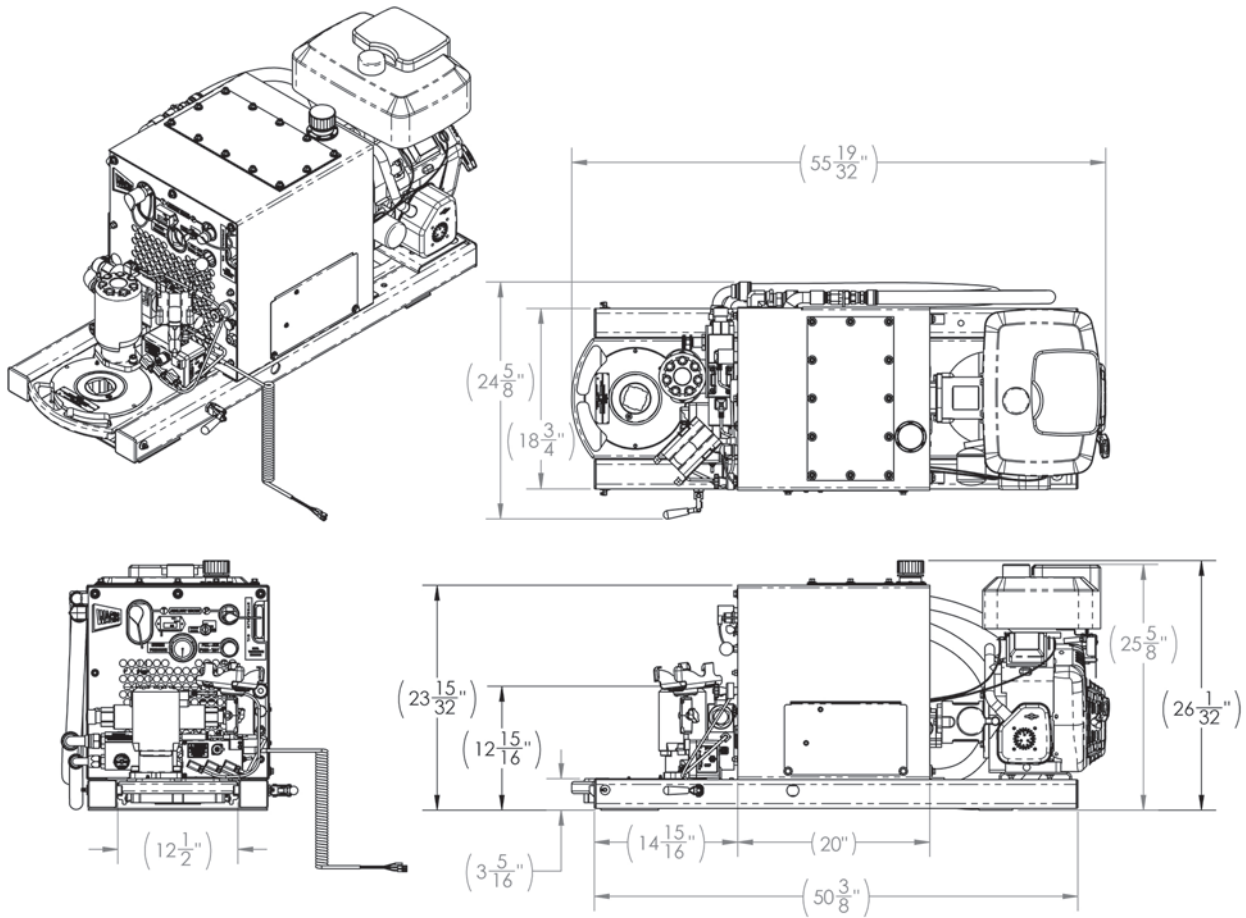


Figure 4-5. Overall dimensions for TM-7 configuration 17-000-24.

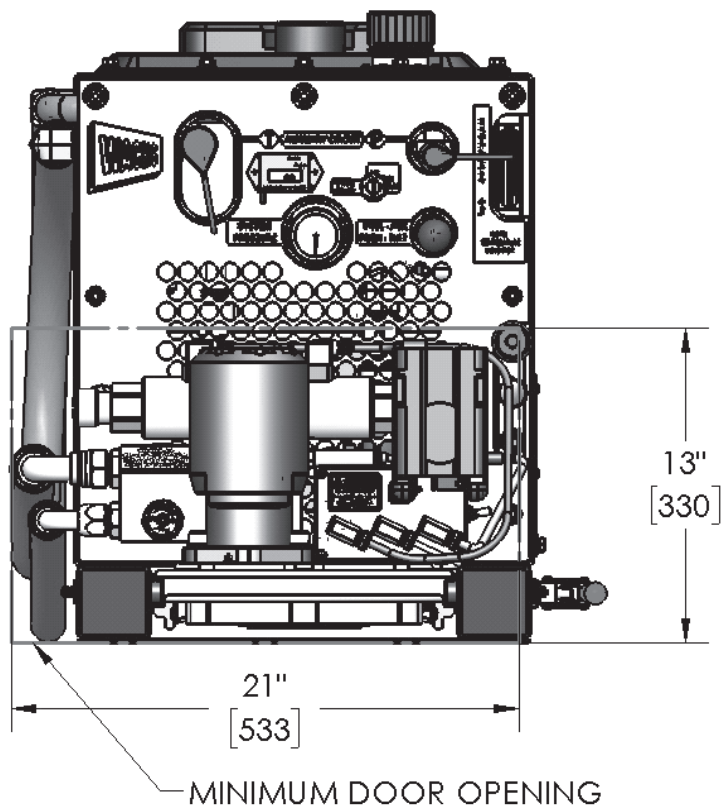


Figure 4-6. Minimum door opening for 17-000-24. (Same for 17-000-22, 17-000-27, and 17-000-29.)

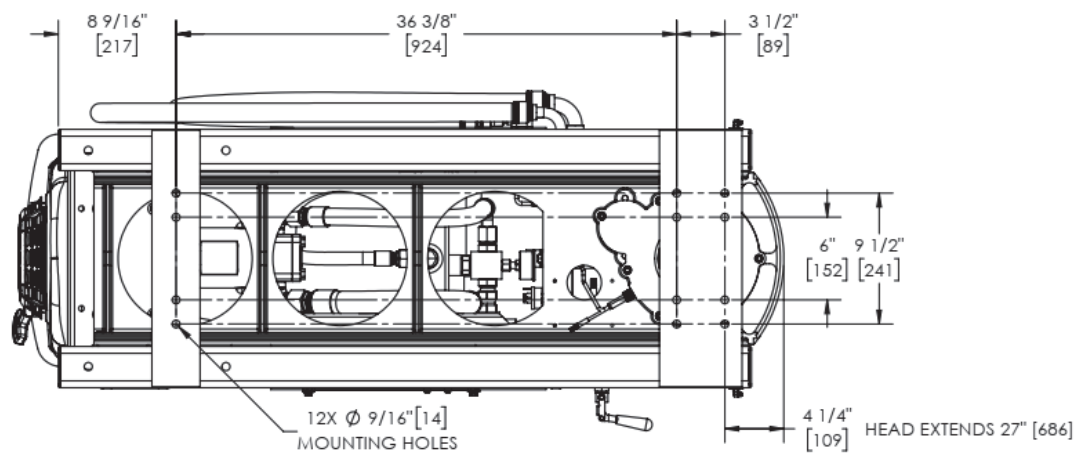


Figure 4-7. Mounting holes for 17-000-24. (Same for 17-000-22 and 17-000-27.)

For a 17-000-24 machine without the hydraulics/gasoline engine option, there are 2x hoses for hydraulic hookup.

- Refer to the hydraulic schematics in Chapter 8 for more details.

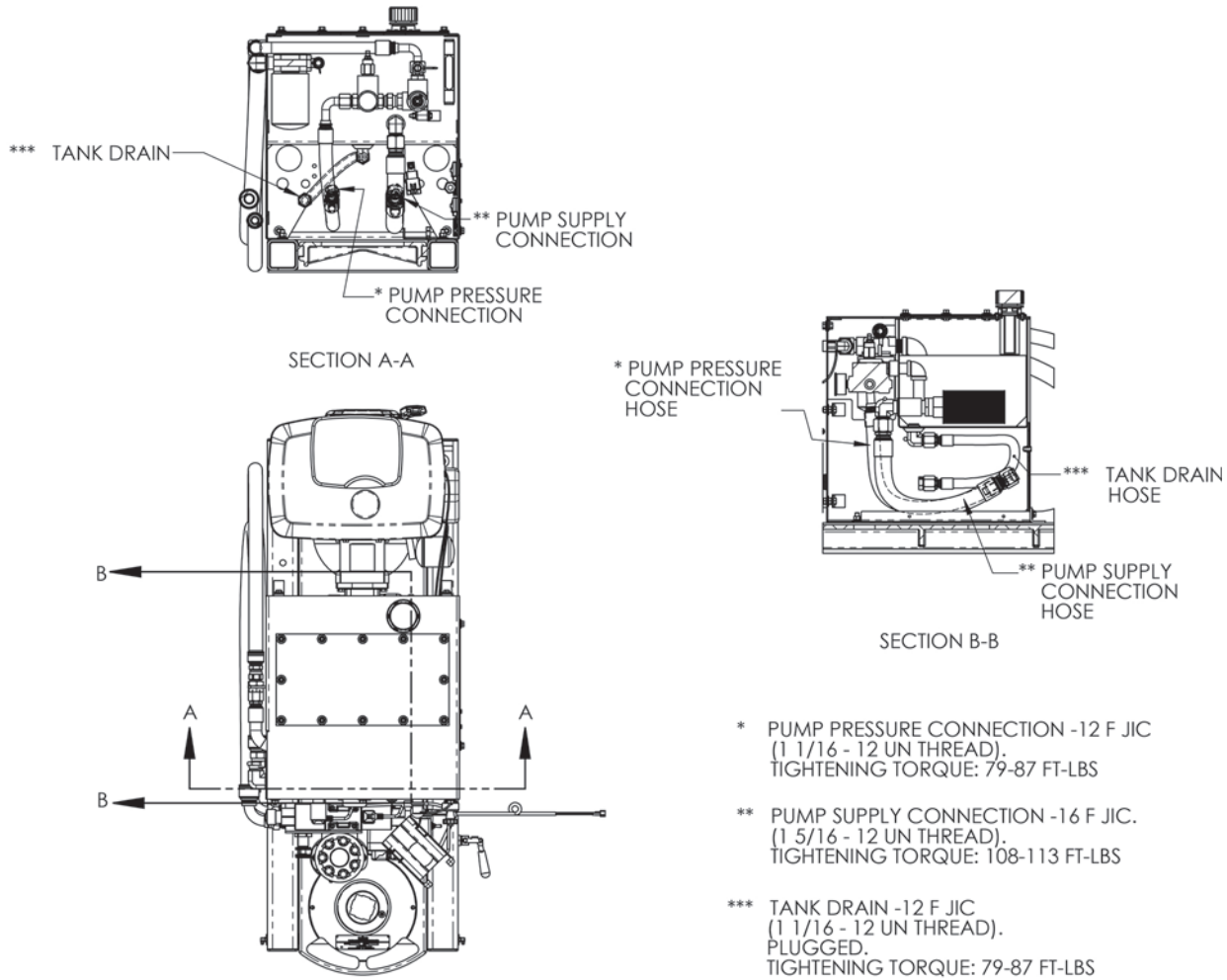


Figure 4-8. Hydraulic hookups, 17-000-24.

Electrical. See Table 1 on page 27 for electrical specifications. See the electrical schematic in Chapter 8 for detailed electrical information.

TM-7 Standard Duty Trailer Mount. 17-000-27

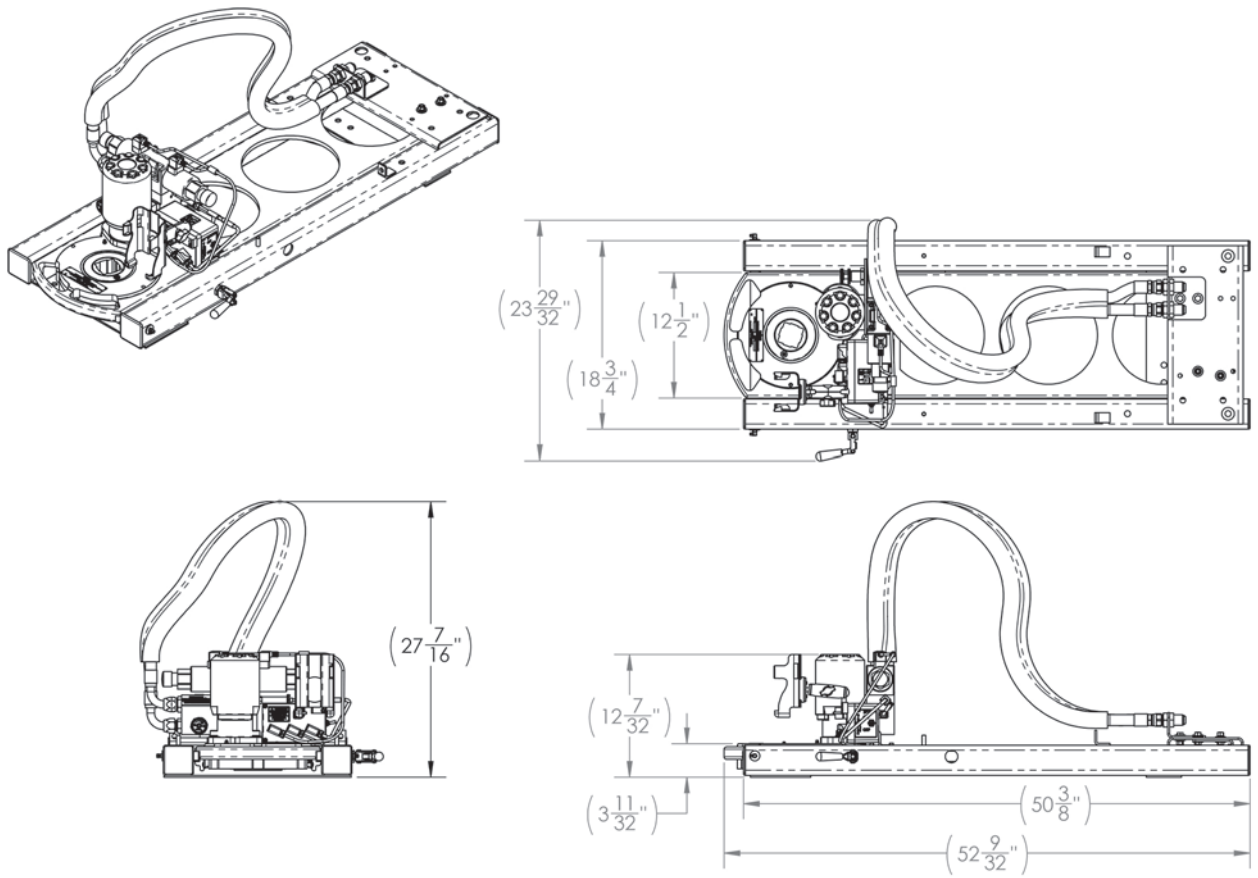


Figure 4-9. Overall dimensions for TM-7 configuration 17-000-27.

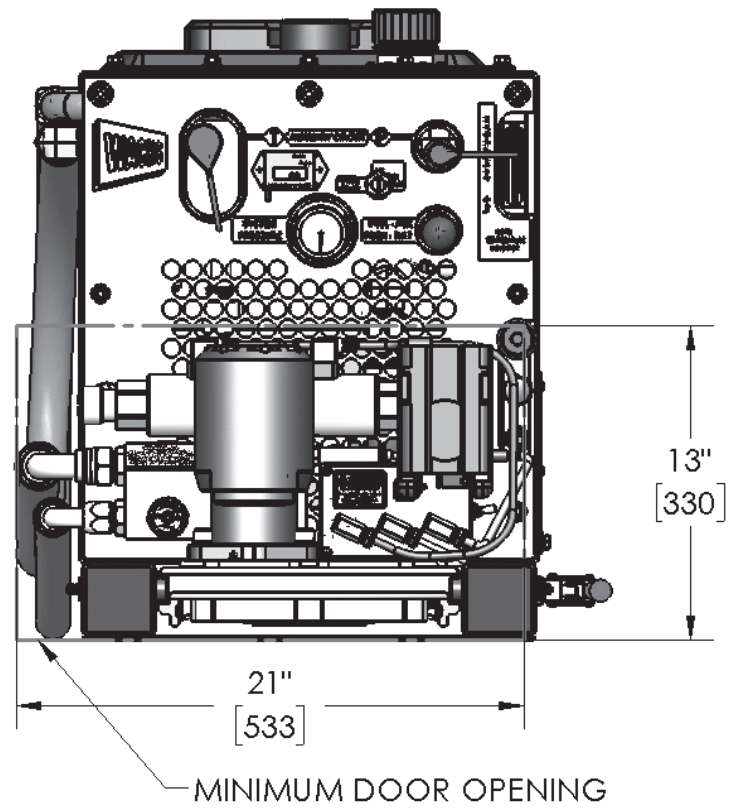


Figure 4-10. Minimum door opening for 17-000-27. (Same for 17-000-22, 17-000-24, and 17-000-29.)

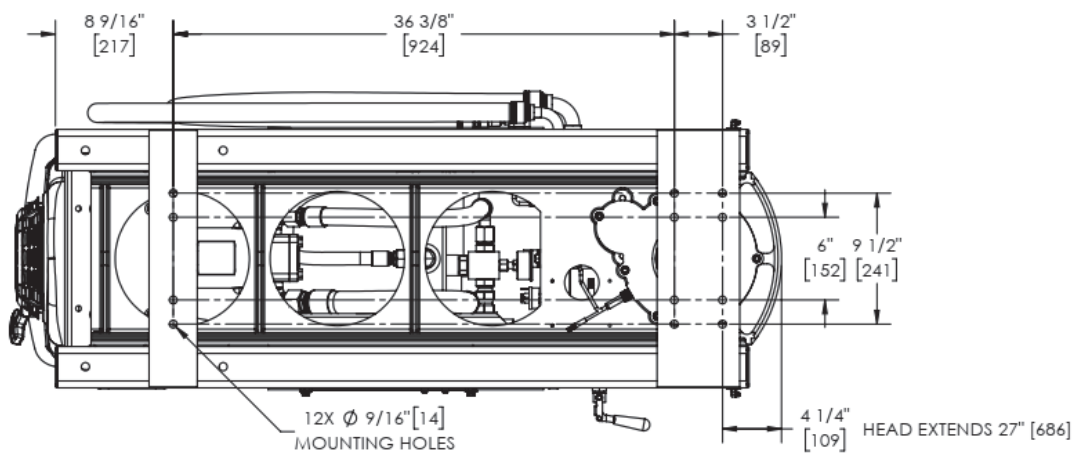


Figure 4-11. Mounting holes for 17-000-27. (Same for 17-000-22 and 17-000-24.)

For 17-000-27 machines, there are 2x male fittings for hydraulic hook-up.

- Refer to the hydraulic schematics in Chapter 8 for more details.

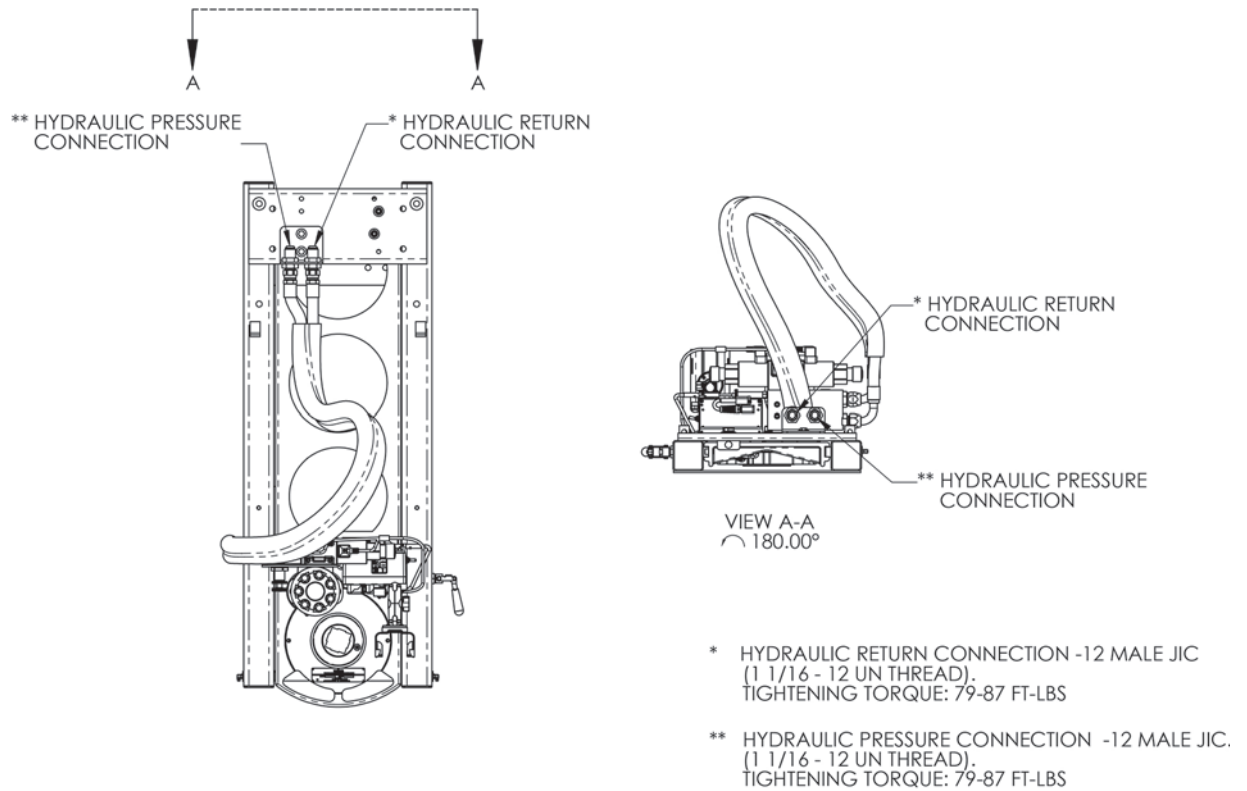


Figure 4-12. Hydraulic hookups for 17-000-27.

Electrical. See Table 1 on page 27 for electrical specifications. See the electrical schematic in Chapter 8 for detailed electrical information.

TM-7 Standard Duty Grand LX Trailer Mount. 17-000-29

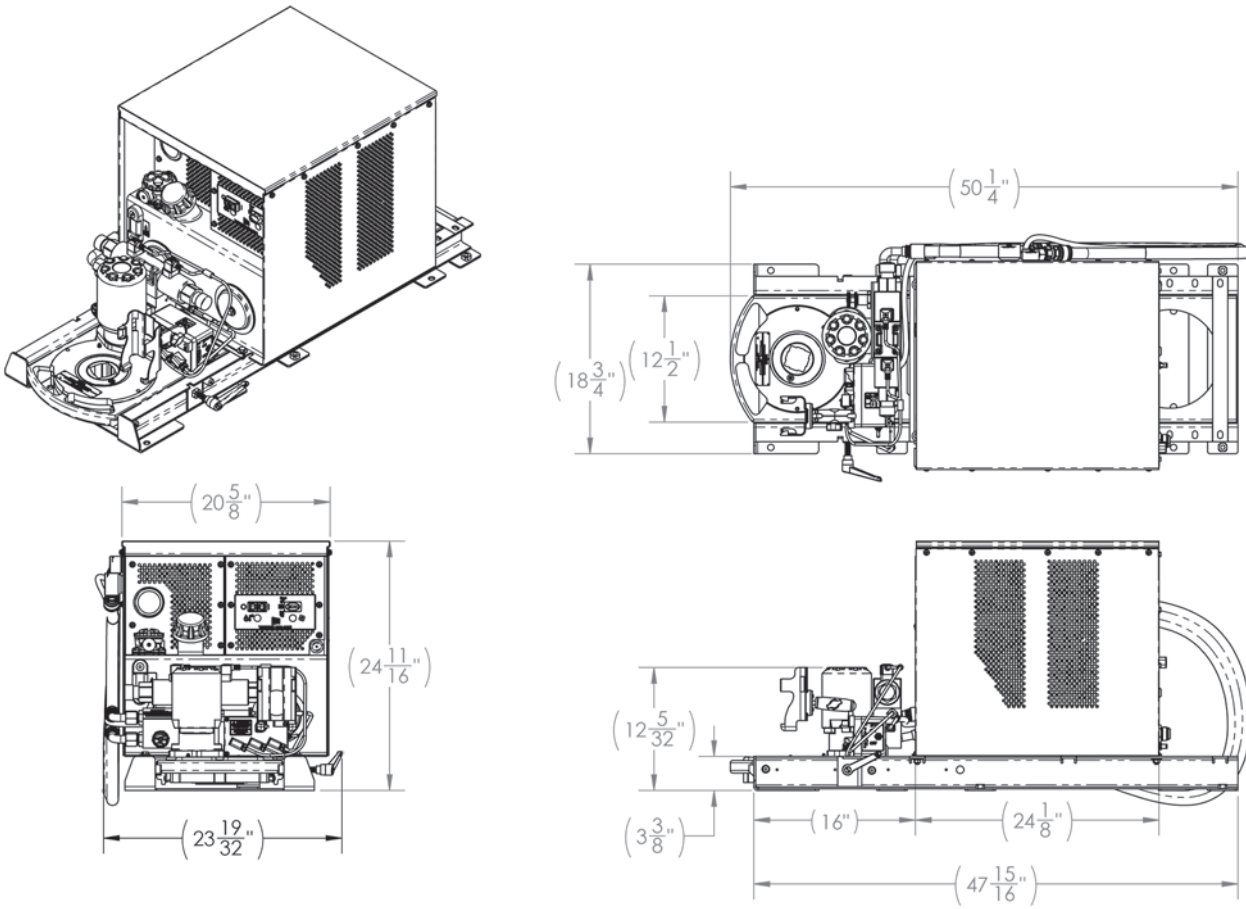


Figure 4-13. Overall dimensions for TM-7 configuration 17-000-29.

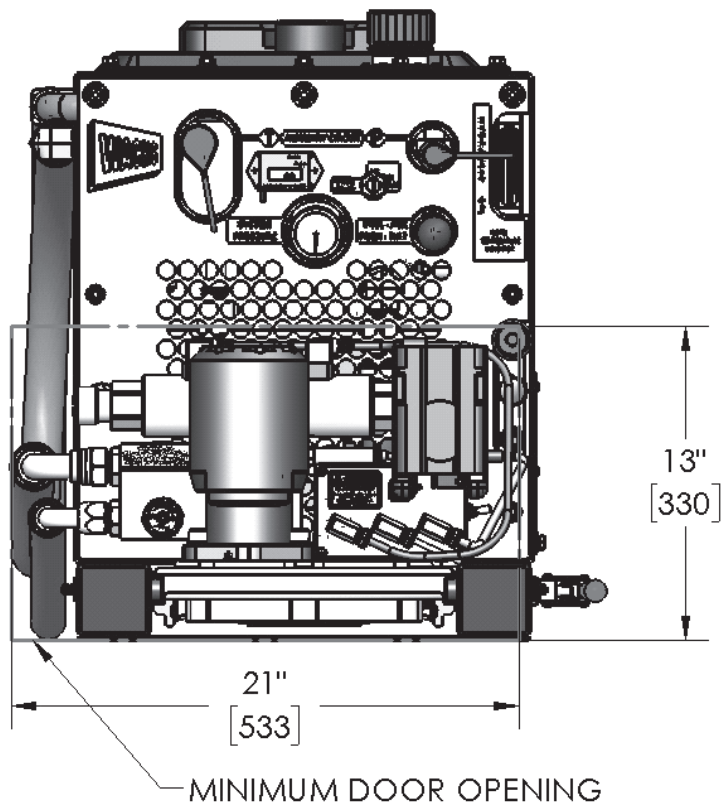
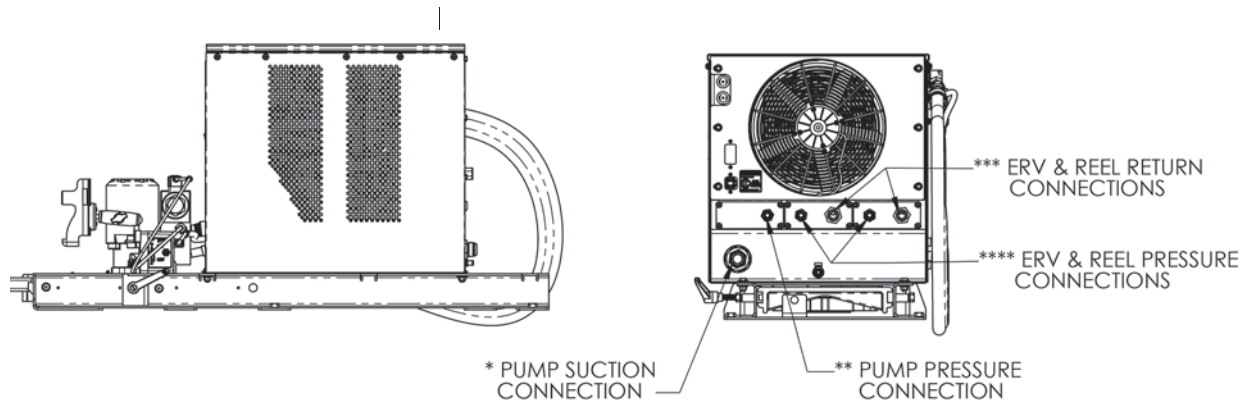


Figure 4-14. Minimum door opening for 17-000-29.
(Same for 17-000-22, 17-000-24, and 17-000-27.)



- * PUMP SUCTION CONNECTION -16 MALE JIC (1 5/16 - 12 UN THREAD). TIGHTENING TORQUE: 108-113 FT-LBS
- ** PUMP PRESSURE CONNECTION -8 MALE JIC. (3/4 - 16 UN THREAD). TIGHTENING TORQUE: 38-42 FT-LBS
- *** ERV & REEL RETURN CONNECTIONS -12 MALE JIC (1 1/16 - 12 UN THREAD). MUST BE PLUGGED IF NOT USED TIGHTENING TORQUE: 79-87 FT-LBS
- **** ERV & REEL PRESSURE CONNECTIONS -8 MALE JIC. (3/4 - 16 UN THREAD). MUST BE PLUGGED IF NOT USED TIGHTENING TORQUE: 38-42 FT-LBS

Figure 4-15. Hydraulic hookups for 17-000-29.

- Refer to the hydraulic schematics in Chapter 8 for more details.

Electrical. See Table 1 on page 27 for electrical specifications. See the electrical schematic in Chapter 8 for detailed electrical information.

TM-7 HD Plus Skid Mount. 17-000-30

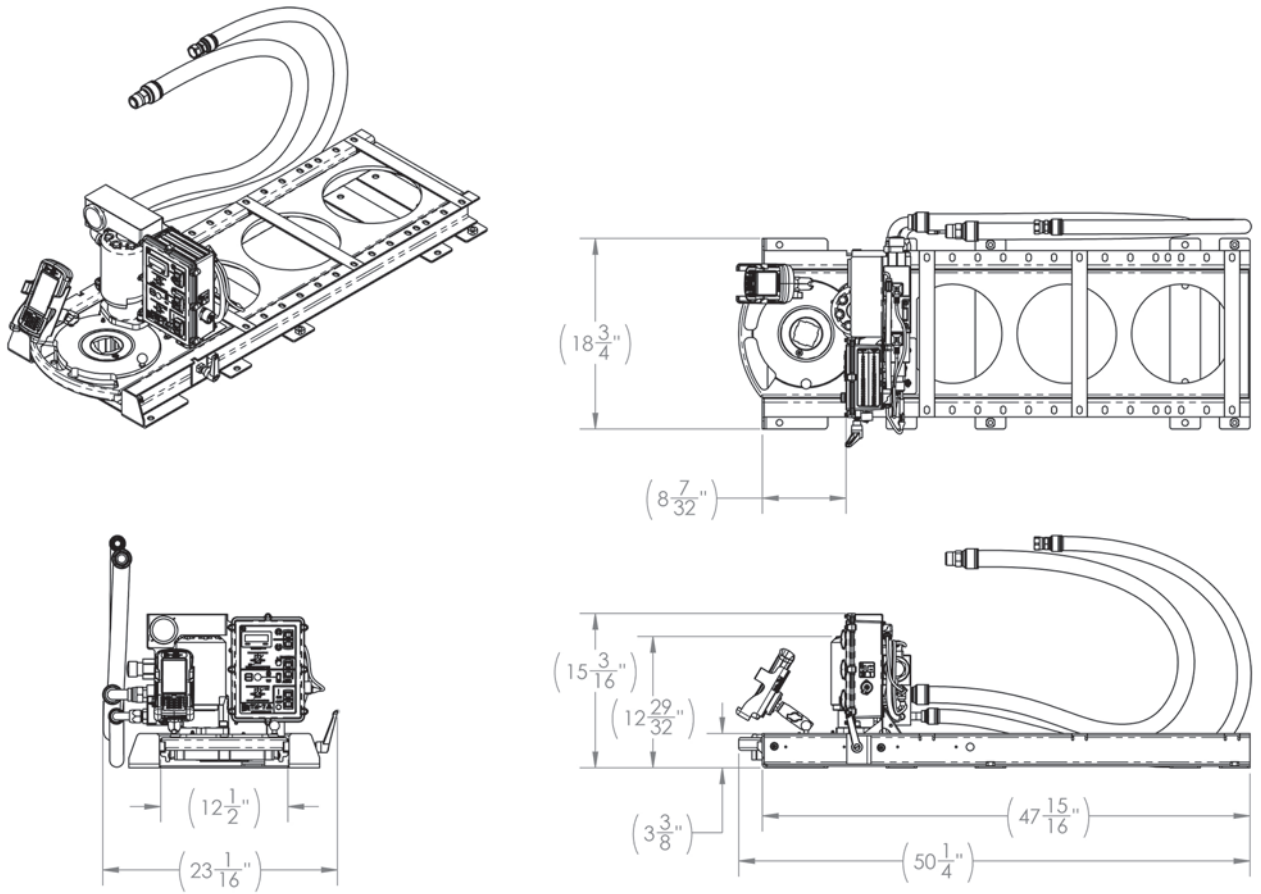


Figure 4-16. Overall dimensions for TM-7 configuration 17-000-30.

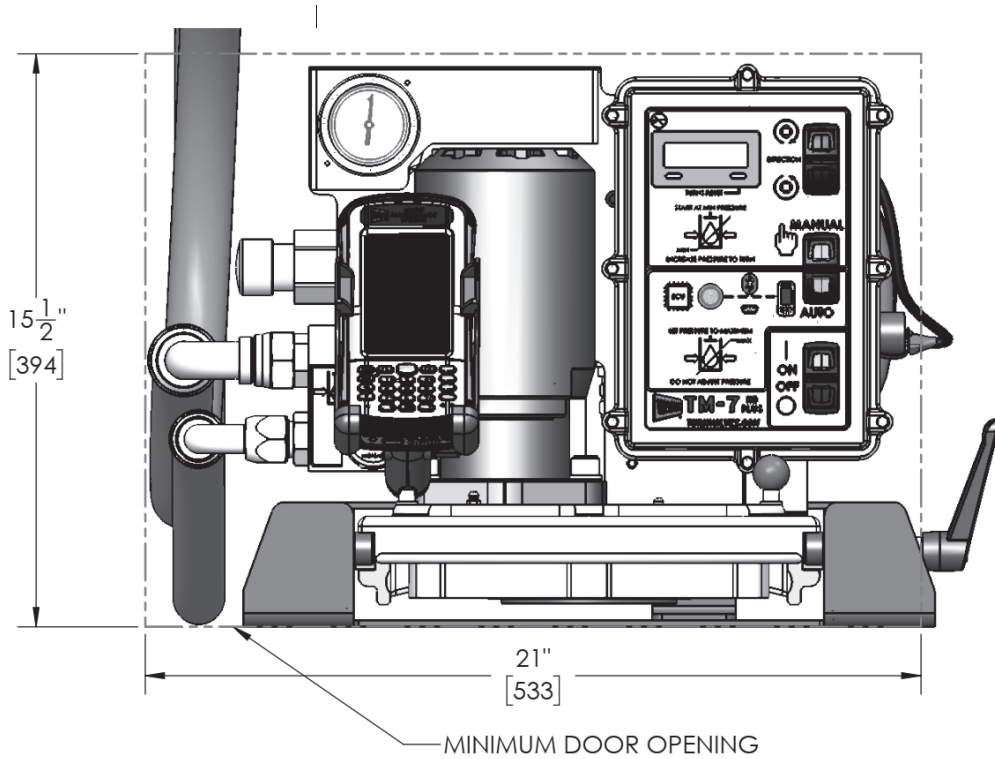


Figure 4-17. Minimum door opening for 17-000-30.

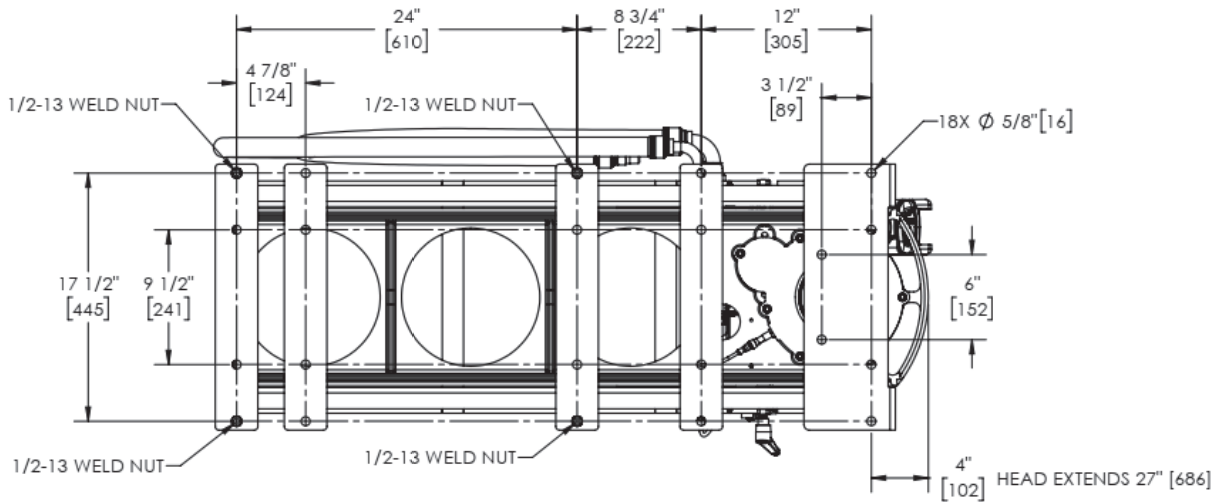


Figure 4-18. Mounting holes for 17-000-30. (Same as 17-000-29).

When the 17-000-30 (TM-7 HD Plus) configuration is installed on a VMS skid system, it is typically ordered as part no. 17-405-00. This includes the TM-7, hoses, and mounting hardware.

When mounted to the skid, the TM-7 HD Plus can be positioned at an appropriate location so that the head can reach the driver side of the truck. The following diagrams illustrate the 17-000-30 installed on a VMS. Refer to drawing 17-405-00 for additional information.

When mounting a TM-7 to 77-405-00 Swivel Plate or to the Grand Trailer swivel plate, refer to drawing 77-405-00 in Chapter 9, or refer to the Trailer Manual (77-MAN-21).

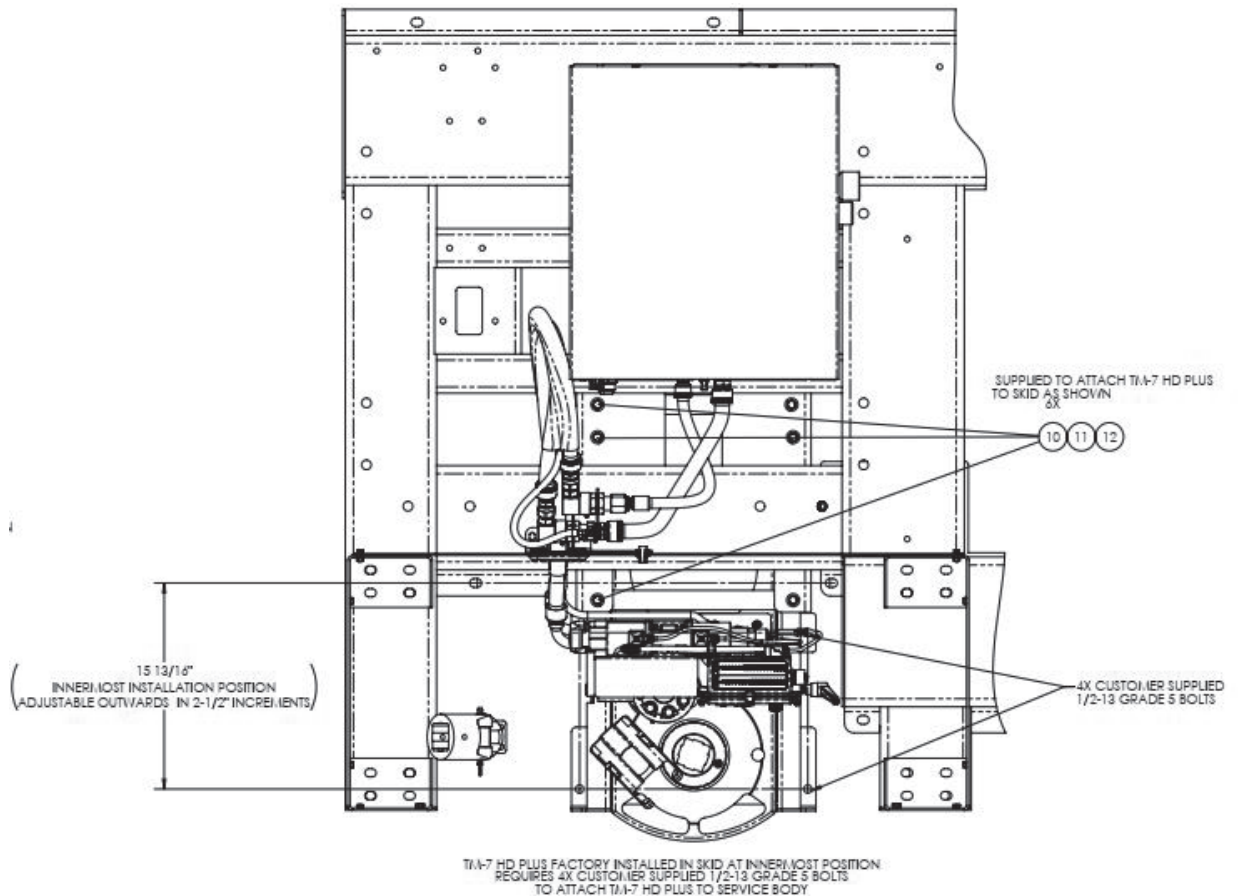


Figure 4-19. The diagram illustrates the skid-mounted TM-7 HD Plus at the innermost slide position.

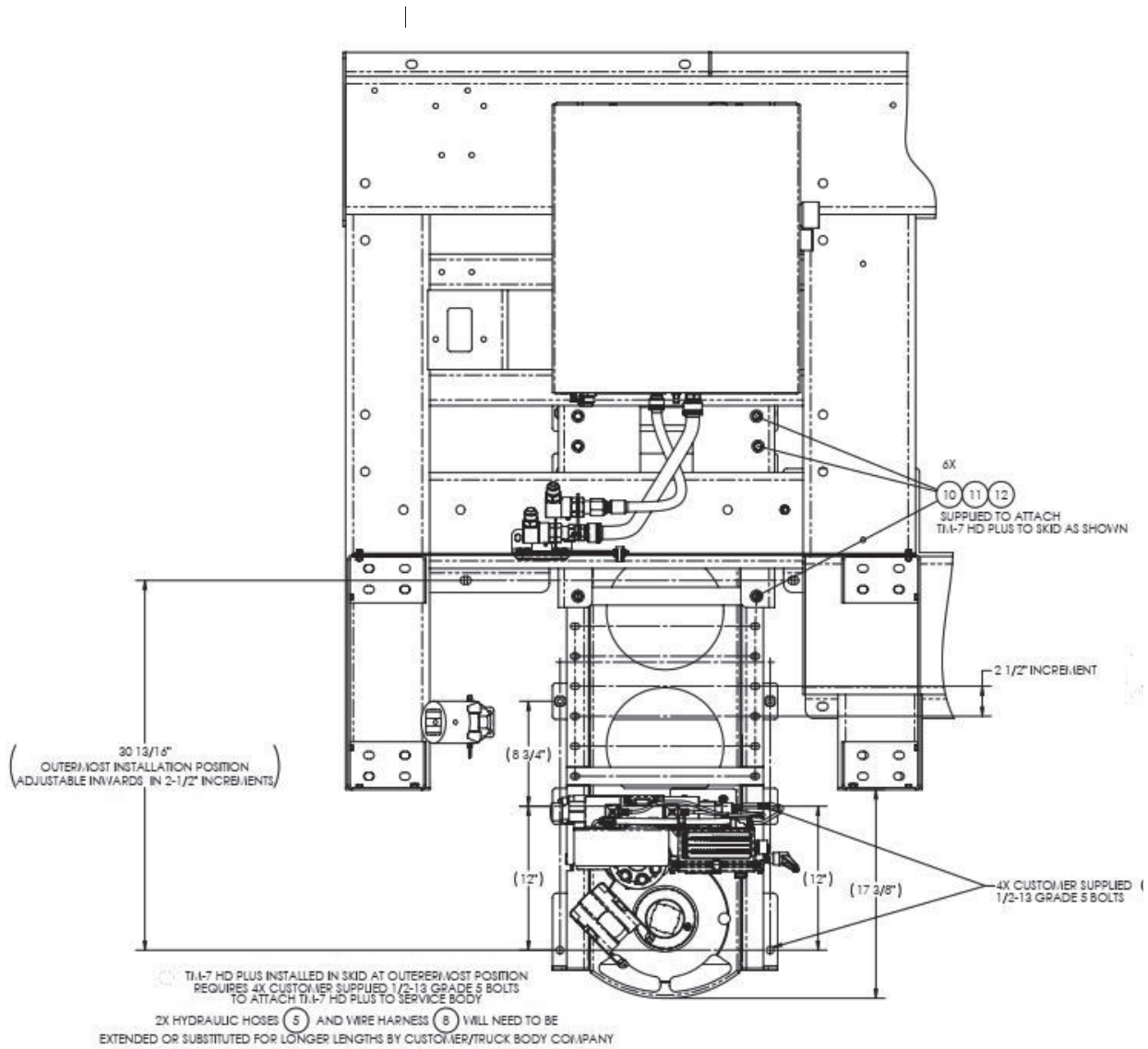
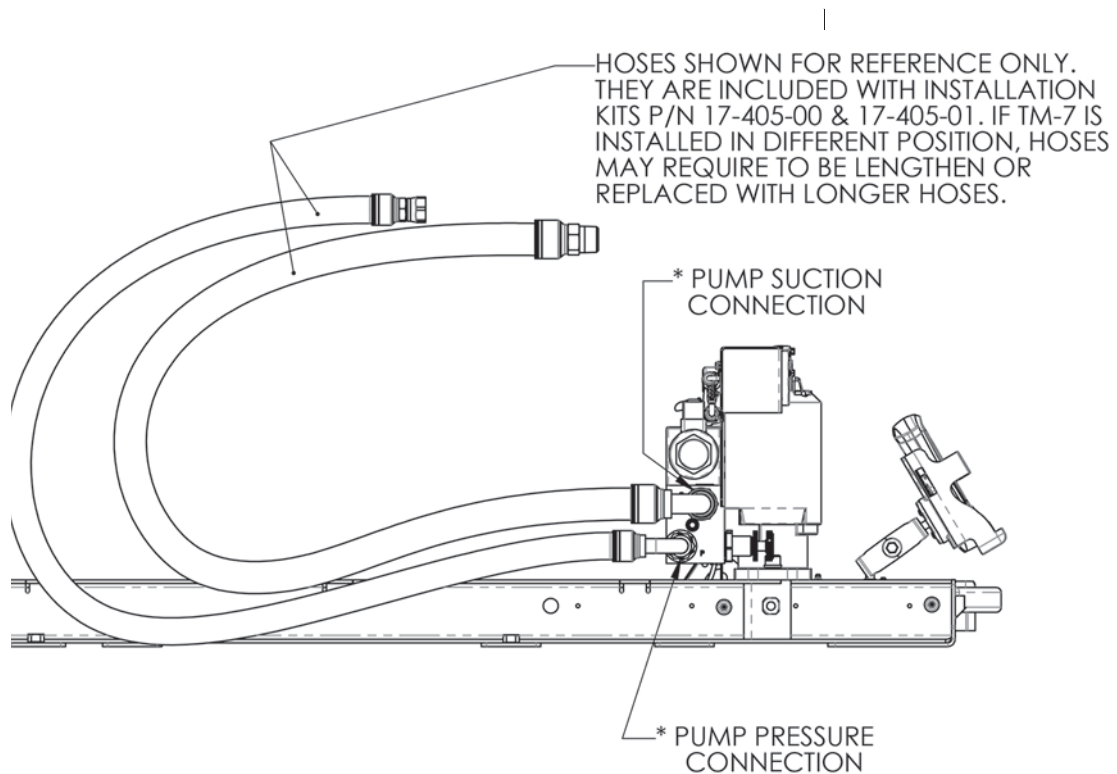


Figure 4-20. The diagram illustrates the skid-mounted TM-7 HD Plus at the outermost slide position.



* PUMP PRESSURE & SUCTION CONNECTIONS -12 MALE JIC (1 1/16 - 12 UN THREAD). MUST BE PLUGGED IF NOT USED
TIGHTENING TORQUE: 79-87 FT-LBS

Figure 4-21. Hydraulic hookups for 17-000-30.

- Refer to the hydraulic schematics in Chapter 8 for more details.

Electrical. See Table 1 on page 27 for electrical specifications. See the electrical schematic in Chapter 8 for detailed electrical information.

Top-Mounted Installation

Have the frame extension, angle brackets, and installation hardware ready before you begin installation. These items are ordered and shipped separately from the TM-7 unit.

See the illustration on the next page.

1. Measure the width of the truck bed.



IMPORTANT

After the first operation of the TM-7, recheck the tightness of the "J" hooks. Check their tightness every month.

- 2.** Slide the frame extension into the TM-7 main frame from the rear. The frame extension has been drilled for multiple mounting locations.
- 3.** Align the mounting holes that allow the overall length of the frame and extension be equal to or slightly longer than the outside maximum width of your truck bed walls.
- 4.** Using the supplied four 1/2-13 x 4" HHCS, 8 flat washers, and four 1/2 13 hex nuts, secure the extension to the TM-7 frame.
- 5.** Lift the TM-7 into the pickup bed and position it at the desired location.
- 6.** Install the adjustable angle brackets. They require two 1/2-13 x 1-1/2" HHCS, four flat washers, two lock washers, and two 1/2 13 hex nuts each, which are supplied.
- 7.** Butt the adjustable angle brackets against the bed wall lip and tighten the fasteners.
- 8.** Install the two rear (engine side) "J" hooks and snug with two flat washers, two lock washers and two 3/8-16 hex nuts.
- 9.** Install the two forward "J" hooks. Snug the fasteners.
- 10.** Tighten all four "J" hooks equally until unit is firmly secured to bed.
- 11.** Using the angle bracket as a template, mark the inside of truck bed for mounting hole locations.
- 12.** Drill through truck bed inside wall. Bolt the angle bracket to truck bed. (Fasteners not included.)



NOTE

The "J" hooks mount on the adjustable angle brackets. They clamp to the upper wall between the inside lip and the outside wall of the pickup bed.

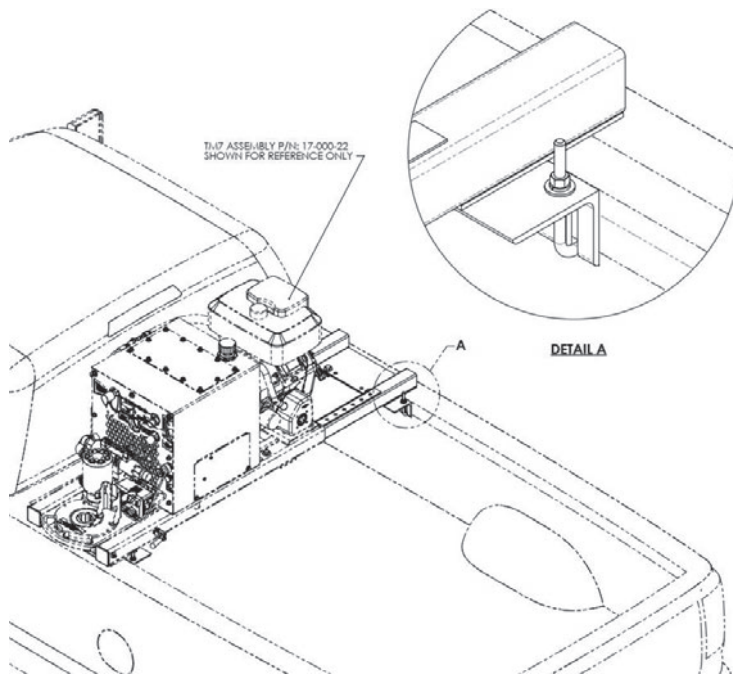


Figure 4-22. The drawing illustrates top-mounted installation of the TM-7 on a pickup bed.

PREPARING FOR USE

After installation, follow these guidelines to put the TM-7 in service.

- 1.** Fill the hydraulic reservoir using Mobile DTE or equivalent hydraulic oil (ISO-32). The reservoir holds approximately 10 gallons.
- 2.** Lubricate the unit according to the instructions in Chapter 6.
- 3.** Check the engine oil level. (Units with gas engine.)
- 4.** Check the engine coolant level. (Units with gas engine.)
- 5.** Fill the engine fuel tank. Use a standard automotive gasoline. (Units with gas engine.)
- 6.** Connect the battery to the cables. The TM-7 is provided with a maintenance-free battery, which does not require you to fill the battery or perform other service.



Chapter 5

Operating Instructions

SETTING UP THE VALVE OPERATOR

Follow all safety guidelines for parking and positioning the vehicle to perform a valve operation.

1. Park the vehicle so that the TM-7 extension slide can reach over the valve. (The power head can be extended up to 27" [686 mm] from the TM-7 frame.)
2. If you are using the TM-7 on a swivel trailer, release the swivel clamps and move the TM-7 to the required orientation. Re-tighten the swivel clamps.

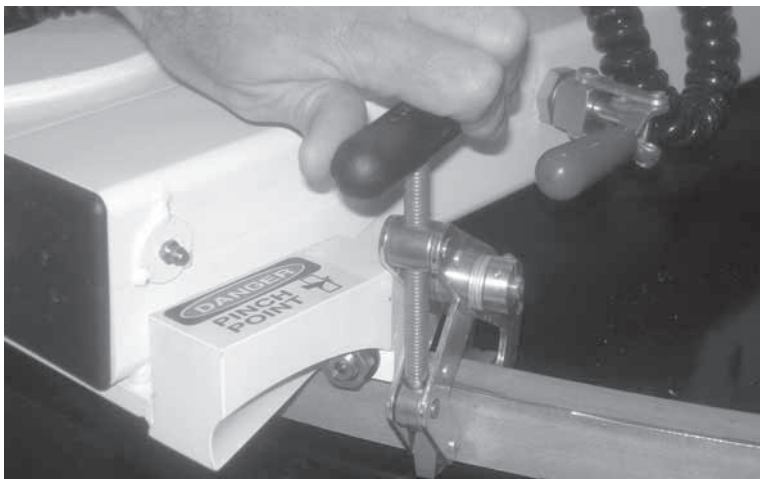


Figure 5-1. For a swivel-mounted TM-7, loosen the swivel clamps (one each side) to position the TM-7.

In This Chapter

SETTING UP THE VALVE OPERATOR

PERFORMING THE VALVE OPERATION

OPERATING AUXILIARY EQUIPMENT

CHARGING OR JUMP-STARTING THE BATTERY

3. Release the latch lever holding the extension slide.

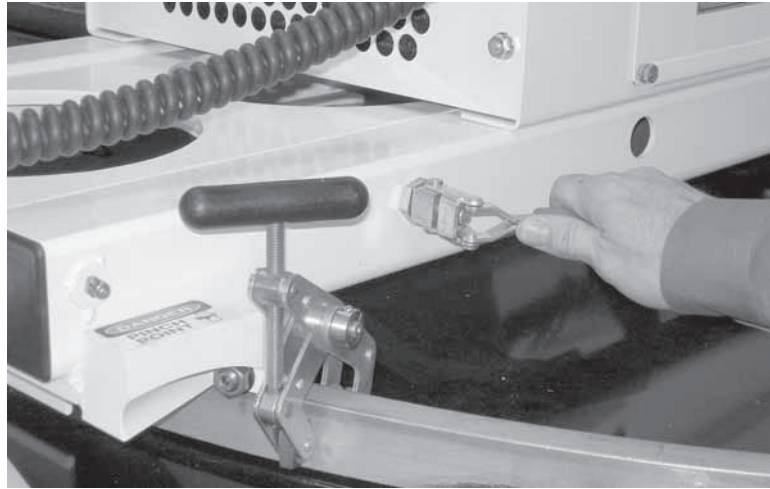


Figure 5-2. Pull the locking lever to release the extension slide.

4. Pull the slide out to position the power head over the valve. Lock the latch lever holding the slide.
5. Insert the valve key adapter through the head.



NOTE

The head does not have to be perfectly positioned over the valve. The valve key attachment swivels to allow off-center operation.

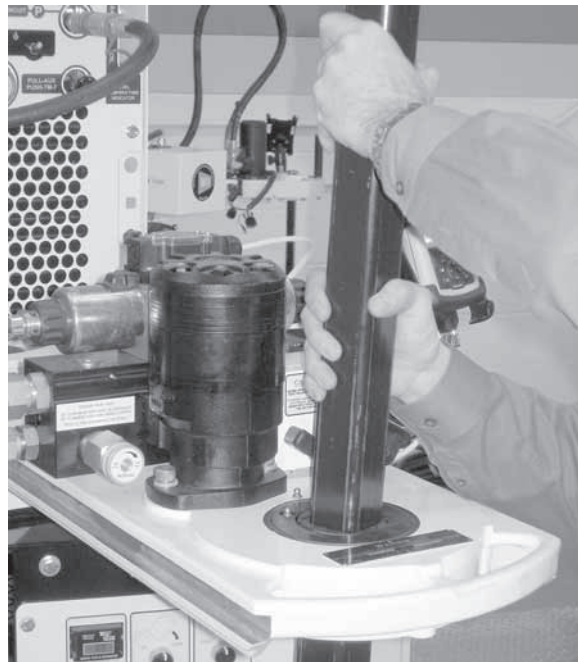


Figure 5-3. Insert the valve key adapter through the power head.

6. Install the socket on the bottom of the key and insert the pin.
7. Lower the valve key down into the valve vault and position the socket end of the key on the valve nut.

Starting the Engine

Use the following procedure for a TM-7 equipped with the gas engine.

1. Check that there is enough fuel in the gas tank for the job you are performing.
2. Open the fuel valve on the engine fuel line.
3. Pull the throttle halfway out.
4. If the engine is cold, pull the choke out.
5. Turn the keyswitch on the front panel to START. When the engine starts, release the keyswitch back to the ON position.
6. Allow the engine to run for a minute or so to warm up. Push the choke back in.



CAUTION

Use short starting cycles with the keyswitch. Prolonged cranking (more than 15 seconds) can damage the starter motor.

PERFORMING THE VALVE OPERATION

TM-7 with Vitals HC-100 Controller

When you perform the valve operation, you can operate the TM-7 only in controller mode (without logging valve data), or you can use the Vitals data logging program to record valve operating information.

Intelligent “Reverse and Turn” Valve Exercising

When you run the valve operator using the Vitals HC-100 controller in **EXER** mode, it uses the Intelligent “Reverse and Turn” exercising protocol to determine direction of valve rotation.

The valve operator starts with a “break-loose” procedure. It turns in one direction, stopping if it meets resistance of 50

lb-ft of torque. It reverses direction, again trying to turn the valve with 50 lb-ft. If unsuccessful, it will reverse again and increase torque to 100 lb-ft.

The operator will continue this back-and-forth procedure (increasing torque in 50 lb-ft increments up to the torque limit) until it finds the valve's free-turning direction. At this point, the **Direction** button will change to **RH** or **LH**. The controller will lower the torque limit to the minimum required to keep the valve turning.

When the valve operator meets resistance and reaches the torque limit, it stops and reverses a few rotations, then tries to rotate forward again. If it can't turn, the controller displays **Insufficient Torque**. Check the **Count** button to see if you have reached the valve's expected end of travel. If you think the valve should turn further, increase the torque limit and tap the **START** button again. See if the valve turns any further. You may have to increase the torque limit additional steps.

Starting the Valve Activity

- 1.** Set the TM-7 up at the valve location as described above in "Setting Up the Valve Operator".
- 2.** If your TM-7 is equipped with a gas engine, start the engine as described above in "Starting the Engine".
- 3.** Adjust the engine throttle to operating speed. For PTO-driven configurations, engage the PTO.
- 4.** Make sure the pressure relief knob on the hydraulic manifold is set to **maximum**. Turn it all the way clockwise for the maximum setting.



CAUTION

Use the maximum setting only when operating the TM-7 with the Vitals HC-100 controller. For manual operation, see "Operating the TM-7 with Manual Override Controls" later in this chapter.



Figure 5-4. Turn the pressure relief knob all the way clockwise for maximum pressure when operating the TM-7 using the Vitals HC-100 controller.

5. Press the switch on the TM-7 control box to the ON position. The power indicator on the switch will light.

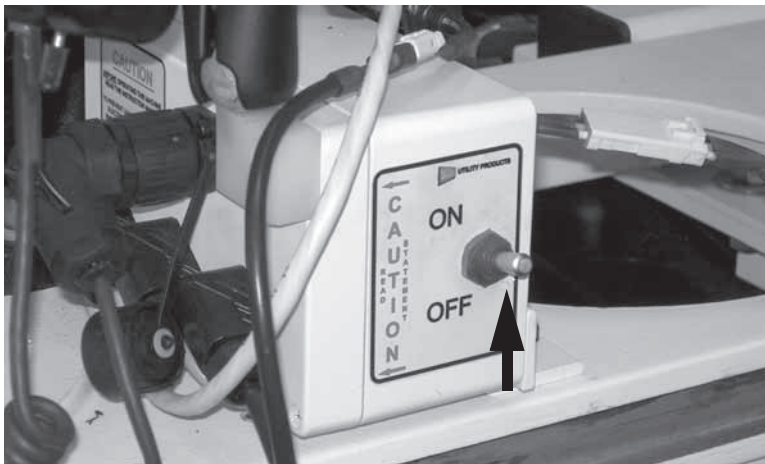


Figure 5-5. Push the switch on the control box to the "ON" position.

6. Take the Vitals HC-100 controller out of its storage cradle and press the power button to turn it on. The Windows Mobile screen will come up.
7. The Vitals Mobile icon appears on the HC-100 home screen. Tap the icon to start the program.



NOTE

Make sure the controller is connected to the control box before turning on the switch.



NOTE

Remove the stylus from the back of the controller and use it to tap the touch-screen controls.



Figure 5-6. HC-100 home screen. Press the Home button on the keypad at any time to return to the home screen.

- 8. The Vitals Mobile main screen appears.

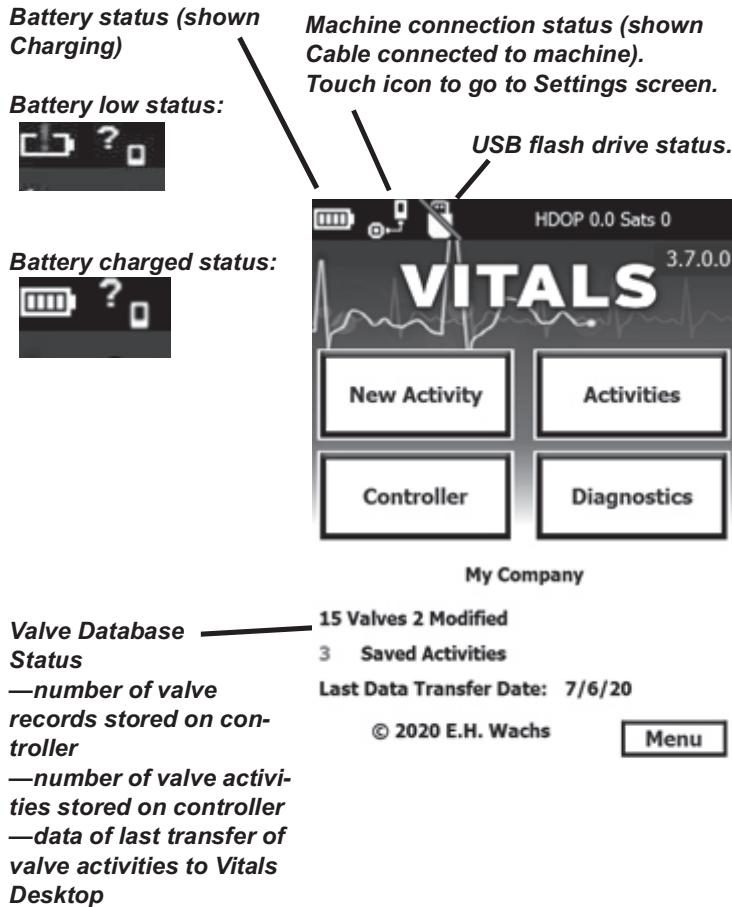


Figure 5-7. From the Vitals Mobile startup screen, you can start a new activity, list saved activities, or review and change program settings.

9. To start a new valve exercising activity, touch the **New Activity** button.
10. You will be prompted to select an existing valve, or enter a new valve. Refer to the *Vitals Help File* on the Vitals disk for detailed instructions on using the Vitals Mobile software.
11. Once you have selected or entered the required valve information, refer to the next section to use the valve exerciser controller program.

Running the Wachs Controller Program

This section briefly describes the operating features of the Wachs Controller program. Refer to the *Vitals Help File* on

the Vitals disk for detailed instructions on using the Vitals Mobile software.

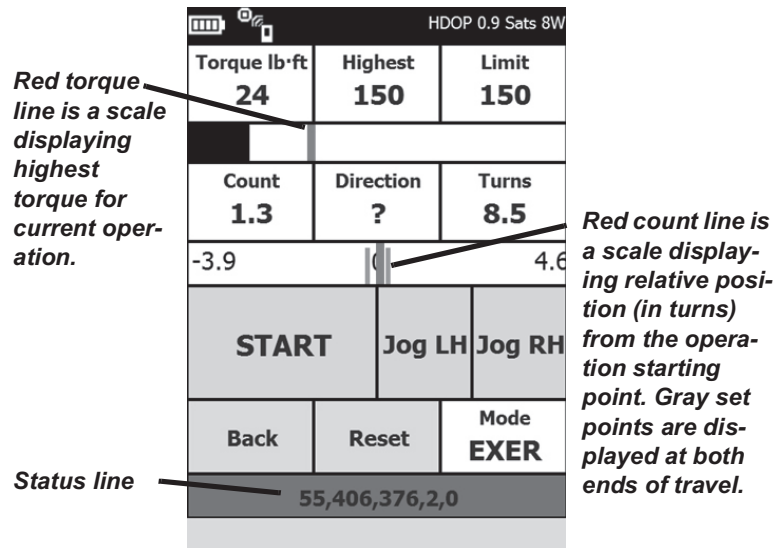


Figure 5-8. Touch the buttons on the controller program screen to change settings and operate the valve exerciser.



NOTE

If you don't know the valve direction, leave the **Direction** set to ?. The valve exercising program will attempt to determine the freely turning direction.

1. The **Limit** field displays the current torque limit. (To change the default torque limit setting, go **Back** to the main screen and tap the **Settings** button. Select a **Default Torque Limit** and tap the **Apply** button, then confirm the "Changing Settings" dialog.)
2. If you know the direction the valve needs to be turned, touch the **Direction** button until either **LH** (left hand) or **RH** (right hand) is displayed.
3. Press the **Start** button. The button will turn red and will display **Stop**. Press the button again if you need to stop the valve operation.
4. The valve operator head will turn the valve until the torque limit is reached.
5. When the torque limit is reached, the head will stop and the controller will increment the limit up by 50 lb-ft. The head will reverse and turn until it reaches the new limit.
6. Once the valve operator finds the free direction of rotation, it will turn the valve all the way to the end of travel. It will stop when the torque limit is reached.

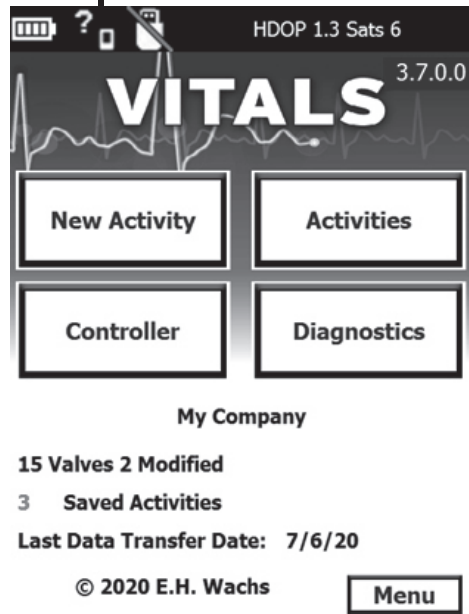
- 7.** If you do not want the valve operator to exceed a certain torque (for example, if you know the valve may be damaged by a high torque), touch the **Mode** button to change the mode to **MAN** (manual). You will then have to set the direction, and manually reverse the direction and increase the torque limit.
- 8.** When the valve operation is complete, you can touch the **Back** button to return to the Vitals Mobile program if you are logging data.
- 9.** If you are not logging data, you can touch the **Reset** button to clear the screen to start another valve operation.

Connecting the Controller to the TM-7

You can connect the controller to the TM-7 using the provided cable (part #79-302-10), or wirelessly using Bluetooth. Use the following instructions to make the connection.

- 1.** Tap the **Controller Settings** icon at the top of the Vitals home screen.

Controller Settings



*Figure 5-9. Tap the **Controller Settings** icon.*

- 2.** The **Controller Settings** screen appears.

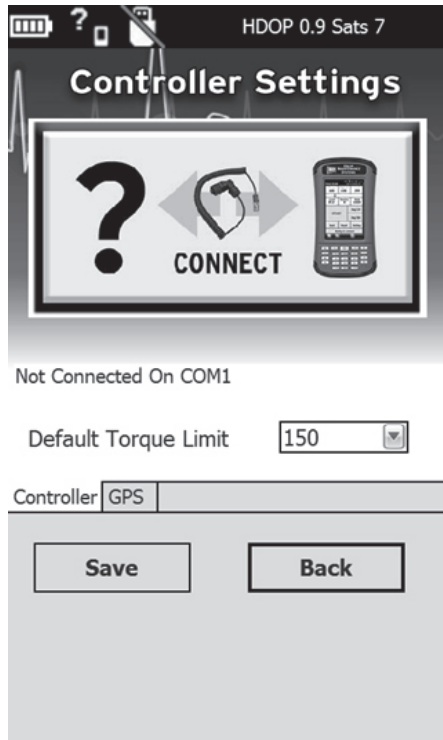


Figure 5-10.

3. Tap the **CONNECT** button to display the connections menu.

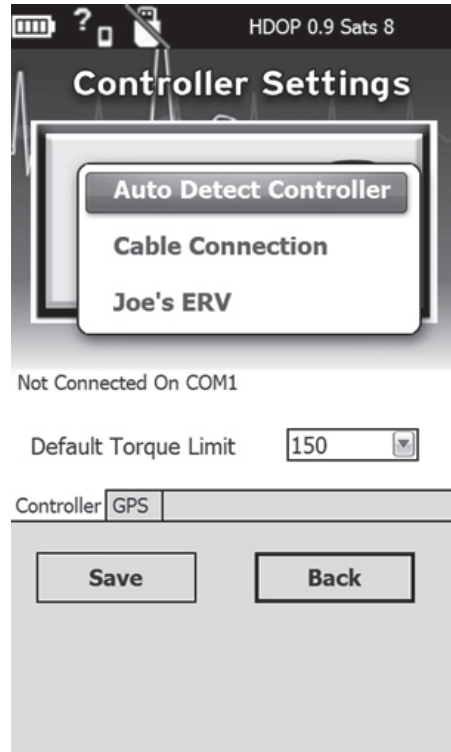


Figure 5-11. Connections menu.

4. Use **Auto Detect Controller** to check all COM ports for a valid machine connection (either cable or Bluetooth).
5. To make a cable connection to a device, tap **Cable Connection**.
 - If there is no device connected, a **Not Connected...** message will appear.

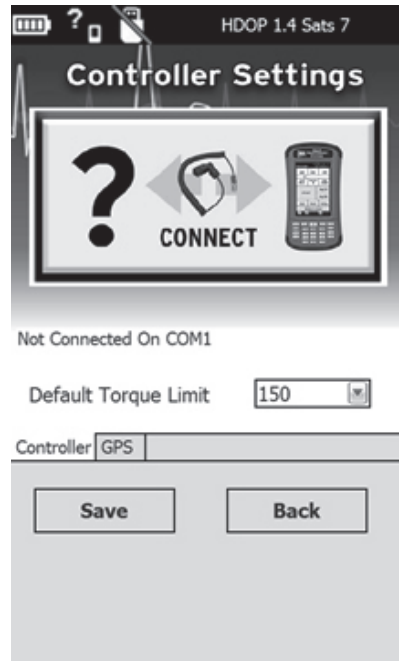


Figure 5-12. Controller Settings screen showing **Not Connected** message.

- If the cable is connected to a device, a **Connected with...** message will appear.

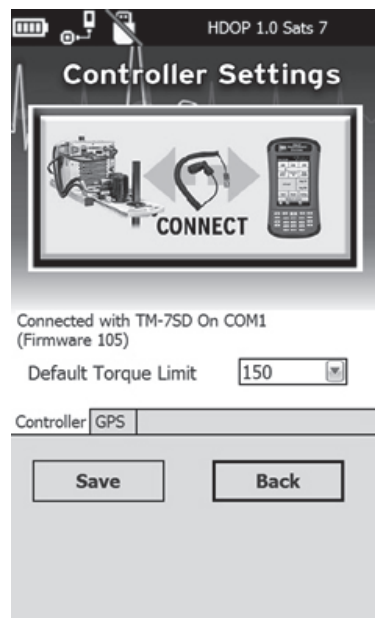


Figure 5-13. The image shows the controller connected to the TM-7.

6. To connect to a specific device, tap on its name in the menu.

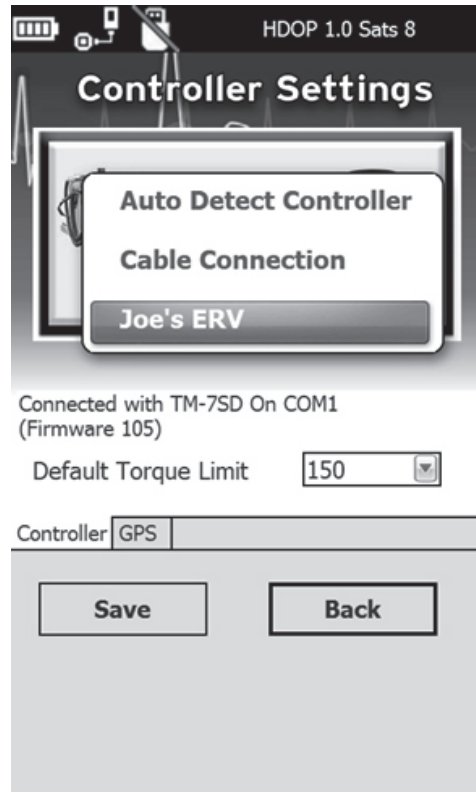


Figure 5-14.

- If the device is not connected, a **Not Connected...** message will appear.

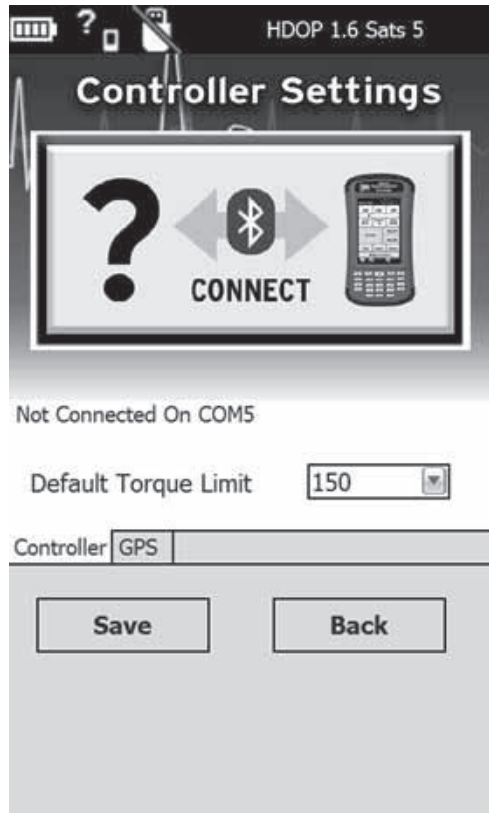


Figure 5-15.

- If the device is connected, a **Connected with...** message will appear.
- 7.** Tap the **Save** button to save the settings. The **Save** button will gray out when settings are saved.

Control Panel Operation with HD Plus Configuration

The TM-7 HD Plus configuration (17-000-30) has controls for operating valves directly from the control panel, without the handheld controller.

- 1.** Set the valve operator up as described at the beginning of this chapter.
- 2.** Start the engine and set the throttle to operating speed.
- 3.** With the power enabled and the control panel turned ON, push **MANUAL** on the **MANUAL/AUTO** switch.

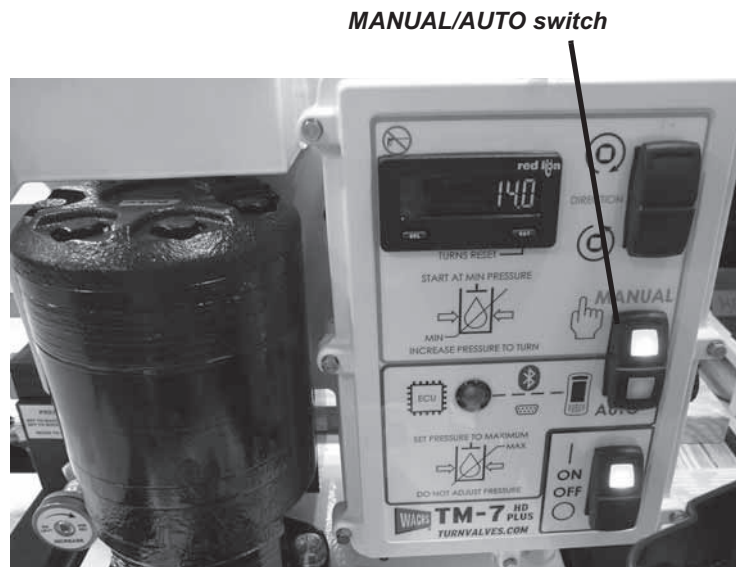
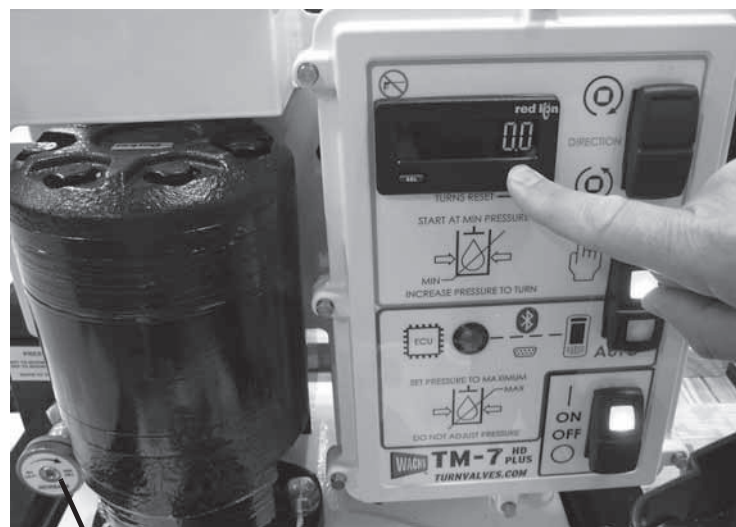


Figure 5-16. The **MANUAL/AUTO** switch will light for the mode you have selected—shown in **MANUAL** mode.

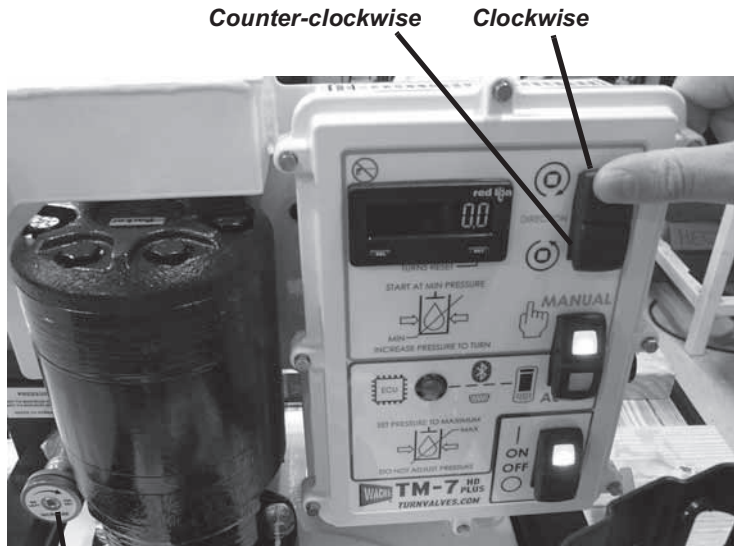
4. Press the **TURNS RESET** button to set the turns counter to 0.
5. Turn the pressure relief knob all the **counter-clockwise** to the minimum pressure setting.



Pressure relief knob—start at minimum (all the way counter-clockwise)

Figure 5-17. Set the pressure relief knob all the way to minimum (counter-clockwise). Press the **TURNS RESET** button to set the counter to 0.

- Press the **DIRECTION** button for the direction you want to turn the valve. While holding the button, turn the pressure relief knob **clockwise** to increase pressure, until the valve starts turning.



Pressure relief knob
 —start at minimum (all the way counter-clockwise)
 —turn clockwise while holding **DIRECTION** button to increase pressure until valve turns

Figure 5-18. Use the **DIRECTION** button and the pressure relief knob to operate the valve.

- Try to turn the valve at the minimum pressure setting. If the valve will not turn, increase the torque by turning the pressure knob approximately one-half turn clockwise.



NOTE

There is a label on the HD Plus control box listing the torque for each pressure setting.

PRESSURE PSI	TORQUE LB-FT
0	0
100	170
200	290
300	410
400	530
500	650
600	772
700	892
800	1012
900	1132
1000	1252
1100	1372
1200	1492
1300	1615
1400	1735
1500	1855
1600	1975
1700	2095
1800	2215
1900	2335
2000	2500



CAUTION

Use caution when increasing the pressure. If you reach a pressure that should turn the valve and the valve isn't turning, set the pressure back to the minimum and try again in the opposite direction.



CAUTION

It is important to operate the valve at the minimum torque required. If you reach the end of travel using high torque setting, you may damage the valve.

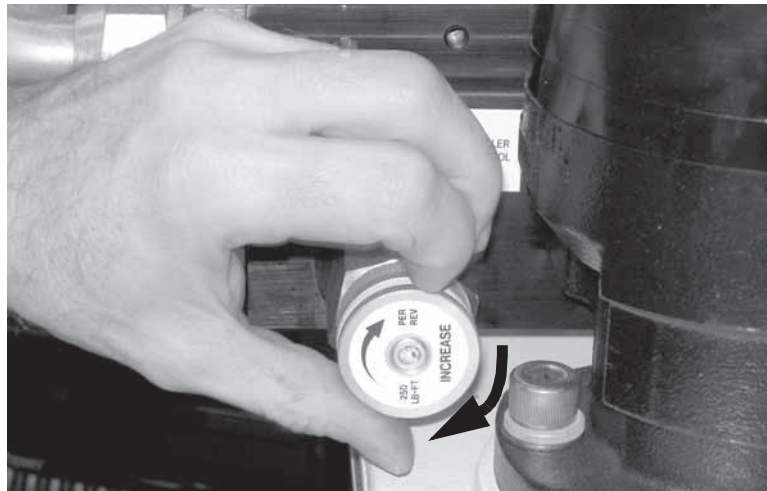


Figure 5-19. To increase the torque, turn the pressure knob clockwise. Each turn increases the torque by approximately 250 lb-ft. Do not increase the pressure more than one turn at a time.

8. If the valve does not turn, increase the torque by one-half turn of the pressure knob at a time.
9. Once you have started the valve turning, release the **DIRECTION** button and reduce the torque to the minimum required to keep the valve turning. You may have to stop and adjust the torque several times.

Operating the TM-7 with Manual Override Controls

If the Vitals HC-100 controller or the TM-7 electronics fail, you can still operate valves using the manual override controls. Turn off the switch on the control box before operating manually.

1. Set the valve operator up as described at the beginning of this chapter.
2. Start the engine and set the throttle to operating speed. For PTO-driven configurations, engage the PTO.
3. Make sure the pressure relief knob on the hydraulic manifold is set to **minimum**. Turn it all the way counter-clockwise for the minimum setting.



Figure 5-20. Turn the pressure relief knob all the way counter-clockwise to start at minimum pressure when operating the TM-7 using the manual controls.

4. To turn the valve operator in the left-hand (counter-clockwise) direction, press in on the left flow control.

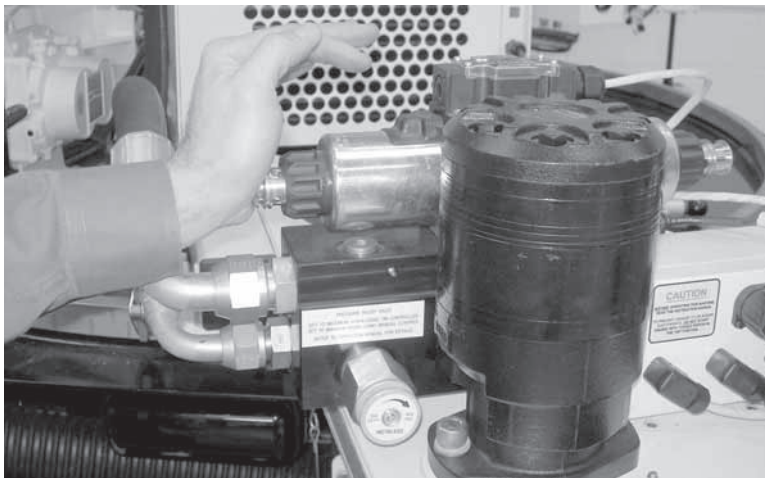


Figure 5-21. Press in the **left** flow control to turn the valve **counter-clockwise**.

5. To turn the valve operator in the right-hand (clockwise) direction, press in on the right flow control.



Figure 5-22. Press in the **right** flow control to turn the valve **clockwise**.

6. Try to turn the valve at the minimum pressure setting. If the valve will not turn, release the flow control and increase the torque by turning the pressure knob one turn clockwise.



Figure 5-23. To increase the torque, turn the pressure knob clockwise. Each turn increases the torque by approximately 250 lb-ft. Do not increase the pressure more than one turn at a time.

7. Try to turn the valve again by pressing in the flow control. If it will not turn, increase the torque by approximately one turn of the pressure knob.

8. Once you have started the valve turning, release the flow control and reduce the torque to the minimum required to keep the valve turning. You may have to stop and adjust the torque several times.

OPERATING AUXILIARY EQUIPMENT

This section applies only to TM-7 configurations 17-000-22 and 17-000-24.

You can use the TM-7's hydraulic system as a power unit to operate other hydraulic tools. If you will be operating Class II tools, you should have the optional hydraulic cooler installed.

1. Connect the hydraulic hoses to the auxiliary circuit ports on the front of the TM-7.

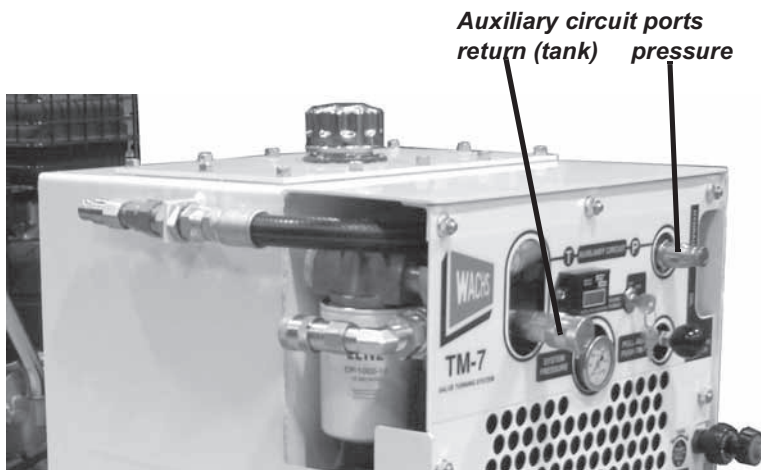


Figure 5-24. Connect the hydraulic hoses to the front connectors on the TM-7.

2. Pull the port selector knob on the front panel **out**.



CAUTION

It is important to operate the valve at the minimum torque required. If you reach the end of travel using high torque setting, you may damage the valve.



NOTE

There is no flow control provided for the auxiliary circuit, other than setting the engine speed. You will have to provide external flow control if your tool requires it.



Figure 5-25. Pull out the port selector knob to operate the auxiliary circuit.

- 3.** Connect the other ends of the hoses to the tool you are operating.
- 4.** Start the engine and set the throttle to operating speed. If using a PTO drive configuration, engage the PTO.
- 5.** When you are finished using the auxiliary circuit, shut down the TM-7. Press the port selector knob back in.



Figure 5-26. Push the port selector knob back in when you are finished using the auxiliary circuit.

CHARGING OR JUMP-STARTING THE BATTERY

CAUTION: Make sure the power switch on the control box is OFF before jump-starting. It is recommended that you disconnect the control box before you connect charging or jumper cables to the battery.

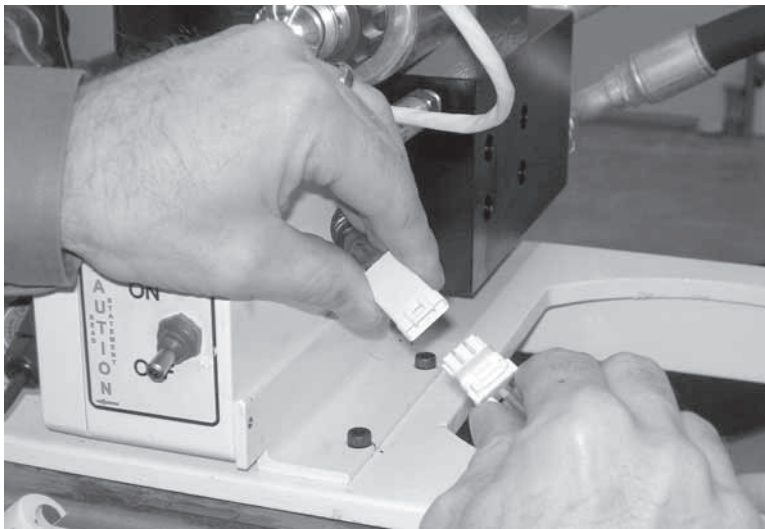


Figure 5-27. Disconnect the cable to the control box before charging or jump-starting the battery.

1. Remove the battery compartment cover on the side of the TM-7 enclosure.



Figure 5-28. Remove the battery cover on the side of the TM-7 enclosure.



CAUTION

Charging or jump-starting the battery with the control box powered on will damage the TM-7's electronic components.

- 2.** To charge the battery, disconnect the TM-7 cables from the battery, then connect the charger cables.
- 3.** To jump-start the TM-7 engine, leave the TM-7 cables connected to the battery. Connect the jumper cables to the battery posts and start the engine with the switch.

Chapter 6

Routine Maintenance

In addition to the procedures described in this chapter, perform the following checks on your TM-7 periodically:

- Check all bolts and fasteners for tightness and integrity.
- Check all electrical connections and components for integrity, corrosion, and insulation where appropriate.
- Inspect the extension slide and rails for wear.

LUBRICATION

There are 4 grease fittings on the TM-7: one on each extension rail, and two on the power head. Apply grease to all 4 fittings each time you use the machine.

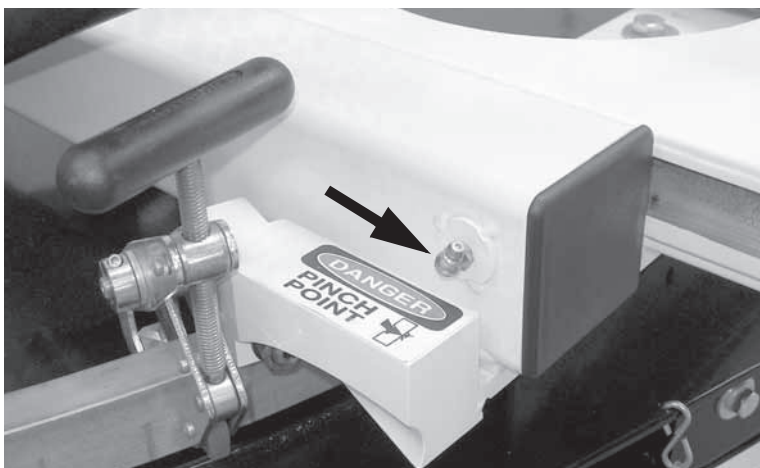


Figure 6-1. Grease the fittings on the side rails. There is one fitting on each side (one side shown).

In This Chapter

LUBRICATION

ENGINE

HYDRAULIC SYSTEM

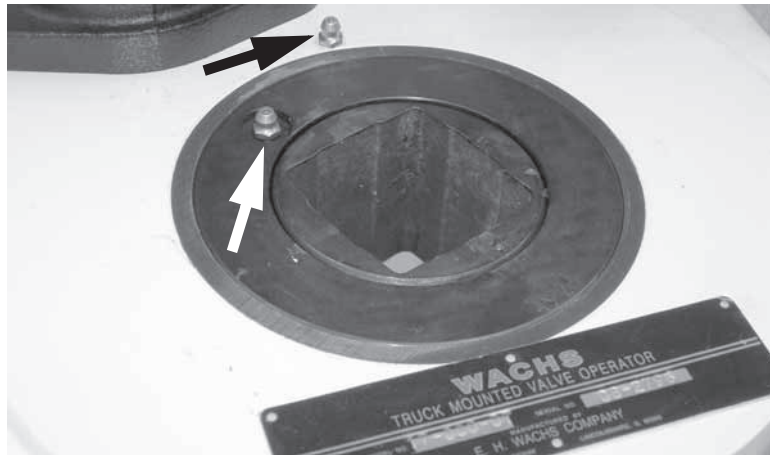


Figure 6-2. Grease the 2 fittings on the power head.

ENGINE

Check the oil and coolant levels in the engine each time you operate the TM-7.

Refer to the manual supplied with the engine for maintenance schedules and procedures.

HYDRAULIC SYSTEM

Perform the following checks each time you use the TM-7.

- Check the oil level in the hydraulic oil gauge. Add oil if necessary, using Mobile DTE Light or equivalent.



Figure 6-3. Check the oil level in the hydraulic oil gauge. The gauge also indicates temperature.

- While the TM-7 is operating, check the hydraulic oil temperature to make sure it does not exceed 180° F (82° C). Temperatures above 180° F will break down the oil, leading to hydraulic pump damage. If the oil temperature exceeds 180° F, change the hydraulic oil. You should also consider installing a Wachs cooling unit.
- If your TM-7 has a cooler installed, make sure it is functioning properly.

Oil and Filter

- Change the hydraulic oil filter every year. You can order the filter from E.H. Wachs.

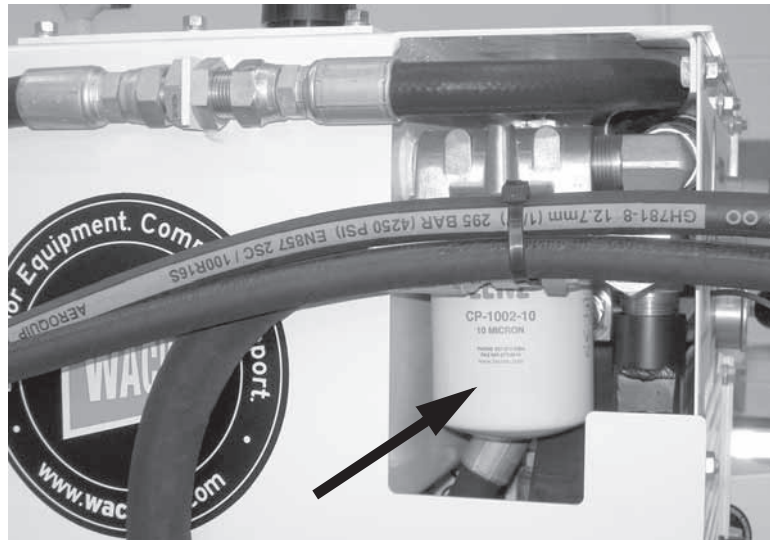


Figure 6-4. The hydraulic oil filter is accessible through the side of the TM-7 enclosure. (The filter will be easier to replace if you disconnect and move the hoses.)

- Change the hydraulic oil every two years. Use Mobile DTE Light or equivalent. If the oil temperature ever exceeds 180° F (82° C), change it immediately to prevent damage to the hydraulic pump.



Figure 6-5. The hydraulic reservoir drain plug is accessible through the back of the TM-7 enclosure.

Chapter 7

Service, Repair, and Storage

REPLACING THE COUNTER PROXIMITY SENSOR

The counter proximity sensor is accessible from beneath the power head. The sensor may wear out or malfunction and need to be replaced.

- 1.** Make sure the power switch on the control box is turned OFF.
- 2.** Release the extension latch lever and pull the extension slide out.
- 3.** From beneath the power head, remove the proximity sensor and disconnect the electrical cable.

In This Chapter

REPLACING THE COUNTER PROXIMITY SENSOR

REPLACING THE TRANSDUCER

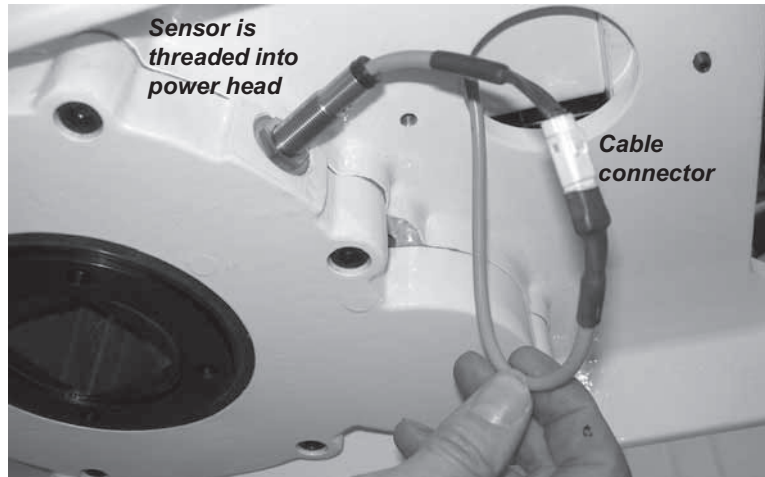


Figure 7-1. Remove the proximity sensor and disconnect the cable.

- 4.** Screw the new sensor into the power head and connect the cable.

REPLACING THE TRANSDUCER

The transducer is mounted on the hydraulic manifold. The transducer may wear out or malfunction and need to be replaced.

- 1.** Make sure the system is turned off and is not under pressure.
- 2.** Remove the transducer from the manifold. The transducer is threaded into its port.

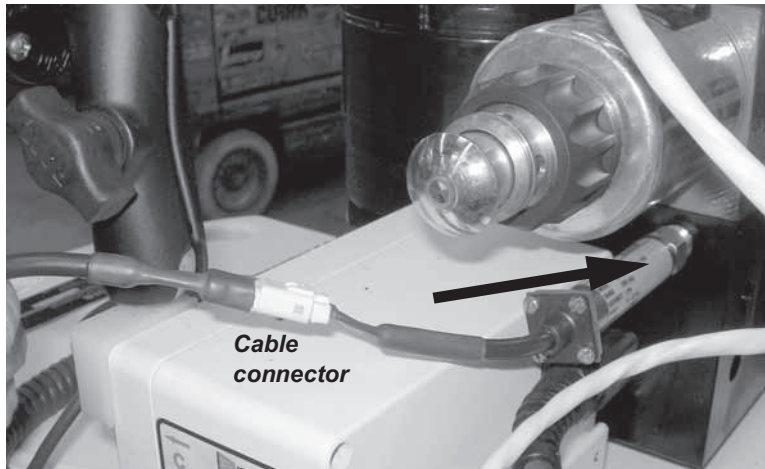


Figure 7-2. Remove the transducer from the hydraulic manifold and disconnect the cable.

- 3.** Disconnect the cable to the transducer.
- 4.** Thread the new transducer into the manifold and connect the cable.

STORAGE

Prepare the TM-7 for storage by following this procedure.

- 1.** Lubricate the unit according to the instructions in Chapter 6.
- 2.** Drain the fuel tank and close the fuel shut-off valve. (Units with gas engine.)
- 3.** If storing in sub-freezing weather, make sure the engine coolant has the appropriate antifreeze mix. (Units with gas engine.)
- 4.** Disconnect the cables from the battery. (Units with gas engine.)
- 5.** Disconnect the Vitals HC-100 controller and store it in its case. Screw the cap on the connector on the TM-7 control box.
- 6.** An optional weatherproof cover is available for the TM-7. If you have the cover, put it over the unit and secure it with the provided straps. The cover is highly recommended for long-term, outdoor storage.



NOTE

If you are storing the machine in cold weather, you may want to remove the battery and store it indoors.



Chapter 8

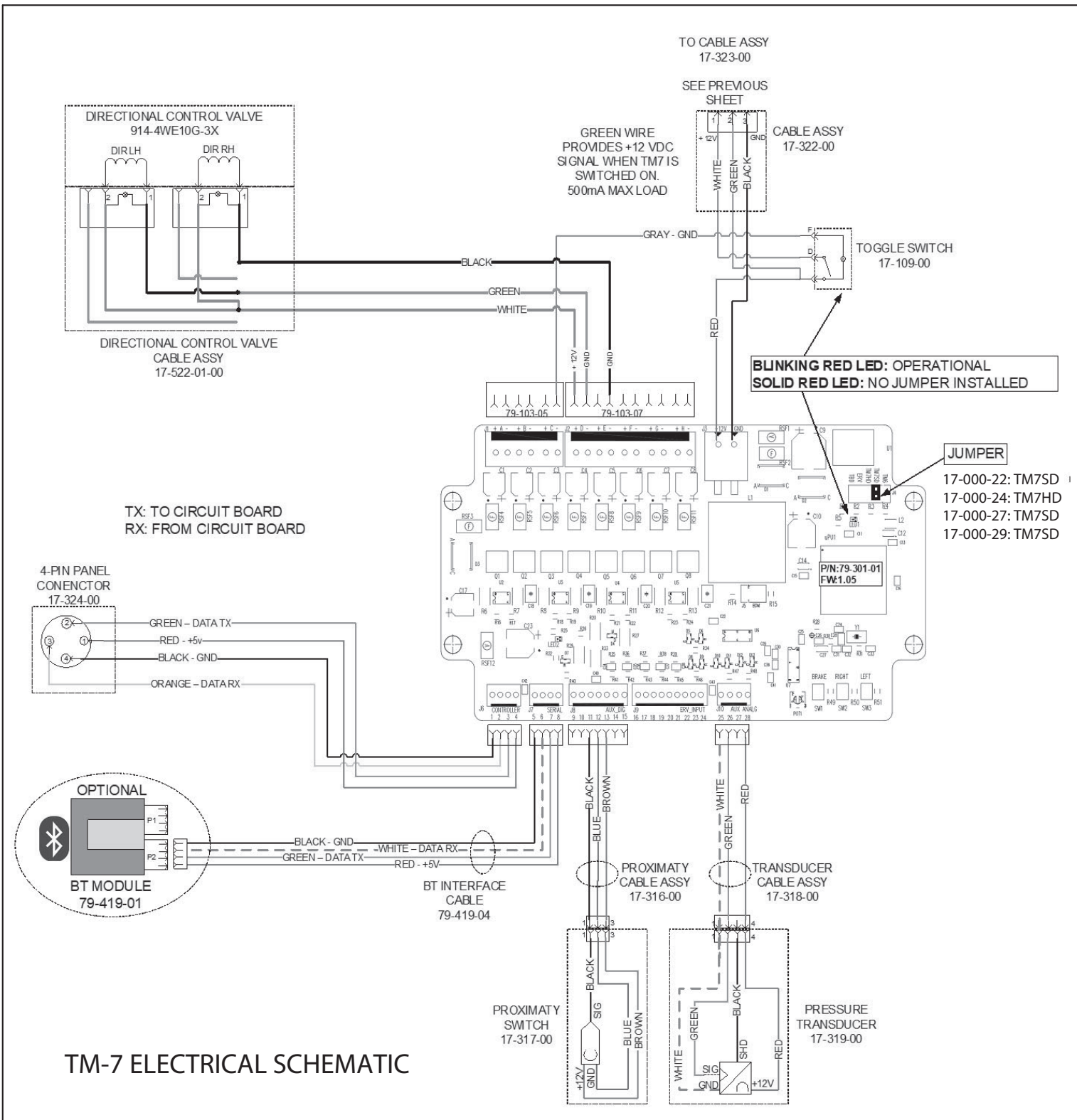
Schematics

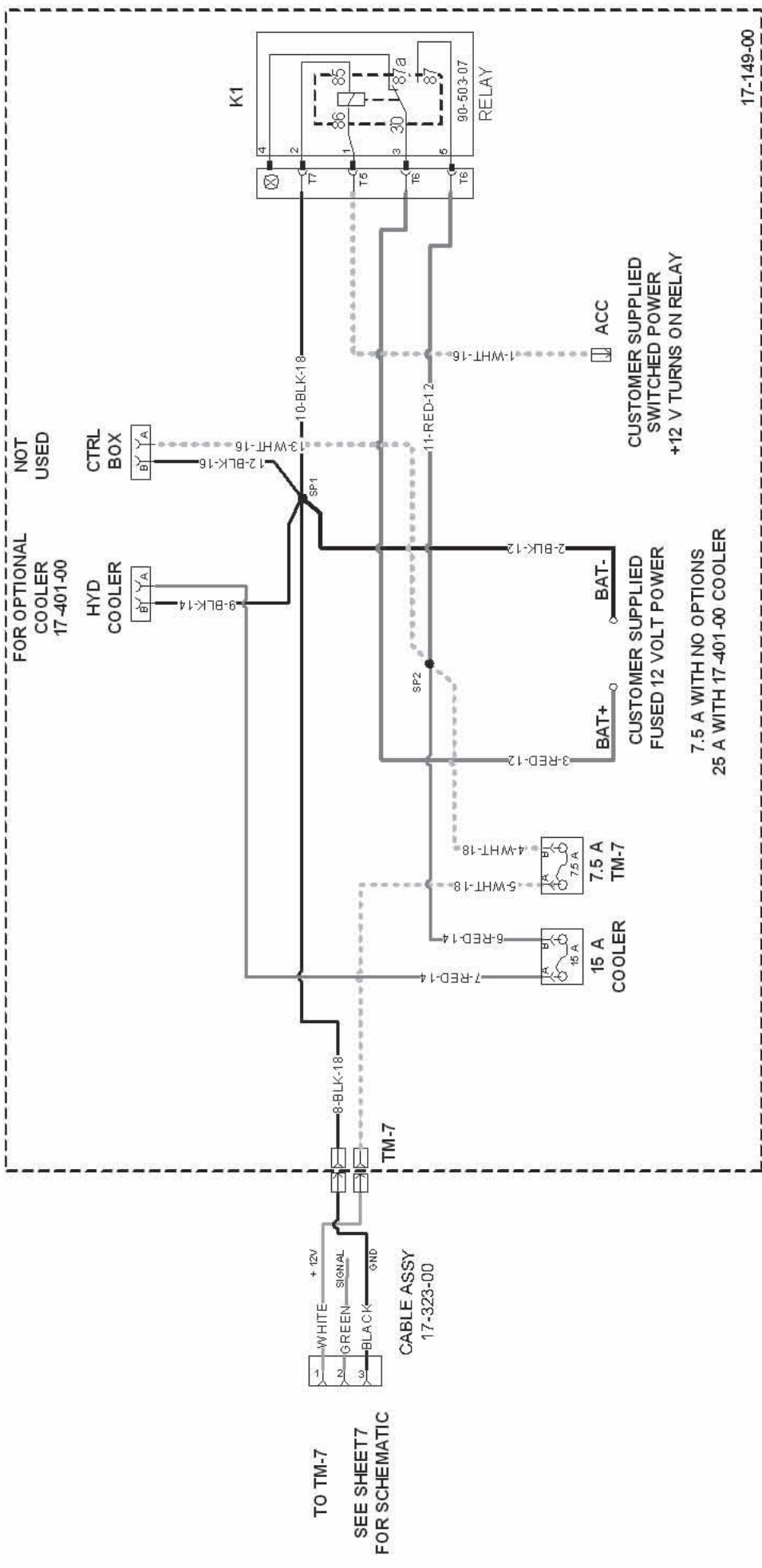
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The following pages are schematics drawings for TM-7 electrical and hydraulic systems.

Some schematics differ depending on TM-7 model. Where multiple versions of a schematic are provided, make sure to refer to the one for your TM-7 configuration.

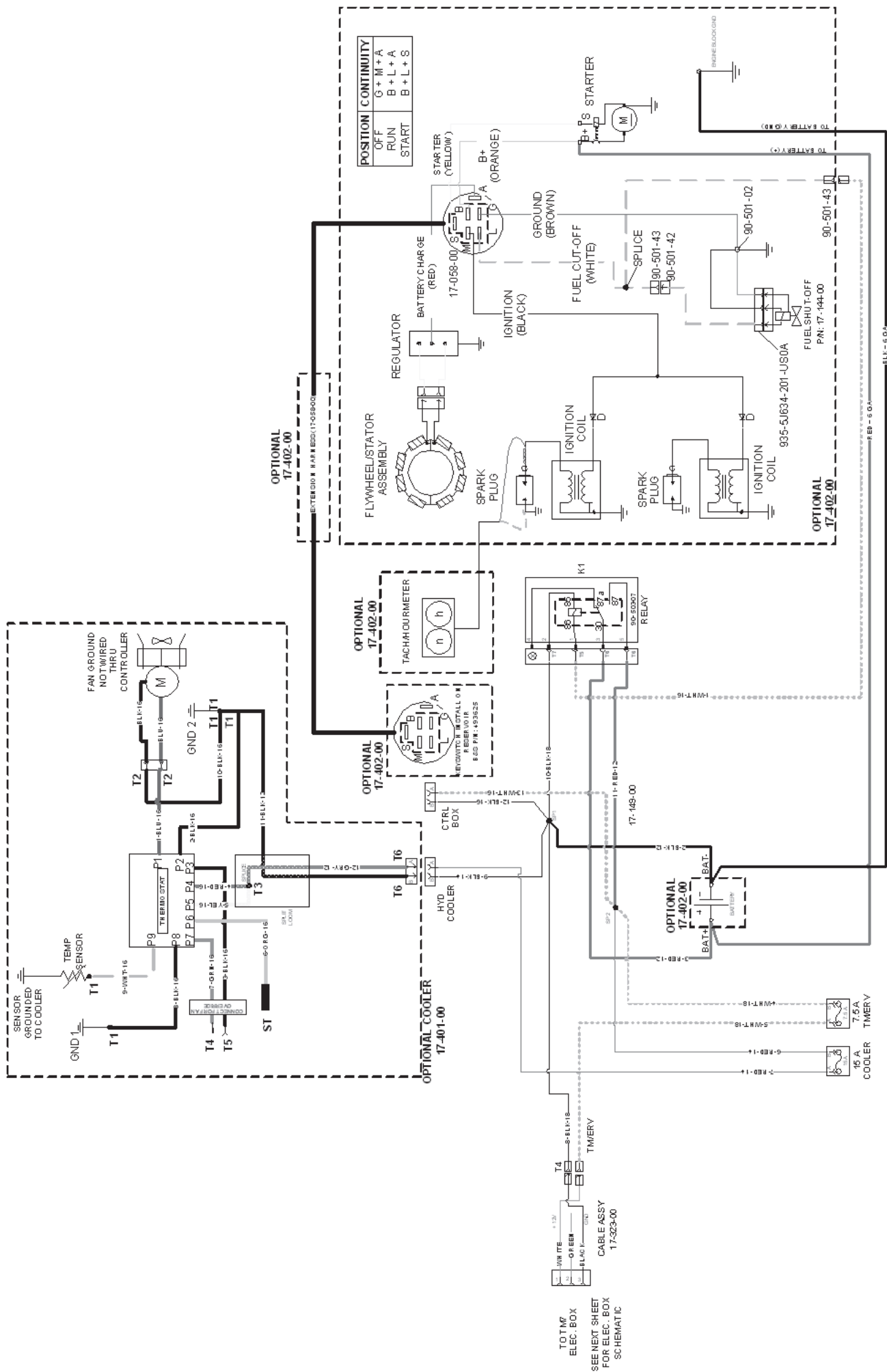






ELECTRICAL SCHEMATIC

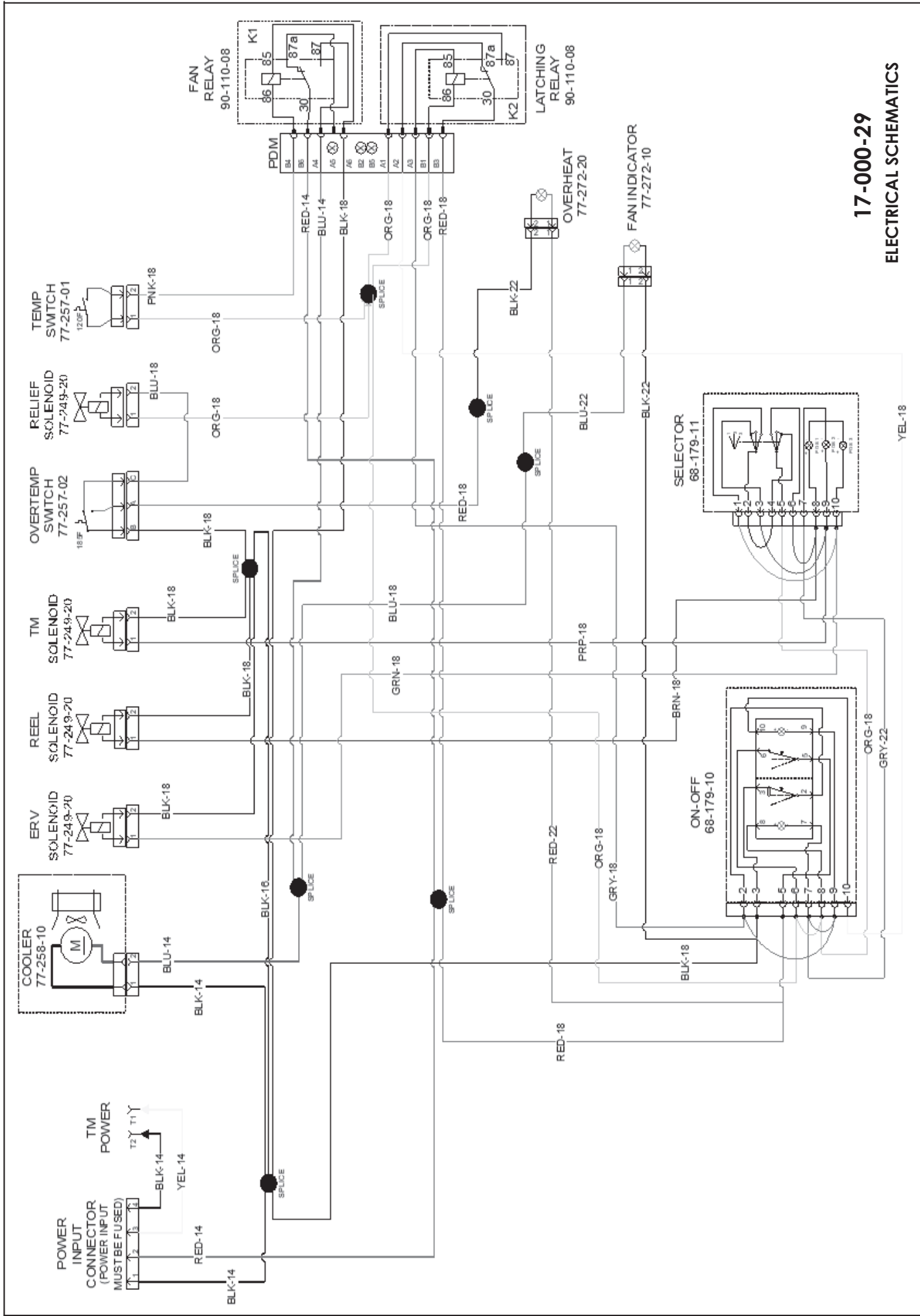
17-000-22, TM-7 Standard Duty
 17-000-24, TM-7 Heavy Duty



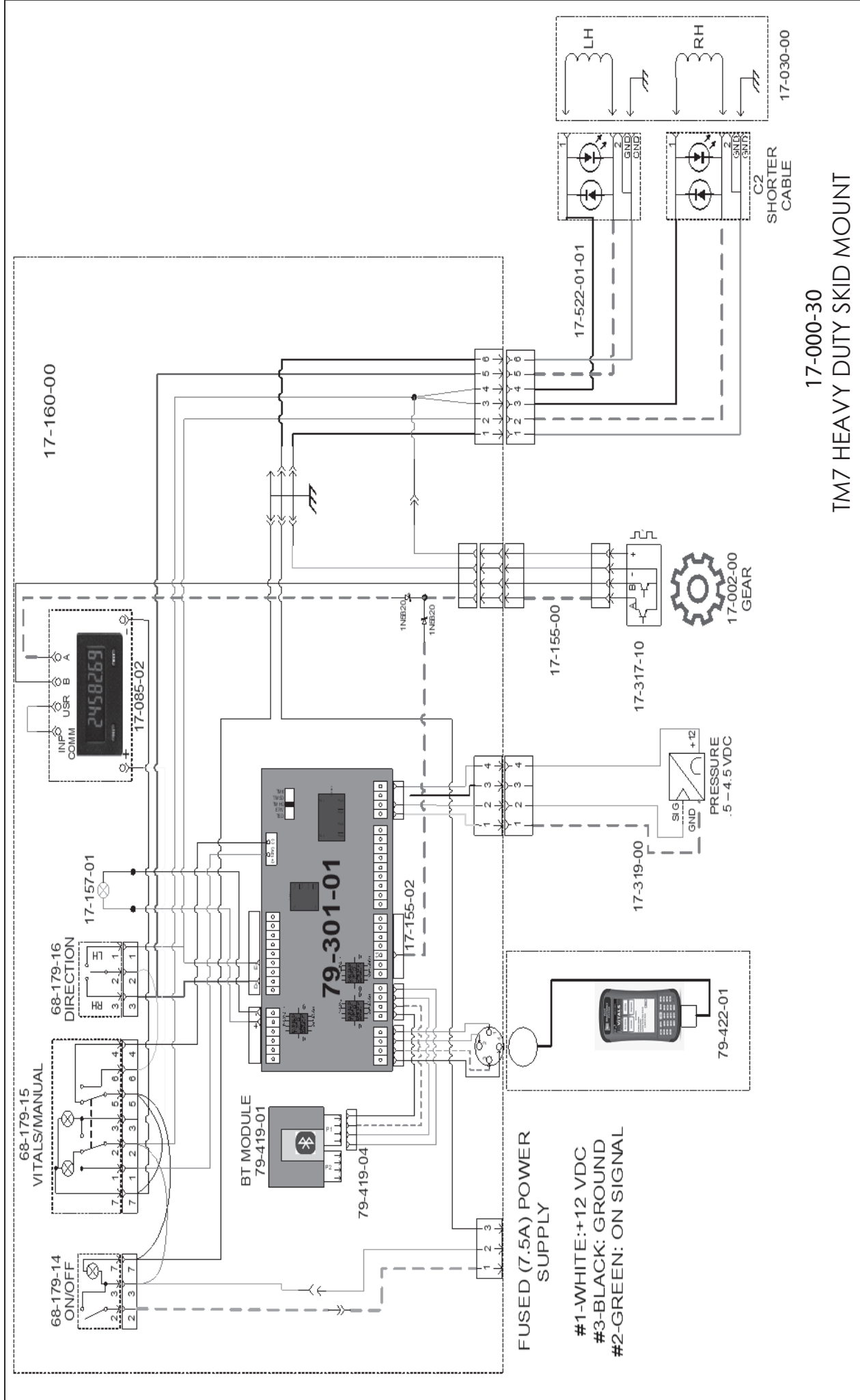
ELECTRICAL SCHEMATIC WITH OPTIONAL ITEMS
(17-401-00 & 17-402-00)

17-000-22, TM-7 Standard Duty
17-000-24, TM-7 Heavy Duty

TOTM7
 ELEC. BOX
 SEE NEXT SHEET
 FOR ELEC. BOX
 SCHEMATIC



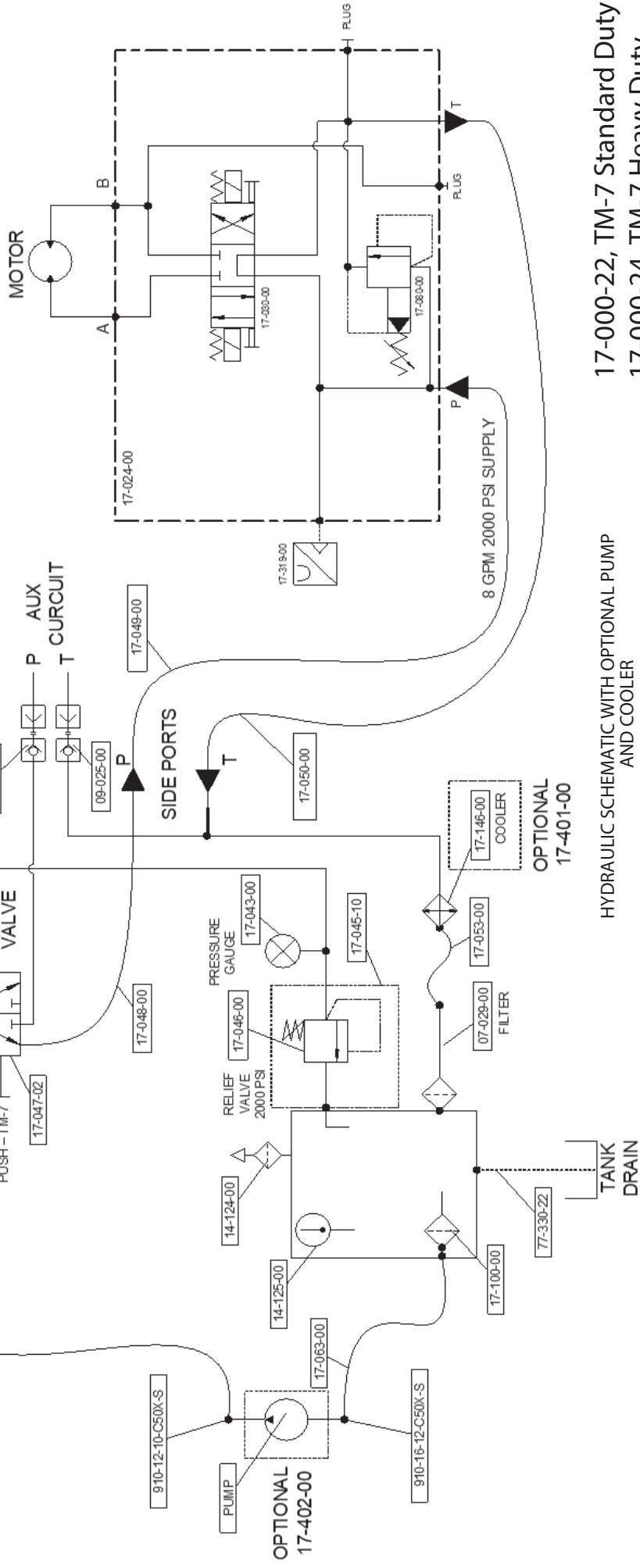
17-000-29
ELECTRICAL SCHEMATICS



17-000-30

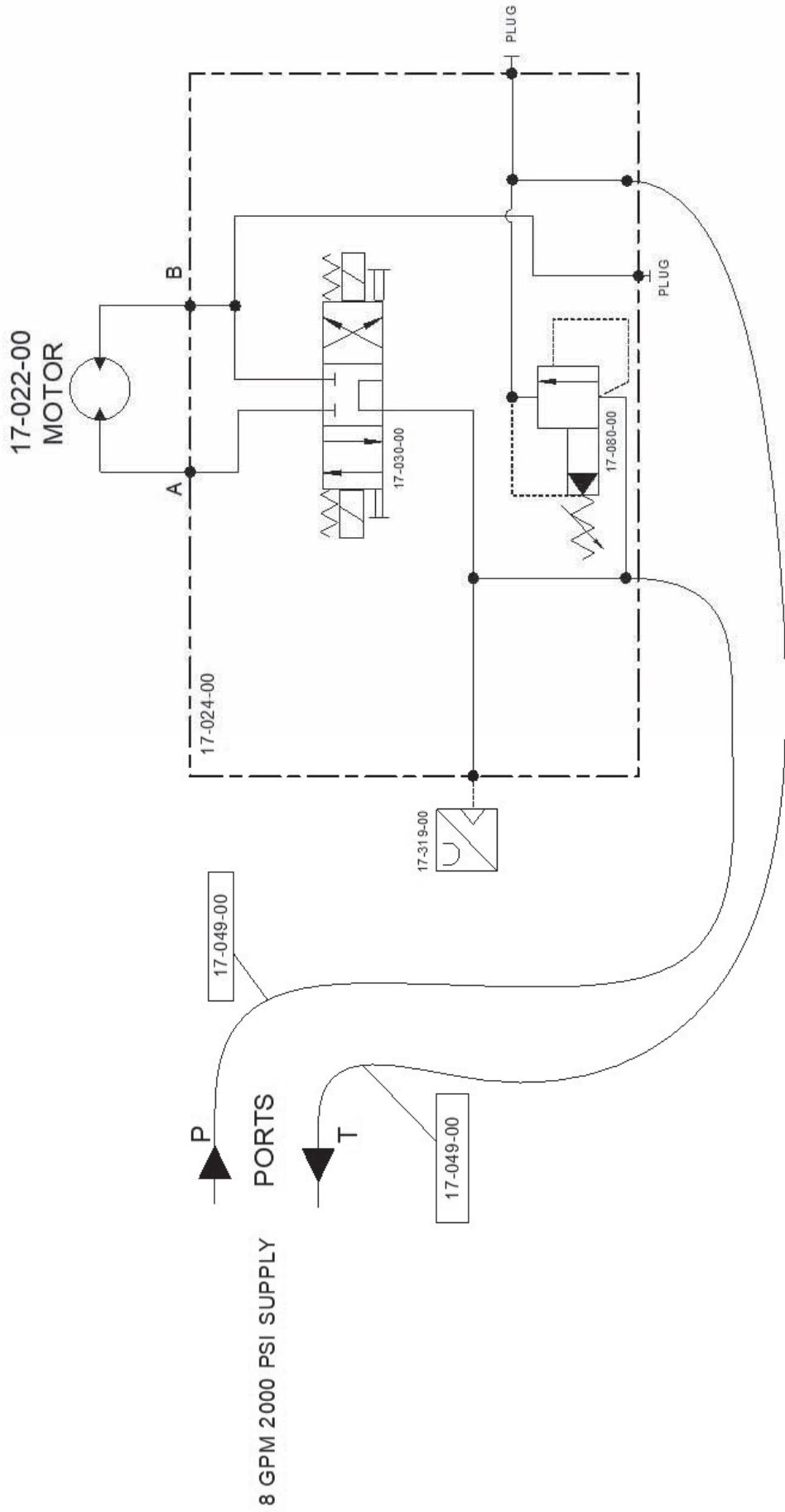
TM7 HEAVY DUTY SKID MOUNT

Motor Part #:
 17-022-00 for 17-000-22
 17-023-00 for 17-000-24

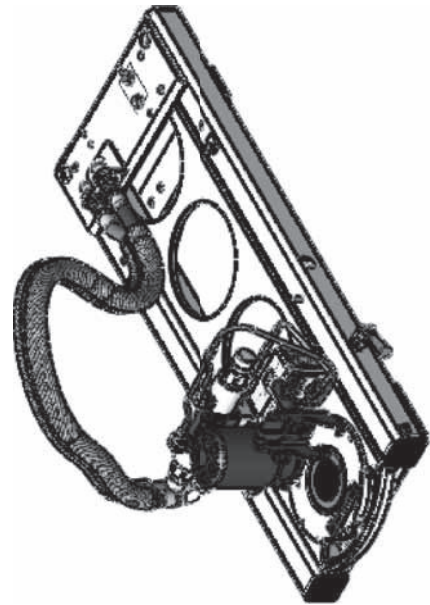


17-000-22, TM-7 Standard Duty
 17-000-24, TM-7 Heavy Duty

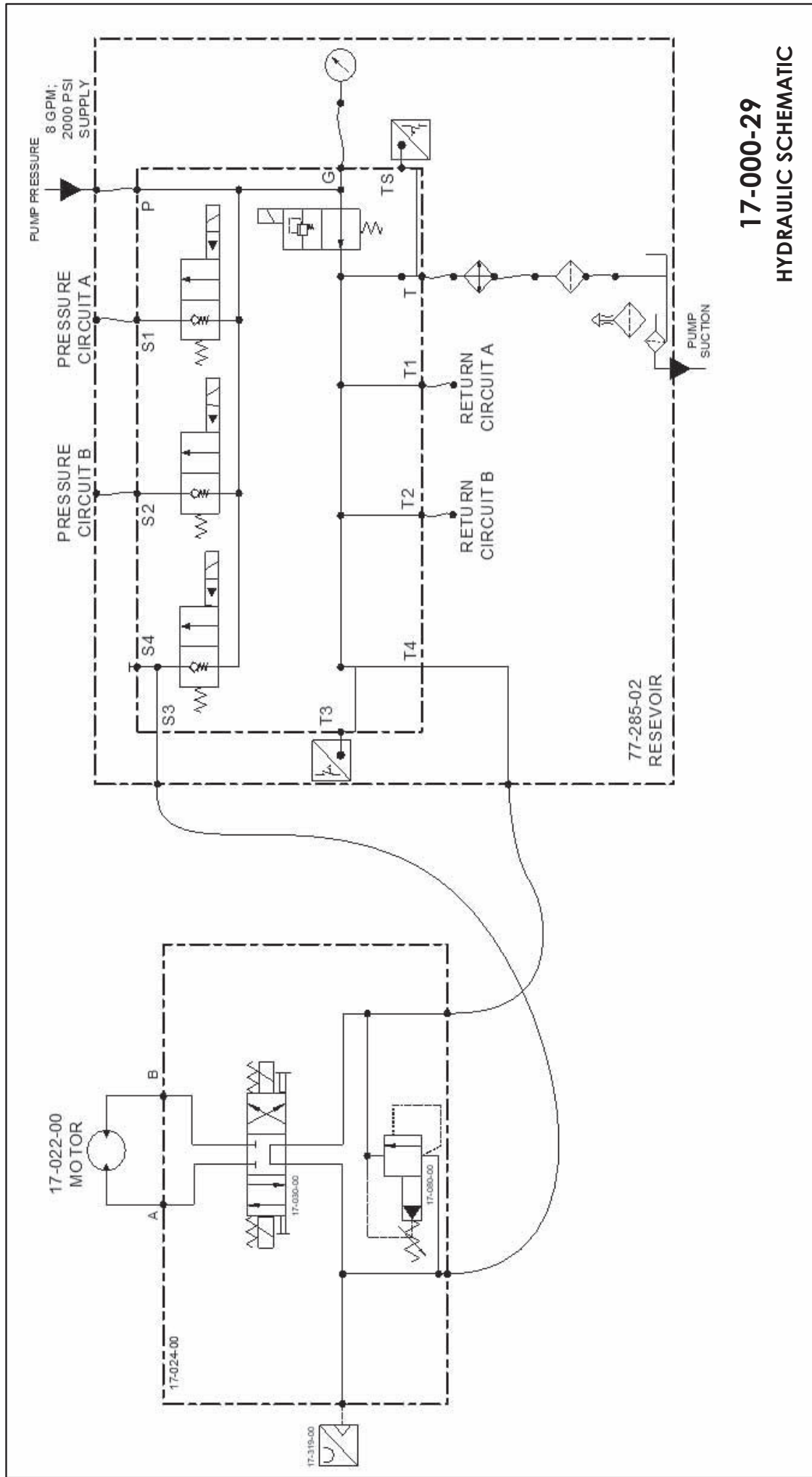
HYDRAULIC SCHEMATIC WITH OPTIONAL PUMP
 AND COOLER
 17-401-00



HYDRAULIC SCHEMATIC



17-000-27
TM-7, Std. Duty without Controller



17-000-29
 HYDRAULIC SCHEMATIC

Chapter 9

Drawings and Parts Lists

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ORDERING INFORMATION

To place an order, request service, or get more detailed information on any E.H. Wachs products, call us at one of the following numbers:

U.S. 800-323-8185

International: 847-537-8800

You can also visit our Web site at:

www.ehwachs.com

Ordering Replacement Parts

When ordering parts, refer to the parts lists in this chapter. Please provide the part description and part number for all parts you are ordering.

Repair Information

Please call us for an authorization number before returning any equipment for repair or factory service. We will advise you of shipping and handling. When you send the equipment, please include the following information:

- Your name/company name
- Your address
- Your phone number

- A description of the problem or the work to be done.

Before we perform any repair, we will estimate the work and inform you of the cost and the time to complete it.

Warranty Information

Enclosed with the manual is a warranty card. Please fill out the registration card and return to E.H. Wachs. Retain the owner's registration record and warranty card for your information.

Return Goods Address

Return equipment for repair to the following address.

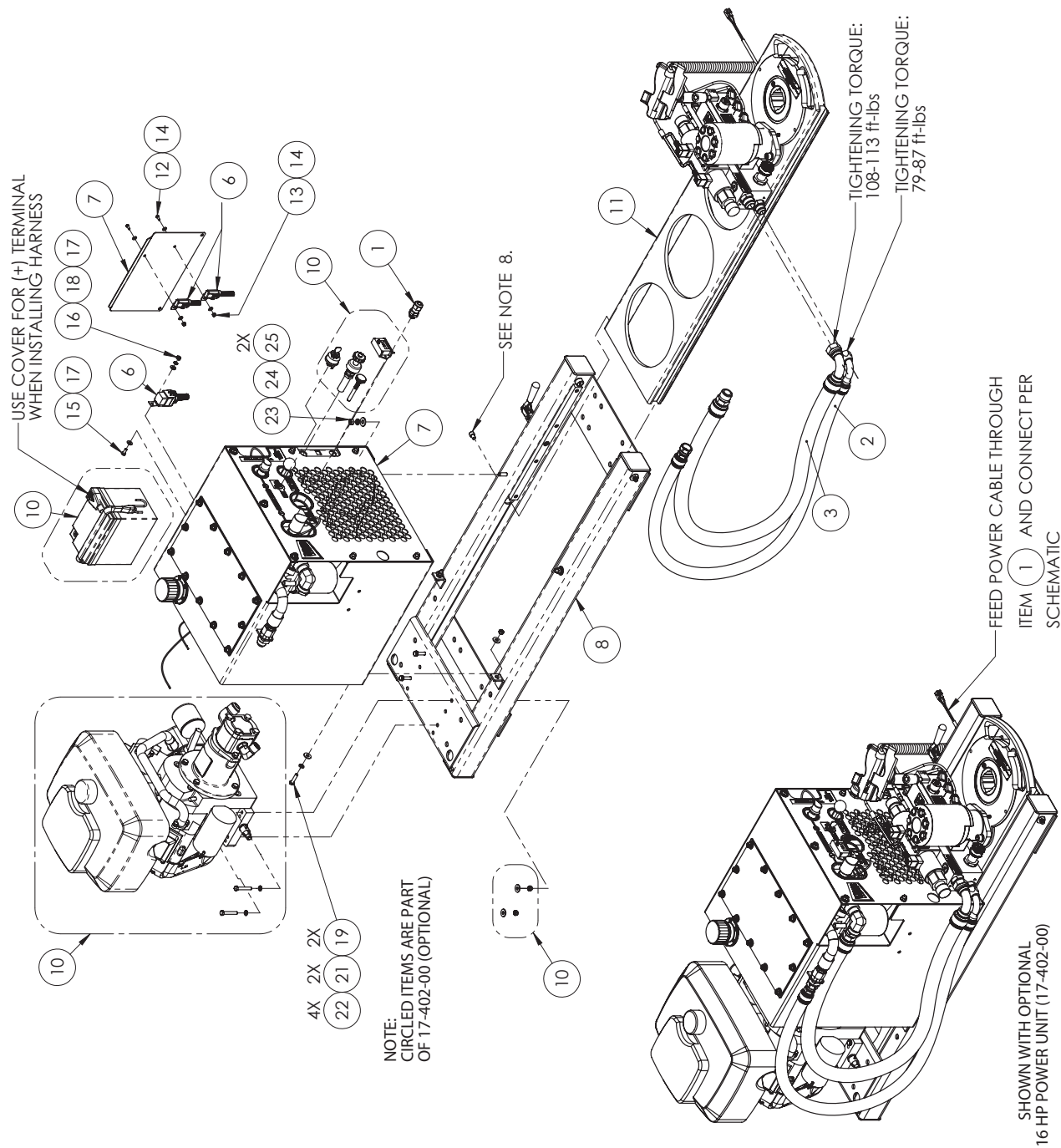
E.H. Wachs
600 Knightsbridge Parkway
Lincolnshire, Illinois 60069 USA

DRAWINGS

The following pages include drawings and parts lists for components of the TM-7. Refer to the drawings for identifying and ordering replacement parts.

ITEM	PART NUMBER	QTY	DESCRIPTION
1	11-004-00	1	CORD CONNECTOR
2	17-049-00	1	HOSE, SUPPLY
3	17-050-00	1	HOSE, RETURN
4	17-062-00	1	18 3/4" HOSE ASSEMBLY, -12 FJX -12 FJX -12 HOSE
5	17-063-00	1	HOSE, TANK
6	17-149-00	1	WIRE HARNESS, HPU-ERV/TM
7	17-302-03	1	HYDRAULIC TANK ASSEMBLY - NO COOLER
8	17-328-00	1	TM7 FRAME ASSEMBLY
9 *	17-401-00	1	COOLER
10 *	17-402-00	1	HYDRAULIC POWER PLANT, 16 HP GASOLINE
11	17-000-25	1	TM7 SLIDE-SD
12	90-031-00	2	HHCS, 10-24 X 1/2"
13	90-045-04	2	NUT, 10-24 NYLOCK
14	90-045-51	4	WASHER # 10 FLAT
15	90-051-06	1	HHCS, 1/4-20 X 5/8 GRADE 5
16	90-055-01	1	NUT, 1/4-20 HEX
17	90-055-49	2	WASHER, 1/4 FLAT
18	90-055-52	1	WASHER, 1/4 SPLIT RING
19	90-061-12	2	HHCS, 5/16-18 X 1-1/4
20	90-065-01	2	NUT, 5/16-18 HEX GRADE 8
21	90-065-51	2	WASHER, 5/16 SPLIT RING
22	90-065-52	4	WASHER, 5/16 FLAT
23	90-075-01	2	NUT, 3/8-16 HEX GR 5 ZN
24	90-075-52	2	WASHER, 3/8 SPLIT RING
25	90-075-53	2	WASHER, 3/8 FLAT

* ITEMS 17-401-00 & 17-402-00 SOLD SEPARATELY

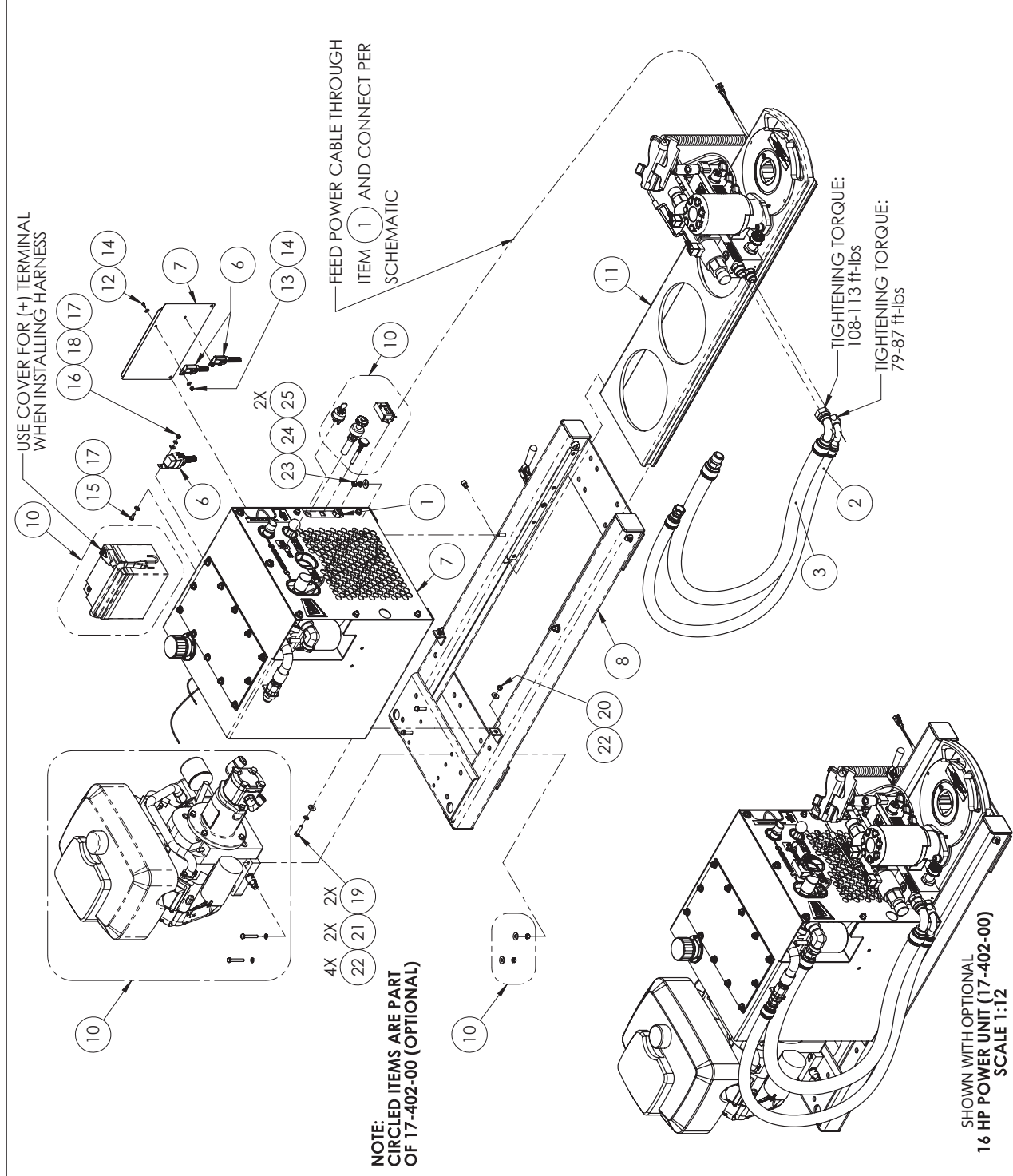


17-000-22
TM7 STD DUTY

SHOWN WITH OPTIONAL
16 HP POWER UNIT (17-402-00)

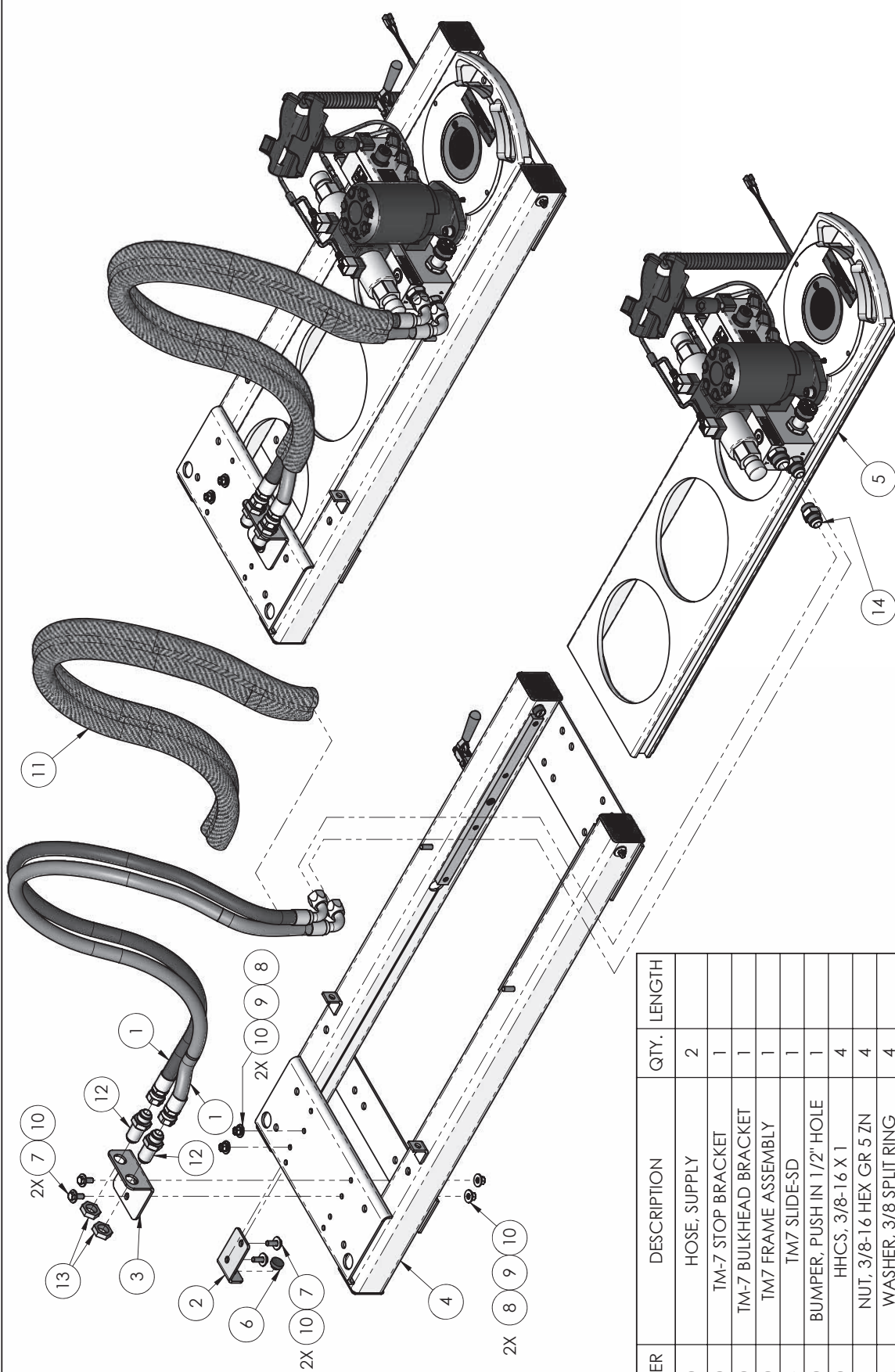
ITEM	PART NUMBER	QTY	DESCRIPTION
1	11-004-00	1	CORD CONNECTOR
2	17-049-00	1	HOSE, SUPPLY
3	17-050-00	1	HOSE, RETURN
4	17-062-00	1	18 3/4" HOSE ASSEMBLY - 12 FJ X - 12 FJ X - 12 HOSE
5	17-063-00	1	HOSE, TANK
6	17-149-00	1	WIRE HARNESS, HPU-ERV/TM
7	17-302-03	1	HYDRAULIC TANK ASSEMBLY - NO COOLER
8	17-328-00	1	TM7 FRAME ASSEMBLY
9 *	17-401-00	1	COOLER
10 *	17-402-00	1	HYDRAULIC POWER PLANT, 16 HP GASOLINE
11	17-000-26	1	TM7 SLIDE-HD
12	90-031-00	2	HHCS, 10-24 X 1/2"
13	90-045-04	2	NUT, 10-24 NYLOCK
14	90-045-51	4	WASHER #10 FLAT
15	90-051-06	1	HHCS, 1/4-20 X 5/8 GRADE 5
16	90-055-01	1	NUT, 1/4-20 HEX
17	90-055-49	2	WASHER, 1/4 FLAT
18	90-055-52	1	WASHER, 1/4 SPLIT RING
19	90-061-12	2	HHCS, 5/16-18 X 1-1/4
20	90-065-01	2	NUT, 5/16-18 HEX GRADE 8
21	90-065-51	2	WASHER, 5/16 SPLIT RING
22	90-065-52	4	WASHER, 5/16 FLAT
23	90-075-01	2	NUT, 3/8-16 HEX GR 5 ZN
24	90-075-52	2	WASHER, 3/8 SPLIT RING
25	90-075-53	2	WASHER, 3/8 FLAT

* ITEMS 17-401-00 & 17-402-00 SOLD SEPARATELY



17-000-24 TM7 HEAVY DUTY

SHOWN WITH OPTIONAL
16 HP POWER UNIT (17-402-00)
SCALE 1:12

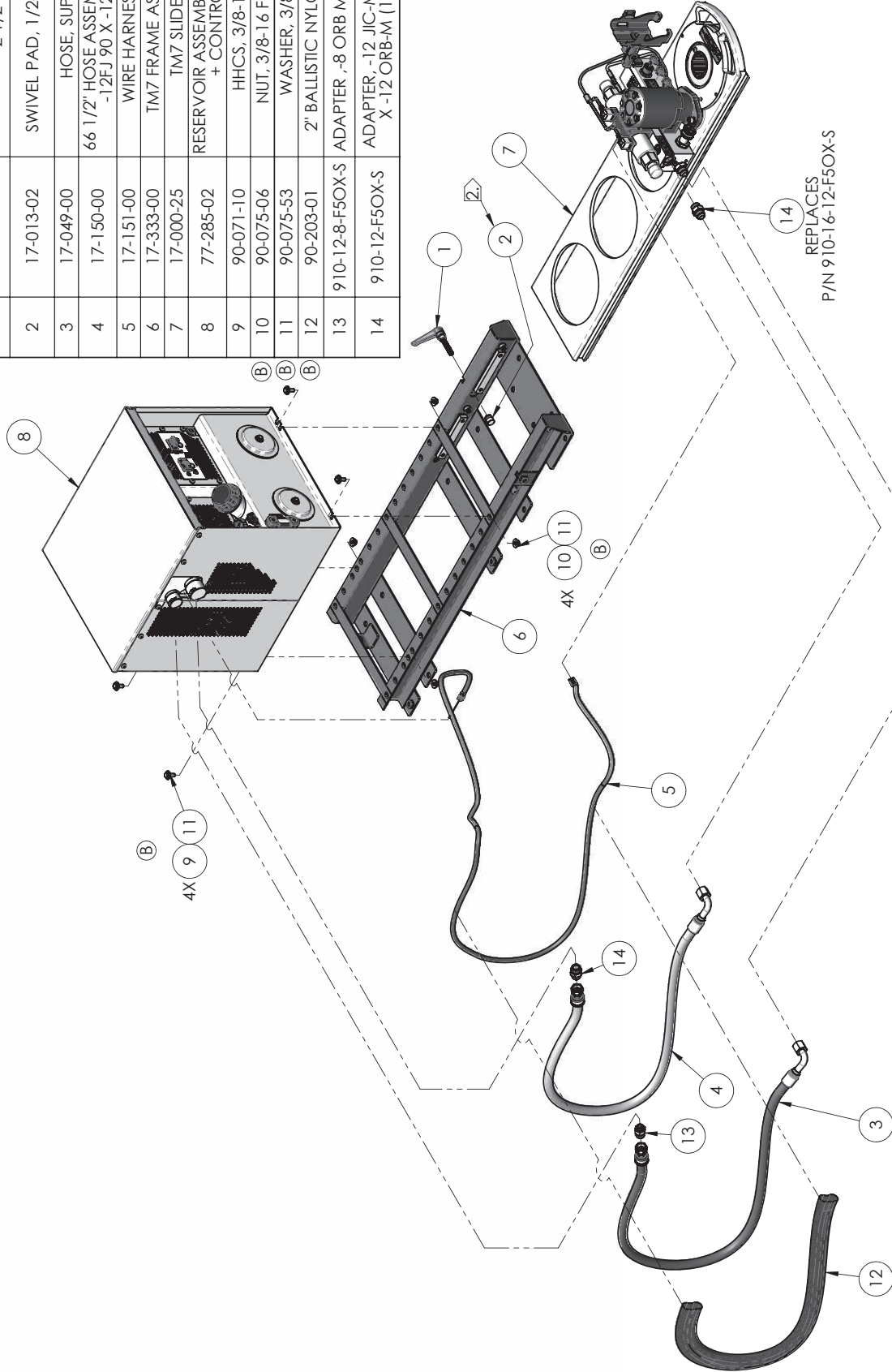


REPLACES
P/N 910-16-12-F50X-S

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.	LENGTH
1	17-049-00	HOSE, SUPPLY	2	
2	17-090-00	TM-7 STOP BRACKET	1	
3	17-141-00	TM-7 BULKHEAD BRACKET	1	
4	17-328-00	TM7 FRAME ASSEMBLY	1	
5	17-000-25	TM7 SLIDE-SD	1	
6	77-175-10	BUMPER, PUSH IN 1/2" HOLE	1	
7	90-071-10	HHCS, 3/8-16 X 1	4	
8	90-075-01	NUT, 3/8-16 HEX GR 5 ZN	4	
9	90-075-52	WASHER, 3/8 SPLIT RING	4	
10	90-075-53	WASHER, 3/8 FLAT	8	
11	90-203-01	2" BALLISTIC NYLON SLEEVE	1	57" ± 1"
12	90-218-96	ADAPTER, -12 JIC-M X -12 JIC-M BULKHEAD	2	
13	90-218-98	NUT, -12 (1-1/16" - 12) BULKHEAD	2	
14	910-12-F50X-S	ADAPTER, -12 JIC-M (1 1/16-12) X -12 ORB-M (1 1/16-12)	1	

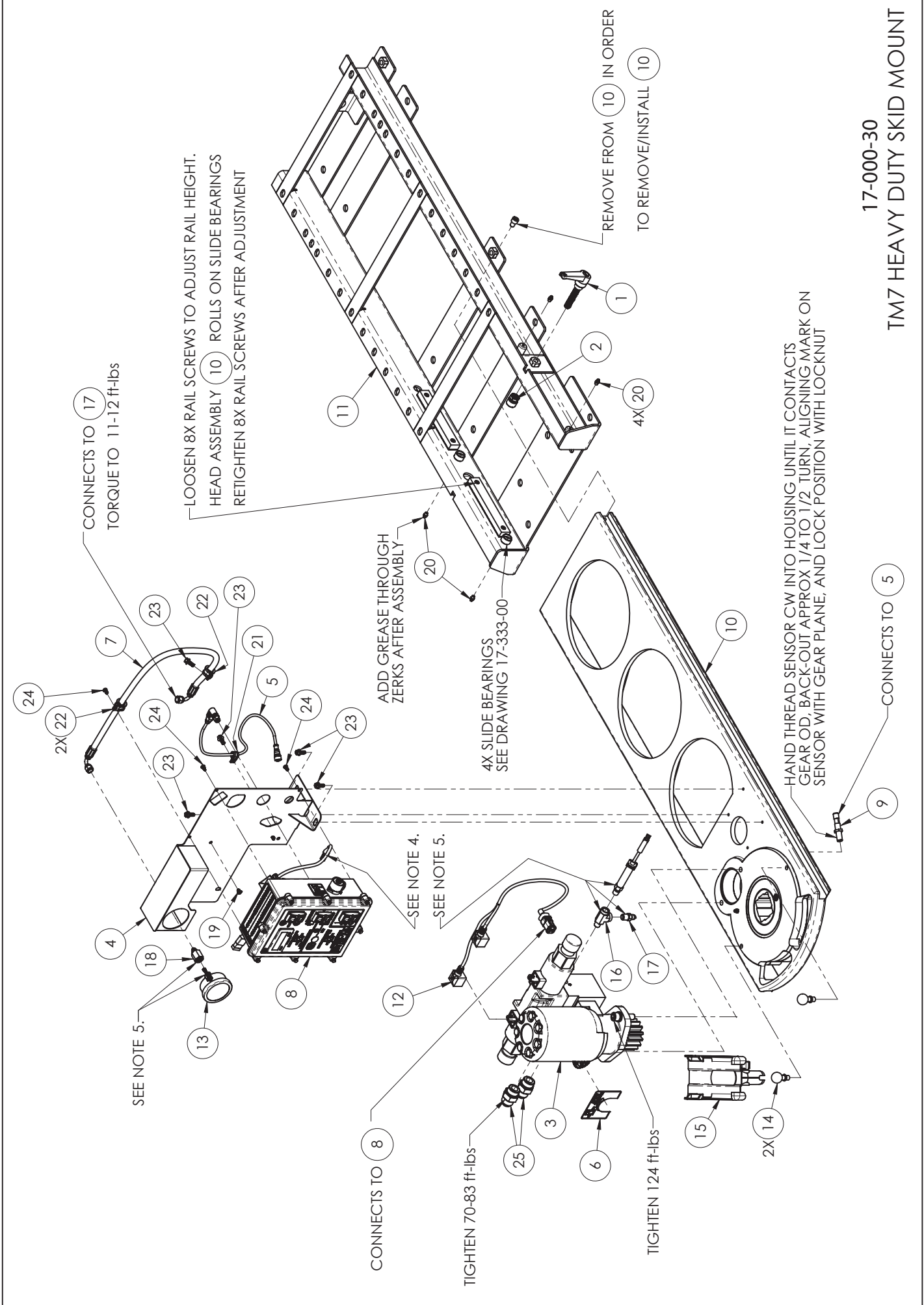
17-000-27
TM7 STD DUTY TRAILER MOUNT

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.	APPROX. LENGTH
1	17-013-01	ADJUSTABLE HANDLE, 1/2-13 X 2-1/2"	1	
2	17-013-02	SWIVEL PAD, 1/2-13 DELRIN	1	
3	17-049-00	HOSE, SUPPLY	1	
4	17-150-00	66 1/2" HOSE ASSEMBLY, -12FJ X -12FJ 90 X -12 HOSE	1	
5	17-151-00	WIRE HARNESS, TM7	1	
6	17-333-00	TM7 FRAME ASSEMBLY	1	
7	17-000-25	TM7 SLIDE-SD	1	
8	77-285-02	RESERVOIR ASSEMBLY, 3 CIRCUIT + CONTROLS	1	
9	90-071-10	HHCS, 3/8-16 X 1	4	
10	90-075-06	NUT, 3/8-16 FLANGE	4	
11	90-075-53	WASHER, 3/8 FLAT	8	
12	90-203-01	2" BALLISTIC NYLON SLEEVE	1	(53")
13	910-12-8-F5OX-S	ADAPTER, -8 ORB M X -12 JIC M	1	
14	910-12-F5OX-S	ADAPTER, -12 JIC-M (1 1/16-12) X -12 ORB-M (1 1/16-12)	2	



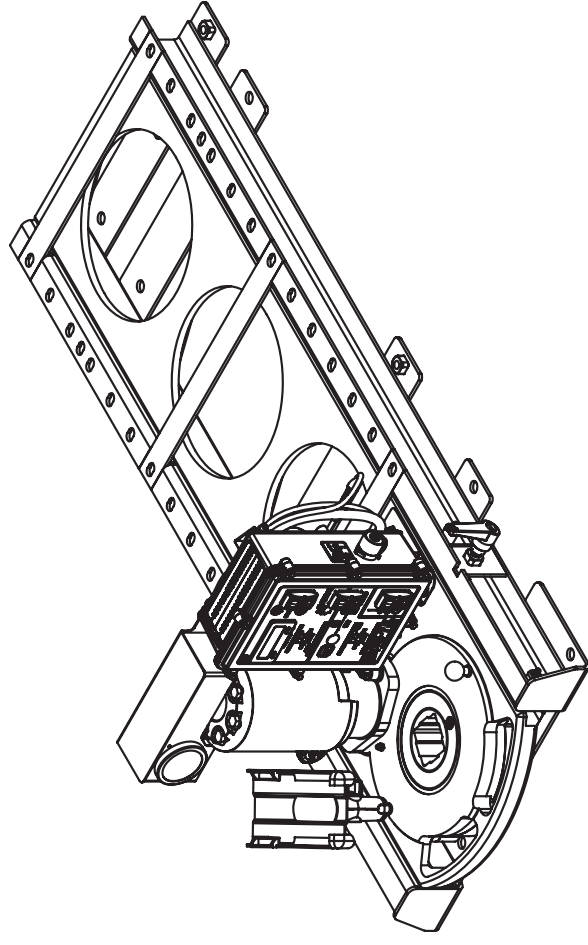
17-000-29

TM7 GRAND LX TRAILER MOUNT



17-000-30
TM7 HEAVY DUTY SKID MOUNT

ITEM	PART NUMBER	QTY	DESCRIPTION
1	17-013-01	1	ADJUSTABLE HANDLE, 1/2-13 X 2-1/2"
2	17-013-02	1	SWIVEL PAD, 1/2-13 DELRIN
3	17-139-00	1	TM7 HYD. MOTOR & MANIFOLD ASSEMBLY, HEAVY DUTY
4	17-154-00	1	ENCLOSURE BRACKET
5	17-155-00	1	CABLE, M12 STRAIGHT FEMALE 90 MALE
6	17-156-02	1	LABEL, PRESSURE ADJUST
7	17-159-01	1	26 5/8" HOSE ASSEMBLY, -04 FJ 90 X -04 FJ 90 X -04 HOSE
8	17-160-00	1	CONTROL ASSEMBLY, TM-7 HD PLUS
9	17-317-10	1	QUADRATURE SENSOR
10	17-329-00	1	TM7 HEAD ASSEMBLY
11	17-333-00	1	TM7 FRAME ASSEMBLY
12	17-522-01-01	1	WIRE HARNESS, HYD VALVE TO CONTROLS
13	77-269-01	1	PRESSURE GAUGE, 0-3000 PSI
14	79-039-02	2	1" BALL MOUNT X M10X1.5 EXT THREAD
15	79-202-00	1	CRADLE, VEHICLE MOUNT
16	90-058-07	1	STREET TEE, 1/4" NPT-M X 1/4" NPT-F X 1/4" NPT-F
17	90-058-08	1	ADAPTER, 1/4" NPT-M X 7/16-20 (-04) JIC-M
18	90-058-14	1	ADAPTER, 1/4" (-04) NPT-F X 7/16-20 (-04) JIC-M
19	90-216-25	1	PUSH BUTTON MOUNT, CABLE TIE
20	90-500-05	4	GREASE FITTING, 1/4-28 STRAIGHT
21	90-903-50	1	CUSHIONED LOOP CLAMP, 1/2"
22	90-903-63	2	MOUNTING CABLE CLAMP, 5/8"
23	90-1062-58	5	HHFS, 1/4-20 x 5/8" GR5 ZN
24	90-1074-10	4	PHSD, M5 x 0.8 X 10 mm ZN
25	910-12-F5OX-S	2	ADAPTER, -12 JIC-M (1 1/16-12) X -12 ORB-M (1 1/16-12)

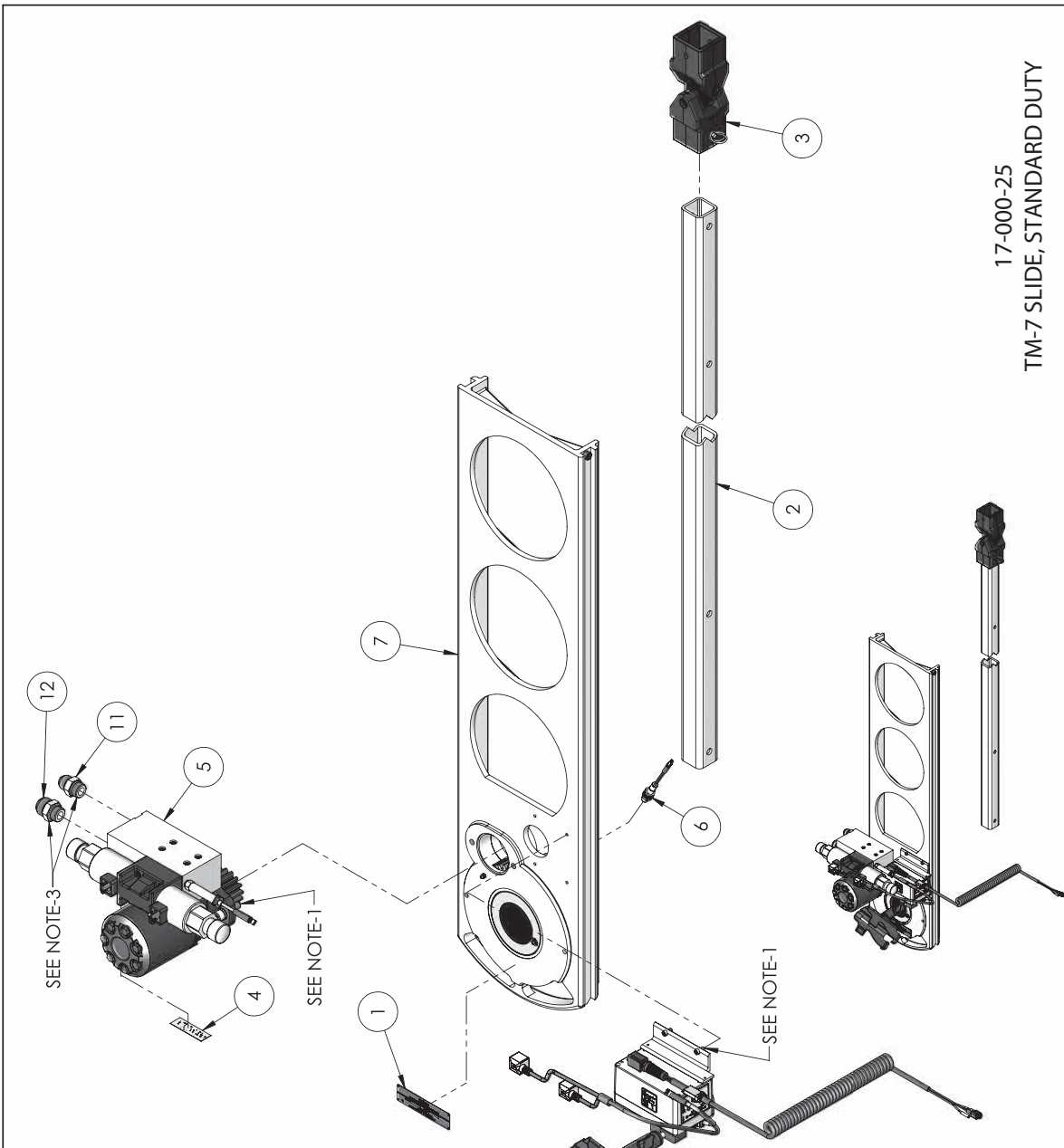


17-000-30
TM7 HEAVY DUTY SKID MOUNT

ITEM	PART NUMBER	QTY	DESCRIPTION
1	07-106-00	1	SERIAL NUMBER PLATE
2	07-406-08	1	KEY, VALVE 8'
3	07-408-00	1	UNIVERSAL SOCKET, 2" TO FIT STD AWWA NUT
4	17-102-00	1	LABEL, RELIEF VALVE
5	17-138-00	1	TM7 HYD. MOTOR & MANIFOLD ASSEMBLY, STANDARD DUTY
6	17-317-00	1	SENSOR ASSEMBLY, PROXIMITY SWITCH
7	17-329-00	1	TM7 HEAD ASSEMBLY
8	17-330-00	1	TM7 CONTROLLER & CRADLE ASSEMBLY
9	17-331-00	2	TM SLIDE SHIM (NOT SHOWN)
10	17-MAN-00	1	MANUAL, TM7 (NOT SHOWN)
11	910-12-F5OX-S	1	ADAPTER, -12 JIC-M (1 1/16-12) X -12 ORB-M (1 1/16-12)
12	910-16-12-F5OX-S	1	ADAPTER, -16 JIC-M (1 5/16-12) X -12 ORB-M (1 1/16-12)

NOTES:

1. APPLY LOCTITE 569 THREAD SEALANT ITEM #7 (TM SLIDE SHIM) TO BE USED FOR GAP
2. CLEARANCE BETWEEN SLIDE AND FRAME.
3. APPLY LOCTITE 569 THREAD SEALANT.

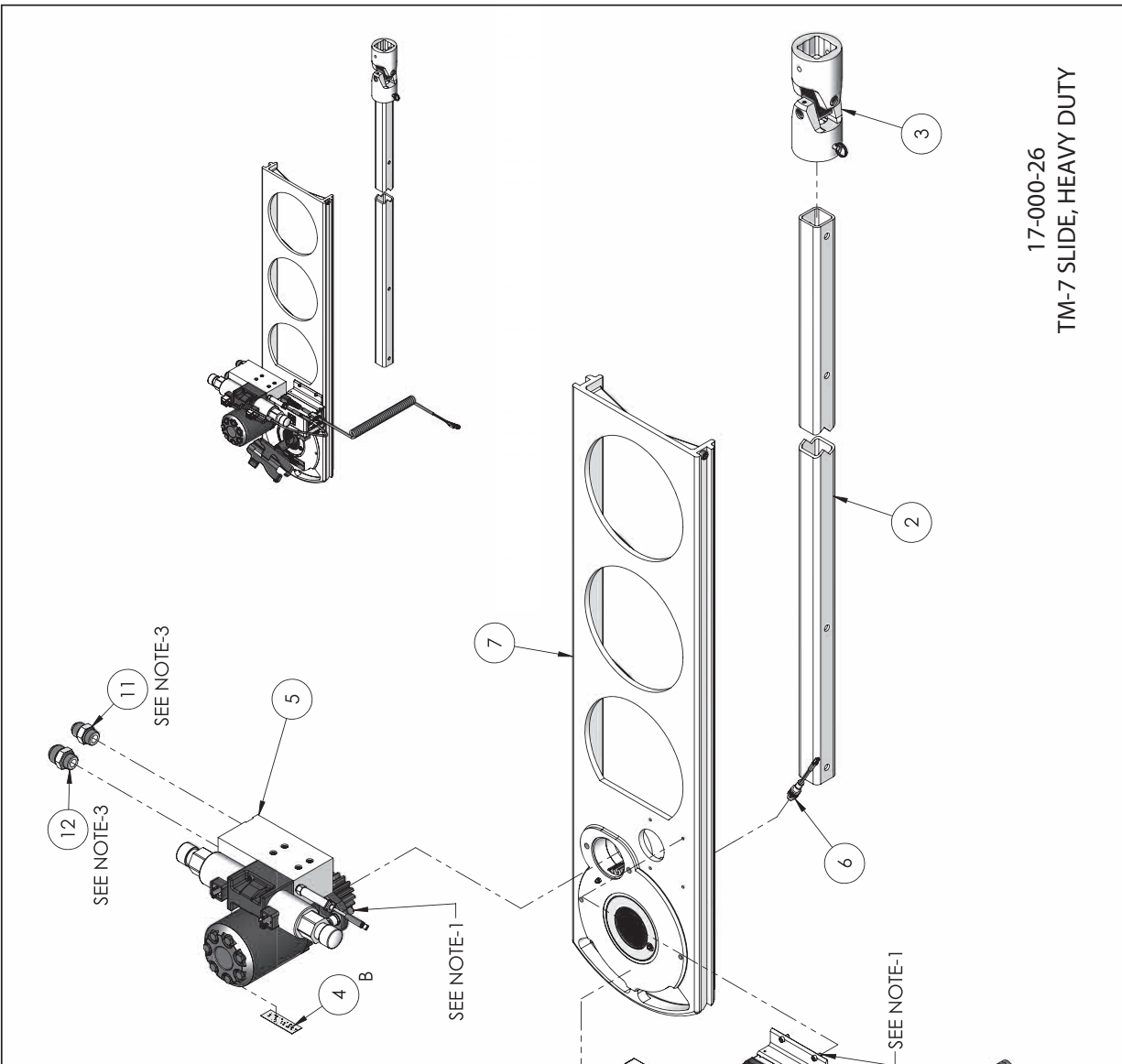


17-000-25
TM-7 SLIDE, STANDARD DUTY

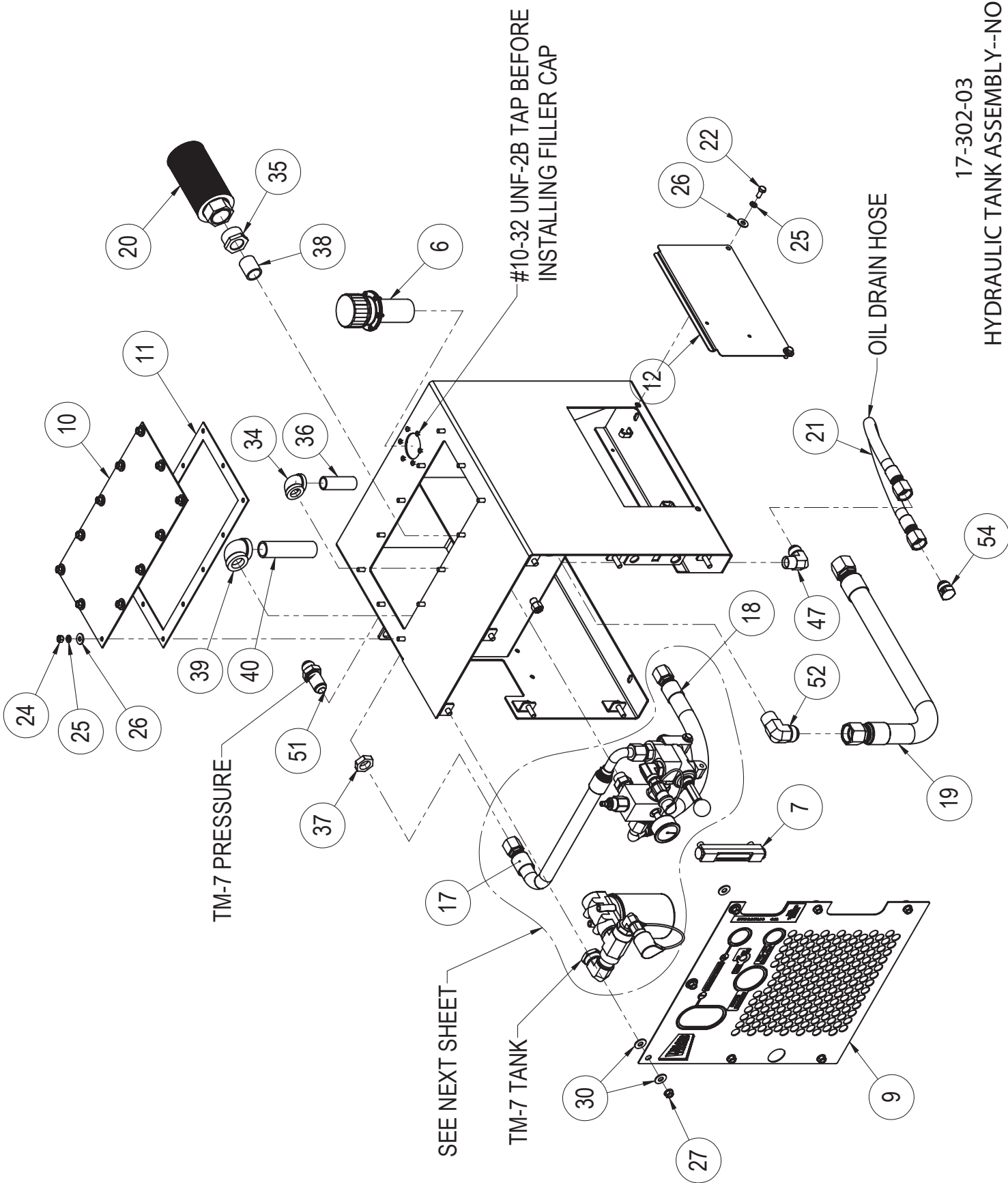
ITEM	PART NUMBER	QTY	DESCRIPTION
1	07-106-00	1	SERIAL NUMBER PLATE
2	07-406-08	1	KEY, VALVE 8'
3	07-508-20	1	ASSEMBLY - 2" HIGH TORQUE
4	17-102-00	1	LABEL RELIEF VALVE
5	17-139-00	1	TM7 HYD. MOTOR & MANIFOLD ASSEMBLY, HEAVY DUTY
6	17-317-00	1	SENSOR ASSEMBLY, PROXIMITY SWITCH
7	17-329-00	1	TM7 HEAD ASSEMBLY
8	17-330-00	1	TM7 CONTROLLER & CRADLE ASSEMBLY
9	17-331-00	2	TM SLIDE SHIM (NOT SHOWN)
10	17-MAN-00	1	MANUAL, TM7 (NOT SHOWN)
11	910-12-F5OX-S	1	ADAPTER, -12 JIC-M (1 1/16-12) X -12 ORB-M (1 1/16-12)
12	910-16-12-F5OX-S	1	ADAPTER, -16 JIC-M (1 5/16-12) X -12 ORB-M (1 1/16-12)

NOTES:

1. APPLY LOCTITE 569 THREAD SEALANT
2. ITEM #7 (TM SLIDE SHIM) TO BE USED FOR GAP CLEARANCE BETWEEN SLIDE AND FRAME.
3. APPLY LOCTITE 569 THREAD SEALANT.

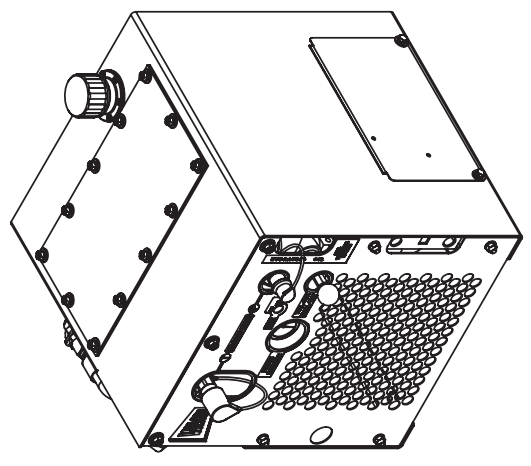
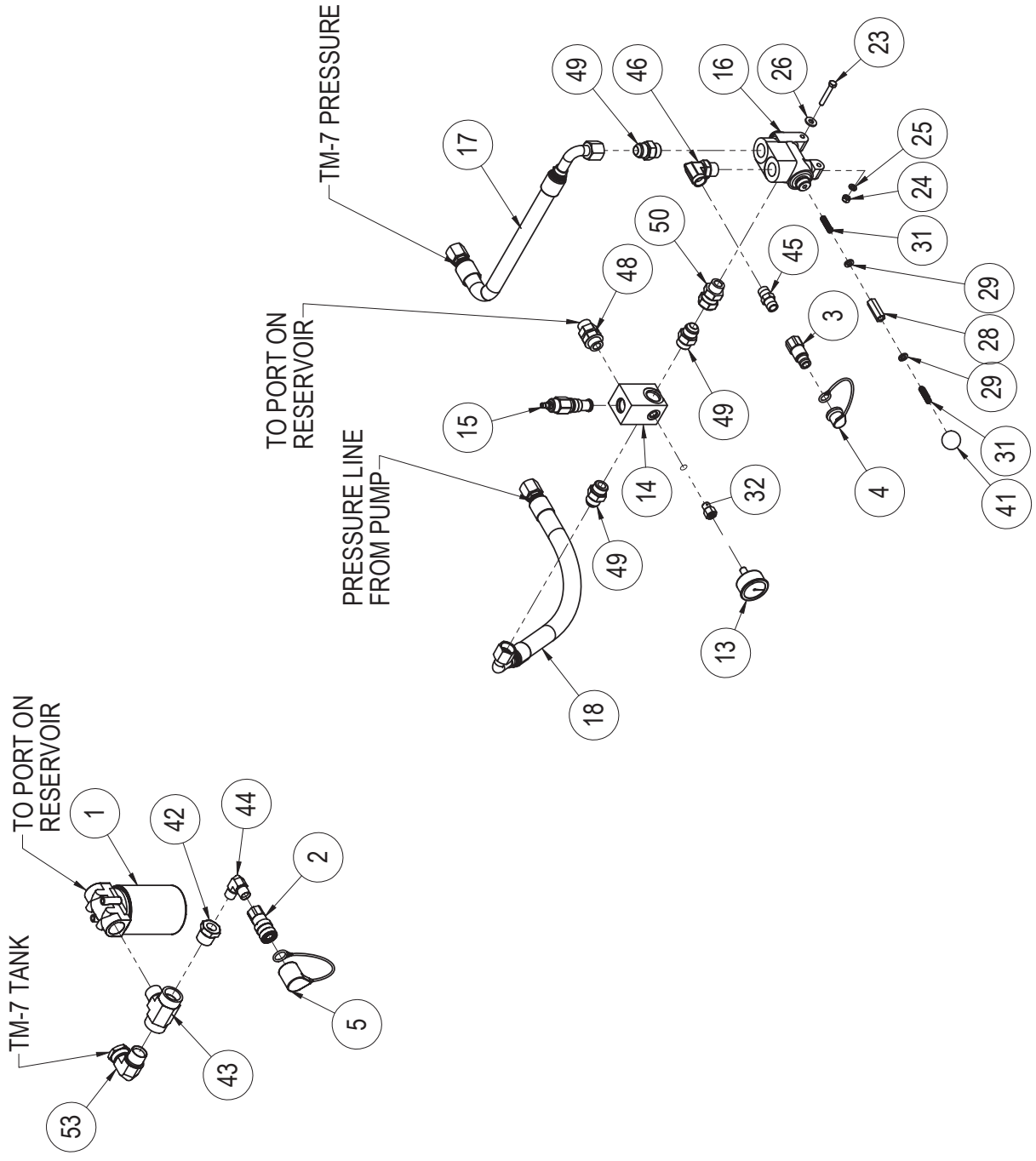


17-000-26
TM-7 SLIDE, HEAVY DUTY



17-302-03

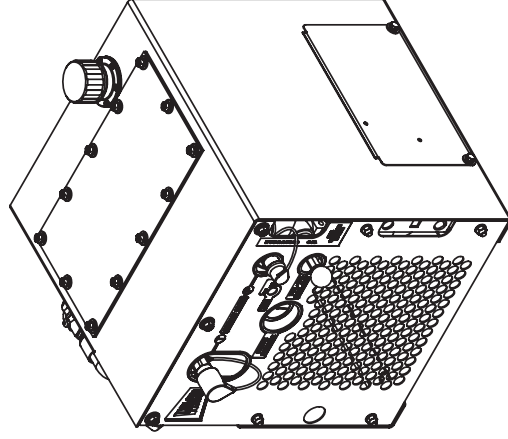
HYDRAULIC TANK ASSEMBLY--NO COOLER



17-302-03
HYDRAULIC TANK ASSEMBLY--NO COOLER

ITEM NO.	PART NUMBER	QTY	DESCRIPTION
1	07-029-00	1	FILTER ASSEMBLY
2	09-025-00	1	QUICK DISCONNECT, FEMALE - HTMA 1/2 NPT F
3	09-026-00	1	QUICK DISCONNECT, MALE - HTMA 1/2 NPT F
4	09-027-00	1	DUST CAP, MALE QUICK-DISCONNECT
5	09-028-00	1	DUST CAP, FEMALE QUICK-DISCONNECT
6	14-124-00	1	FILLER CAP
7	14-125-00	1	GAUGE, LEVEL
8	17-042-01	1	WELDMENT, TANK
9	17-042-12	1	COVER, FRONT, TM7 TANK
10	17-042-13	1	COVER, TM7 TANK
11	17-042-14	1	GASKET, TM-7 TANK
12	17-042-15	1	COVER, RIGHT SIDE
13	17-043-00	1	GAUGE, PRESSURE
14	17-045-10	1	T-3A CAVITY MANIFOLD
15	17-046-00	1	VALVE, RELIEF
16	17-047-02	1	VALVE, 2 WAY SELECTOR
17	17-048-00	1	HOSE, PRESSURE
18	17-062-00	1	18 3/4" HOSE ASSEMBLY, -12 FJ X -12 FJ X -12 HOSE
19	17-063-00	1	HOSE, TANK
20	17-100-00	1	FILTER, SUCTION
21	77-330-22	1	39 1/2" HOSE ASSEM, -12 FJ X -12 FJ X -08 HOSE
22	90-061-07	2	HHCS, 5/16-18 x 3/4
23	90-061-20	1	HHCS, 5/16-18 X 2
24	90-065-01	13	NUT, 5/16-18 HEX GRADE 8
25	90-065-51	15	WASHER, 5/16 SPLIT RING
26	90-065-52	15	WASHER, 5/16 FLAT
27	90-075-06	11	NUT, 3/8-16 FLANGE
28	90-075-17	1	NUT, 3/8-16 X 1-3/4 COUPLING
29	90-075-52	2	WASHER, 3/8 SPLIT RING
30	90-075-53	10	WASHER, 3/8 FLAT
31	90-075-65	2	3/8-16 X 1 1/2" CUP POINT SET SCREW
32	90-078-18	1	ADAPTER, -6 (9/16-18) MORB X 1/4" NPT F
33	90-143-08	6	BHCS #10-32 X 5/8 SS 18-8
34	90-218-07	1	ELBOW, 3/4-90 LP
35	90-218-11	1	BUSHING, 1-1/4 X 1 REDUCING
36	90-218-82	1	NIPPLE, 3/4 X 3
37	90-218-98	1	NUT, -12 (1-1/16" - 12) BULKHEAD
38	90-238-01	1	NIPPLE, 1 CLOSE LP
39	90-238-05	1	ELBOW, 1-90 LP

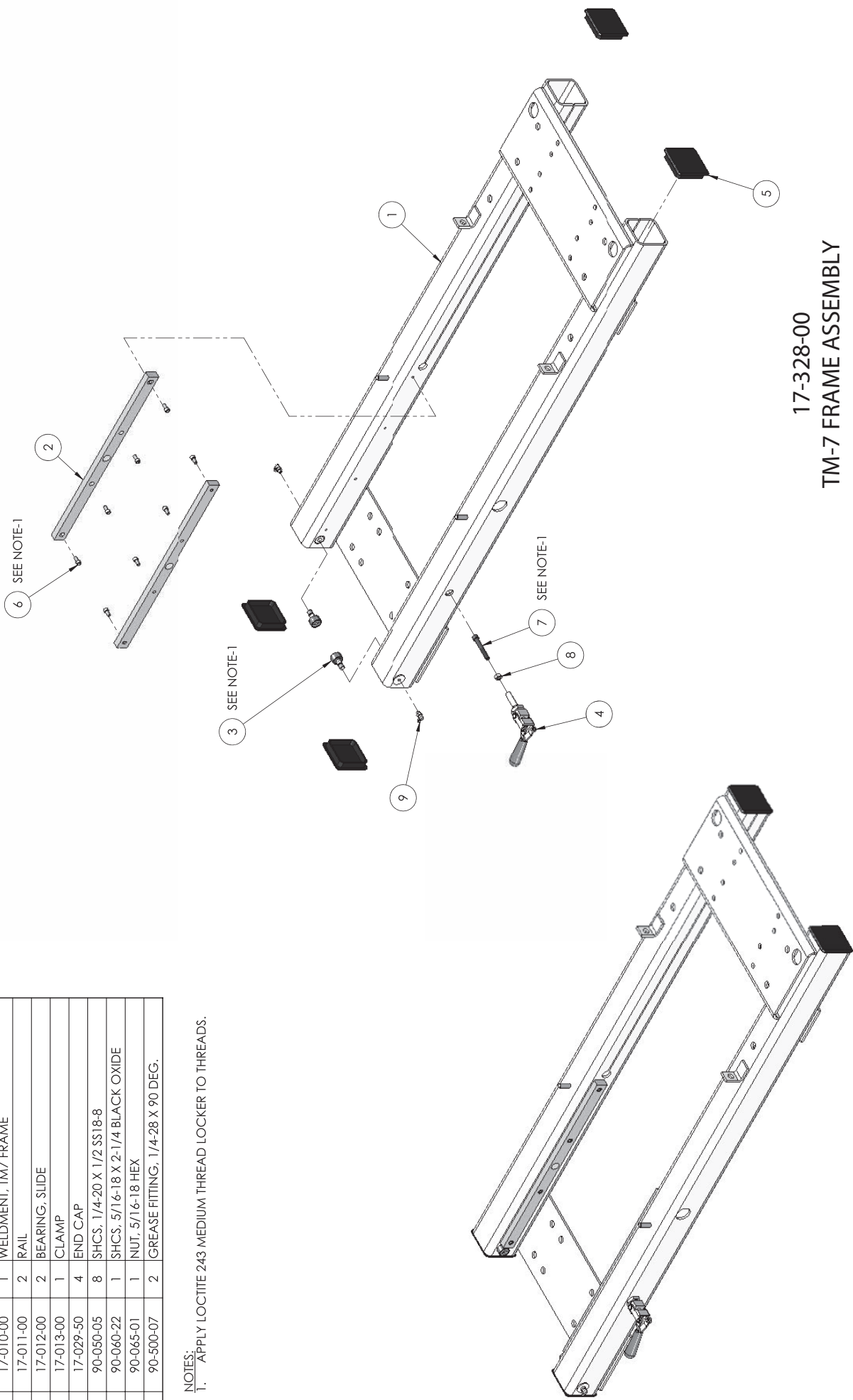
ITEM NO.	PART NUMBER	QTY	DESCRIPTION
40	90-238-08	1	NIPPLE, 1 X 5 LG
41	90-900-50	1	KNOB, 3/8-16 X 1-3/8 BLK
42	910-1-1/2-PTR-S	1	REDUCER BUSHING, 1" NPT X 1/2" NPT
43	910-1-MMS-S	1	TEE, 1" FPT X 1" FPT X 1" MPT BRANCH
44	910-1/2-CR-S	1	ELBOW, 1/2" NPT-M X 1/2" NPT-M 90 HP
45	910-1/2-FF-S	1	NIPPLE, 1/2" NPT-M HEX
46	910-12-1/2-AOEG-S	1	ELBOW, -12 MORB X 1/2" NPT-F 90
47	910-12-CTX-S	1	ELBOW, -12 JIC-M X 3/4" NPT-M 90
48	910-12-F5OHAO-S	1	UNION, -12 MORB X -12 MORB STRAIGHT
49	910-12-F5OX-S	3	ADAPTER, -12 JIC-M (1 1/16-12) X -12 ORB-M (1 1/16-12)
50	910-12-F65OX-S	1	ADAPTER, -12 MORB X -12 JIC-F SWIVEL STRAIGHT
51	910-12-WTX-S	1	ADAPTER, -12 JIC-M X -12 JIC-M BULKHEAD
52	910-16-CTX-S	1	ELBOW, -16 JIC-M X 1" NPT-M 90
53	910-2107-16-16-S	1	ELBOW, 1" MNPT X 1" SWIVEL FNPS
54	910-C5229X12	1	PLUG, -12 SAE 37 (JIC)



17-302-03
HYDRAULIC TANK ASSEMBLY--NO COOLER

ITEM	PART NUMBER	QTY	DESCRIPTION
1	17-010-00	1	WELDMENT, TM7 FRAME
2	17-011-00	2	RAIL
3	17-012-00	2	BEARING, SLIDE
4	17-013-00	1	CLAMP
5	17-029-50	4	END CAP
6	90-050-05	8	SHCS, 1/4-20 X 1/2 SS18-8
7	90-060-22	1	SHCS, 5/16-18 X 2-1/4 BLACK OXIDE
8	90-065-01	1	NUT, 5/16-18 HEX
9	90-500-07	2	GREASE FITTING, 1/4-28 X 90 DEG.

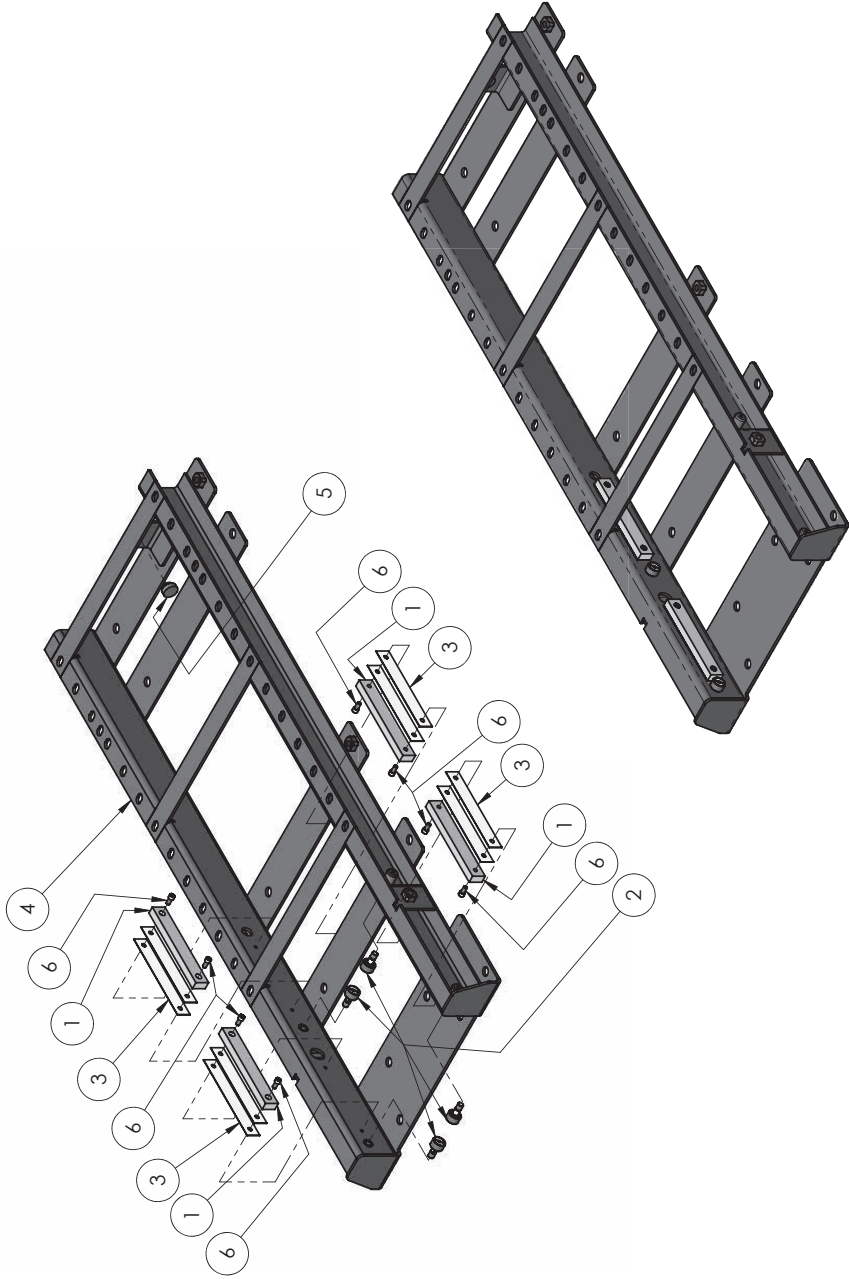
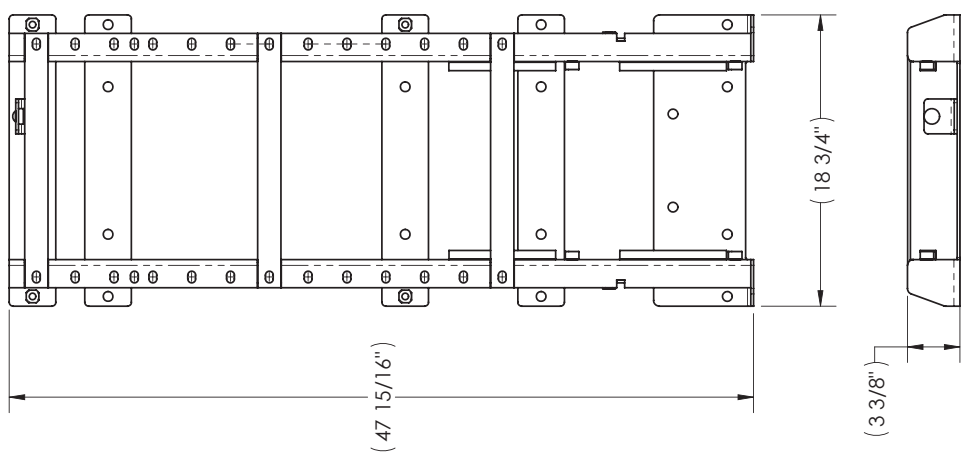
NOTES:
 1. APPLY LOCTITE 243 MEDIUM THREAD LOCKER TO THREADS.



17-328-00
 TM-7 FRAME ASSEMBLY

NOTES:

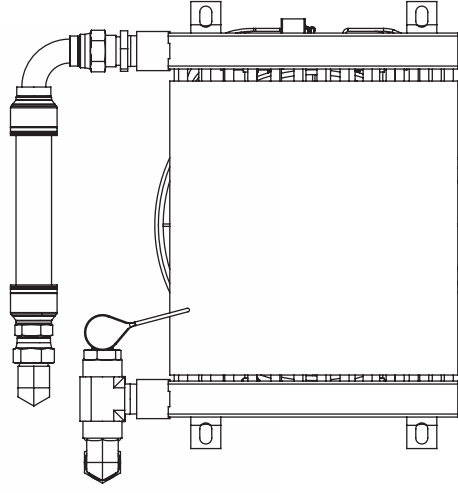
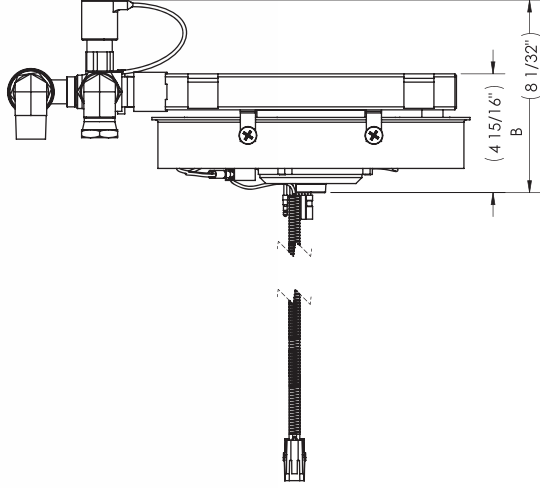
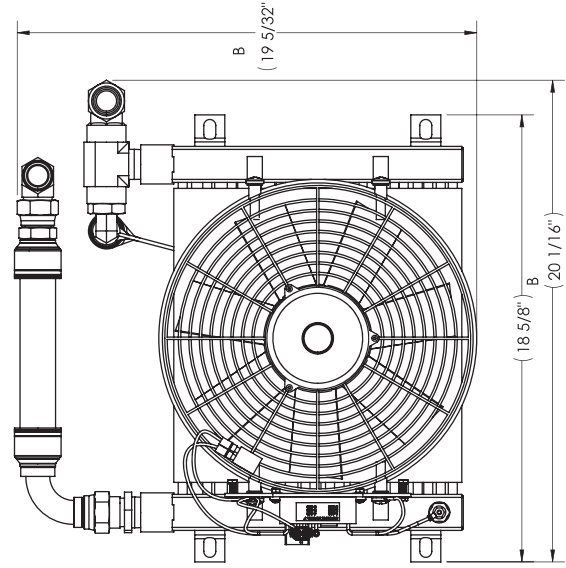
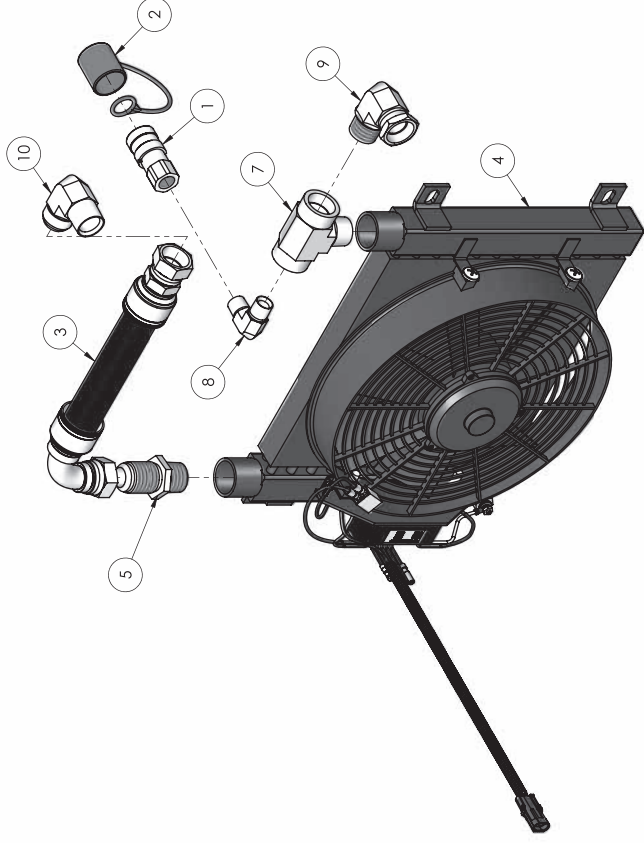
TO MINIMIZE GAP BETWEEN 1 AND TM7 SLIDE, USE SHIMS 3 AS REQUIRED. BOM INCLUDES (2) SHIMS PER LOCATION. GAP ADJUSTMENT MAY REQUIRE MORE THAN (2) SHIMS.



ITEM	PART NUMBER	QTY	DESCRIPTION
1	17-011-01	4	RAIL
2	17-012-00	4	BEARING, SLIDE
3	17-331-01	8	TM SLIDE SHIM
4	17-332-00	1	WELDMENT, TM7 FRAME
5	77-175-10	1	BUMPER, PUSH IN 1/2" HOLE
6	90-050-05	8	SHCS, 1/4-20 X 1/2 SS18-8

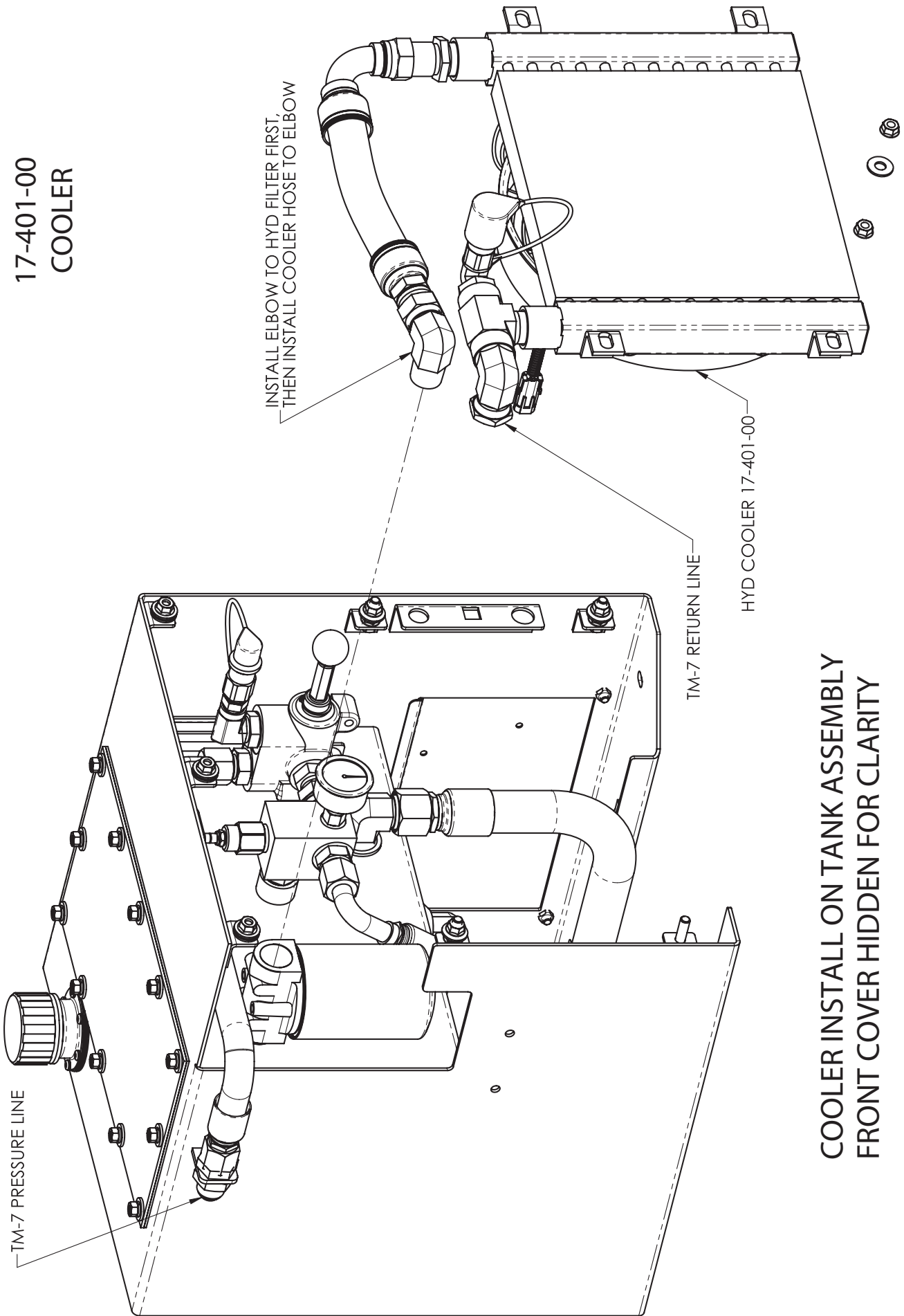
17-333-00
TM-7 FRAME ASSEMBLY

ITEM	PART NUMBER	QTY	DESCRIPTION
1	09-025-00	1	QUICK DISCONNECT, FEMALE - HTMA 1/2 NPT F
2	09-028-00	1	DUST CAP, FEMALE QUICK-DISCONNECT
3	17-053-00	1	COOLER HOSE ASSEMBLY
4	17-146-00	1	COOLER, THERMOSTAT ASSEMBLY
5	90-238-65	1	MALE CONNECTOR, 1" FLARE X 1" MNPT
6	910-1-1/2-PTR-S	1	REDUCER BUSHING, 1" NPT X 1/2" NPT
7	910-1-MMMS-S	1	TEE, 1" FPT X 1" FPT X 1" MPT BRANCH
8	910-1/2-CR-S	1	ELBOW, 1/2" NPT-M X 1/2" NPT-M 90 HP
9	910-2107-16-16-S	1	ELBOW, 1" MNPT X 1" SWIVEL FNPS
10	910-16-CTX-S	1	ELBOW, -16 JIC-M X 1" NPT-M 90

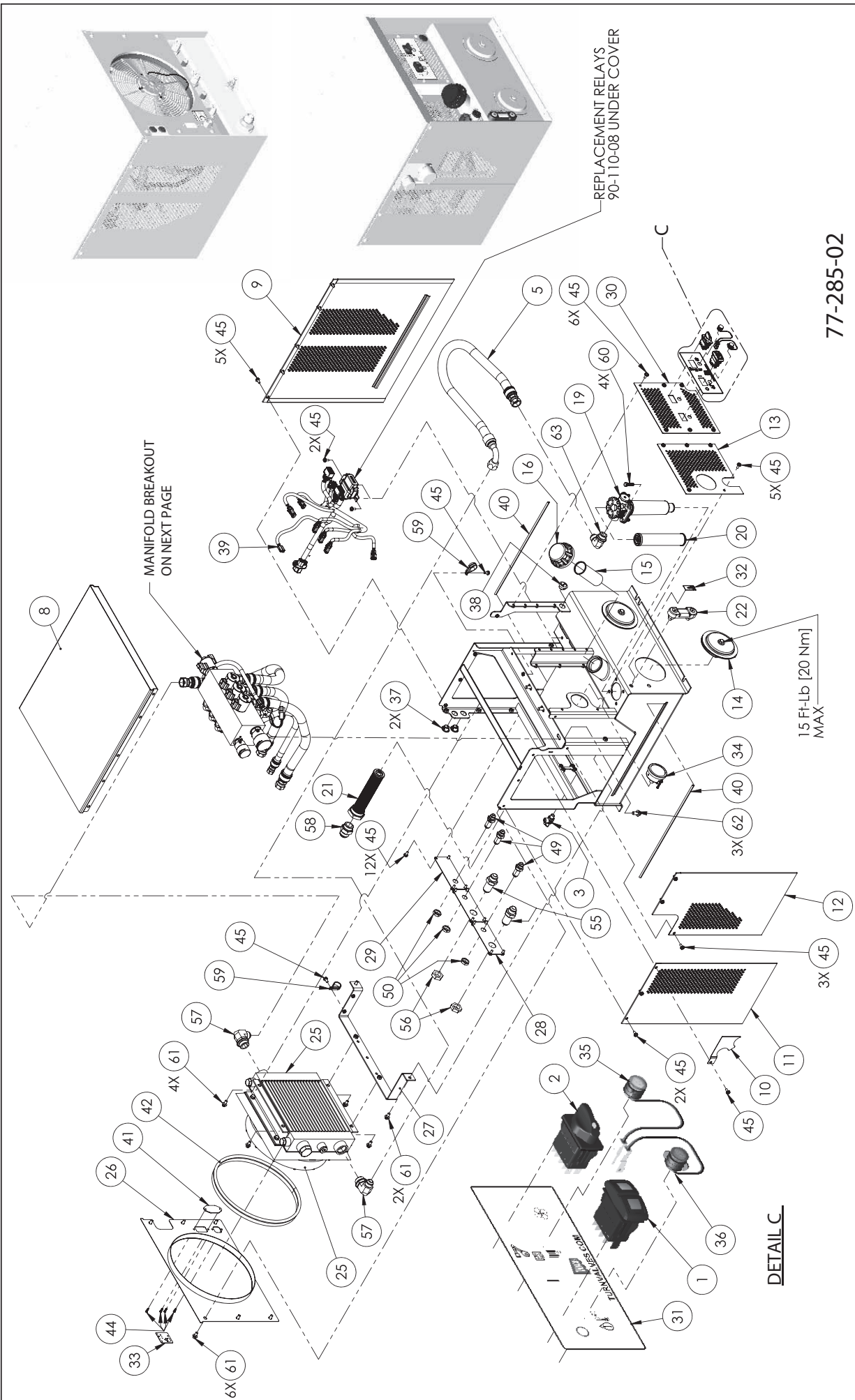


17-401-00
COOLER

17-401-00
COOLER

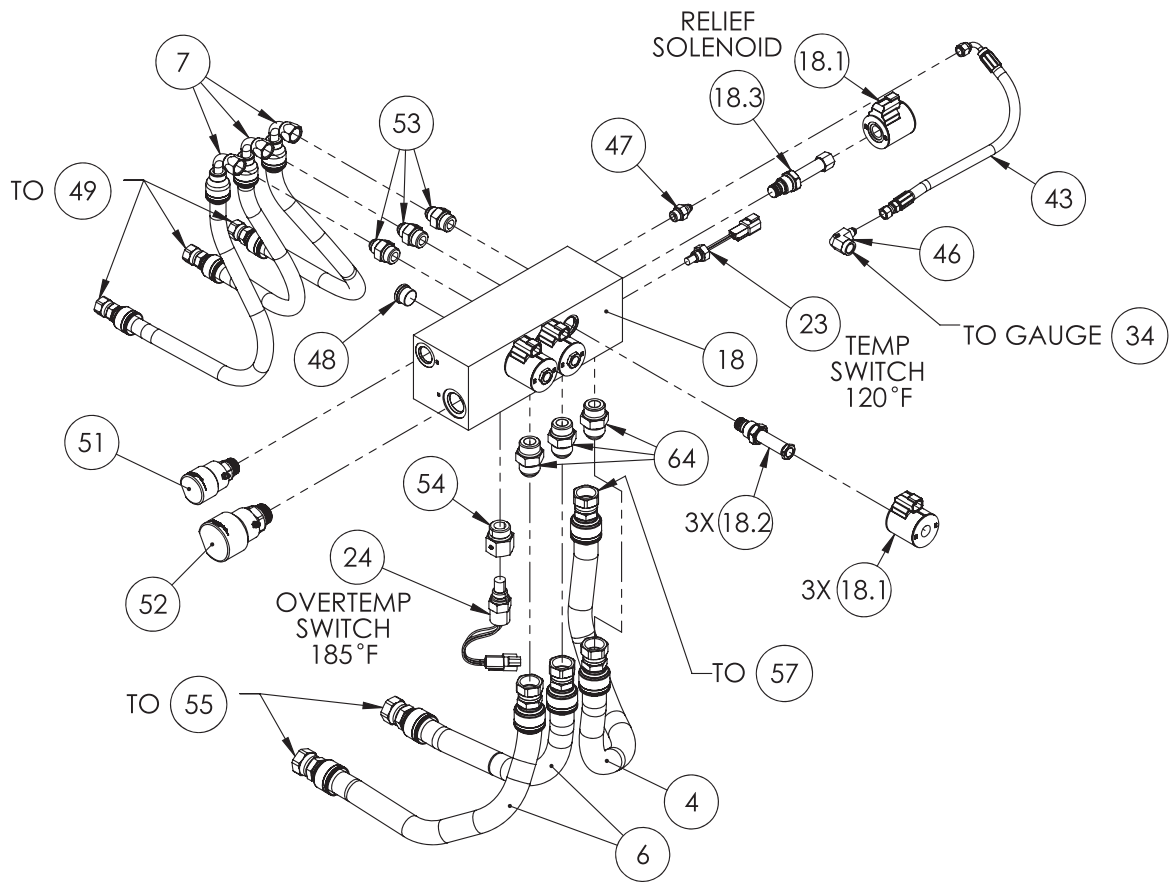


COOLER INSTALL ON TANK ASSEMBLY
FRONT COVER HIDDEN FOR CLARITY



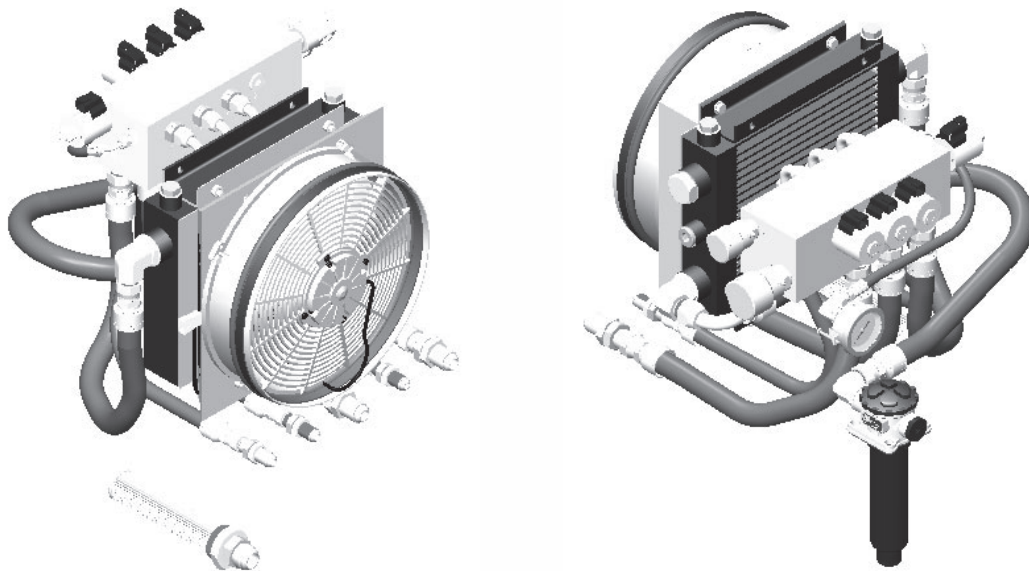
77-285-02

3-CIRCUIT RESERVOIR ASSEMBLY WITH CONTROLS



REPLACEMENT PARTS FOR MANIFOLD ITEM 18

ITEM	PART NUMBER	QTY	DESCRIPTION
18.1	77-249-20	4	COIL, #10 12 VDC
18.2	77-249-30	3	SV10-20, 2-WAY CARTRIDGE
18.3	77-249-40	1	SVRV10-26F RELIEF CARTRIDGE



77-285-02
3-CIRCUIT RESERVOIR ASSEMBLY WITH CONTROLS

ITEM	PART NUMBER	QTY	DESCRIPTION
1	68-179-10	1	SEALED ROCKER SWITCH, 3 POSITION 2 LAMP
2	68-179-11	1	SELECTOR SWITCH, 3 POSITION
3	77-185-55	1	OIL DRAIN VALVE, 1/2-20 X 3/8" HOSE
4	77-243-01	1	27-3/16" HOSE ASSEMBLY, -12FJ X -12FJ X -12 HOSE
5	77-243-02	1	30" HOSE ASSEMBLY, -12 FJ X -12 FJ X -12 HOSE
6	77-243-03	2	19-3/16" HOSE ASSEMBLY, -12 FJ X -12 FJ X -12 HOSE
7	77-243-00	3	19-7/8" HOSE ASSEMBLY, -08 FJ X -08 FJ 90 X -08 HOSE
8	77-246-15	1	WELDMENT, RESERVOIR TOP COVER
9	77-246-20	1	SIDE PANEL, RIGHT FULL
10	77-246-22	1	SWIVEL COVER PANEL
11	77-246-23	1	SIDE PANEL, BACK LEFT
12	77-246-24	1	SIDE PANEL, FRONT LEFT
13	77-246-25	1	GAUGE COVER PLATE
14	77-246-60	2	RESERVOIR ACCESS COVER, 6"
15	77-246-70	1	STRAINER BASKET WITH CHAIN
16	77-246-75	1	FILLER CAP WITH BREATHER
17	77-246-00	1	WELDMENT, RESERVOIR
18	77-249-03	1	MANIFOLD ASSEMBLY 3 CIRCUIT SELECTOR
19	77-255-01	1	HYDRAULIC OIL FILTER, IN-TANK RETURN
20	77-255-10	1	FILTER ELEMENT, 10 MICRON
21	77-255-50	1	SUCTION STRAINER, 149 MICRON W/ 5 PSI BYPASS
22	77-256-01	1	RESERVOIR SIGHT LEVEL/THERMOMETER 3" CENTER
23	77-257-01	1	TEMP SWITCH, 120F NO SPST-6 SAE ORB
24	77-257-02	1	TEMP SWITCH, 180F SPDT-8 SAE ORB
25	77-258-10	1	HYDRAULIC COOLER, 12 VDC
26	77-258-12	1	FAN SHROUD
27	77-258-14	1	LOWER COOLER SUPPORT
28	77-259-02	2	BULKHEAD PLATE, -8 + -12
29	77-259-03	1	BULKHEAD PLATE, -8
30	77-264-01	1	FRONT PANEL - CONTROLS
31	77-267-02	1	LABEL, HYDRAULIC CONTROLS 3 POSITION
32	77-267-03	1	LABEL, OIL LEVEL
33	77-267-04	1	LABEL, 12V POWER INPUT-RESERVOIR
34	77-269-01	1	PRESSURE GAUGE, 0-3000 PSI
35	77-272-10	1	INDICATOR, GREEN LED JWPF CONNECTOR

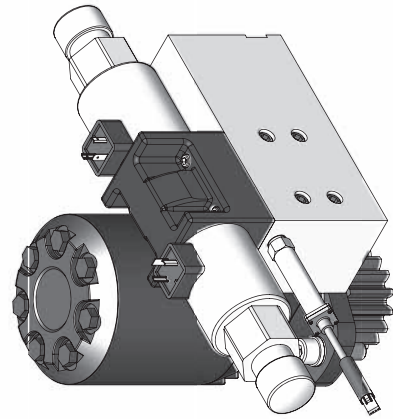
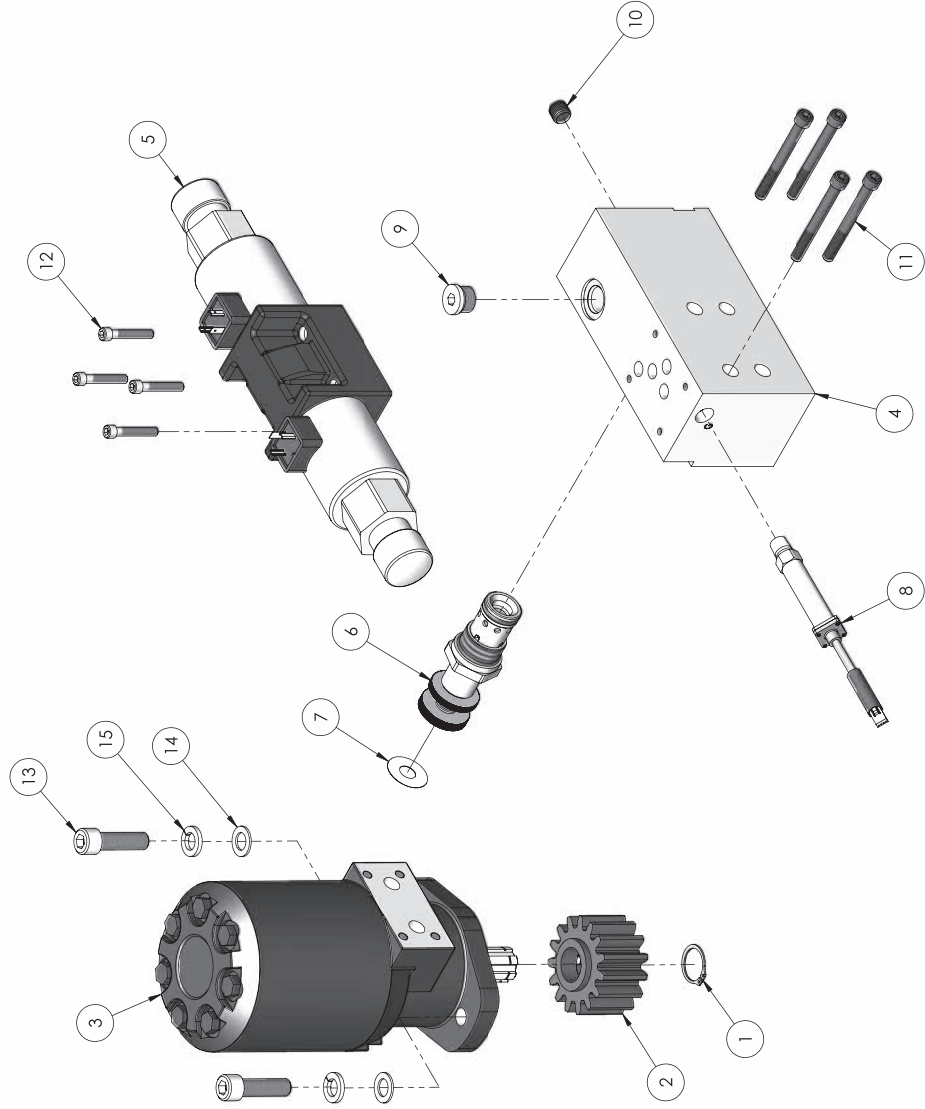
ITEM	PART NUMBER	QTY	DESCRIPTION
36	77-272-20	1	INDICATOR, RED LED JWPF CONNECTOR
37	77-273-07	2	HOLE PLUG, 3/4"
38	77-273-08	1	HOLE PLUG, 7/8"
39	77-274-01	1	WIRE HARNESS, RESERVOIR + CONTROLS
40	77-277-01	2X 18"	EDGE TRIM, 1/16" EDGE X 5/16" NEOPRENE (INCH)
41	77-287-01	1	COVER PLATE
42	77-288-01	41"	PUSH-ON BULB SEAL, 1/16" EDGE X 3/8" BULB
43	79-102-06	1	HOSE ASSEMBLY, 1/4" HYDRAULIC 16-1/2" LONG
44	90-030-00	4	TPHST, M4.5 X 14mm
45	90-055-12	38	PHMS, M6 X 16 DOUBLE SEMS
46	90-058-13	1	ELBOW, 1/4 NPT-F X -04 JIC-M (7/16-20)
47	90-078-19	1	ADAPTER, -6 ORB-M (9/16-18) X -4 JIC-M (7/16-20)
48	90-088-90	1	PLUG, SAE -10 ORB (7/8-14)
49	90-098-30	3	ADAPTER, -8 JIC-M (3/4-16) X -8 JIC-M BULKHEAD
50	90-098-31	3	NUT, -8 (3/4-16) BULKHEAD
51	90-200-10	1	SWIVEL, -10 ORB M X -8 ORB F 90
52	90-200-12	1	SWIVEL, -12 ORB M X -12 ORB F 90
53	90-208-10	3	ADAPTER, -10 ORB M (7/8"-14) X -8 JIC M (3/4"-16)
54	90-218-81	1	ADAPTER, -12 ORB-M (1-1/16"-12) X -8 ORB-F (3/4"-16)
55	90-218-96	2	ADAPTER, -12 JIC-M X -12 JIC-M BULKHEAD
56	90-218-98	2	NUT, -12 (1-1/16" - 12) BULKHEAD
57	90-238-66	2	ELBOW, -16 ORB M X -12 JIC M
58	90-238-67	1	ADAPTER, -16 ORB-M (1-5/16"-12) X -16 JIC-M
59	90-903-10	2	CUSHIONED LOOP CLAMP, 1"
60	90-1002-30	4	HHCS, M8 X 1.25MM X 30MM
61	90-1055-16	12	HHFS, M8-1.25 X 16 mm ISO 4162 8.8 ZN
62	90-1056-20	3	HHFS, M10-1.5 X 20 mm ISO 4162 8.8 ZN
63	910-12-C5OX-S	1	ELBOW, -12 M JIC (1-1/16"-12) X -12 M ORB (1-1/16"-12) 90
64	910-12-F5OX-S	3	ADAPTER, -12 JIC-M (1 1/16-12) X -12 ORB-M (1 1/16-12)

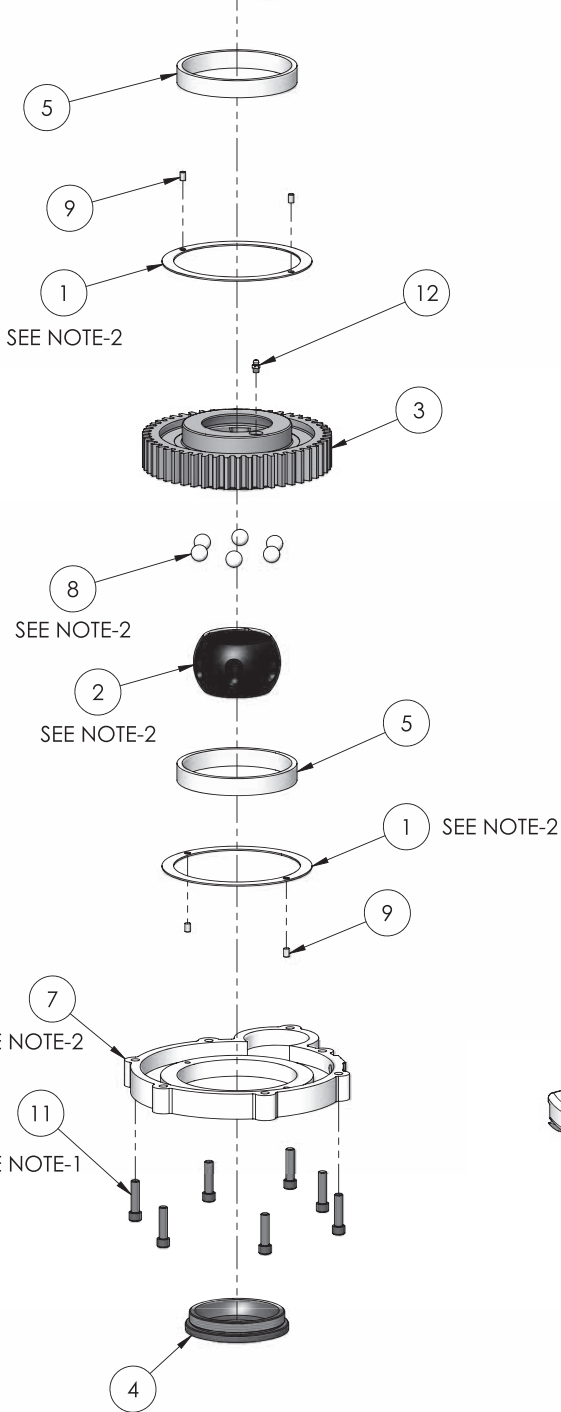
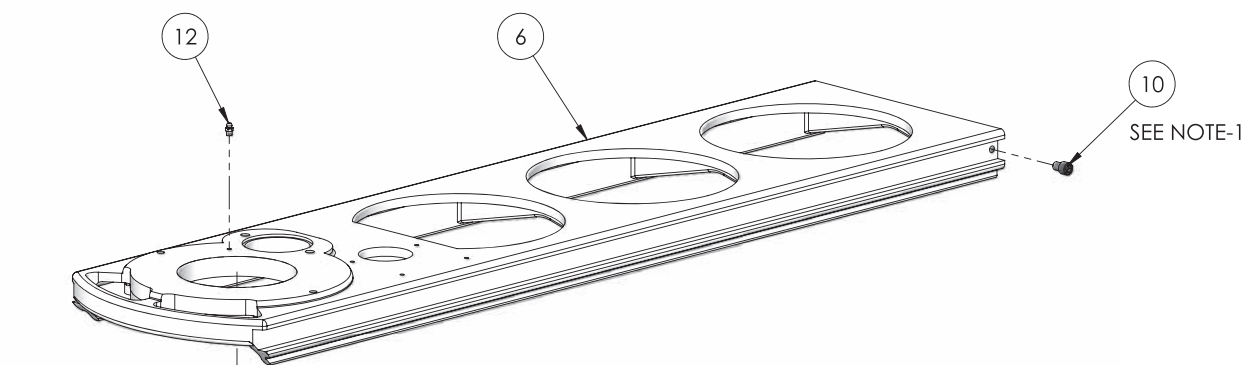
77-285-02

3-CIRCUIT RESERVOIR ASSEMBLY WITH CONTROLS

TM-7 HYDRAULIC MOTOR & MANIFOLD ASSEMBLY
17-138-00, STANDARD DUTY
17-139-00, HEAVY DUTY

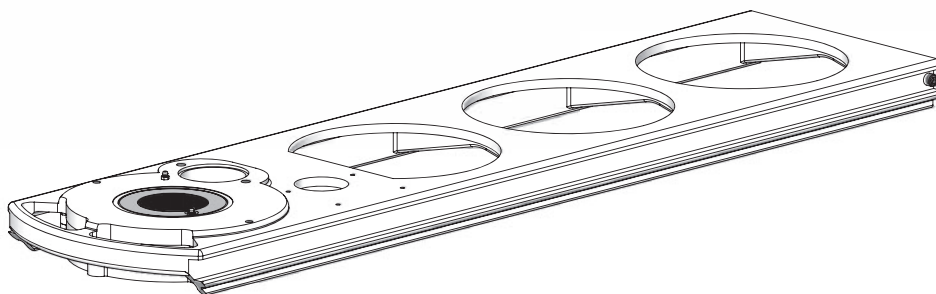
ITEM	PART NUMBER	QTY	DESCRIPTION
1	07-018-00	1	RING, RETAINING-EXTERNAL
2	17-004-00	1	PINION GEAR
3	17-022-00/17-023-00	1	MOTOR (Std. Duty 17-022-00; Heavy Duty 17-023-00)
4	17-024-00	1	MANIFOLD
5	17-030-00	1	DIRECTIONAL CONTROL VALVE W/MANUAL OVERRIDE
6	17-080-00	1	TORQUE CONTROL VALVE
7	17-104-00	1	LABEL, INCREASE 250
8	17-319-00	1	SENSOR ASSEMBLY, PRESSURE TRANSDUCER
9	90-018-50	1	PLUG, SAE-8 ORB
10	90-059-62	1	PLUG, 1/4 NPT
11	90-060-30	4	SHCS, 5/16-18 X 3 BLACK OXIDE
12	90-150-15	4	SHCS, 1/4-20 X 1-1/2 SS18-8
13	90-190-17	2	SHCS, 1/2-13 X 1-3/4 SS18-8
14	90-195-52	2	WASHER, 1/2 FLAT SS
15	90-195-58	2	WASHER, 1/2 LOCK SS18-8





ITEM	PART NUMBER	QTY	DESCRIPTION
1	07-006-01	2	UPPER THRUST WASHER
2	17-001-00	1	KNUCKLE, MACHINED
3	17-002-00	1	GEAR HUB
4	17-003-00	1	RING, LOCK
5	17-005-00	2	BEARING, GARLOCK
6	17-006-00	1	HOUSING, UPPER
7	17-007-00	1	HOUSING, LOWER
8	17-008-00	6	BALL, DRIVE .75 DIA
9	90-056-03	4	PIN, 1/4 X 3/8 DOWEL
10	90-070-05	1	SHCS, 3/8-16 X 1/2
11	90-070-15	7	SHCS, 3/8-16 X 1-1/2
12	90-500-05	2	GREASE FITTING, 1/4-28 STRAIGHT

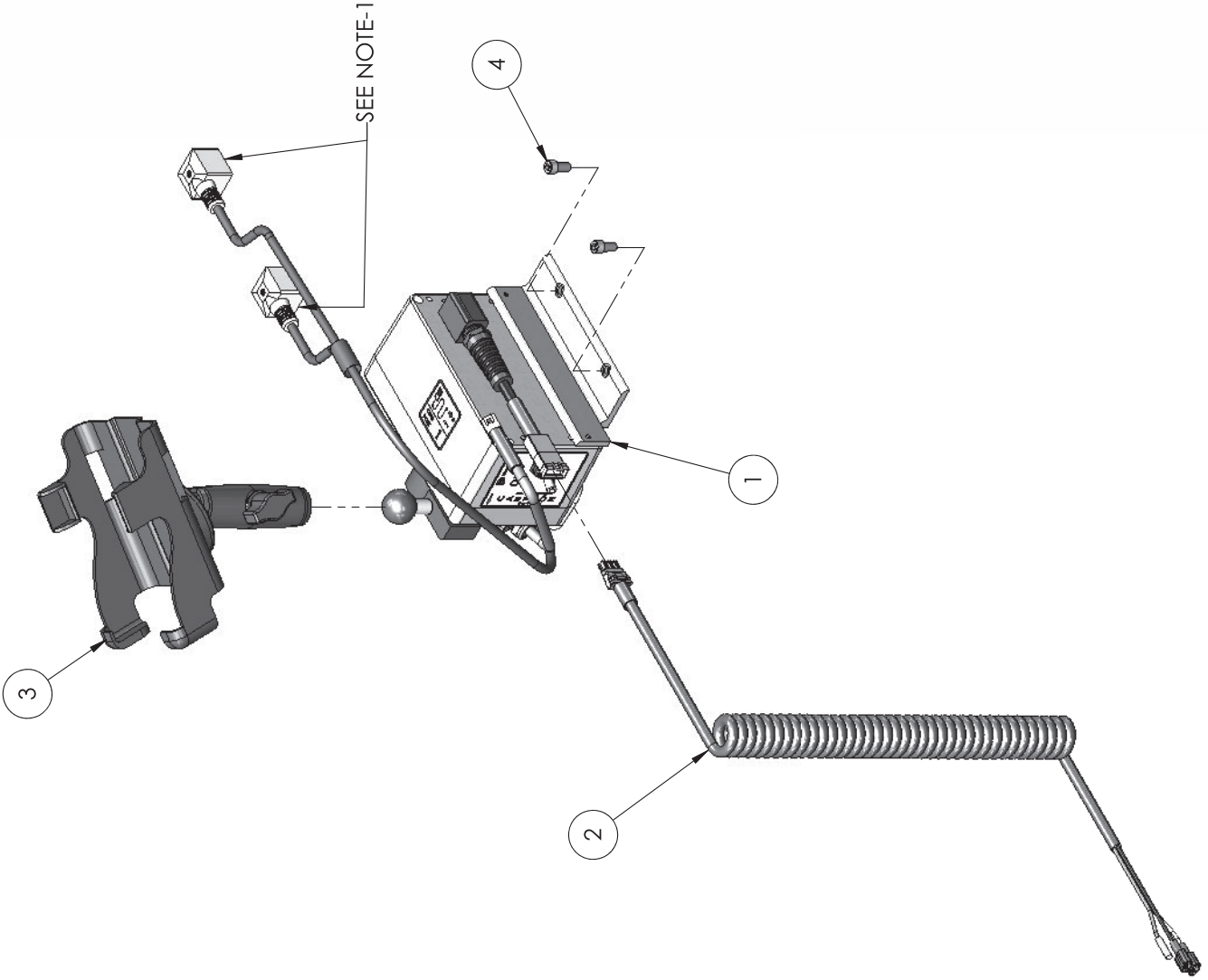
- NOTES:
 1. APPLY LOCTITE 243 MEDIUM THREAD LOCKER TO THREADS.
 2. APPLY MULLIN 735 GREASE.



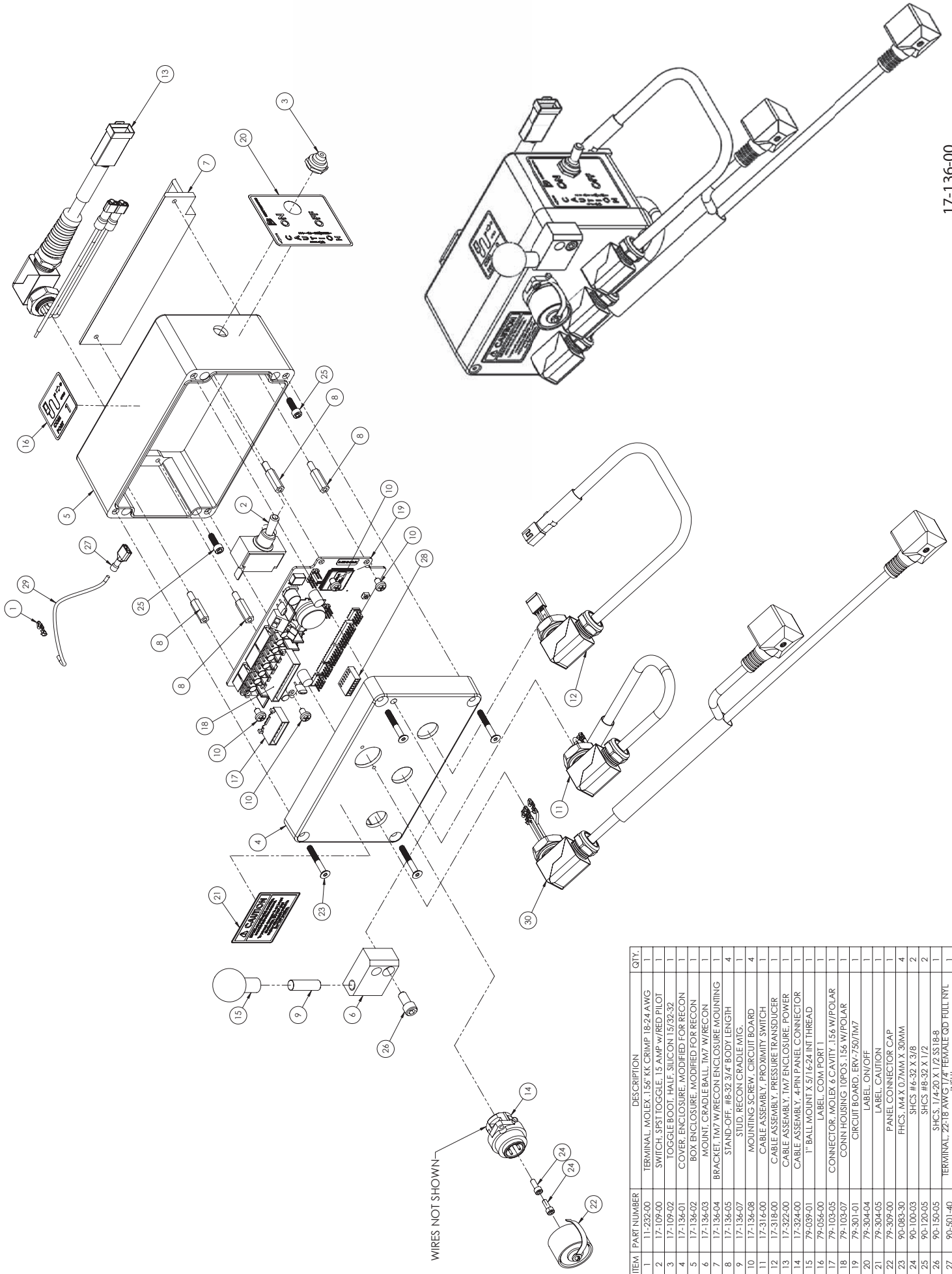
17-329-00
 TM-7 HEAD ASSEMBLY

ITEM	PART NUMBER	QTY	DESCRIPTION
1	17-136-00	1	ASSEMBLY, TM-7 CONTROL ENCLOSURE
2	17-323-00	1	CABLE ASSEMBLY, TM7 W/ RECON POWER
3	79-202-00	1	CRADLE, VEHICLE MOUNT
4	90-150-05	2	SHCS, 1/4-20 X 1/2 SS18-8

NOTES:
 1. APPLY LOCTITE 37535 DIELECTRIC GREASE.



17-330-00
 TM-7 CONTROLLER & CABLE ASSEMBLY

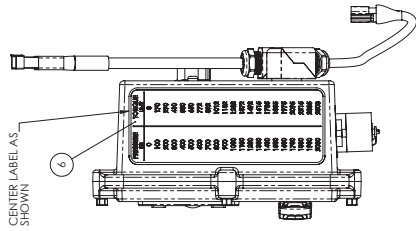
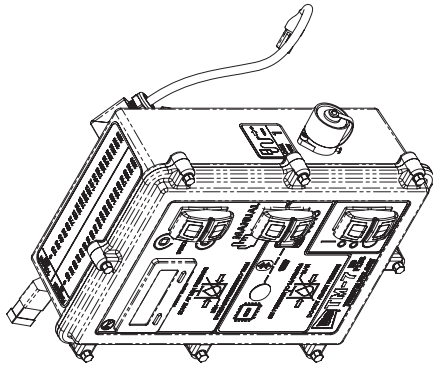


WIRES NOT SHOWN

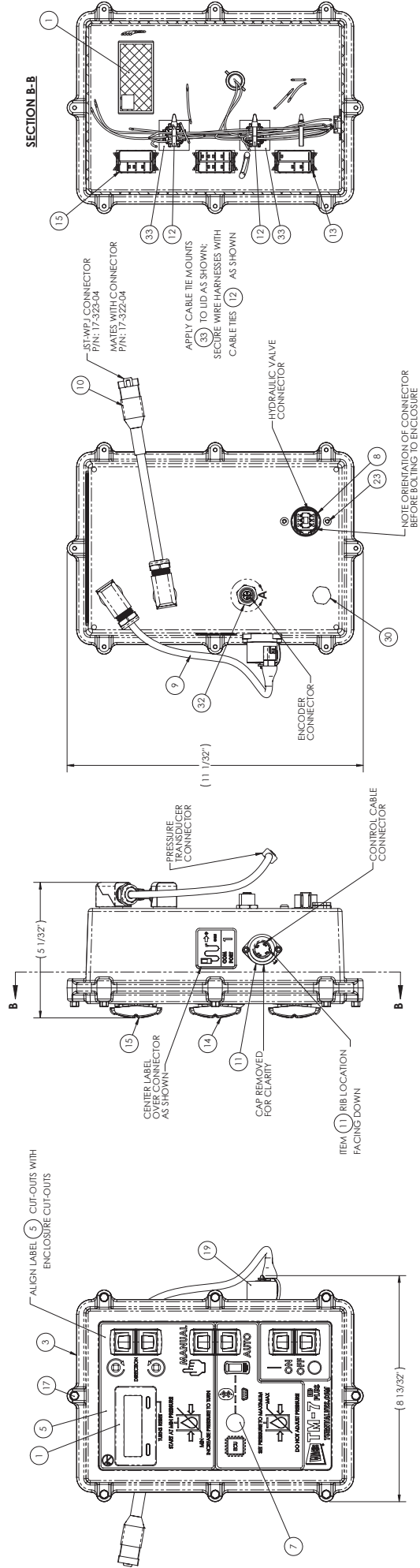
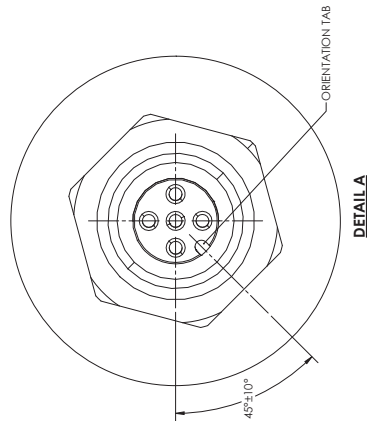
ITEM	PART NUMBER	DESCRIPTION	QTY.
1	11-232-00	TERMINAL, MOLEX .156" KK CRIMP 18-24 AWG	1
2	17-109-00	SWITCH, SPST TOGGLE, 15 AMP W/RED PILOT	1
3	17-109-00	TOGGLE BOOT, HALF, SILICON 15/32-32	1
4	17-136-01	COVER, ENCLOSURE, MODIFIED FOR RECON	1
5	17-136-02	BOX, ENCLOSURE, MODIFIED FOR RECON	1
6	17-136-03	MOUNT, CRADLE BALL, TM7 W/RECON	1
7	17-136-04	BRACKET, TM7 W/RECON ENCLOSURE MOUNTING	1
8	17-136-05	STAND-OFF, #8-32 3/4" BODY LENGTH	4
9	17-136-07	STUD, RECON CRADLE MTG.	1
10	17-136-08	MOUNTING SCREW, CIRCUIT BOARD	4
11	17-316-00	CABLE ASSEMBLY, PROXIMITY SWITCH	1
12	17-318-00	CABLE ASSEMBLY, PRESSURE TRANSDUCER	1
13	17-322-00	CABLE ASSEMBLY, TM7 ENCLOSURE, POWER	1
14	17-324-00	CABLE ASSEMBLY, 4PIN PANEL CONNECTOR	1
15	79-039-01	1" BALL MOUNT X 5/16-24 INT THREAD	1
16	79-056-00	LABEL, COM PORT 1	1
17	79-103-05	CONNECTOR, MOLEX 6 CAVITY .156 W/POLAR	1
18	79-103-07	CONN HOUSING 10POS .156 W/POLAR	1
19	79-301-01	CIRCUIT BOARD, ERV-750/TM7	1
20	79-304-04	LABEL, ON/OFF	1
21	79-304-05	LABEL, CAUTION	1
22	79-309-00	PANEL CONNECTOR CAP	1
23	90-083-30	FHC'S, M4 X 0.7MM X 30MM	4
24	90-100-03	SHCS #4-32 X 3/8	2
25	90-120-05	SHCS #8-32 X 1/2	2
26	90-150-05	SHCS 1/4-20 X 1/2 SS B-8	1
27	90-507-03	TERMINAL, 22-18 AWG, PERVALE GID FULL NYL INSUL	1
28	90-507-03	CONNECTOR, MOLEX 100 HIGH PRESSURE 7 CAVITY	1
29	90-901-29	WIRE 18 GA GRAY GXL	5'
30	17-522-01-00	CABLE, DIRECTIONAL VALVE, DIN	1

17-136-00
CONTROL ENCLOSURE, ASSY.

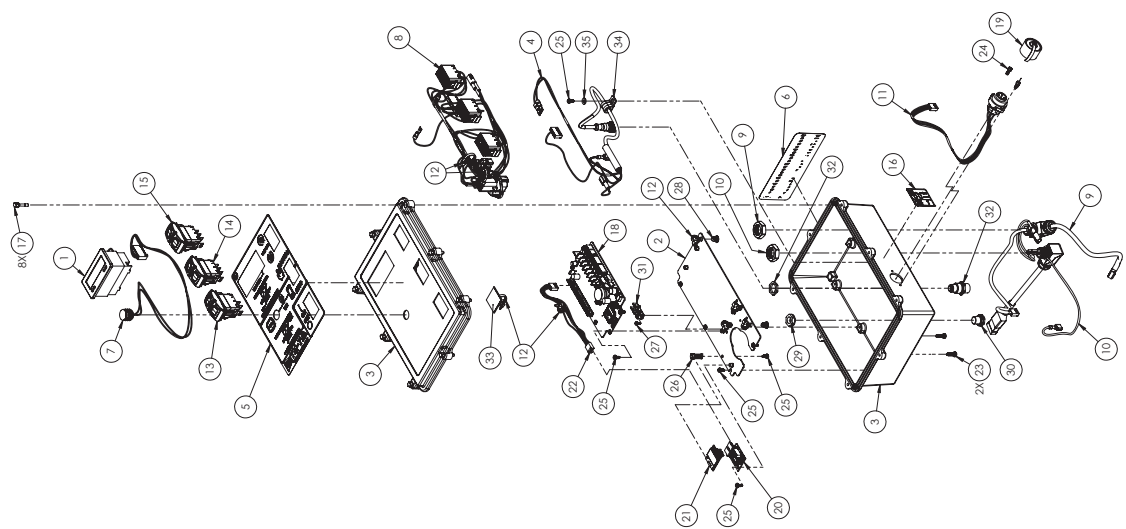
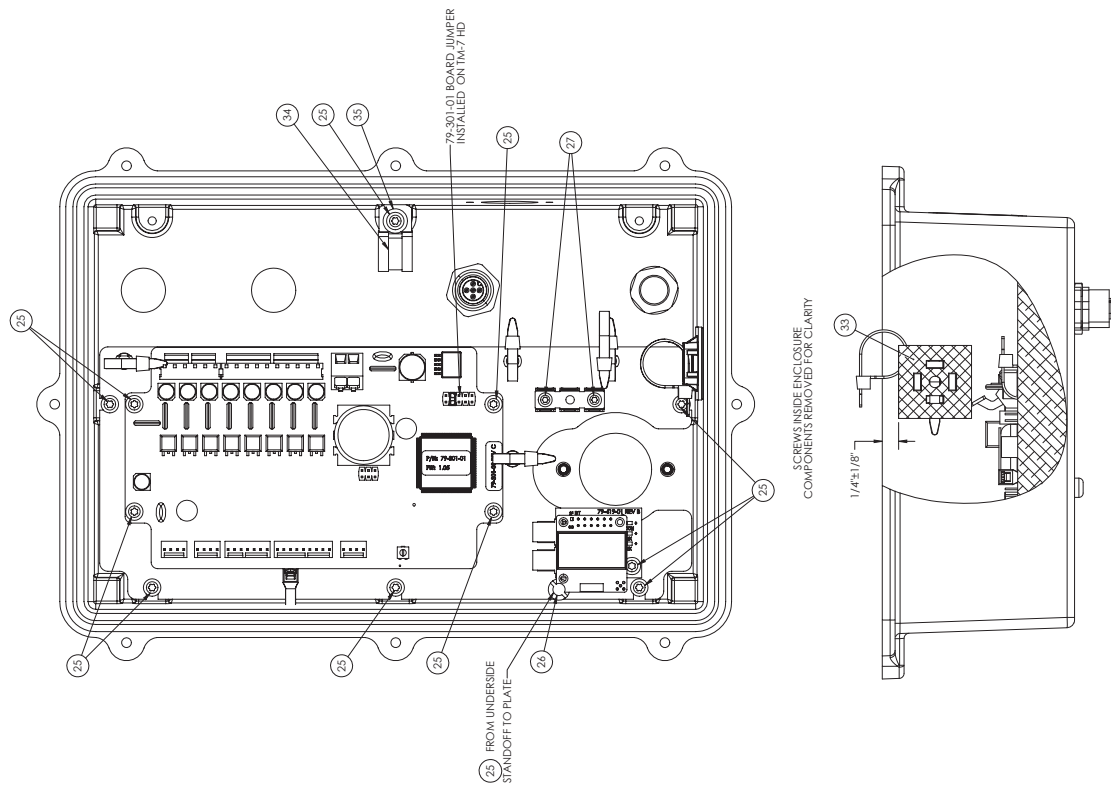
17-160-00
TM-7 HD PLUS CONTROL ASSEMBLY



CENTER LABEL AS SHOWN



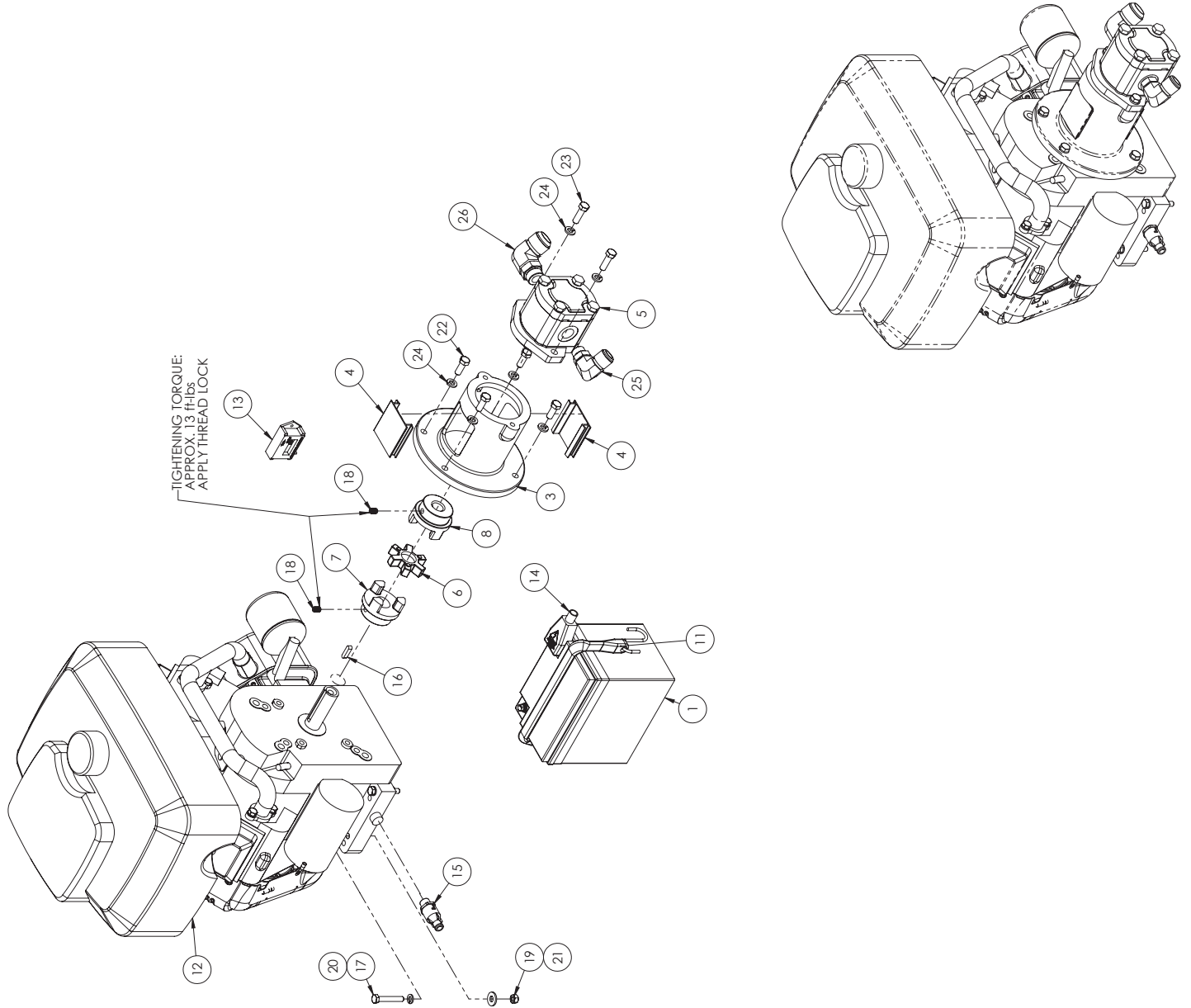
17-160-00
 TM-7 HD PLUS CONTROL ASSEMBLY



ITEM PART NUMBER	QTY	DESCRIPTION
1	1	COUNTER PROGRAMMED
2	1	BASE PLATE
3	1	ENCLOSURE
4	1	WIRE HARNESS, PROXIMITY
5	1	LABEL, LOCAL CONTROL
6	1	LABEL, TM7 HD PLUS PRESSURE/TORQUE
7	1	INDICATOR LED
8	1	WIRE HARNESS, TM7 HD PLUS SWITCHES
9	1	CABLE ASSEMBLY, PRESSURE TRANSDUCER
10	1	CABLE ASSEMBLY, TM7 ENCLOSURE POWER
11	1	CABLE ASSEMBLY, 4-PPH PANEL CONNECTOR
12	9	CABLE TIE, #4
13	1	SEALED ROCKER SWITCH, 2 POSITION, 1 LAMP
14	1	SEALED ROCKER SWITCH, 2 POSITION, 2 LAMP
15	1	SEALED ROCKER SWITCH, 3 POSITION
16	1	LABEL, COM PORT 1
17	8	ENCLOSURE SCREW
18	1	CIRCUIT BOARD, ERV-750/TM7
19	1	PANEL CONNECTOR CAP
20	1	TILT ID SERIAL ADAPTER BOARD
21	1	BLUETOOTH SERIAL MODULE
22	1	BLUETOOTH INTERFACE CABLE
23	2	THIST, M4.5 X 1.4mm
24	2	SHCS, #6-32 X 3/8" LING. - 1B-8 SS
25	12	PHSD, M3.5 X 0.6 X 8MM
26	1	STANDOFF, CORNER SCREW MOUNT, .63" TALL NYLON
27	2	PHSD, M3 X 0.5 X 6mm ZN
28	4	PUSH BUTTON MOUNT, CABLE TIE
29	2	NUT, GORE VENT M12X1.5
30	1	VENT, M12X1.5 SCREW-IN
31	1	STUD MOUNT TAB, .6X .25 O.C. MALE
32	1	CONNECTOR, M12 FEMALE TO MALE, BULKHEAD
33	3	CABLE TIE MOUNT WR NYLON, 6.6 VHB
34	1	CUSHIONED LOOP CLAMP, 1/2"
35	1	WASHER, #6 ZINC

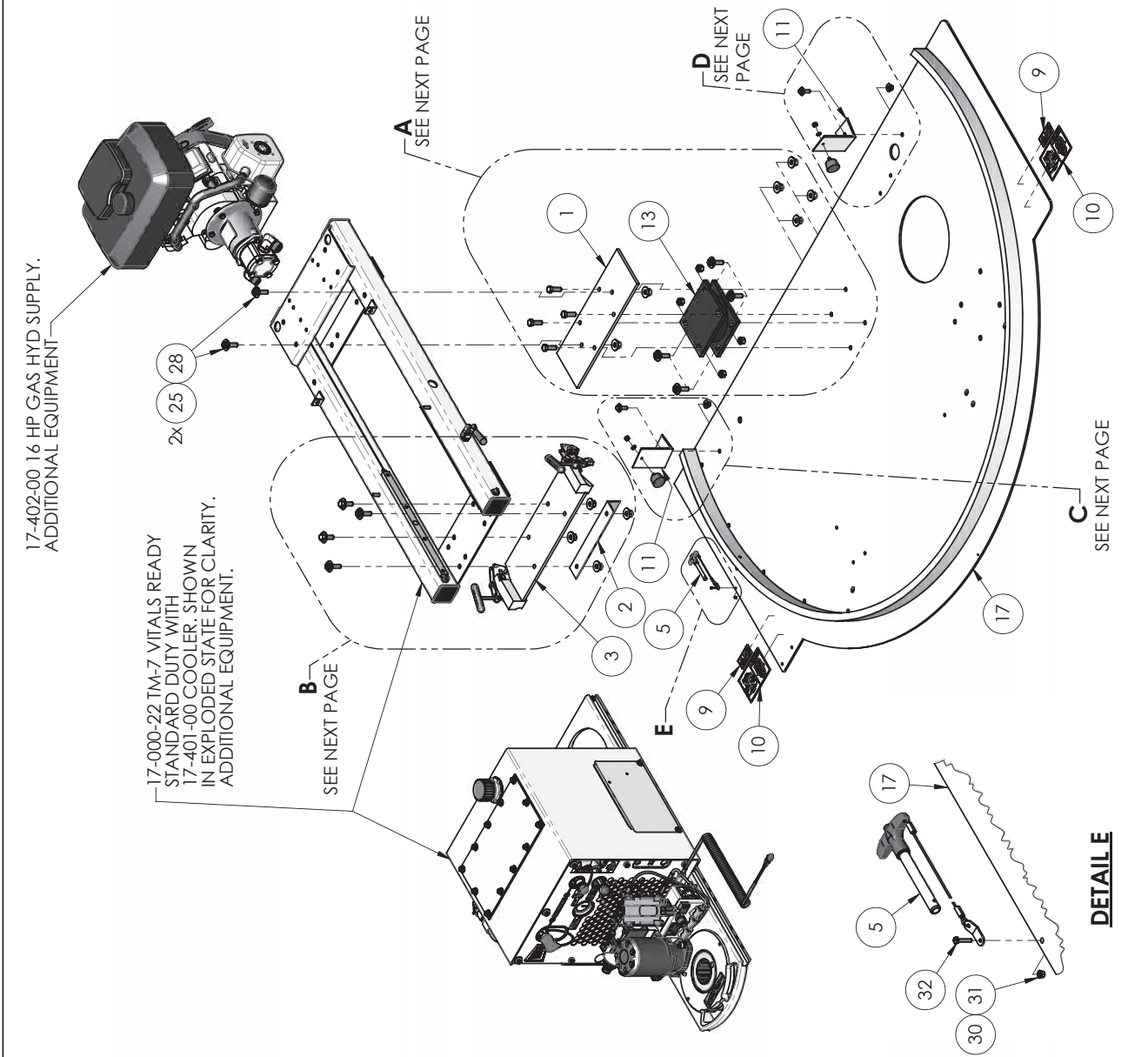
ITEM NO.	PART NUMBER	DESCRIPTION	Default/ QTY.
1	14-136-00	BATTERY, SEALED LEAD ACID, 12 V, 35 AH	1
2*	17-058-00	EXTENSION, SWITCH WIRING	1
3	17-059-01	PTO ADAPTER	1
4	17-059-20	ACCESS COVER	2
5	17-060-00	PUMP, HYDRAULIC GEAR	1
6	17-061-60	SPIDER, HYDREL 1099/L100 COUPLING	1
7	17-061-70	HUB, AL099, 1 BORE (1/4 X 1/8 KEY)	1
8	17-061-80	HUB, AL099 3/4 BORE (3/16 X 3/32 KEY)	1
9**	17-064-00	CHOKE CABLE, REMOTE	1
10**	17-065-00	THROTTLE CABLE, REMOTE	1
11	17-066-00	14" STRAP, TIE DOWN	1
12	17-145-00	16 HP B&S ENGINE ASSEMBLY WITH SHUT-OFF	1
13	59-035-00	TACHOMETER/ HOUR METER	1
14	59-060-00	COVER, TERMINAL, SQUARE (RED)	1
15	77-185-50	VALVE, OIL DRAIN	1
16	90-057-10	KEY, 1/4 SQ. X 1 UNDERSIZED	1
17	90-061-20	HHCS, 5/16-18 X 2	4
18	90-064-05	SSS, 5/16-18 X 1/2 Cup Pt	2
19	90-065-01	NUT, 5/16-18 HEX GRADE 8	4
20	90-065-51	WASHER, 5/16 SPLIT RING	4
21	90-065-52	WASHER, 5/16 FLAT	4
22	90-071-10	HHCS, 3/8-16 X 1	4
23	90-071-12	HHCS, 3/8-16 X 1-1/4 GRADE 5	2
24	90-075-52	WASHER, 3/8 SPLIT RING	6
25	910-12-10-C5OX-S	ELBOW, -12 M. JIC (1-1/16"-12) X-10 M. ORB (7/8"-14)	1
26	910-16-12-C5OX-S	ADAPTER, -12 MORB X-16 M. JIC 90 DEGREE ELBOW	1
27***	90-901-33	WIRE, 6 AWG RED J1127 SGX 133/25	18"
28***	90-901-34	WIRE, 6 AWG RED J1127 SGX 133/25	36"

* NOT SHOWN
 ** NOT SHOWN
 *** NOT SHOWN



17-402-00
 HYDRAULIC POWER PLANT
 16 HP GASOLINE

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	77-155-00	PLATE, TM7 PIVOT	1
2	77-156-50	BRACKET, TM7 TO SWIVEL RING LOCK	1
3	77-156-00	WELDMENT, TM-7 TRACKING	1
4	77-157-20	GRIP, CLAMP	2
5	77-157-50	T-HANDLE PIN W/ LANTARD	1
6	77-157-00	CLAMP, TM-7 LOCK	2
7	77-158-00	PIN, CLAMP PIVOT	2
8	77-159-00	SPACER, CLAMP PIVOT	2
9	77-160-11	LABEL, PINCH POINT	2
10	77-160-00	LABEL, WARNING	2
11	77-168-00	MOUNTING ANGLE, LIGHT BAR	2
12	77-175-00	LOAD-RATED BUMPER	2
13	77-188-00	HEAVY DUTY TURNTABLE	1
14	77-189-00	RADIAL / THRUST LOAD TRACK ROLLER	2
15	77-190-00	BRASS FINISHED FLAT WASHER	4
16	77-191-00	ONE PIECE THREADED CLAMP ON COLLAR	2
17	77-201-02	WELDMENT, TM-7 SWIVEL DECK	1
18	90-065-01	NUT, 5/16-18 HEX GRADE 8	2
19	90-065-51	WASHER, 5/16 SPLIT RING	2
20	90-071-12	HHCS, 3/8-16 X 1-1/4 GRADE 5	2
21	90-075-01	NUT, 3/8-16 HEX GR 5 ZN	2
22	90-075-52	WASHER, 3/8 SPLIT RING	2
23	90-075-53	WASHER, 3/8 FLAT	4
24	90-091-15	HHCS, 1/2-13 X 1-1/2 GRADE 8 ZN	6
25	90-091-18	HHCS, 1/2-13 X 1-3/4 GR8 ZN	8
26	90-095-01	NUT, 1/2"-13 HEX	6
27	90-095-13	NUT, 1/2-13 NYLOCK GRADE 8	8
28	90-095-52	WASHER, 1/2 FLAT	20
29	90-095-58	WASHER, 1/2 SPLIT RING	14
30	90-1059-00	NUT, M3 X 0.5mm NYLOCK CLASS 8, ZN PLATED	1
31	90-1060-00	WASHER, M3 FLAT	1
32	90-1061-16	HHCS, M3 X 0.5mm X 1.6mm CLASS 8.8, ZN PLATED	1



77-405-00
TM-7 SWIVEL PLATE

DETAIL E

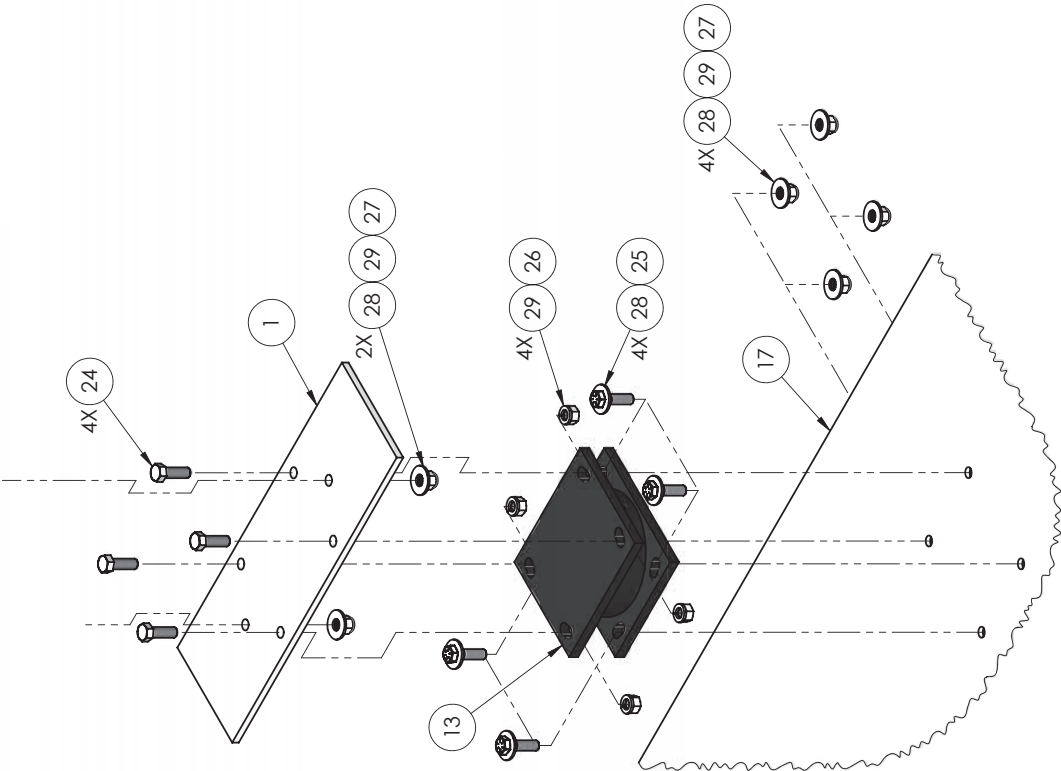
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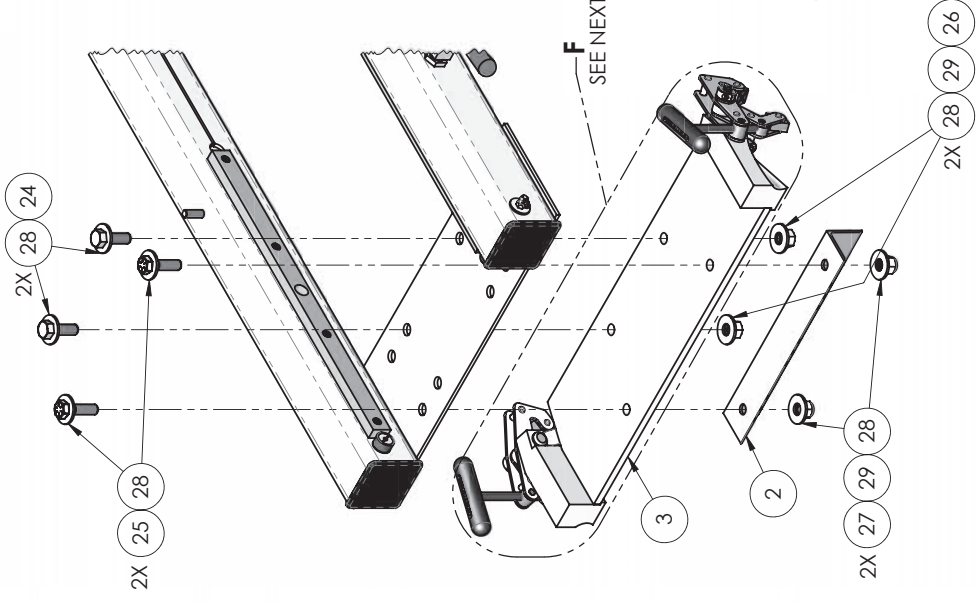
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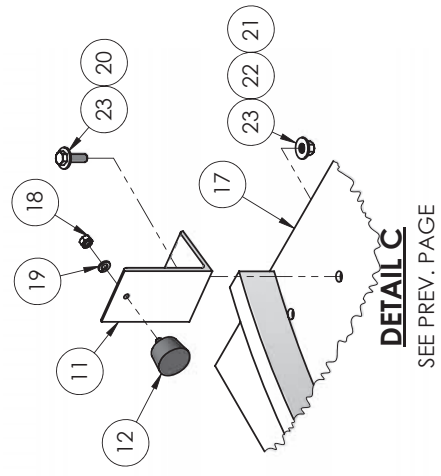
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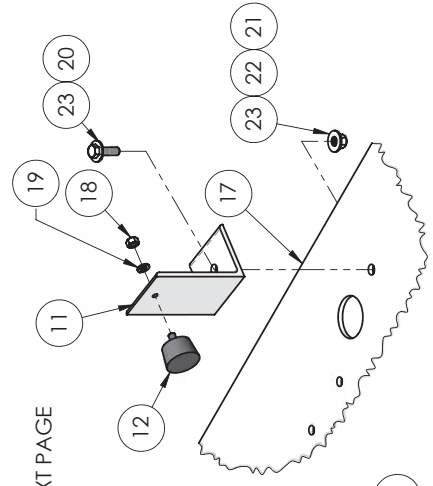
DETAIL A
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DETAIL B
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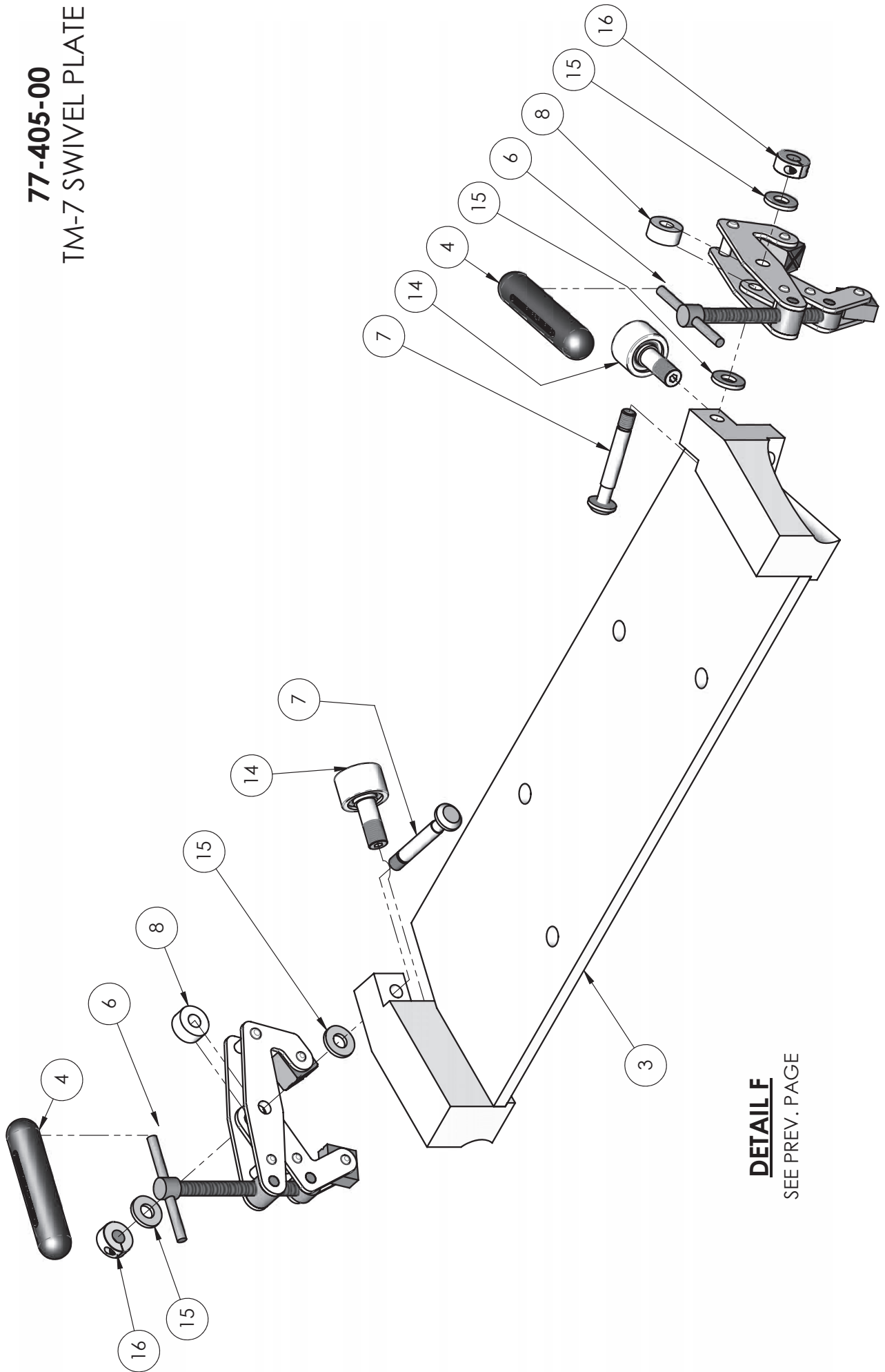


DETAIL C
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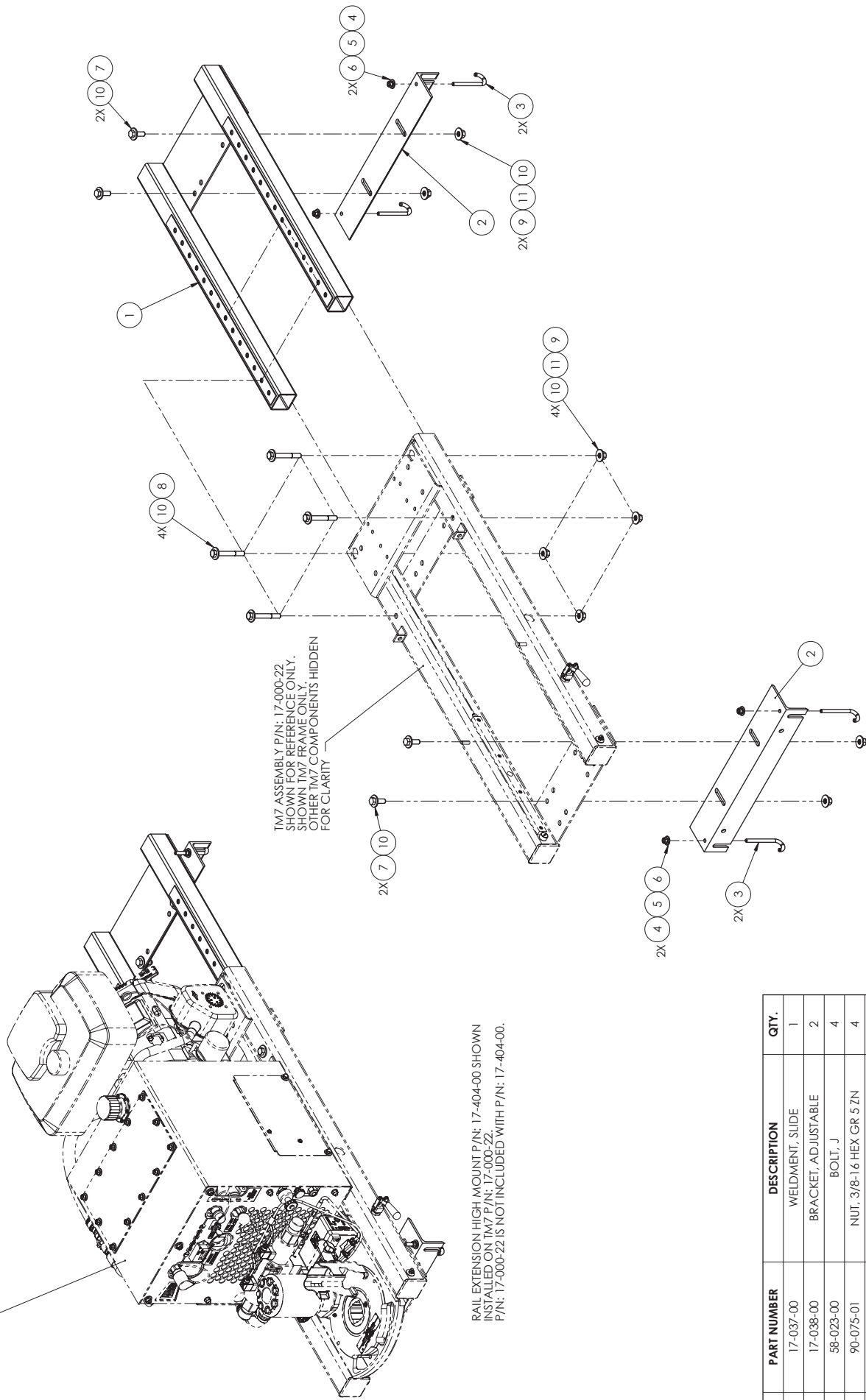
DETAIL D
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77-405-00
TM-7 SWIVEL PLATE



DETAIL F
SEE PREV. PAGE

TM7 ASSEMBLY P/N: 17-000-22
SHOWN FOR REFERENCE ONLY



RAIL EXTENSION HIGH MOUNT P/N: 17-404-00 SHOWN
INSTALLED ON TM7 P/N: 17-000-22.
P/N: 17-000-22 IS NOT INCLUDED WITH P/N: 17-404-00.

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	17-037-00	WELDMENT, SLIDE	1
2	17-038-00	BRACKET, ADJUSTABLE	2
3	58-023-00	BOLT, J	4
4	90-075-01	NUT, 3/8-16 HEX GR 5 ZN	4
5	90-075-52	WASHER, 3/8 SPLIT RING	4
6	90-075-53	WASHER, 3/8 FLAT	4
7	90-091-15	HHCS, 1/2-13 X 1-1/2 GRADE 8 ZN	4
8	90-091-40	HHCS, 1/2-13 X 4	4
9	90-095-01	NUT, 1/2-13 HEX GRADE 8	8
10	90-095-52	WASHER, 1/2 FLAT	16
11	90-095-58	WASHER, 1/2 SPLIT RING	8

17-404-00
RAIL EXT. HIGH MOUNT



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