Operation, Maintenance, and Parts Manual

Stewart & Stevenson TUG • 815 Allgood Rd., Marietta, GA 30062

MODEL
TR/TMD-300/400
AIR START UNIT

Aircraft Ground Support Equipment **CD313**

AIR START UNIT

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1	
2	
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5	
6	
7	
8	
9	
10	

AIR START UNIT

LIST OF EFFECTIVE PAGES
TR/TDM-300/400

AIR START UNIT

MANUAL TABLE OF CONTENTS

MANUAL TABLE OF CONTENTS (CONT.)

DESCRIPTION CHAPTER-SECTION-PAGE

AIR START UNIT

MANUAL TABLE OF CONTENTS (CONT.)

AIR START UNIT

MANUAL TABLE OF CONTENTS (CONT.)

DESCRIPTION **CHAPTER-SECTION-PAGE**

AIR START UNIT

MANUAL TABLE OF CONTENTS (CONT.)

DESCRIPTION **CHAPTER-SECTION-PAGE**

Chapter 6_ Optional Equipment and Manufacturer's Data (Cont.)

AIR START UNIT

LIST OF FIGURES

AIR START UNIT

LIST OF FIGURES (CONT.)

AIR START UNIT

LIST OF FIGURES (CONT.)

AIR START UNIT

LIST OF TABLES

AIR START UNIT

LIST OF TABLES (CONT.)

AIR START UNIT

LIST OF TABLES (CONT.)

AIR START UNIT

INTRODUCTION

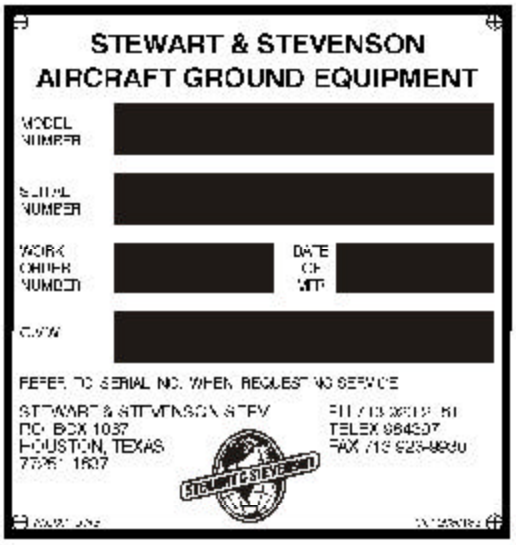
This manual contains instructions for the overhaul, maintenance, and operation of the Air Start Unit, Model TR/TMD-300/400.

Full benefit of the long life and dependability built into these units can be realized through proper operation and maintenance. Of equal importance is the use of proper tools and procedures during equipment overhaul.

Personnel responsible for operation and maintenance should study the sections of the manual pertaining to their particular duties. Similarly, before beginning a repair or overhaul job, the service technician should read the manual carefully to become familiar with the components, parts, or subassemblies of the equipment.

UNIT IDENTIFICATION

To aid the technician in repair or service work on this unit, a Stewart & Stevenson TUG identification nameplate is located on the operator's compartment of the unit.



The serial number identification of each unit will appear on the nameplate (as shown above) along with the work order and date of manufacture. The mailing address of Stewart & Stevenson TUG, telephone number, telex number, and fax information are all located on the bottom of the nameplate. This necessary information will ensure the customer a fast and accurate response to any parts and/or service request.

The aforementioned serial number may pertain to a corresponding alpha code designation used in the parts portion of this book. These letter designations (alpha codes) will notify customers of any change made to the unit and will be referenced directly to the unit serial number located on the identification name plate. If the “Usable On Code” column located in the parts section has been left blank or not referenced with an alpha code designation, the parts apply to all units.

AIR START UNIT

TECHNICAL ASSISTANCE

In case of emergency, wire or write Stewart & Stevenson TUG, 815 Algood Rd. Marietta Ga. 30062. Be sure to list the equipment model number, rating, specific nature of the problem, and the suspected area of malfunction.

For emergency assistance, call:

For Airline Parts: 800-989-8499
(Georgia Residents: 770-422-7230; ask for Airline Department.)

For Airline Service: 800-989-8499; Stewart & Stevenson TUG Warranty Department
(Georgia Residents: 770-422-7230; ask for Warranty Department.)

AIR START UNIT

SAFETY PRECAUTIONS

Observe the safety precautions herein during all phases of operation:

1. Ensure that the parking brake is set whenever the unit is parked.

2. Clean or service the unit only with the engine shut down.

3. To prevent damaging the equipment or setting it up to deteriorate, use only an approved solvent to clean it.

4. Do not smoke or use an open flame in the vicinity of any fueling operation.

5. Prior to starting the unit, ensure that no loose bars, tools, parts, etc., are lying in or on it. Loose articles can become projectiles that seriously injure personnel or cause equipment damage.

6. Pipe exhaust fumes outside of any enclosed operating area.

7. Properly maintain the equipment by following the manufacturer's recommendations.

8. In case of a malfunction that shuts down the equipment, do not attempt to restart it until the cause of the trouble has been corrected. Serious damage to the equipment can otherwise result.

9. In case of an accident, immediately shut down the unit.

10. Before personnel attempt access underneath the unit, ensure it is safely supported on blocks or other appropriate supporting devices. Ensure that equipment used to raise and support the air start unit is rated to withstand 150% (1-1/2 times) of the unit's gross weight.

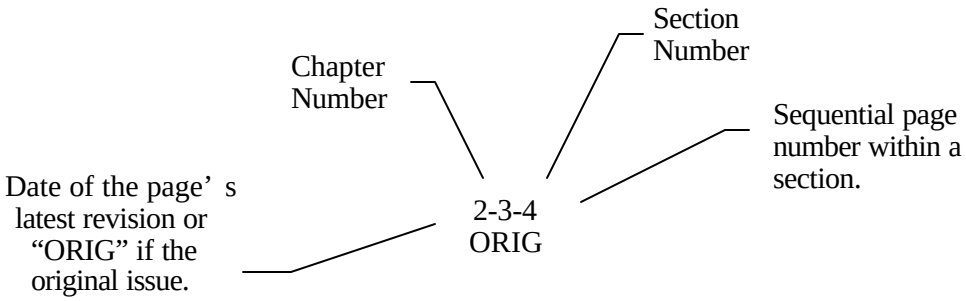
11. This equipment uses both metric and S.A.E. (inch-type) fasteners and fittings. This can present special servicing requirements. Many metric nuts, bolts, and screws are dimensionally very close to S.A.E.-rated nuts, bolts, and screws. It is easy to mismatch threads or use improperly sized components. This can result in damage, malfunction, or possible personal injury. Save components and hardware from the unit for reuse when possible. If the parts are not reusable, take care to select a replacement that matches the original in dimensions, strength, and thread pitch.

AIR START UNIT

HOW TO USE THIS MANUAL

1. This manual is divided into six chapters. Each chapter is further subdivided into applicable sections. See the Table of Contents at the front of each chapter for details of the contents of that respective chapter.

2. The page numbering system utilizes a three-part number. The explanation is as follows:



3. Warnings, Cautions, and Notes are used throughout this manual. The forms and explanations are as follows:

Refers to Potential Danger to Personnel.

Refers to Potential Damage to Equipment or Components.

Note: Calls attention to methods which make the job easier or to operating procedures, conditions, etc., to be highlighted. Notes appear before or after the related text, whichever is more logical.

4. Chapter 6, Options and Manufacturer's Data, is divided into sections. When applicable, each section will contain one particular option. Refer to the Table of Contents for Chapter 6 for a list of the options. Any information on adjustments, operation, or maintenance contained in the options section supersedes related information in the first five chapters of the manual. Additional or new drawings and schematics required for some options will also be located in Chapter 6 in their applicable sections. However, Chapter 5 always contains those drawings and schematics common to all units. Please check the Table of Contents in Chapter 6 against your unit to see what options might be applicable.

Chapter 1

General Information and Operating Instructions

TABLE OF CONTENTS

TABLE OF CONTENTS (CONT)

Chapter 1, Section 1

General Description

FIGURE 1.1 MODEL TMD-300/400 AIR START UNIT

1.1 INTRODUCTION

1.1.1 This manual contains General Specifications, Controls and Indicators, Operating Instructions, Service Requirements, and Parts Information on the *Stewart & Stevenson TUG* Model TR/TMD-300/400 Air Start Unit.

1.2 UNIT DESCRIPTION

1.2.1 The Model TMD-300/400 (Figure 1.1) air start unit is a self-contained, weatherproof, diesel-driven power pack. It is provided with all the instruments, controls, and accessories necessary for the safe and efficient operation of the air compressor. This unit is trailer mounted, designed to be pulled behind a tow tractor. Refer to *Chapter 6* for details of options.

1.2.2 This unit is also designed to be mounted on a truck and with this option, has the designation TRD-300/400. Refer to *Chapter 6* for details of this option.

1.2.3 Units are shipped factory adjusted to deliver a maximum of 42 psig (250 kPa) air for jet start applications, and a maximum of 24 psig (165kPa) air for air packs mode.

1.3 ENGINE DESCRIPTION

1.3.1 The engines are normally equipped with an oil cooler, lubricating oil filter(s), fuel strainer, fuel filter, air cleaner, electronic control module (ECM), fan and radiator, and starting motor.

1.3.2 **Fuel System.** Fuel is drawn from the supply tanks through a primary filter by a gear-type fuel pump. It is then forced through a secondary filter and into the fuel inlet manifolds in the cylinder heads and to the injectors. Excess fuel is returned to the supply tank through the fuel outlet manifolds and connecting lines. Since fuel is constantly circulating through the injectors, it serves to cool the injectors and carry off any air in the fuel system. The fuel is cooled as it flows through a fuel-to-air heat exchanger.

1.3.3 **Air Intake System**. Air for scavenging and combustion is supplied by a charge air manifold which pumps air into the engine cylinders. All air entering the charge air manifold first passes through an air cleaner and a charge air cooler (heat exchanger). The TMD-400 charge air is cooled by the SCCC system with a separate coolant system pump.

1.3.4 **Lubrication System** Full pressure lubrication is supplied to all main, connecting rod, and camshaft bearings, and to other moving parts of the engine. A gear-type pump draws oil from the oil pan through an intake screen, through the oil filter, and then to the oil cooler. From the oil cooler, the oil flows through passages that connect with the oil galleys in the cylinder block and cylinder heads for distribution to the bearings, rocker arm mechanisms and other functional parts.

1.3.5 **Cooling System**. Coolant is circulated through the engine by a centrifugal type water pump. Heat is then removed from the coolant, which circulates in a closed loop system, via the radiator. Control of the engine temperature is accomplished by thermostats that regulate the flow of the coolant within the coolant system.

1.3.6 **Electrical System** Engine starting is provided by an electric starting system. The electric starting motor is energized by a storage battery. A battery-charging alternator, with a built-in voltage regulator, serves to keep the battery charged.

1.3.7 Engine speed is regulated by the electronic control module (ECM). Speed is controlled proportionally to maintain constant compressor pressure.

1.4 AIR COMPRESSOR DESCRIPTION

1.4.1 The TR/TMD-300 incorporates a rotary screw single stage *GHH-RAND* (CD42S) air compressor that is driven by a *Detroit Diesel* 4-cycle engine. The TR/TMD-400 incorporates a rotary screw single stage *GHH-RAND* (CD72S) air compressor that is driven by a *Detroit Diesel* 4-cycle engine. The power transmission from the engine to the compressor is through step-up gears, via a resilient coupling.

1.4.2 The compressor casing houses a screw type, precision-machined, male and female meshing rotor mounted on an angular contact single row ball bearings. The rotors are bored and relieved for internal cooling. Sealing rings on the rotor shafts prevent the lubricating and cooling oil from entering the rotor housing, thus the air delivery is completely oil-free. There is no surface contact between the rotors and casing. The male rotor, which is driven by the engine, drives the female rotor through a set of timing gears that maintain the slight clearance provided between the male and female rotor lobes.

1.4.3 As the rotors rotate, the air in the interlobal spaces is forced towards the compressor outlet end by the action of the meshing rotors. The lobe of the male rotor moves along the groove of the female rotor, pushing the entrapped air before it. As the air is compressed, the volume decreases. The compression continues until the outlet end of the groove in the rotor comes into line with the outlet port. The compressed air is then forced smoothly into the outlet port until the lobe of the male rotor reaches the end of the groove. At this point, the next groove has come into line with the outlet port, thus maintaining a continuous air delivery free of pulsation.

1.4.4 The absence of metal to metal contact between the rotors, and between the rotors and casing, eliminates practically all wear and friction loss.

1.4.5 The engine and compressor and their auxiliary equipment are completely enclosed in a canopy which has two (2) doors, giving easy access to the engine and compressor for normal maintenance.

1.4.6 The unit is equipped with a 24 volt, negative ground electrical system.

1.4.7 Oil System: Cooling and Lubrication. (See Figure 1.2, Oil Circulation Cooling and Lubrication.)

a. Oil is used in the compressor gearbox for cooling as well as for lubrication.

b. The compressor oil pump (13) draws oil from the compressor oil sump. The pump is driven by a gear on the compressor drive shaft and delivers approximately 11 GPM (50 liters per minute).

c. Upon startup, the oil pump pushes oil to the thermostatic valve (1), which then diverts oil to the oil manifold (2) where the oil then returns to the oil sump.

d. Once the unit has been running long enough for the oil to heat up to 120 °F (49 °C), the thermostatic valve (1) opens and allows oil to flow to the heat exchanger (14), where it then returns to the oil manifold (2) before being dumped back into the sump to be circulated through the system again.

e. Whether the unit is cold or sufficiently warmed up, oil always flows through the oil manifold (2). This is where all oil temperatures and pressures are monitored.

f. Once oil returns to the sump, it is pressure regulated and filtered within the sump housing before flowing to the various cooling ports on the compressor and gearbox casing.

PHOTO NOT AVALIABLE AT TIME OF PRODUCTION

1. Thermostatic Valve
2. Oil Temperature Sensors, Compressor Manifold
9. Compressor Pump to Thermal Valve Hose Assembly
10. Thermal Valve to Oil Cooler Hose Assembly
11. Oil Cooler to Oil Manifold Hose Assembly
12. Oil Manifold to Compressor Hose Assembly
13. Compressor Oil Pump
14. Heat Exchanger

Figure 1.2 Schematic, Lube Oil GHH Compressors

1.5 AIR REGULATION SYSTEM DESCRIPTION

1.5.1 Dual Pressure Regulation of Air Supply. This system provides a dual pressure air delivery system for both the JET START and AIR PACKS mode of operation.

a. The JET START position delivers air at 42 psig (250 kPa), nominal.

b. The AIR PACKS position delivers air at 24 psig (165 kPa), nominal.

1.6 OPERATION

1.6.1 Theory of Operation. The primary components and their functions for the TR/TMD-300/ 400 are as follows:

a. Mode selector Switch. The mode selector switch has three operating positions: UNLOAD, JET START, and AIR PACKS. The switch is an operator control point that generates signals to a series of solenoid valves.

b. Pressure Control. The pressure control for Jet Start and Air Packs modes is accomplished via engine speed control, from within the ECM. As pressure decreases, engine speed will increase, up to 2100 rpm. As pressure increases, engine speed will decrease, down to 1200 rpm. Should the pressure still be increasing when the engine speed drops to 1200, a solenoid valve (L6) will open to the Discharge Relief Valve. The valve is fast-opening, and slow-closing (about 30 to 40 seconds). Pressure will begin to build as the valve returns to the closed position.

c. Start Relief. To aid in starting the engine, the Start Relief Solenoid (L5) opens while the Engine Start Switch is engaged. This action bleeds air from the start relief tank to the Discharge Relief Valve. With the valve open, the system is relieved of the pressure created as soon as the compressor begins to turn. The tank is recharged each time the machine is brought up to operating pressure.

d. Discharge Relief Valve. The discharge valve receives a control (pilot) air signal from the pressure regulators. The control air signal closes the discharge valve allowing it to regulate to the appropriate system pressure. When the mode selector switch is placed in the UNLOAD mode, there is no control air signal to the discharge valve, thus allowing the discharge valve to vent discharge air to atmosphere.

e. Discharge Air Silencer. The silencer is connected via piping and connectors to the exhaust (atmospheric) side of the discharge valve. The silencer is packed with sound attenuating material and an oversized outlet to attenuate or dampen the sound pressure level of the compressor discharge air to atmosphere.

f. Safety Pressure Relief Valve. The safety pressure relief valve is connected to the compressor discharge pipe. It is set to open, thus venting to atmosphere, at 50 psig (358kPa) ±5 psig. The safety pressure relief valve is designed to relieve the full capacity of the compressed air discharge should the discharge valve fail in the closed position.

1.6.2 Modes of Operation.

There are three modes of operation with three control air circuit variations. The three modes of operation are (1) UNLOAD, (2) AIR PACKS, and (3) JET START.

The three control air circuit variations are:

1. UNLOAD mode with discharge air to atmosphere.

2. AIR PACKS mode with demand for discharge air.

(a) The pressure transmitter in the air discharge piping sends a signal to the ECM. If the pressure is less than 24 psig, the engine will speed up. If the pressure is more than 24 psig, the engine will slow down.

(b) If there is no demand for air (if the valves in the system are closed), the pressure will rise in the piping and manifold. Once the pressure reaches about 27 psig, the discharge relief valve will open, 'dumping' the excess air. Once opened, the discharge relief valve takes about 30 to 40 seconds to re-close. During this time, the pressure will remain about constant, but the engine speed will change. It is not recommended to let the machine operate with the valves closed for an extended time.

3. JET START mode.

(a) The pressure transmitter in the air discharge piping sends a signal the ECM. If the pressure is less than 42 psig, the engine will speed up. If the pressure is more than 42 psig, the engine will slow down.

(b) If there is no demand for air (if the valves in the system are closed), the pressure will quickly rise in the piping and manifold. Once the pressure reaches about 45 psig, the discharge relief valve will open, 'dumping' the excess air. Once opened, the discharge relief valve takes about 30 to 40 seconds to re-close. During this time, the pressure will remain about constant, but the engine speed will change. It is not recommended to let the machine operate with the valves closed for an extended time.

1.7 ELECTRICAL PRINCIPLES OF OPERATION

1.7.1 The engine electronic control modules (2 each) (ECM) are the heart of the system. These are a non-repairable item that should be replaced as units. A schematic is not provided for the ECM; all required information is provided on the drawings. Should the ECM become defective, a replacement assembly may be ordered from *Stewart & Stevenson TUG*.

1.8 STARTING CIRCUIT

1.8.1 The mode selector switch (S10) is in the UNLOAD position. The operator holds the engine crank toggle switch (S1) in the START position causing the auxiliary starting coil (K2 and K3) to be energized from the unit's series-connected batteries (BT1A, BT1B, BT2A, and BT2B). When the auxiliary starting coil is energized, its normally open contacts close, energizing the engine starting solenoid (L1). As a result, the L1 contacts close and voltage from the batteries is applied to the engine starting motor (B1) and the engine cranks for starting. The attempt start circuit is provided necessary voltage when the K2 and K3 contacts are closed. The attempt start circuit causes the ECM to energize the governor to the full fuel position.

1.8.2 When the engine starts, the operator releases the engine start toggle switch (S1), causing the auxiliary start coil (K2 and K3) to de-energize, opening the auxiliary starting coil contact, and the L1 de-energizes. In turn, the L1 contacts open and the engine starting motor (B1) de-energizes. When the engine reaches 500 rpm, the engine running indication and crank disconnect relay (K1) energizes, applying 24 volts to the assembly. As a result, a normally closed contact that is in the crank circuit for K2 and K3 will open to prevent accidental starter attempt while the engine is running.

1.9 AUTOMATIC SHUTDOWN PROTECTIVE CIRCUITS

1.9.1 Engine High Coolant Temperature. Should the engine coolant temperature exceed approximately 210 °F (99 °C), the engine high coolant temperature sensor (SE4) will send a signal to the ECM and the following will occur:

a. The ECM assembly will send a signal, illuminating the ENGINE TROUBLE lamp (DS10), which will remain illuminated until it is manually reset by actuation of the TROUBLE RESET switch (S15).

b. The ENGINE TROUBLE lamp (DS10) will provide a visual warning of an abnormal condition.

c. The unit will shut down, except when the unit is operating in the JET START mode.

1.9.2 Engine Low Oil Pressure Circuit. In the event the engine oil pressure drops below the allowed level, the engine oil pressure sensor (SE3) will send a signal to the ECM. The following will occur:

a. The ECM will send a signal, illuminating the ENGINE TROUBLE lamp (DS10), which will remain illuminated until it is manually reset by actuation of the TROUBLE RESET switch (S15).

b. The ENGINE TROUBLE lamp (DS10) will provide a visual warning of an abnormal condition.

c. The unit will shut down, except when the unit is operating in the JET START mode.

1.9.3 Compressor High Oil Temperature Circuit. If the compressor oil temperature exceeds 176 °F (80 °C), the compressor high oil temperature switch (S3) will send a signal to the ECM assembly, with the following results:

a. There will be a signal to the ECM assembly, illuminating the high compressor oil temperature lamp (DS3) and that will remain illuminated until it is manually reset by actuation of the TROUBLE RESET switch (S15).

b. The ENGINE TROUBLE lamp (DS10) will provide a visual indication of an abnormal condition.

c. The unit will shut down, except when the unit is operating in the JET START mode.

1.9.4 Compressor High Discharge Air Temperature Circuit. This circuit detects a HIGH AIR TEMPERATURE condition in the discharge manifold. This is sensed by temperature switch (S4), which switches at temperatures over 500 °F (260 °C). In operation, the S4 senses the air temperature and if switch (S4) detects a high temperature condition, a signal will be applied to the ECM assembly, with the following results:

a. The ECM assembly will send a signal, illuminating the COMPRESSOR HIGH DISCHARGE AIR TEMPERATURE lamp (DS4), that will remain illuminated until the TROUBLE RESET switch (S15) is manually activated.

b. The COMPRESSOR HIGH DISCHARGE AIR TEMPERATURE lamp (DS4) will provide a visual warning of an abnormal condition.

c. The unit will shut down, except when the unit is operating in the JET START mode.

1.9.5 Compressor Low Oil Pressure Circuit. In the event the compressor oil pressure drops below 10 psig (69 kPa), the COMPRESSOR LOW OIL PRESSURE switch (S5) will send a signal to the ECM assembly, which starts a 10-second delay (TD2). If, at the end of this delay period, the S5 is still closed, the following will occur:

a. The ECM assembly will send a signal, illuminating the COMPRESSOR LOW OIL PRESSURE lamp (DS5), which will remain illuminated until the TROUBLE RESET switch (S15) is manually activated.

b. The COMPRESSOR LOW OIL PRESSURE lamp (DS5), will provide a visual warning of an abnormal condition.

c. The unit will shut down, except when the unit is operating in the JET START mode.

1.10 NORMAL SHUTDOWN CIRCUIT

1.10.1 When the operator switches the ENGINE STOP switch (S2) to stop, power is removed from the engine run relay, and time delay relay (TD1) times the cooldown period.

1.11 EMERGENCY SHUTDOWN CIRCUIT

1.11.1 When the EMERGENCY STOP switch (S9) is closed, a signal is sent to the ECM. To activate the Emergency Stop Switch, raise the red emergency stop switch cover and activate the toggle switch.

Do not use the emergency stop to stop the engine except in an emergency.

1.12 MISCELLANEOUS CIRCUITS

1.12.1 Panel Lights Circuit. When the PANEL LAMPS switch (S12) is closed, the battery voltage illuminates the panel lamps (DS12A, DS12B, and DS12C).

Chapter 1, Section 2

Operation

2.1 PRE-OPERATIONAL CHECKS

Before using the equipment, the operator should carefully read the instructions in this section and become familiar with the unit's controls and indicators, described in Table 1.2 of this section.

2.1.1 In order to ensure safe, reliable operation, perform the following checks prior to operating the unit:

a. Stop the unit at the proper location and set parking brake. (Push handle down as far as it will go.) Block tires with chocks.

b. Walk around and inspect the unit for damage or missing equipment. Ensure that all required procedures listed in Chapter 2 have been performed. Remember to check for the following:

1. Damaged or under inflated tires. Look for cuts, cracks in sidewalls, or foreign objects in treads.

2. Loose wheel nuts.

3. Proper operation of hitches.

c. Look underneath the unit for leaks of coolant or lubricating oil. If significant leaks in any of these systems are found, repair as soon as possible.

d. Check engine and compressor oil levels

Do not loosen or remove radiator cap while coolant is hot. Hot coolant under pressure can cause severe burns.

e. Check engine coolant level. Add coolant as necessary, but do not overfill.

f. Inspect engine compartment for loose hardware, loose wires, and leaking lines or fittings.

g. When all mechanical checks are completed, check the operation of all lights.

h. Check fuel level by lifting upon fuel level switch. Fuel level may also be verified at the fuel level gauge located on fuel saddle tank. Fill tank if required.

Note: Fuel contamination owing to moisture condensing on the inner surfaces of the fuel tank can be minimized or eliminated by keeping the fuel tank as full as possible. The fuel tank should always be topped off at the end of the day's operation, as part of the post-operation maintenance routine.

2.2 STARTING PROCEDURES

This unit is to be operated only by authorized trained personnel wearing appropriate ear protection. Before operating unit, read unit manual. This unit is equipped with an emergency stop switch, which is to be used only for emergency conditions.

2.2.1 Set parking brake and block tires with chocks.

2.2.2 Check fuel level. Lift FUEL LEVEL CHECK switch, located on the instrument panel. Allow FUEL LEVEL gauge to decrease, then release switch. Indicator should reflect the level of fuel in tanks. Fill tank if required.

2.2.3 Disconnect optional oil/coolant/battery heater electrical power (if applicable).

2.2.4 Check engine and compressor oil levels. Ensure that engine oil level is at the full mark on the engine dipstick, located on the engine. Ensure that the compressor oil level is above the halfway mark on the sight glass, located on the compressor oil reservoir.

2.2.5 Place compressor mode selector switch in unload position.

2.2.6 Close air delivery/cutoff valve(s) and air bleeddown ball valve(s).

2.2.7 Connect air hose(s) to aircraft.

Ensure personnel and loose items are clear of the unit before starting engine.

2.2.8 Place the engine run-stop switch in the run position. The check engine light and engine trouble light will come on providing automatic lamp check. Allow several seconds for these lights to go out.

2.2.9 Verify that all fault lamp bulbs on the control panel are functioning by lifting up momentarily on the lamp test switch.

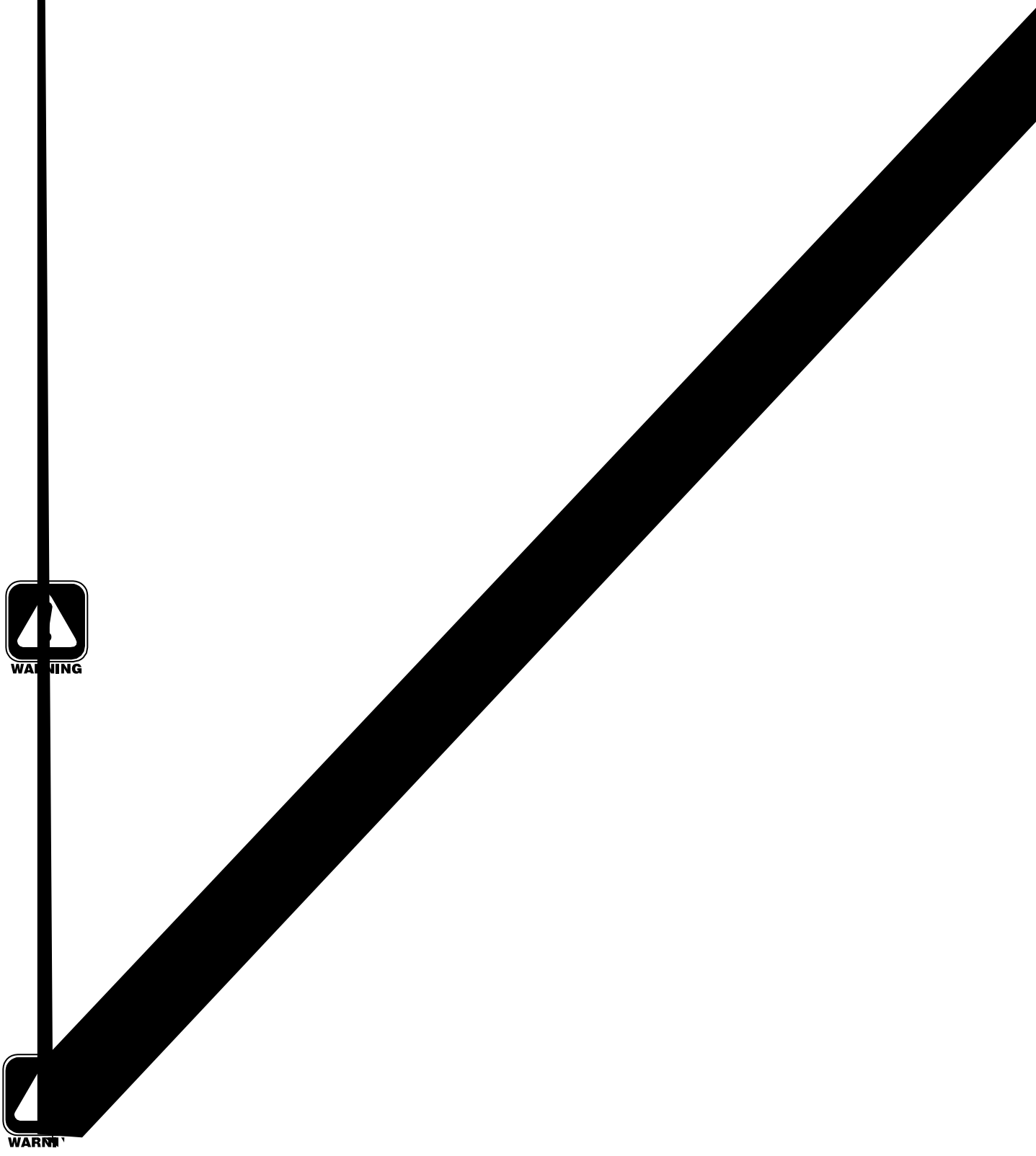
To avoid overheating the starter motor, do not operate the starting motor for more than 15 seconds without allowing a minimum cooling period of at least 30 seconds.

2.2.10 To start engine, lift up on engine start switch; release switch immediately when engine starts. Do not crank engine for more than 15 seconds at a time, with a 30 second rest between cranks.

2.2.11 Ensure all engine/compressor trouble lights are dark. If any are illuminated, place engine run-stop switch in stop position and correct the problem before proceeding. If only the check engine light comes on, operation may be continued: see engine diagnostics section.

2.2.12 Check compressor and engine gauges for normal operating conditions (Refer to *Table 1.1*). Run unit in unload mode for approximately 5 minutes to allow engine to warm up. Engine idle speed is 1200 rpm.

2.2.13 Ensure that air hose(s) are still properly connected to aircraft.


WARNING

2.3.4 Close air delivery/cutoff valve(s).

2.3.5 Open bleeddown ball valve(s) to relieve any pressure remaining in the hose(s)

Do not unplug air hose(s) with mode selector switch in AIR PACKS or JET START position, as hose(s) will be under pressure.

Hose temperatures may be near 500 °F (260 °C) after the unit has been operated. Therefore, wait until the air hose coupling has cooled or use appropriate gloves to protect hands.

2.3.6 Disconnect air hose(s) from aircraft and store them.

2.3.7 Remove wheel chocks and release parking brake before moving unit.

2.3.8 After moving unit, set parking brake and block tires with chocks.

2.3.9 Reconnect optional oil/coolant/battery heater electrical power (if applicable).

2.3.10 Close the manual bleeddown valve.

2.3.11 Perform any necessary maintenance procedures as listed in *Chapter 2, Section 1*.

2.4 ENGINE PROTECTIVE SHUTDOWNS

2.4.1 In the AIR PACKS mode, the unit will shut down automatically from high engine coolant temperature, low engine oil pressure, high compressor air temperature, high compressor oil temperature, and low compressor oil pressure, as specified in *Chapter 1, Section 1*

2.5 ENGINE DIAGNOSTICS

2.5.1 CHECK ENGINE FOR MINOR PROBLEM light provides warning and inactive codes (a fault which has previously occurred, but may not be the currently active). If only this light comes on, operation may be continued, but cause of trouble should be diagnosed as soon as possible. When diagnostic check is made, this light will flash codes in order of occurrence with codes for the most recent faults flashed first. Make diagnostic checks as noted below.

2.5.2 The ENGINE TROUBLE light indicates engine has a problem, which could damage engine if operation is continued. This light will first burn steadily and then begin to flash rapidly (non code) after the engine shuts down. Immediately after engine shuts down, make diagnostic checks as noted in 2.5.3. This light flashes only active codes (a fault present at the time a diagnostic check is made). Therefore, if the problem that shut the engine down has corrected itself before a diagnostic check is made, this light will flash code 25 (no code) or go completely out. If this occurs, continue to hold the diagnostic switch on and the cause of the shutdown will be flashed by the CHECK ENGINE light: The first code flashed will indicate the cause of shutdown. Subsequent flash codes are historical and not related to the cause of shutdown. After making diagnostic check, actuate TROUBLE RESET switch and hold for a full 3 seconds to turn off seal-in circuits and diagnostic lights. Then place RUN-STOP switch in STOP position.

Table 1.1 NORMAL OPERATING CONDITIONS

Engine Oil Pressure (2110 rpm)	40-60 psi (276-414 kPa) (approx.)
Engine Speed	
Idle:	1200 rpm
Operation:	2110 rpm
Compressor Air Temperature	(At ambient temperature 85 °F (29 °C))
Idle (1200 rpm):	250 °F (121 °C)
During Operation	
JET START Mode:	450 °F (232 °C)
NOTE: AIR PACKS mode will be slightly lower	
Compressor Oil Temperature	120-176 °F (49-80 °C)
Compressor Oil Pressure	
LOADED:	20 psi (138 kPa)
UNLOADED:	10 psi (69 kPa)
Compressor Air Pressure	42 psig (250 kPa) JET START mode 24 psig (165 kPa) AIR PACKS mode
Fuel Pressure	
Idle (Unloaded):	15-20 psi (103-138 kPa)
AIR CONDITION or	
JET START Mode:	100-120 psi (689-827 kPa)
Coolant Temperature	170-200 °F (77-93 °C)

2.5.3 When the ENGINE DIAGNOSTIC CHECK switch(es) are actuated and held on, following an engine trouble shutdown or check engine warning, the ENGINE TROUBLE light or CHECK ENGINE light will flash codes representing numbers. For example, if the code is 43 (coolant level low), the light will flash four times, pause, then flash three times. Record the flash code. This is important, as maintenance personnel will determine the cause of the problem by referring to flash code chart in the technical manual. Diagnostic check using the ENGINE TROUBLE light must be made following an engine trouble shutdown before actuating the TROUBLE RESET switch or placing the ENGINE RUN-STOP switch in STOP position. Otherwise, the cause of shutdown will be transferred to historical data (flashed by the CHECK ENGINE light). Diagnostic check using the CHECK ENGINE light may be made immediately after an engine trouble shutdown. To check inactive or warning codes, place the ENGINE RUN-STOP switch in RUN position, then actuate the ENGINE DIAGNOSTIC CHECK switch(es).

2.6 AIR START UNIT CONTROLS AND INDICATORS

2.6.1 The air start unit employs a complete complement of indicators and controls that monitor and govern all facets of its operation. The following table lists these controls and indicators and explains the specific function of each. Please refer to Figure 1.3 and Table 1.2.

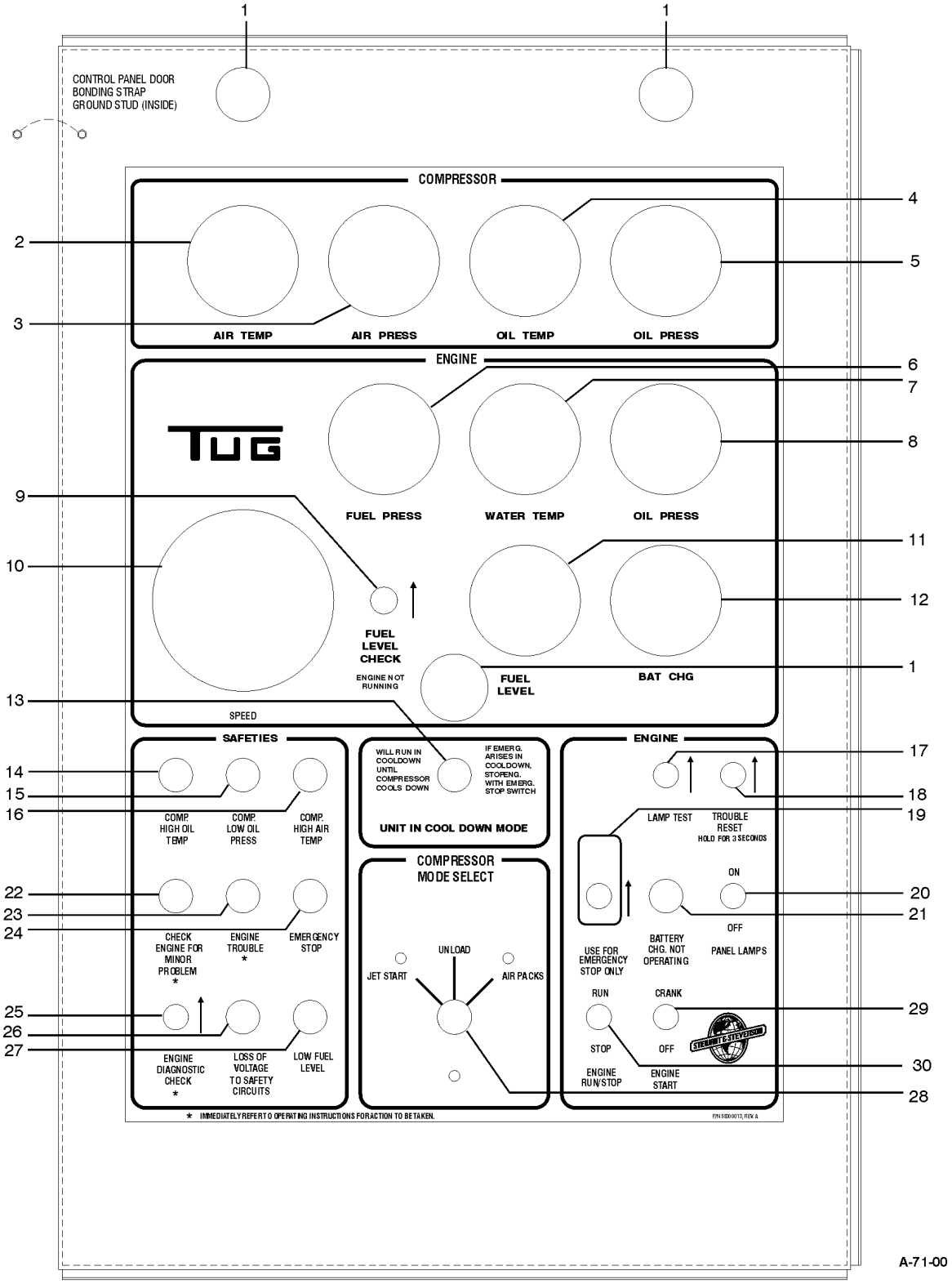


Figure 1.3 Control Panel (Sheet 1 of 4)

(Table 1.2)

Table 1.2 Controls and Indicators (Figure 1.3)

NAME OF CONTROL OR INDICATOR	ITEM NO.	FUNCTION
PANEL Lamp (DS12A, DS12B, DS12C)	1	The Panel lamps (DS12A, DS12B, DS12C) illuminate the control when the PANEL LIGHT switch (S12) is placed in the ON position.
COMPRESSOR AIR TEMPERATURE Gauge	2	The COMPRESSOR AIR TEMPERATURE gauge indicates the discharge air temperature of the air in the discharge manifold. Normal indication of this instrument at an ambient temperature of 85 °F (29 °C) is approximately 410 °F (210 °C) when operating in the JET START mode. Normal readings are slightly lower for the AIR PACKS mode of operation. Maximum safe discharge air temperature is approximately 502 °F (261 °C)
COMPRESSOR AIR PRESSURE Gauge	3	The COMPRESSOR AIR PRESSURE gauge indicates the discharge air pressure. Normal pressure indications are approximately 24 psiG (165 kPa) when operating in the AIR PACKS mode or 42 psiG (250 kPa) in JET START mode.
COMPRESSOR OIL TEMPERATURE Gauge (GA6)	4	The COMPRESSOR OIL TEMPERATURE gauge (GA6) is gauge displays the current compressor oil temperature, normally 120–176 °F (49–80 °C).
COMPRESSOR OIL PRESSURE Gauge (GA5)	5	The COMPRESSOR OIL PRESSURE gauge (GA5) monitors the compressor lube oil pressure in psi. When operating in the AIR PACKS or JET START mode, the gauge should read between 25-30 psi (172-207 kPa). When the compressor is unloaded, this gauge should read between 20-25 psi (103-172 kPa).
FUEL PRESSURE Gauge (GA2)	6	The FUEL PRESSURE gauge (GA2) indicates the relative fuel pressure of the engine. Normal fuel pressures are approximately 15–20 psi (103–138 kPa) when the compressor is unloaded (engine idling) and 100–120 psi (689–827 kPa) when operating in the AIR PACKS or JET START modes (engine running at the rated rpm).
ENGINE WATER TEMPERATURE Gauge (GA4)	7	The ENGINE WATER TEMPERATURE gauge (GA4) monitors the engine coolant temperature. Normal indication (following engine warm-up) is 170–200 °F (77–93 °C).
ENGINE OIL PRESSURE Gauge (GA3)	8	The ENGINE OIL PRESSURE gauge monitors the engine lube oil pressure in psi. Low idle is 40 psi (270 kPA). Oil pressure at rated speed is 110-140 psi (758-965 kPA).

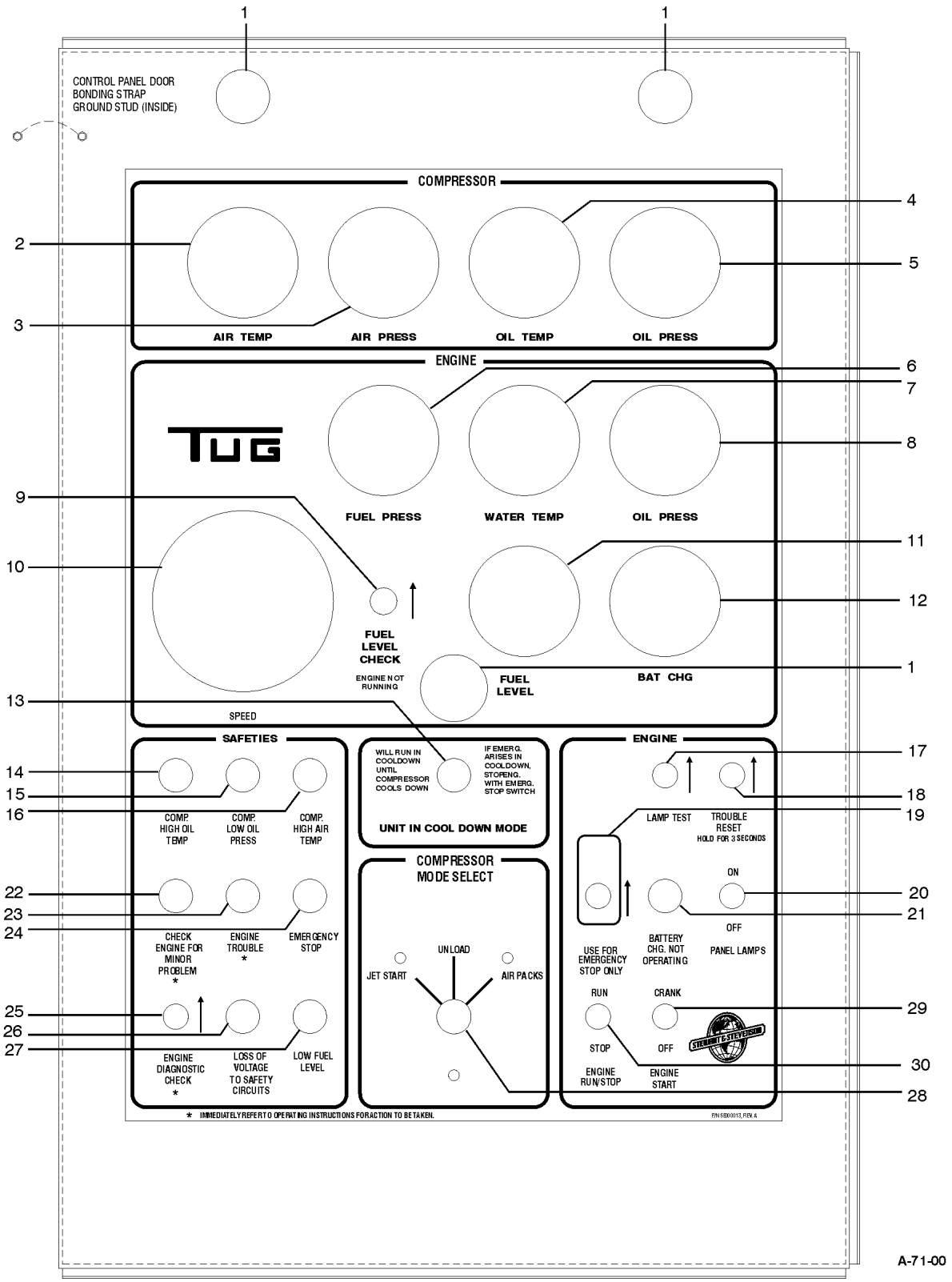


Figure 1.3 Control Panel (Sheet 2 of 4)

(Table 1.2)

Table 1.2 Controls and Indicators (Cont)
(Figure 1.3)

NAME OF CONTROL OR INDICATOR	ITEM NO.	FUNCTION
FUEL LEVEL CHECK Switch (S16)	9	Activation of the FUEL LEVEL CHECK switch (S16) will test the fuel gauge, ensuring there is an accurate reading.
TACHOMETER	10	The tachometer (GA7) is a mechanically operated instrument that indicates engine speed in revolutions per minute.
FUEL LEVEL Gauge (GA1)	11	The FUEL LEVEL gauge (GA1) indicates level of fuel in the unit tank.
VOLTMETER Battery Charge Output (M1)	12	The battery Voltmeter (M1) monitors the battery charging current from the battery charging alternator or discharge current from the battery.
UNIT IN COOLDOWN MODE Lamp (DS2) (AMBER)	13	The UNIT COOLDOWN MODE lamp (DS2) will illuminate when the RUN/STOP switch (S2) is placed in the STOP position to shut down the unit. (The unit will run at 1100 rpm (idle speed) for five minutes.)
COMPRESSOR HIGH OIL TEMPERATURE Lamp (DS3) (RED)	14	Illumination of the COMPRESSOR HIGH OIL TEMPERATURE lamp (DS3) indicates that the compressor oil temperature has risen above 176 °F (80 °C)
COMPRESSOR LOW OIL PRESSURE Lamp (DS5) (RED)	15	While the engine is running, the COMPRESSOR LOW OIL PRESSURE lamp (DS5) will illuminate if the compressor oil pressure drops below 10 psi (69 kPa).
COMPRESSOR HIGH DISCHARGE AIR TEMPERATURE Lamp (DS4) (RED)	16	Illumination of the COMPRESSOR HIGH DISCHARGE AIR TEMPERATURE lamp (DS4) indicates that compressor air discharge temperature has risen above 502 °F (261 °C).
LAMP TEST Switch (S13)	17	The LAMP TEST Switch (S13) is used to test the warning lights located on the instrument panel except for the CHECK ENGINE and BATTERY CHARGE Lamps. When actuated, the warning lamps will illuminate.
TROUBLE RESET Switch (S15)	18	The TROUBLE RESET switch (S15) is a normally closed toggle switch that is used to restore the safety circuits employed in the power unit, following actuation caused by an abnormal operating condition. Activation of the TROUBLE RESET switch will extinguish all fault lamps, resetting the safety circuits. (HOLD FOR 3 SECONDS.)

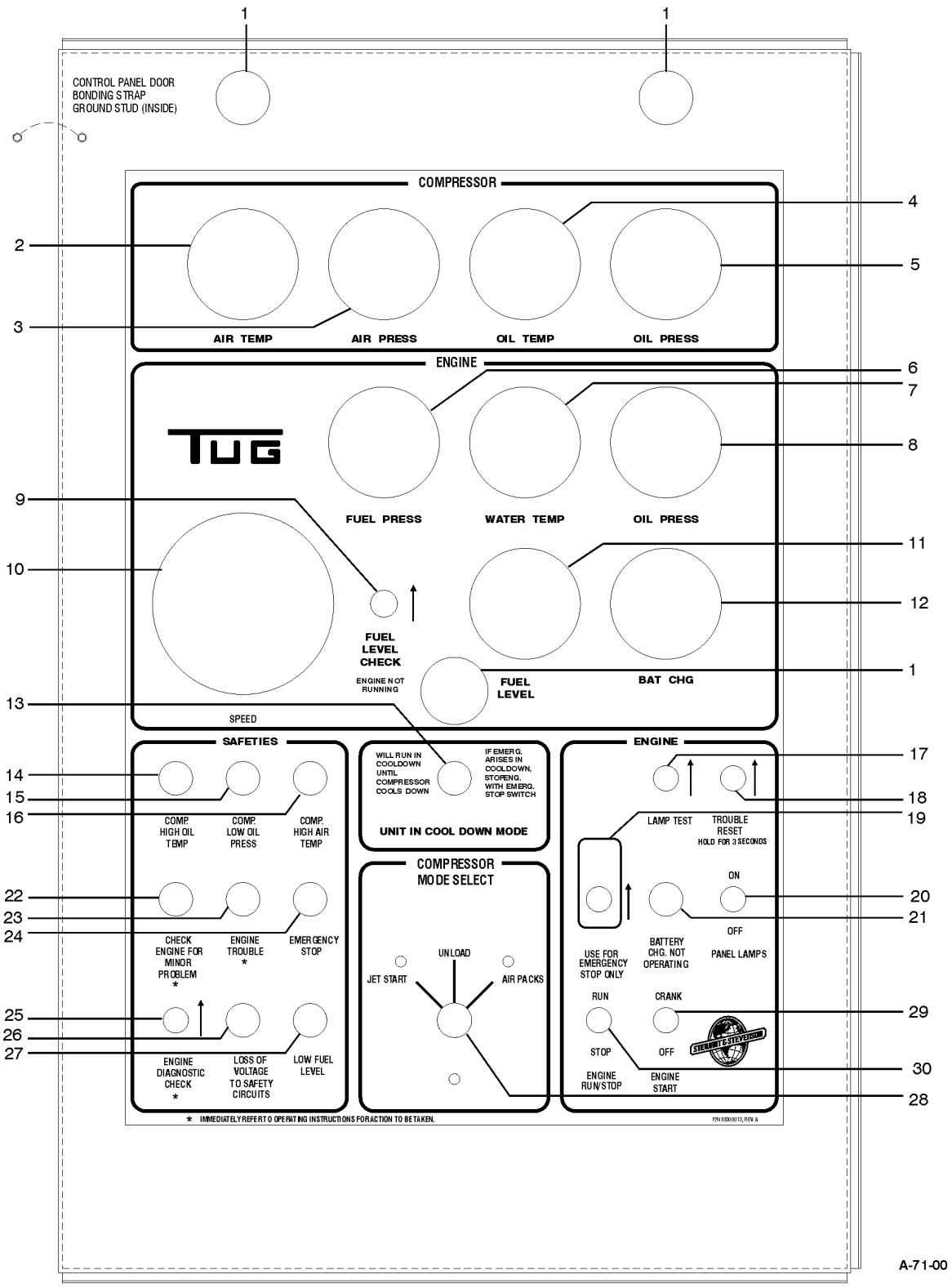


Figure 1.3 Control Panel (Sheet 2 of 4)

(Table 1.2)

Table 1.2 Controls and Indicators (Cont)
(Figure 1.3)

NAME OF CONTROL OR INDICATOR	ITEM NO	FUNCTION
		**EXCEPT IN AN EMERGENCY, DO NOT USE THE EMERGENCY STOP SWITCH TO STOP THE ENGINE.**
EMERGENCY STOP Switch (S9)	19	The EMERGENCY STOP switch (S9), when in the closed position, energizes. Thus, the EMERGENCY STOP switch provides an alternative method of stopping the engine in an emergency, or in the event the primary shutdown mechanism fails.
PANEL LAMPS Switch (S12)	20	The PANEL LAMPS switch (S12) is a maintained contact toggle switch that is used to illuminate and extinguish the control panel lamp.
BATTERY CHARGER NOT OPERATING Lamp (DS1) (RED)	21	Illumination of the BATTERY CHARGER NOT OPERATING lamp (DS1) indicates the alternator charging system is not providing voltage to the battery.
CHECK ENGINE FOR MINOR PROBLEM Lamp (DS11) (AMBER)	22	Illumination of the engine CHECK ENGINE FOR MINOR PROBLEM lamp (DS11) indicates that an engine malfunction exists (such as low fuel pressure). The unit will continue to run.
ENGINE TROUBLE Lamp (DS10) (RED)	23	The ENGINE TROUBLE lamp (DS10) will illuminate when there is a signal from the ECM that there is a major problem with one of the unit systems. Unit will shut down.
EMERGENCY STOP Lamp (DS9) (RED)	24	The EMERGENCY STOP lamp (DS9) will illuminate when the Emergency Stop Switch (S9) has been activated
ENGINE DIAGNOSTIC Switch (S6)	25	When ENGINE DIAGNOSTIC switch (S6) is activated, it will test the flash codes in the DDEC control box.
LOSS OF VOLTAGE TO SAFETY CIRCUITS Lamp (DS6) (RED)	26	The LOSS OF VOLTAGE TO SAFETY CIRCUITS lamp (DS6) will illuminate when there is a loss of voltage to the safety circuits.
LOW FUEL LEVEL Lamp (DS8) (RED) OPTIONAL	27	Illumination of LOW FUEL LEVEL lamp (DS8) indicates that the fuel level has dropped to within 1/2 inch (12.7 mm) from the bottom of the fuel tank (approximately 1 hour of run time). The Low Fuel Level Beacon (DS7) blue lamp on outside of unit will also be activated.

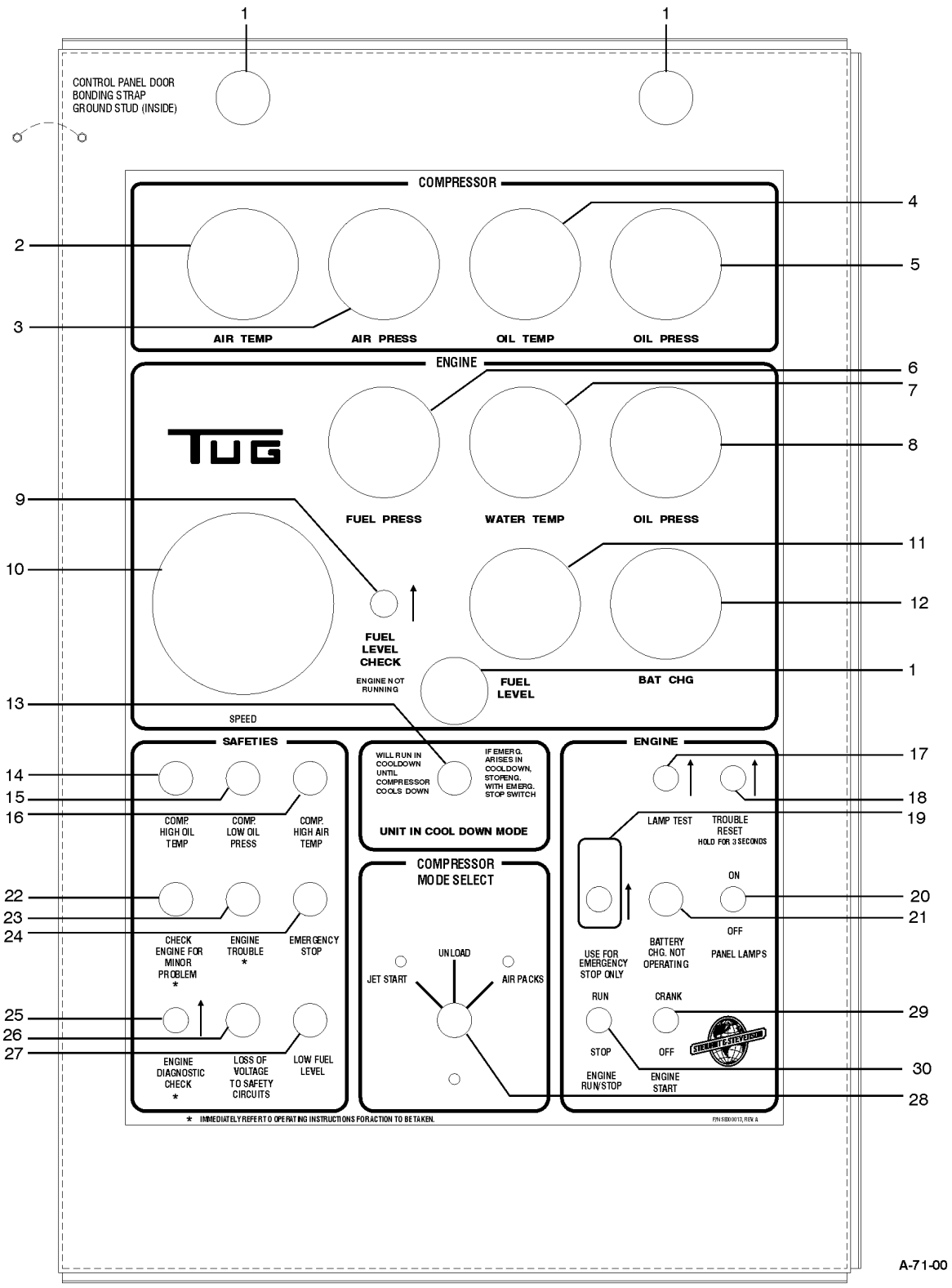


Figure 1.3 Control Panel (Sheet 2 of 4)

(Table 1.2)

Table 1.2 Controls and Indicators (Cont)
(Figure 1.3)

NAME OF CONTROL OR INDICATOR	ITEM NO.	FUNCTION
MODE SELECTOR Switch (S10)	28	The MODE SELECTOR switch has three positions as follows:
UNLOAD		In the UNLOAD position, the engine is at idle speed, and the discharge pressure is reduced to near atmospheric. The mode selector switch must be in the UNLOAD position when starting or stopping the unit, and when air is not required.
JET START		Prior to placing the mode selector switch in the JET START position, the air delivery hose(s) must be uncoiled and stretched out or connected to the aircraft with discharge valves closed. In this mode of operation, the engine will maintain maximum safe speed and the unit will deliver air at full capacity. Abnormal operation conditions (listed in Section 2) will cause the compressor and engine fault lamp to flash
AIR PACKS		Prior to placing the mode selector switch in the AIR PACKS position, the air delivery hose(s) must be uncoiled and stretched or connected to the aircraft with discharge valves closed. In this position, the engine will maintain maximum safe speed and the unit will deliver air at full capacity. In the AIR PACKS mode, all safety shutdowns are in effect and will shut down the unit upon their individual actuation. Compressor and engine fault lamp on the control panel will flash.
ENGINE CRANK Switch (S1)	29	The ENGINE CRANK switch (S1), when actuated, initiates starting of the engine by causing the engine starter solenoid to energize.
ENGINE STOP/RUN Switch (S2)	30	The ENGINE STOP/RUN switch (S2) is used for normal stopping of the engine. When actuated, this switch sends a signal to the DDEC control box for the unit to go into the cooldown mode for 5 minutes at 1200 rpm and then shuts the unit down.

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Chapter 1, Section 3

Specifications

3.1 INTRODUCTION

3.1.1 The following specification tables provide important data as to the characteristics of the Model TR/TMD-300/400 Air Start Unit and its related components.

3.2 SPECIFICATION TABLES

3.2.1 General specifications and fuel capacities for the TR/TMD-300/400 Air Start Unit and related components are listed in Tables 1.3 and 1.4.

3.2.2 Engine Oil Grades: For the SAE viscosity grades of engine oil to use at various temperatures, refer to the Detroit Diesel Operator's Manual located in Chapter 6, Tab B.

3.2.3 Specifications are subject to change without notice at the sole discretion of Stewart & Stevenson TUG (7/01/01).

Table 1.3 Specifications Standard Detroit Diesel TR/TMD-300 Air Start Unit

A. Engine

- Manufacturer	Detroit Diesel
- Type	Direct injection 4 cycle turbo charged
- Model	Series DDC/MTU 2000 DDEC IV
- Rating	760 brake horsepower (567 kW)
- Number of cylinders	Twelve (12)
- Speed (idle)	1200 rpm
- Speed (max. when loaded)	2100 rpm

B. Emission Data

- Smoke, Rated Speed – Bosch Number	0.2
- Smoke, Peak Torque Speed – Bosch Number	0.4
- Noise – dB(A)@1m	105.7
- Additional Noise Data	#N/A
- CO – g/hr	176
- HC – g/hr	235
- NOx – g/hr	6120
- SO2 – g/hr	1216

Table 1.3 Specifications Standard Detroit Diesel TR/TMD-300 Air Start Unit (Cont)

B. Compressor

- Manufacturer	GHH-RAND
- Type	Rotary dry screw oil free air
- Model	CD72S (single element)
- Output at 68 °F (20 °C), 0% RH, sea level	300 lb/min (102 kg/min)
- Discharge pressure (max.)	42 psi (289 (kPa)
- Discharge air temperature	410 °F (210 °C) nominal

D. Engine and Compressor Protection System

Operating conditions below are factory set for operator warning and/or automatic shutdown in "UNLOAD" and "AIR PACK" modes only. Only shutdown in "JET START" mode is an operator Emergency Stop.

- Engine high coolant temperature	217 °F (103 °C)
- Engine low oil pressure	Variable with engine speed
- Compressor high air temperature	502 °F (261 °C)
- Compressor high lube oil temperature	176 °F (80 °C)‘
- Compressor low lube oil pressure	10 psi (69 kPa)

E. Aircraft Protection System

- Discharge air regulating valve	42 psi (289 kPa)
- Discharge air safety valve	50 psi (345 kPa)

F. Dimensions and Weights

	TMD-300 (trailer unit)	TRD-300 (truck & module)	
Length	17’9” (5.4 m)	17’9” (5.4 m)	
Width	8’ (2.4 m)	8’ (2.4 m)	
Height	10’ (3.0 m)	13’ (4.0 m)	
Weight (dry)	21,900 lb (9,933.7 kg)	31,270 lb (14,183.8 kg)	TRD-300 + truck GVW

Table 1.4 Specifications Standard Detroit Diesel TR/TMD-400 Air Start Unit

A. Engine

- Manufacturer	Detroit Diesel
- Type	Direct injection 4 cycle turbo charged
- Model	Series 2000 DDEC IV
- Rating	905 brake horsepower (657 kW)
- Number of cylinders	Twelve (12)
- Speed (idle)	1200 rpm
- Speed (max. when loaded)	2100 rpm

B. Emissions Data

- Smoke, Rated Speed – Bosch Number	0.7
- Smoke, Peak Torque Speed – Bosch Number	1.0
- Noise – dB(A)@1m	103
- Additional Noise Data	#N/A
- CO – g/hr	230
- HC – g/hr	120.6
- NOx – g/hr	4300
- SO2 – g/hr	1390

C. Compressor

- Manufacturer	GHH-RAND
- Type	Rotary dry screw oil free air
- Model	CD72S (single element)
- Output at 68 °F (20 °C), 0% RH, sea level	400 lb/min (136 kg/min)
- Discharge pressure (max.)	42 psi (289 (kPa)
- Discharge air temperature	410 °F (210 °C) nominal

D. Engine and Compressor Protection System

Operating conditions below are factory set for operator warning and/or automatic shutdown in “UNLOAD” and “AIR PACK” modes only. Only shutdown in “JET START” mode is an operator Emergency Stop.

- Engine high coolant temperature	217 °F (103 °C)
- Engine low oil pressure	10 psi (69 kPa)
- Compressor high air temperature	502 °F (261 °C)
- Compressor high coolant temperature	176 °F (80 °C)‘
- Compressor low coolant pressure	10 psi (69 kPa)

Table 1.4 Specifications Standard Detroit Diesel TR/TMD-400 Air Start Unit (Cont)

E. Aircraft Protection System

- Discharge air regulating valve	42 psi (289 kPa)
- Discharge air safety valve	50 psi (345 kPa)

F. Dimensions and Weights

	TMD-400 (trailer unit)	TRD-400 (truck & module)	
Length	17’9" (5.4 m)	27’9" (8.5 m)	
Width	8' (2.4 m)	8' (2.4 m)	
Height	10' (3.0 m)	13’ (4.0 m)	
Weight (dry)	21,900 lb (9,933.7 kg)	31,270 lb (14,183.8 kg)	TRD-400 + truck GVW

Chapter 1, Section 4

Shipping

4.1 INTRODUCTION

4.1.1 This section contains instructions for the preparation of shipping the TR/TMD-300/400 Air Start Unit from one location to another. Normally, shipping the unit does not involve storage time. If the unit is to be stored before or after shipment, refer to Section 5 of this chapter for details on preparation. The unit is normally shipped in a fully operational status. The unit can be towed to on-load or off-load from the trailer bed of the transporting truck. Any systems that are not operational should be appropriately tagged on the unit and indicated on the shipping document that accompanies the unit. If the fully operational method of shipment is not preferable, refer to paragraphs 4.4 through 4.8.

4.2 LIFTING

To avoid injury to personnel or damage to equipment, always use lifting equipment, supports, and chains with a rated capacity of at least one and one-half (1-1/2) times that of the object being lifted or supported.

4.2.1 The unit may be lifted by a hydraulic lift (forklift) with, minimum, seven-foot forks. Place forks under the main frame just outboard of the fuel tank supports.

4.3 PREPARING THE ENGINE AND COMPRESSOR

4.3.1 Drain fuel tank; close and seal all openings.

4.3.2 Drain coolant from engine cooling system; close and seal all openings.

4.3.3 Seal end of exhaust with weatherproof tape, to prevent entry of foreign matter.

4.3.4 Seal the compressor air intake by enclosing the air cleaner assembly in plastic sheeting and securing with duct tape to prevent entry of foreign matter.

4.3.5 Seal the end of the engine intake with duct tape to prevent damage or foreign matter to enter.

4.4 PREPARING THE UNIT

4.4.1 Batteries.

a. Disconnect the battery cables and securely fasten inside the enclosure to prevent them from coming in contact with battery terminals.

b. Ensure battery hold-down devices are installed and tightened.

4.4.2 Control Panel. Protect the control panel with cardboard or other suitable material to prevent damage from impact by loose debris.

4.4.3 Warning Beacons. Remove roof-mounted beacon(s), if supplied, before shipment. Securely tape a protective covering over the beacon mounting plate(s). Securely pack roof-mounted beacon(s) in a box(es), label box(es), and ship with unit.

4.5 MARKING

4.5.1 Before shipment, ensure that a warning tag of some type is securely fastened to the ENGINE START switch on the control panel. This tag should warn as to the following:

Do not start engine! Coolant has been drained. Fuel has been drained.

4.6 RECEIVING EQUIPMENT

4.6.1 Inventory. Inventory items received against shipper's Bill of Lading. Note any missing items on Bill of Lading.

4.6.2 Inspection. Inspect equipment for damage. Damaged coverings require an in-depth inspection in that area. Note any damaged items or protective coverings on Bill of Lading.

4.6.3 Notification. Immediately notify the shipper and any other responsible parties of missing items and/or damage found to the unit or parts of the unit.

4.7 PREPARING UNIT FOR SERVICE

4.7.1 Warning Beacon(s). If warning beacons are supplied on unit, remove protective tape covering from beacon mounting plate(s), remove beacon(s) from box(es), and install beacon(s).

4.7.2 Air Cleaners. Remove plastic sheeting and duct tape from air intake of the compressor and engine air cleaners.

4.7.3 Batteries. Ensure battery hold-down devices are secure. Clean battery posts, then coat with petroleum jelly and install battery cables. Charge batteries if needed.

4.7.4 Engine and Compressor. Perform the following:

a. Remove sealing tape from end of engine exhaust pipe.

b. Fill engine cooling system and radiator with coolant. Use coolant per Detroit Diesel Operation and Maintenance Manual.

c. Fill fuel tank with diesel fuel per Detroit Diesel Operation and Maintenance Manual.

4.7.5 Control Panel. Remove cardboard from control panel.

4.7.6 Markings. Remove WARNING tag from ENGINE START switch on the control panel. Perform Daily maintenance tasks as listed on the Preventive Maintenance Schedule (Table 1.1) in Chapter 2 of this manual. Perform Pre-Start Procedures and Operation Procedures in Section 2 of this chapter.

Chapter 1, Section 5

Storage

5.1 PREPARING THE UNIT FOR STORAGE

5.1.1 When a unit is to be stored or removed from operation for a period of time, special precautions should be taken to protect the interior and exterior of the air start unit from rust accumulation and corrosion. The parts requiring attention and the recommended preparations are given below. The compressor does not require special preservation.

5.1.2 Rust and Corrosion Removal. It will be necessary to remove all rust or corrosion completely from any exposed part before applying a rust-preventive compound. Therefore, it is recommended that the unit be processed for storage as soon as possible after removal from operation.

5.1.3 Storage Conditions. The unit should be stored in a building which is dry and can be heated during the cold, wet weather season. Moisture-absorbing chemicals are available commercially for use when excessive dampness prevails in the storage area.

5.2 TEMPORARY STORAGE (30 DAYS OR LESS)

5.2.1 To protect the unit for 30 days or less, proceed as follows:

a. Drain the engine crankcase.

b. Fill the crankcase to the proper level with the recommended viscosity and grade of oil.

c. Fill the fuel tank with the recommended grade of fuel oil. Operate the engine for 2 minutes in the UNLOAD mode.

Note: Do not drain the fuel system or the crankcase after this run.

d. Check and service the air cleaners, if required, as outlined in Chapter 2.

e. If freezing weather is expected during the storage period, add an ethylene-glycol– based antifreeze solution in accordance with the manufacturer's recommendations.

Note: If an antifreeze solution is not to be used during this storage period, the coolant system should be flushed with a good rust inhibitor to prevent rusting of the outside diameter of the cylinder liners.

f. Seal all of the engine openings. The material used for this purpose must be waterproof, vaporproof and possess sufficient physical strength to resist puncture and damage from the expansion of entrapped air.

5.2.2 Returning to Service. Prepared in this manner, the unit can be returned to service in a short time by removing all sealing material and checking the engine coolant, fuel oil, lubricating oil, and compressor oil.

5.3 EXTENDED STORAGE (MORE THAN 90 DAYS)

5.3.1 To prepare the unit for extended storage (more than 90 days), perform the following procedures:

a. Drain the cooling system and flush with clean, soft water. Refill with clean, soft water and add a rust inhibitor to the cooling system.

b. Remove, check, and recondition the injectors, if necessary, to ensure they will be ready to operate when the engine is restored to service.

c. Reinstall the injectors, time them, and adjust the exhaust valve clearance.

d. Circulate the coolant by operating the engine until normal operating temperature 160–185 °F (71–85 °C) is reached.

e. Stop the engine.

f. Drain the engine crankcase, then reinstall and tighten the drain plug. Install new lubricating oil filter elements and gaskets.

g. Fill the crankcase to the proper level with a 30-weight preservative lubricating oil MIL-L-21260C, Grade 2.

h. Drain the fuel tank. Refill with enough clean No. 1 diesel fuel or pure kerosene to permit the engine to operate for about ten minutes. If it isn't convenient to drain the fuel tank, use a separate portable supply of the recommended fuel.

Note: If the unit is stored where condensation of water in the fuel tank may be a problem, add pure, waterless isopropyl alcohol (isopropanol) to the fuel at a ratio of 1 pint (0.5 L)-to-125 gallons (473 L) of fuel or 0.010% by volume. Where biological contamination of fuel may be a problem, add a biocide such as Biobor JF, or equivalent, to the fuel. When using a biocide, follow the manufacturer's concentration recommendations and observe all cautions and warnings.

i. Drain and disassemble the fuel filter and strainer. Discard the used elements and gaskets. Fill the cavity between the element and the shell with No. 1 diesel fuel or pure kerosene, and reinstall on the engine.

j. Operate the engine for five minutes to circulate the clean fuel oil throughout the fuel system.

k. Drain the engine cooling system.

l. Remove and clean the battery and battery cables with a baking soda-water solution and rinse with fresh water. Do not allow the soda solution to enter the battery. Add distilled water to the electrolyte, if necessary, and fully charge the battery. Store the battery in a cool (never below 32 °F or 0 °C) dry place. Keep the battery fully charged and check the level and the specific gravity of the electrolyte regularly.

m. Insert heavy paper strips between the pulleys and belts to prevent sticking.

n. Seal all unit openings, including the exhaust outlet, with moisture-resistant tape. Use cardboard, plywood, or metal covers where practical.

o. Clean and dry the exterior painted surfaces of the unit and protect with a suitable liquid automobile body wax, a synthetic resin varnish, or a rust-preventive compound.

Do not put silica gel or any other foreign matter in the compressor air inlet.

5.3.2 Open-Weather Environment Storage. Open-weather environment storage is not recommended. However, in some instances, open-weather environment storage may be unavoidable. If units must be kept in an open-weather environment, follow the preparation and storage instructions listed above. Protect the units with quality, weather-resistant tarpaulins (or other suitable covers) arranged to provide air circulation.

Do not use plastic sheeting for open weather environment storage. Plastic is fine for enclosed, dry storage. When used in an open weather environment, enough moisture can condense on the inside of the plastic to rust ferrous metal surfaces and pit aluminum surfaces. If a unit is stored in an open weather environment for an extended period of time, severe corrosion damage can result.

5.3.3 Periodic Inspection. The stored unit should be inspected periodically. If there are any indications of rust or corrosion, corrective steps must be taken to prevent damage to the unit. Perform a complete inspection at the end of one year and apply additional treatment as required.

5.4 RESTORING A UNIT FROM EXTENDED STORAGE

5.4.1 Restoring the Unit to Service. To restore the unit to service after having been stored for a long period, perform the following procedure:

a. Remove the covers and tape from all of the openings of the engine, fuel tank, and electrical equipment. Do not overlook the exhaust outlet.

b. Wash the exterior of the unit to remove the rust preventive.

c. Remove the rust preventive from the flywheel with brake cleaner.

d. Remove the paper strips from between the pulleys and belts.

e. Remove the drain plug and drain the preservative oil from the crankcase. Reinstall the drain plug. Fill the crankcase to the proper level with the recommended grade of lubrication oil.

f. Fill the fuel tank with the Detroit Diesel recommended grade of fuel listed in the Detroit Diesel Operator's Guide provided in Chapter 6.

g. Close all of the drain cocks and fill the engine cooling system with clean soft water and rust inhibitor. If the engine is to be exposed to freezing temperatures, fill the cooling system with an ethylene glycol-based antifreeze solution.

h. Install and connect the battery.

i. Service the air cleaners as outlined in Chapter 2, Section 3.

j. Remove seals from the compressor air intake, compressor discharge and manifold.

5.4.2 Starting the Unit. After all of the preparations have been completed, start the engine. The small amount of rust preventive compound, which remains in the fuel system, will cause a smoky exhaust for a few minutes.

Note: Before subjecting the engine to a load or high speed, it is advisable to check the engine tune-up.

Chapter 2

Maintenance

TABLE OF CONTENTS

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Chapter 2, Section 1

Preventive Maintenance Schedule

1.1 INTRODUCTION

1.1.1 The Preventive Maintenance Schedule (Table 2.1) defines preventive maintenance tasks and time intervals between each task. This schedule applies to all TR/TMD-300/400 Air Start Units. The following information will help you utilize the preventive maintenance schedule.

1.2 HOW TO USE THE PREVENTIVE MAINTENANCE SCHEDULE

1.2.1 To use the preventive maintenance schedule, perform the following steps:

a. Refer to Table 2.1. The scheduled maintenance tasks are listed in rows on the far left side of the table. The frequency of each maintenance action is listed in the columns at the top of the table. The hour frequency of preventive maintenance is based on the time (hours) of actual operation of the equipment. Refer to the unit hour meter to obtain hours of operation. The calendar schedule frequency of preventive maintenance is based on the equipment being operated during a daily, weekly, monthly, or yearly period of time as listed on the Preventive Maintenance Schedule. The equipment owner should establish a preventive maintenance schedule based on his equipment usage.

b. Immediately to the right of the maintenance tasks are references to direct the technician to the required maintenance procedures. The references are defined as follows:

1. MI 01001, MI 02001, etc.: Refer to Maintenance Instruction (MI) "XXXXX" located in Chapter 2, Section 3.

2. Vendor Material: Refer to the manufacturer's data located behind Tab A or B of Chapter 6 or manuals shipped under separate cover.

c. From the reference column, follow the row to the right until you encounter an "X" in one of the blocks. Each "X" indicates a need for preventive maintenance at specified time intervals.

d. At the "X," move up the column up until you reach the recommended frequency (i.e., the time interval between) of the maintenance action. Both calendar-day and hourly time intervals are included.

To prevent damage to the unit, do not exceed the recommended time intervals between inspection, servicing, or lubrication. Increase the frequency of inspection, servicing, and lubrication if you operate the unit in harsh environmental conditions.

e. Perform the maintenance item at, or before expiration of, the indicated time interval.

Table 2.1 Preventive Maintenance Schedule

PREVENTIVE MAINTENANCE TASKS	REFERENCE	DAILY	WEEKLY (50 HR)	MONTHLY (200 HR)	EVERY 6 MONTHS (500 HR)	YEARLY (1000 HR)
Fluid Levels, Check	MI 99002A	X				
Unit, Visual Inspection	MI 01002A	X				
Tire Pressure, Check for TMD Air Start Unit	MI 02004A		X			
Fuel/Water Separator, Drain Water	MI 04004A		X			
Engine Oil and Filter, Change	MI 06002A Vendor Material			X		
Radiator Fan & Alternator Belts, Check	Vendor Material			X		
Alternator Wiring Harness & Terminals, Inspect	Vendor Material			X		
Fuel Strainer and Fuel Filter, Change Elements	Vendor Material			X		
Fuel Tank, Drain Sediment & Moisture	Vendor Material				X	
Water Pump, Inspect Drain Hole	Vendor Material				X	
Fuel Tank, Inspect Mounts, Lines and Fittings for TMD Air Start Unit	MI 01003A				X	
Cooling System Hoses, Inspect	Vendor Material				X	
Engine and Compressor Air Filters, Change Elements or when Indicator is Greater Than 8 Inches W.C.*	MI 08003A				X	
Exhaust Stack Rain Cap, Check Operation	Vendor Material				X	
Fuel/Water Separator, Change (Option)	MI 04004				X	
Emergency Shutdown, Test	MI 05010A					X
Radiator, Inspect and Clean Core and Fins (Exterior)*	Vendor Material					X
Thermostats and Seals, Check	Vendor Material					X
Cooling System, Clean, Flush, and Replace Coolant.*	Vendor Material					X
Crankcase Breathers and Tubes, Clean*	Vendor Material					X
Compressor Oil and Filter, Change	MI 11002A				X	
Parking Brakes, Check and Adjust for TMD Air Start Unit	MI 03001A					X
Wheel Bearings, Clean, Inspect, and Repack for TMD Air Start Unit	MI 02005A					X
Engine Crankcase, Check Pressure	Vendor Material					X
Engine, Perform Tune-up*	Vendor Material					X
Engine and Compressor Mounts, Inspect	Vendor Material					X

* To be performed as required, as determined by engine performance.

Chapter 2, Section 2

Troubleshooting

2.1 INTRODUCTION

2.1.1 This section provides information and troubleshooting tables for diagnosing and correcting problems with the TR/TMD-300/400 air start units. The following paragraphs will assist you in quickly locating the information needed to diagnose malfunctions.

2.2 HOW TO USE THE TROUBLESHOOTING TABLES

2.2.1 Attempting tests or repairs to correct a problem without first analyzing its cause can be very wasteful of time and resources. Before attempting tests or repairs:

a. Determine which category below most closely relates to the problem your unit is experiencing:

1. Engine (Tables 2.2 through 2.6)

2. Compressor (Tables 2.7 through 2.12)

3. Electrical System (Tables 2.13 and 2.14)

4. Trailer Chassis (Tables 2.15 and 2.16)

Note: Because of the close relationship between some components of the engine and electrical system, some troubleshooting procedures may cover similar areas.

b. Turn to the applicable procedure, and read the material carefully.

c. If there is a fault indication on the Electronic Control Module (ECM), refer to *DDEC III/IV Troubleshooting Guide* (under separate cover). Repair as directed.

d. Carefully perform the troubleshooting steps and recommended corrective action.

2.2.2 The troubleshooting tables often reference other sections of this manual for corrective actions or procedures. The references may be to another troubleshooting table, the *DDEC III/IV Troubleshooting Guide* (under separate cover), a Maintenance Instruction (MI XXXXX), or to the manufacturer's manuals in Chapter 6 or under separate cover of this manual.

2.2.3 If any corrective action reference requires contacting *Stewart & Stevenson TUG*, please follow these steps:

g. Ensure that all applicable steps of the troubleshooting chart(s) have been executed.

h. If the problem is engine-related, write down all parts type codes from the decal affixed to the engine rocker cover.

i. Obtain the air start unit serial number from the unit's nameplate.

j. Contact *Stewart & Stevenson TUG* at:

Stewart & Stevenson TUG, Inc.
815 Algood Rd.
Marietta, Georgia 30062
Phone: 770-422-7230
FAX: 770-422-8730

2.3 ENGINE TROUBLESHOOTING

2.3.1 The information provided in the engine troubleshooting tables helps maintenance personnel diagnose and correct engine problems. Four engine troubleshooting tables are provided:

a. Table 2.1 Engine Will Not Crank

b. Table 2.2 Engine Cranks, But Will Not Start

c. Table 2.3 Engine Starts, But Will Not Continue To Run

d. Table 2.4 Malfunction Shutdowns

e. Table 2.5 Abnormal Operation

2.3.2 Tables 2.1, 2.2, and 2.3 deal with engine starting problems. Table 2.4 addresses malfunctions that trip protective circuits to stop the engine. Table 2.5 deals with problems with engine performance.

2.3.3 To diagnose and correct engine problems:

a. Determine which table applies to the engine problem.

b. Refer to the applicable table.

Note: The probable causes for engine problems are listed in descending order, from "most likely" to "least likely" to occur.

c. Read the data in the troubleshooting tables and perform the recommended corrective actions.

d. Refer to *DDEC III/IV Troubleshooting Guide* (under separate cover of this manual). Repair as directed.

2.4 SPECIAL TOOLS & EQUIPMENT (ENGINE TROUBLESHOOTING)

2.4.1 The following tools and equipment will be needed to complete all tests and corrective actions prescribed by the engine troubleshooting tables:

a. Catch pans or containers for draining oil and coolant

b. Oil filter strap wrench

c. Standard mechanic's tool set

d. Floor jack or hoist rated at 25,000 lb (11340 kg).

e. Jack stands rated for at least 25,000 lb (11340 kg)

Table 2.2 Engine Will Not Crank

PROBLEM	SOLUTION
1. ENGINE FAULT INDICATION	Refer to *DDEC III/IV Troubleshooting Guide* (under separate cover). Repair as directed.
2. ENGINE RUN/STOP SWITCH (S2) NOT IN RUN	Move RUN/STOP switch (S2) to RUN.
3. MODE SELECTOR SWITCH (S10) NOT IN UNLOAD	Place the MODE SELECTOR switch (S10) in UNLOAD.
4. BATTERIES (BT1A, BT1B, BT2A, BT2B) DISCHARGED (dead)	Charge, or replace batteries (BT1A, BT1B, BT2A, BT2B) as needed.
5. BATTERY CABLE TERMINALS (J1, J2, J3, J4) LOOSE, CORRODED, OR DISCONNECTED	Clean, tighten, or replace battery cable terminals (J1, J2, J3, J4) as needed.
6. DEFECTIVE FUSES (F1, F2, F3, F4)	Replace fuses (F1, F2, F3, F4) as needed.
7. LOOSE STARTER CONNECTIONS	Tighten connections.
8. DEFECTIVE STARTER (B1)	Repair or replace starter (B1).
9. DEFECTIVE ALTERNATOR (G1) (batteries not charging/discharging) OR VOLTMETER (M1)	Refer to Electrical Troubleshooting Procedure, paragraph 2.9, positively isolate faulty switch. Repair or replace as needed.
10. DEFECTIVE ENGINE CRANK SWITCH (S1) and/or ENGINE RUN/STOP SWITCH (S2)	Refer to the Electrical Troubleshooting Procedure, paragraph 2.9, to positively isolate the faulty switch. Repair or replace as needed.
11. WIRING OR CABLES DEFECTIVE	Refer to Electrical Troubleshooting Procedure, paragraph 2.9, to positively isolate faulty wiring or cables. Repair or replace as needed.
12. DEFECTIVE RELAY OR RELAYS (K1, K2, K5, K8, K9, K11, K12, K14, K15)	Refer to Electrical Troubleshooting Procedure, paragraph 2.9, to positively isolate faulty relay(s). Repair or replace as necessary.
13. DEFECTIVE STARTER SOLENOID (L1)	Refer to Electrical Troubleshooting Procedure, paragraph 2.9, to positively isolate faulty solenoid. Repair or replace as necessary.
14. DEFECTIVE MODE SELECT SWITCH (S10)	Refer to Electrical Troubleshooting Procedure, paragraph 2.9, to positively isolate faulty switch (S10). Repair or replace as necessary.
15. INTERNAL ENGINE SEIZURE OR COMPRESSOR SEIZURE	Set RUN/STOP switch (S2) to STOP and attempt to rotate engine manually. To do this, apply a socket and large breaker bar to crankshaft's snout bolt and pull, or remove starter motor and carefully pry on ring gear teeth with a pry bar. Failure to achieve a complete revolution indicates internal engine or compressor damage. Contact *Stewart & Stevenson TUG* for repairs.

Table 2.3 Engine Cranks, But Will Not Start

PROBLEM	SOLUTION
1. ENGINE FAULT INDICATION	Refer to *DDEC III/IV Troubleshooting Guide* (under separate cover). Repair as directed.
2. DEFECTIVE FUSES (F1, F2, F3, F4)	Replace defective fuses and attempt a start. If fuse burns out, determine why and replace fuse prior to attempting another engine start.
3. EMERGENCY STOP SWITCH (S9) IN WRONG POSITION	Check position of the Emergency Stop Switch (S9). Reset as necessary.
4. DEFECTIVE EMERGENCY STOP RELAY (K9)	Refer to Electrical Troubleshooting Procedure, paragraph 2.9, to positively isolate the faulty relay. Repair or replace as necessary.
5. ENGINE OVERSPEED INDICATED	
a. Defective ECM.	Refer to *DDEC III/IV Troubleshooting Guide* (under separate cover). Repair as directed.
6. NO AIR	
a. Clogged engine air intake filter.	Service or replace filter.
7. SLOW CRANKING	
a. Low battery (BT1A, BT1B, BT2A, BT2B) output.	Service and charge the batteries. Replace batteries if damaged. Clean and tighten loose, dirty, or corroded battery terminals. Repair or replace damaged battery cables. Cold temperatures will reduce battery output; if unit is equipped with a battery heater, warm the batteries.
b. Loose starter connections or faulty starter.	Clean and tighten any loose starter connections. If engine still cranks slowly, remove and repair or replace starter.

Table 2.3 Engine Cranks, But Will Not Start (Cont)

PROBLEM	SOLUTION
8. INSUFFICIENT FUEL	
a. Engine fuel system has run dry.	Fill empty fuel tank and bleed any air from fuel lines. Refer to the *Detroit Diesel Series DDC/MTU 2000 Service Manual* (under separate cover), for fuel system bleeding procedures.
b. Clogged primary or secondary fuel filter.	(Some units are equipped with an optional fuel/water separator in place of primary fuel filter.) Replace clogged filter. Check fuel tank for contamination. Drain and flush any debris or contaminants. If unit is equipped with an optional fuel/water separator, drain any water and sediment.
c. Kinked or obstructed fuel lines.	Replace obstructed or kinked fuel lines. Prime fuel system per the *Detroit Diesel Series DDC/MTU 2000 Service Manual* (under separate cover).
d. Air leaks on suction side of the pump.	Locate leaks and eliminate them. Prime fuel system as per the Detroit Diesel *Series DDC/MTU 2000 Service Manual* (under separate cover).
e. Faulty fuel pump.	Check fuel pump as per the *Detroit Diesel Series DDC/ MTU 2000 Service Manual* (under separate cover). Repair or replace the faulty fuel pump.
9. COLD ENGINE	
a. Lube oil viscosity too heavy for particular cold weather, causing slow cranking.	Change oil to viscosity recommended for your current temperatures. See MI 06002A. If temperatures are below 5 °F (-15 °C), heat engine. Coolant, oil, and battery heaters are available as options.
b. Ether injection starting aid failure (temperatures below 40 °F (4 °C). (OPTIONAL)	Check for an empty ether cylinder. Check ether delivery line for kinks, crimps, or breaks. Check connecting fittings for leaks. Check solenoid valve control circuit (including thermostatic switch) for faults. (Thermostatic switch closes at 40 °F (4 °C) or lower.)
10. LOW COMPRESSION	
a. Improper exhaust valve clearance.	Adjust exhaust valve clearance per the *Detroit Diesel Series DDC/MTU 2000 Service Manual* (under separate cover).
b. Internal engine damage.	Check for burned or sticking exhaust valves, worn or broken compression rings, leaking cylinder head gasket, or malfunctioning blower. Check engine components per inspection and diagnosis procedures provided in the *Detroit Diesel Series DDC/MTU 2000 Service Manual* (under separate cover). Contact Stewart & Stevenson TUG for engine repairs.

Table 2.4 Engine Starts, But Will Not Continue To Run

PROBLEM	SOLUTION
1. ENGINE FAULT INDICATION.	Refer to *DDEC III/IV Troubleshooting Guide* (under separate cover). Repair as directed.
2. UNIT SAFETY CIRCUIT FAULT.	See if any safety circuit faults have been detected. Repair any faults prior to making additional start attempts. Refer to Table 2.4 Malfunction Shutdowns.

Table 2.5 Malfunction Shutdowns

PROBLEM	SOLUTION
1. LOW OIL PRESSURE	
a. Low oil crankcase level.	Replenish oil level per MI 06002A.
b. Improper lube oil viscosity.	Change oil. Use oil recommended by engine lube oil specifications table in MI 06002A.
c. Defective engine lube oil pressure sensor (SE3), ECM, or fault in wiring.	Check for wiring faults and repair as needed. Test ECM and pressure sensor (SE3) and replace as necessary.
d. Internal engine lube oil system damage or malfunction.	Refer to the *Detroit Diesel Series DDC/MTU 2000 Service Manual* (under separate cover), for troubleshooting procedures. Contact *Stewart & Stevenson TUG* for engine repairs.

Table 2.5 Malfunction Shutdowns (Cont)

PROBLEM	SOLUTION
2. HIGH COOLANT TEMPERATURE	
a. Fan belts slipping.	Adjust fan belt tension per the *Detroit Diesel Series DDC/MTU 2000 Service Manual* (under separate cover).
b. Debris or dirt blocking radiator airflow.	Check for and remove any large foreign objects on radiator's exterior. Flush dirt and dust from radiator's core and its fins with low-pressure water. Use mild detergent and a soft bristle brush to remove any oily deposits.
c. Low coolant level.	Replenish coolant per MI 99002A.
d. Thermostat(s) inoperative.	Test and replace thermostat(s).
e. Leaking or collapsed coolant hoses.	Replace faulty hoses.
f. Scale deposits in cooling system are impeding heat transfer.	Use a good cooling system cleaner to remove scale and deposits from cooling system. Neutralize and thoroughly flush system to eliminate both deposits and corrosive cleaner. Use distilled or mineralized water in a fresh coolant solution to minimize scale deposits. Refer to the *Detroit Diesel Series DDC/MTU 2000 Service Manual* (under separate cover), for detailed cleaning and flushing instructions.
g. Water pump worn or damaged.	Inspect and repair or replace damaged pump as per the *Detroit Diesel Series DDC/MTU 2000 Service Manual* (under separate cover).
h. Exhaust gases are leaking into water jacket via cylinder head gasket or via cracks in cylinder heads.	Remove radiator cap, start engine, and watch for gas bubbles in coolant. If exhaust gas leakage is detected, remove and inspect cylinder head for cracks. Replace cylinder head gaskets as detailed in the *Detroit Diesel Series DDC/MTU 2000 Service Manual* (under separate cover).
i. Defective temperature sensor (SE4) or wiring, or a fault in the ECM.	Check for wiring faults and repair as needed. Test ECM and temperature sensor (SE4) and replace as necessary.
3. LOW FUEL TANK LEVEL (Optional)	
a. Fuel tank empty or low.	Fill fuel tank.
b. Fuel level switch (S8) or wiring faulty.	Check wiring and repair as needed. Test switch. Replace if faulty.
c. Defective fuel low level sensor (SE1) or wiring, or a fault in the ECM.	Check for wiring faults and repair as needed. Test ECM and fuel low level sensor (SE1) and repair as necessary.
d. Defective Low Fuel Relay K8.	Refer to Electrical Troubleshooting Procedure, Paragraph 2.9, to positively isolate the faulty relay. Repair or replace as necessary.

Table 2.5 Malfunction Shutdowns (Cont)

PROBLEM	SOLUTION
4. LOW COOLANT LEVEL	
a. Coolant level low.	Check for a coolant level leak. Repair as necessary. Refill engine with coolant.
b. Defective coolant level sensor (LT1), wiring harness, or ECM.	Check for wiring faults. If no faults are discovered, check sensor (LT1) and ECM functions. Replace as necessary.
5. HIGH OIL TEMPERATURE	
a. Mechanical defect in engine.	Troubleshoot engine.
b. Plugged lube oil cooler.	Remove and clean oil cooler core. See the *Detroit Diesel Series DDC/MTU 2000 Service Manual* (under separate cover).

Table 2.6 Abnormal Operations

PROBLEM	SOLUTION
1. ENGINE FAULT INDICATION	Refer to *DDEC III/IV Troubleshooting Guide* (under separate cover). Repair as directed.
2. LACK OF POWER	
a. High ambient air temperature.	At air inlet temperatures above 90 °F (32 °C), for every 20 °F (11 °C) of inlet air temperature increase, a 2% brake horsepower loss occurs. Measure ambient temperature and determine if high inlet temperature is the cause for power loss.
b. High altitude operation.	Increasing altitude decreases air density. This causes an engine to lose horsepower. The percentage of power lost is approximately 1% per 1000 feet, beginning at 3000 feet above sea level.
2. LACK OF POWER (Cont.)	
c. Insufficient fuel.	Perform fuel flow test described in the *Detroit Diesel Series DDC/MTU 2000 Service Manual* (under separate cover). If fuel flow is inadequate, refer to the NO FUEL OR INSUFFICIENT FUEL table in the same manual.
d. Insufficient air.	Inspect air filter for evidence that filter is plugged. Inspect turbocharger compressor blades for damage and freedom of movement. Clean ports if they are over 50% plugged. Check exhaust back pressure per the *Detroit Diesel Series DDC/MTU 2000 Service Manual* (under separate cover). Clean, repair, or replace faulty parts.
e. Faulty tune-up.	Check tune-up per the *Detroit Diesel Series DDC/MTU 2000 Service Manual* (under separate cover).
f. Improper gear train timing.	Check engine gear train timing per the *Detroit Diesel Series DDC/MTU 2000 Service Manual* (under separate cover). Adjust timing as needed.
g. Defective ECM.	Refer to *DDEC III/IV Troubleshooting Guide* (under separate cover). Repair as directed.

Table 2.6 Abnormal Operations (Cont.)

PROBLEM	SOLUTION
3. UNEVEN RUNNING OR FREQUENT STALLING	
a. Low coolant temperature—coolant does not reach 165 °F (74 °C).	Check thermostats for proper operation per the *Detroit Diesel Series DDC/MTU 2000 Service Manual* (under separate cover). Inspect for leakage past thermostat seals. Replace as needed.
b. Insufficient fuel.	Perform fuel flow test described in the Detroit Diesel *Series DDC/MTU 2000 Service Manual* (under separate cover). Refer to the troubleshooting chart, NO FUEL OR INSUFFICIENT FUEL, for fault analysis.
c. Faulty injectors.	Refer to the *Detroit Diesel Series DDC/MTU 2000 Service Manual* (under separate cover) and perform procedure to test for misfiring cylinder. Check injector timing. Erratic operation can be caused by injectors with leaking spray tips. Replace any faulty injectors.
d. Low compression pressures.	Refer to the *Detroit Diesel Series DDC/MTU 2000 Service Manual* (under separate cover) and perform compression check procedure.
e. Defective ECM.	Refer to *DDEC III/IV Troubleshooting Guide* (under separate cover). Repair as directed.
4. DETONATION	
a. Low coolant temperature.	See item 3.a. of this table.
b. Air box drain tubes plugged or check valves stuck closed. Accumulations of foreign objects are being ingested through cylinder intake ports.	Clean air boxand drain tubes. Inspect and drain check valves as per the *Detroit Diesel Series DDC/MTU 2000 Service Manual* (under separate cover).
c. Faulty injectors.	See item 3.c. of this table.
d. Oil picked up by the airstream.	Inspect turbocharger compressor discharge for evidence of an oil leak. Repair, rebuild, or replace the leaking turbocharger.
e. Defective ECM.	Refer to *DDEC III/IV Troubleshooting Guide* (under separate cover). Repair as directed.

2.5 COMPRESSOR AND AIR PRESSURE REGULATION SYSTEM TROUBLESHOOTING

2.5.1 The information provided in the troubleshooting tables helps maintenance personnel diagnose and correct problems with the compressor and air pressure regulation system. Six troubleshooting tables are provided.

a. Table 2.7 Compressor High Discharge Air Temperature

b. Table 2.8 Compressor Low Discharge Air Pressure

c. Table 2.10 Compressor Malfunction Indicated

d. Table 2.11 Compressor Oil Leaks

e. Table 2.12 Compressor Manifold Pressure Safety Valve Opens

2.5.2 How to diagnose and correct problems:

a. Determine the table that applies to the problem.

b. Refer to the applicable table.

Note: The probable causes for compressor problems are listed in descending order, from "most likely" to "least likely" to occur.

c. Read the data in the troubleshooting tables, and perform the recommended corrective actions.

d. Refer to *DDEC III/IV Troubleshooting Guide* (under separate cover). Repair as directed.

2.6 SPECIAL TOOLS & EQUIPMENT (COMPRESSOR TROUBLESHOOTING)

2.6.1 The following tools and equipment will be needed to complete all tests and corrective actions prescribed by the troubleshooting tables:

a. Catch pans or containers for draining oil

b. Oil filter strap wrench

c. Standard mechanic's tool kit

Table 2.7 Compressor High Discharge Air Temperature

PROBLEM	SOLUTION
1. UNIT FAULT INDICATION.	Refer to *DDEC III/IV Troubleshooting Guide* (under separate cover). Repair as directed.
2. INACCURATE DISCHARGE AIR TEMPERATURE	Check discharge air temperature with a calibrated gauge.
3. RESTRICTED COMPRESSOR AIR INLET PASSAGE	Check filter restriction indicators for evidence of clogged filter elements. Ensure no foreign objects or materials are blocking compressor inlets.
4. EXCESS COMPRESSOR ROTOR DISCHARGE END CLEARANCE	Call *Stewart & Stevenson TUG* for repairs.
5. COMPRESSOR ROTORS OUT OF TIME AND CONTACTING	Call *Stewart & Stevenson TUG* for repairs.
6. COMPRESSOR OIL LEVEL TOO LOW	Service compressor oil per MI 99002A.

Table 2.8 Compressor Low Discharge Air Pressure in Jet Start or Air Packs Mode

PROBLEM	SOLUTION
1. UNIT FAULT INDICATION.	Refer to *DDEC III/IV Troubleshooting Guide* (under separate cover). Repair as directed.
2. LEAK IN PIPING OR LOOSE, LEAKING AIR HOSE	Repair or replace piping, hoses, and fittings as needed.
3. INACCURATE DELIVERY AIR PRESSURE GAUGE READING	Check gauge reading with a calibrated gauge.
4. RESTRICTED COMPRESSOR INLETS	Check compressor air filter for evidence of clogged filters. Replace clogged filters per MI 08003A. Inspect compressor inlets for obstructions. *
5. RESTRICTION OR LEAK IN AIR CONTROL CIRCUIT LINES FROM DISCHARGE MANIFOLD TO UNLOADER VALVE	Inspect lines for leaks, cracks, kinks, dents, or crimps. Eliminate leaks at fittings. Repair or replace damaged line.
6. IMPROPERLY ADJUSTED ENGINE SPEED	Call *Stewart & Stevenson TUG* Service Department.
7. SOLENOID NOT ENERGIZED OR STUCK IN VENT POSITION	Check electrical connections between mode selection switch (S10) and solenoid valve.

***** Maximum inlet restriction allowed is 55 millibar (22” H2O).

Table 2.9 Compressor High Discharge Air Pressure in Jet Start or Air Packs Mode

PROBLEM	SOLUTION
1. UNIT FAULT INDICATION	Refer to *DDEC III/IV Troubleshooting Guide* (under separate cover). Repair as directed.
2. RESTRICTION OR LEAKS IN SENSING LINE FROM DISCHARGE AIR MANIFOLD	Find and eliminate leaks. Replace kinked, cracked, or dented sensing line.
3. LEAKING OR MALFUNCTIONING SOLENOID VALVES	Replace faulty valve. See Chapter 3, Section 2.
4. IMPROPERLY ADJUSTED ENGINE SPEED CONTROL	Call *Stewart & Stevenson TUG* Service Department.
5. UNSTABLE AIR PRESSURE IN JET START OR AIR PACKS MODE	Call *Stewart & Stevenson TUG* Service Department.

Table 2.10 Compressor Malfunction Indicated

PROBLEM	SOLUTION
1. UNIT FAULT INDICATION	Refer to *DDEC III/IV Troubleshooting Guide* (under separate cover). Repair as directed.
2. COMPRESSOR LOW OIL PRESSURE	
a. Low lube oil level.	Replenish compressor oil per MI 99002A (Table 2).
b. Compressor oil filter clogged.	Change compressor oil and filter per MI 11002A.
c. Internal compressor damage.	Call *Stewart & Stevenson TUG* Services for repairs.
d. Oil pressure switch (S5 and SE5) faulty.	Replace oil pressure switch (S5 and SE5).
3. COMPRESSOR HIGH DISCHARGE AIR TEMPERATURE	
a. Discharge air temperature high.	Refer to Table 2.6.
b. Compressor discharge air temperature switch (S4) faulty.	Replace compressor discharge air temperature switch (S4).
4. COMPRESSOR HIGH OIL TEMPERATURE	
a. Compressor oil cooler fins dirty or obstructed.	Remove airflow obstructions from cooler fins. Clean cooler exterior with low-pressure water. Use a mild detergent and a soft bristle brush if needed to remove oily deposits.
b. Internal compressor damage.	Call *Stewart & Stevenson TUG* Services for repairs.
c. Faulty oil temperature switch (S3, S6).	Replace defective switch (S3, S6).
d. Compressor oil hose, oil cooler internally clogged or faulty thermostatic bypass valve.	Replace.
e. Oil filter clogged.	Replace.

Table 2.11 Compressor Oil Leaks

PROBLEM	SOLUTION
1. OIL LEVEL IS TOO HIGH	Drain oil until it is approximately halfway up sightglass. (See MI 11002A.)
2. LOOSE OIL HOSE FITTINGS	Tighten fittings.
3. OIL FILTER IS LOOSE	Tighten filter.
4. INTERNAL COMPRESSOR SEALS ARE DAMAGED	Call Stewart & Stevenson TUG Services for repairs.

Table 2.12 Compressor Discharge Manifold Safety Valve Opens

	PROBLEM	SOLUTION
1.	SAFETY VALVE IS FAULTY	Ensure the safety valve opens at 52 psig (359 kPag). Replace the valve if it opens above or below 52 psig (359 kPag).
2.	HIGH DISCHARGE PRESSURE	Refer to Table 2.8.

2.7 ELECTRICAL SYSTEM TROUBLESHOOTING

2.7.1 Troubleshooting Tables. Tables 2.13 and 2.14 deal with the possible types of electrical system malfunctions. In both tables, the probable causes are listed along with their suggested remedies from most likely to least likely. For help in locating electrical components, refer to Stewart & Stevenson TUG Air Start Control Circuits with DDEC IV Engine Schematic and see tables in Chapter 4, Section 4, Group 8.

2.8 SPECIAL TOOLS & EQUIPMENT (ELECTRICAL TROUBLESHOOTING)

2.8.1 A high-impedance volt-ohm-meter (20,000 ohms/volt or higher) can perform the voltage and resistance checks used to isolate electrical system faults. Jumper wires, alligator clips, and similar test probe attachments make it easier to perform circuit tests.

2.9 ELECTRICAL TROUBLESHOOTING PROCEDURE

2.9.1 Visual Indications. The air start unit is equipped with malfunction sensing and indicating circuits. Before beginning electrical tests, check malfunction indicator lamps for clues as to which circuit is faulty. This may reduce the time necessary to isolate faults.

2.9.2 Fault Isolation Techniques. Use the following universal fault isolation techniques with the unit's electrical schematic to minimize the time needed to locate electrical system faults:

a. Half-Split Method. The quickest way to locate an unknown fault in a circuit is the half-split method. To employ the half-split method, you must know the fault exists in a particular circuit or current path. This method is most often used for voltage checks but may also be used for continuity checks and may be applied to isolate short circuits. The steps for DC voltage checks are as follows:

1. Set multimeter to DC volts. If using an analog (dial and needle)-type meter, choose the voltage range that will register the desired voltage near the middle of the scale. (For instance, to test for 12 VDC, select the 24 or 25 VDC scale. To test for 24 VDC, select the 50-VDC scale.)

2. Connect the negative (-) test lead to the ground of the circuit being tested. (Refer to the unit's schematic to identify connection.)

3. Apply operating voltage to the circuit.

4. Pick a point near middle of the circuit and test for the desired voltage.

5. If the desired voltage is observed, the fault lies between the selected point and the circuit's ground. If no voltage is observed, the fault lies between the tested point and the DC voltage source.

6. Test a point in the middle of the circuit's faulty section.

7. Repeat steps (5) and (6) until a point is found beyond which no voltage is present. This is the site of the circuit's fault.

b. Backtrack Method. Use the backtrack method when it is impractical to use the half-split method. To perform the backtrack method:

1. Perform steps (1) through (3) of the half-split method.

2. Test for voltage at the positive terminal of the malfunctioning device. If the desired voltage is present, the device is faulty.

3. If no voltage is present, test the circuit at the next connection toward the voltage source. Repeat the test at each succeeding connection until voltage is observed. The fault will lie at the point where that occurs or between that point and the last point tested.

Table 2.13 Starting System Malfunctions

PROBLEM	SOLUTION
1. ENGINE FAULT INDICATION	Refer to *DDEC III/IV Troubleshooting Guide* (under separate cover). Repair as directed.
2. ENGINE WILL NOT CRANK	
a. MODE SELECTOR switch (S10) is not in UNLOAD or it is defective.	Place switch S10 in UNLOAD or replace it if it's defective.
b. Batteries (BT1A, BT1B, BT2A, BT2B) are discharged.	Charge or replace battery.
c. Battery cables (J1, J2, J3, J4) are loose or corroded.	Tighten or clean batteries and cable terminals.
d. Starter connections loose or dirty.	Clean connections with solvent and tighten as needed.
e. Defective fuses (F1, F2, F3, F4).	Check fuses and replace as necessary; wait one minute to see if fuses burn out again. If fuses burn out, a short circuit exists that must be found and repaired. If fuses are okay, attempt another start.
f. Defective Starter Solenoid (L1).	Replace Starter solenoid (L1).
g. Defective relay(s) (K1, K2, K5, K8, K9, K11, K12, K14, K15).	Refer to Electrical Troubleshooting Procedure, paragraph 2.9, to positively isolate faulty relay(s). Repair or replace as necessary.
h. Broken or loose wire in cranking faulty.	Tighten connections and/or repair broken wire.
i. ENGINE CRANK switch S14 faulty.	Replace Crank switch (S1).
j. RUN/STOP Switch (S1) faulty.	Replace switch S11.
k. Engine running indication and crank disconnect relay (K1) defective.	Replace relay (K1).
l. Starter (B1) faulty.	Replace starter (B1).
m. Voltmeter (M1) faulty.	Replace Voltmeter (M1).

Table 2.13 Starting System Malfunctions (Cont)

PROBLEM	SOLUTION
3. ENGINE CRANKS, WON'T START	
a. Batteries are weak (cranking speed is too slow).	Charge or replace battery.
b. Cool-down relay (TD1) is faulty.	Replace relay TD4.
c. Defective fuses (F1, F2, F3, F4).	Replace fuses and attempt another start. If fuse burns out again, halt all start attempts and determine cause.
d. Broken or loose wire in run circuit.	Tighten connections and/or repair broken wire.
e. Engine Run Relay (K2) defective.	Replace relay (K2).
f. RUN/STOP switch (S1) faulty.	Replace switch (S1).
g. TROUBLE RESET switch (S15) faulty.	Replace switch (S15).
h. Problems with engine fuel.	Repair as required.
i. Defective Emergency Stop Relay (K9).	Replace relay (K9).
j. Defective Emergency Stop Switch (S9).	Replace switch (S9).
k. Defective ECM or wiring harness.	Check wiring harness and repair or replace as necessary. Refer to *DDEC III/IV Troubleshooting Guide* (under separate cover) for checkout of ECM. Repair as directed.
l. Attempt start input missing.	Check for 24 volts at plug P-2, pin #P2-V on solid state module. 24 volts is applied when engine is cranked only.
4. ENGINE STARTS, THEN DIES	
a. Fuel pressure switch (SE3) is faulty.	Replace fuel pressure switch (SE3).
b. Engine run relays (K1, K2) faulty.	Replace relays (K1, K2).
c. Broken or loose wire in run circuit.	Tighten connections or repair broken wire.
d. Problems with engine fuel or governor system.	Repair or replace.
e. Engine/Compressor Safety Circuit Active.	Check Engine/Compressor Safety circuits. If any circuit is triggered, investigate and repair cause before attempting another engine start.
f. Defective wiring harness.	Check the wiring harness and repair or replace as necessary. Refer to *DDEC III/IV Troubleshooting Guide* (under separate cover) for checkout of the ECM. Repair as directed.

Table 2.14 Battery Charging System Malfunctions

PROBLEM	SOLUTION
1. ENGINE FAULT INDICATION	Refer to *DDEC III/IV Troubleshooting Guide* (under separate cover). Repair as directed.
2. ALTERNATOR BELT SLIPPING	Adjust alternator belt tension as per the *Detroit Diesel Series DDC/MTU 2000 Service Manual* (under separate cover).
3. ALTERNATOR (G1) NOT CHARGING (INTERNAL WEAR OR DAMAGE)	Repair or replace alternator (G1).
4. BATTERY CABLES (J1, J2, J3, J4) LOOSE OR CORRODED	Tighten or clean batteries and cable terminals.
5. LEAKAGE BETWEEN BATTERY TERMINALS DUE TO DIRT ON BATTERY CASE	Clean battery case.
6. BATTERY PLATES AND/OR CASE DAMAGED	Replace batteries (BT1A, BT1B, BT2A, BT2B).
7. ALTERNATOR (G1) VOLTAGE IS TOO HIGH. BATTERY ELECTROLYTE IS BOILING	Repair or replace alternator (G1).

2.10 TRAILER CHASSIS TROUBLESHOOTING

2.10.1 Applicability. These troubleshooting tables apply only to TMD-300/400 (trailer-mounted) air start units.

2.10.2 The information provided in the troubleshooting tables helps maintenance personnel diagnose and correct problems with the air start unit trailer chassis. Table 2.15 lists problems that may be experienced while towing the trailer. Table 2.16 lists problems that could occur with the trailer parking brakes.

2.11 SPECIAL TOOLS & EQUIPMENT (TRAILER CHASSIS TROUBLESHOOTING)

2.11.1 A standard mechanic's tool set is required. The following support equipment is also required:

a. Vehicle jack rated to support at least 25,000 lb (11340 kg)

b. Vehicle jackstands rated to support at least 25,000 lb (11340 kg)

Table 2.15 Towing Difficulties

PROBLEM	SOLUTION
1. TRAILER PULLS TO ONE SIDE	
a. Tire air pressure low.	Inflate tires to 110 psi (758 kPa) and examine for punctures and leaks. Repair any punctures or leaks, or replace tire. Max. tire pressure (front): 120 psi (827 k/A). Max. tire pressure (rear): 150 psi (1034 kPA).
b. Brakes grabbing on one side:	Adjust brake shoes as per MI 03001A.
(1) Brake shoes are unevenly adjusted.	Inspect brake shoes per MI 03001A. Replace any worn out shoes and ensure that all shoes and hardware are properly installed. Inspect wheel brake cylinders for leaks and shoe linings for brake fluid or grease contamination. If contaminated, eliminate source of contamination and replace any contaminated brake shoes.
(2) Brake shoes are improperly installed.	
c. Wheel bearing binding or seized.	Inspect wheel bearings. Replace any damaged wheel bearings. Lubricate and install wheel bearings and new grease seal per MI 02005A.
d. Axle bent.	Inspect axle carefully for bends or damage to spindle. Replace damaged or bent axle assembly.
2. TRAILER DIFFICULT TO TURN	
a. Tire pressure low.	

ont): 120 psi (827 k/A).

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Template: C:\WINDOWS\Application Data\Microsoft\Templates\Normal.dot
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Subject:
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Chapter 2, Section 3

Maintenance Instructions

3.1 INTRODUCTION

3.1.1 A Maintenance Instruction (MI) provides information for servicing and maintaining the TR/TMD-300/400 air start units. The following information will assist you in using the maintenance instructions and allow you to service and maintain your unit.

3.1.2 The numbering system used for these maintenance instructions is based on the following:

Example: **MI 01001**

a. The initials **MI** stand for Maintenance Instruction.

b. The first two numbers refer to the assigned category: 01 for Body/Chassis. This category is assigned by Stewart & Stevenson TUG and consists of the following codes:

01 BODY/CHASSIS

02 DRIVE TRAIN

03 BRAKES

04 FUEL SYSTEM

05 GOVERNORS

06 LUBRICATION SYSTEM

07 COOLING SYSTEM

08 INTAKE/EXHAUST SYSTEM

09 ELECTRICAL SYSTEM

10 GENERATOR

11 COMPRESSOR

99 MISCELLANEOUS

c. The remaining numbers are sequential and allow for as many maintenance instructions per category, as required.

3.2 HOW TO USE THE MAINTENANCE INSTRUCTIONS

3.2.1 In order to use the MI sheets, perform the following steps:

a. Look up the required MI on the List of Effective Maintenance Instructions (Table 2.17).

b. To the right of the desired Maintenance Task is the Maintenance Instruction Number. All MIs are in sequential order as they pertain to this unit.

c. Turn to the desired MI. Verify that the MI reflects your particular piece of equipment.

d. Remove MI sheet(s). Each MI lists tools, equipment, and materials needed to complete the maintenance task. Gather all necessary tools, equipment, and materials and follow instructions on sheet(s) to perform the maintenance task.

Note: If an office copier is available, make copies of the Maintenance Instruction pages, and return the original pages to your technical manual. This will ensure that needed maintenance information will still be available, despite loss or damage to sheets used at the unit.

e. After the maintenance task is complete, return MI sheet(s) to the technical manual.

3.3 LIST OF EFFECTIVE MAINTENANCE INSTRUCTIONS

3.3.1 A list of all MI's included in this manual can be found using Table 2.17.

Table 2.17 List of Effective Maintenance Instructions

MAINTENANCE TASK	MI NO.
Unit, Visual Inspection	MI 01002A
Fuel Tank, Inspect Mounts, Lines, and Fittings for TR/TMD-300/400 Air Start Unit	MI 01003A
Tire Pressure, Check for TMD-300/400 Air Start Unit	MI 02004A
Wheel Bearings, Clean, Inspect, and Repack for TMD-300/400 Air Start Unit	MI 02005A
Parking Brake, Check and Adjust for TMD-300/400 Air Start Unit	MI 03001A
Fuel/Water Separator, Drain Water	MI 04004A
Fuel Filter/Water Separator, Change Element	MI 04005A
Engine Oil and Filter, Change	MI 06002A
Engine and Compressor Air Filters, Change Elements	MI 08003A
Compressor Oil and Filter, Change	MI 11002A
Fluid Levels, Check	MI 99002A

MAINTENANCE INSTRUCTION 01002A

TECHNICAL PROCEDURES

UNIT, VISUAL INSPECTION

Total Number of Pages in this MI is 2.

1. TOOLS/EQUIPMENT:

   a. Flashlight

   b. Clean rag

2. MATERIALS:

   a. None required.

3. PROCEDURE:

   a. Set the parking brake and block tires with chocks.

   b. Inspect the trailer and the unit's exteriors for cleanliness, damage, and general condition.

   c. Inspect the fuel lines and fuel system components. Note their general condition, and look for fuel leaks.

   d. Inspect the oil lines and oil system components. Note their general condition, and look for leaks.

   e. Inspect the air delivery hoses for wear, cracks, and splits.

   f. Check the turbocharger mounting flange, connections, and oil lines for leaks.

   g. Correct and record any discrepancies.

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TECHNICAL PROCEDURES

FUEL TANK, INSPECT MOUNTS, LINES, AND FITTINGS FOR TMD AIR START UNIT

Total Number of Pages in this MI is 2.

1. TOOLS/EQUIPMENT:

   a. Standard mechanic's hand tool set

   b. Clean rag

2. MATERIALS:

   None required.

3. PROCEDURE:

   a. Set the parking brake and block tires with chocks.

   b. Inspect the fuel tank mounts for general condition, cracks, chafing, and tightness. Tighten the mounts, as required.

   c. Check the general condition of the fuel lines and fittings at the tank. Look for leaks. Tighten any lines and wipe up any fuel accumulations, as required.

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TECHNICAL PROCEDURES

TIRE PRESSURE, CHECK FOR TR/TMD-300/400 AIR START UNIT

Total Number of Pages in this MI is 2.

1. TOOLS/EQUIPMENT:

   Tire pressure gauge

2. MATERIALS:

   Shop air, if required

3. PROCEDURE:

Note: Do not check the tire pressure immediately after extensive road travel. Road friction will have raised the tires' temperature and pressure. Check the tire pressure when the tires are cold.

a. Apply the parking brake and block tires with chocks.

b. Check the tire pressure. Proper tire pressure is 110 psi (758 kPa). Front tires max. pressure: 120 psi (827 kPa); rear tires max. pressure: 150 psi (1034 kPa).

c. Inflate or deflate the tires to their proper pressures, as required. Use low-pressure shop air to inflate the tires, if it's required.

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TECHNICAL PROCEDURES

WHEEL BEARINGS, CLEAN, INSPECT, AND REPACK FOR TMD AIR START UNIT

Total Number of Pages in this MI is 4.

1. TOOLS/EQUIPMENT:

   a. Hydraulic jack, lifting capacity greater than 25,000 lb (11,340 kg)

   b. Jackstands, supporting capacity greater than 25,000 lb (11,340 kg)

   c. Standard mechanic's hand tool set

   d. Bucket or pail

   e. Clean rag

2. MATERIAL:

   a. Grease seal (replacement)

   b. Solvent, cleaning - diesel fuel, Varsol, or equivalent

   c. Grease - NGLI #2, or equivalent

3. PROCEDURE:

Always use lifting equipment, supports, and chains with a minimum capacity of one and a half times the weight of the object being lifted or supported. Otherwise, fatal or severe injury to personnel or damage to equipment may occur.

   a. Place a warning tag on the unit's control panel stating: "Unit Out of Service."

   b. Block the trailer tires with chocks. Loosen the trailer's lug nuts, but do not remove.

Note: Ensure the parking brake is released.

   c. (Trailer-mounted units only) Jack the unit up by its axles, and support it with jack stands or supports rated for at least 25,000 lb (11,340 kg).

Do not work beneath a unit or vehicle that is supported only by jacks. Make sure the unit is stable and firmly supported on stands before proceeding underneath it. Personnel under a falling unit would sustain severe or fatal crushing injuries.

d. Refer to Figure 1. Remove the trailer wheel's lug nuts (1) and wheel (2).

e. Loosen and remove the wheel spindle grease cap (3).

f. Remove the cotter pin (4), spindle nut (5), and washer (6).

g. Dislodge the outer wheel bearing (7) by rocking the brake drum (8) (rear wheels) or wheel spider (front wheels). Remove the outer wheel bearing (7).

h. Carefully remove the brake drum (8) or wheel spider from the wheel spindle.

i. Pry the grease seal (9) out of the brake drum (8) or wheel spider. Discard any grease seal with a bent shell or damaged seal lip.

j. Remove the inner wheel bearing (10) from the brake drum (8) or wheel spider.

k. To remove the old grease, clean the bearings and brake drum or wheel spider with solvent.

l. Examine the bearing rollers for grooves, brinelling, pitting, or flat spots. Examine the roller cage assemblies and look for dents or damage. Replace any bearing that has sustained any of those.

m. Examine the bearing races in the cleaned brake drums and wheel spiders for pitting, grooving, dimples, or dents. Replace any bearing races exhibiting those types of damage:

    1. Place the brake drum (8) or wheel spider on a solid surface. Ensure that the race to be removed is facing downward.

    2. Using a brass drift and a hammer against the back of the race, drive it out of the brake drum or wheel spider.

    3. Clean the race seat with solvent.

    4. Press a new race into the seat, or drive it into a seated position with the brass drift and hammer.

n. Pack the center cavities of the brake drum (8) or wheel spider with clean bearing grease.

o. Pack the inner bearing (10) with grease until clean grease is forced out around the rollers.

p. Install the inner bearing (10) into the brake drum (8) or wheel spider, then retain them by installing the grease seal (9). (Grease seals may be pressed into place or driven into place with a wooden block and a hammer.)

q. (Rear wheels only) Clean the inside of the brake drum (8) with solvent to remove all traces of oil and grease from the braking surface.

r. Carefully install the brake drum (8) or wheel spider over the spindle and brake shoes (11).

s. Pack the outer wheel bearing (7) with grease until clean grease is forced out around the rollers.

t. Install the outer wheel bearing (7), washer (6), and spindle nut (5).

u. Tighten and lock the spindle nut (5) as follows:

1. Tighten the spindle nut (5) to 15 ft-lb (20.34 Nm) while turning the brake drum (8) or wheel spider to fully seat the bearings.

2. Loosen the spindle nut (5) just enough to allow the drum to be easily rotated. Push and pull in and out on the drum or spider to detect any axial play. Tighten the spindle nut enough to eliminate any axial play but not enough to bind the bearings.

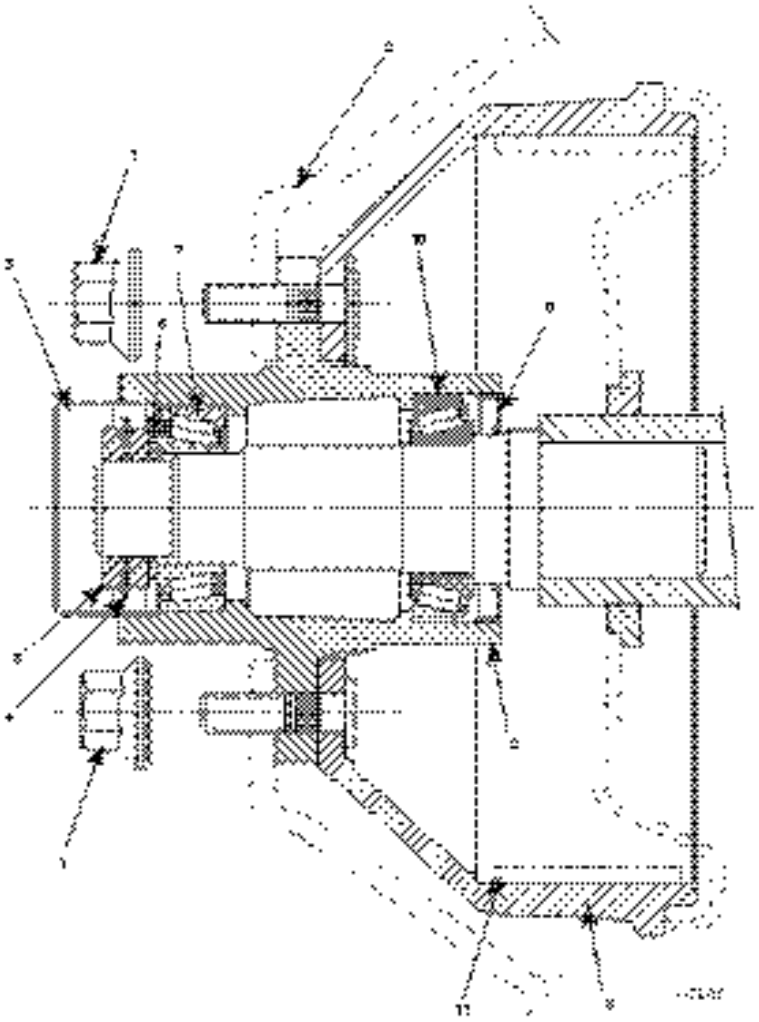
v. Install the castellated spindle nut retainers with new cotter pin (4).

w. Place the grease cap (3) in position, and tap it with a rawhide or plastic mallet to seat it.

x. Install the wheel (2) and lug nut (1).

y. Lower the unit to ground. Tighten its wheels' lug nuts (1) (90 ft-lbs.) 122.02 Nm, using a criss-cross pattern.

z. Remove the warning tag and return the unit to service.



1. Lug Nuts
2. Wheel
3. Grease Cap
4. Cotter Pin
5. Spindle Nut
6. Washer
7. Outer Bearing
8. Brake Drum or Wheel Spider
9. Grease Seal
10. Inner Bearing
11. Brake Shoes

Figure 1 Hub and Drum Assembly

MAINTENANCE INSTRUCTION 03001A

TECHNICAL PROCEDURES

PARKING BRAKES, CHECK AND ADJUST

Total Number of Pages in this MI is 6.

1. TOOLS/EQUIPMENT:

   a. Standard mechanic's hand tool set

   b. Jack or hoist, rated at 25,000 lb (11,340 kg)

   c. Jack stands rated for at least 25,000 lb (11,340 kg)

   d. Brake adjustment tool (optional)

2. MATERIAL:

   None required

3. ROUTINE ADJUSTMENT PROCEDURE:

   Routine adjustment may be done by the operator, by tightening or loosening the knurled knob on the parking brake operating handle:

   a. Block tires with chocks to immobilize unit.

   b. Release parking brake to relieve tension on brake rods.

   c. To increase tension on parking brakes, turn knurled adjustment knob (1, Figure 1) on parking brake handle (2) clockwise.

   d. To decrease tension on parking brakes, turn knurled adjustment knob on parking brake handle counterclockwise.

   e. Operate brake handle two or three times to verify proper tension and operation.

Too much tension will make the handle hard to operate. Too little tension will not fully engage the brakes. Brake handle should firmly engage the brakes without excessive effort.

   f. Once proper operation is restored, remove the wheel chocks, and return the unit to operation. If proper operation cannot be restored, a major adjustment is needed.

4. MAJOR ADJUSTMENT PROCEDURES:

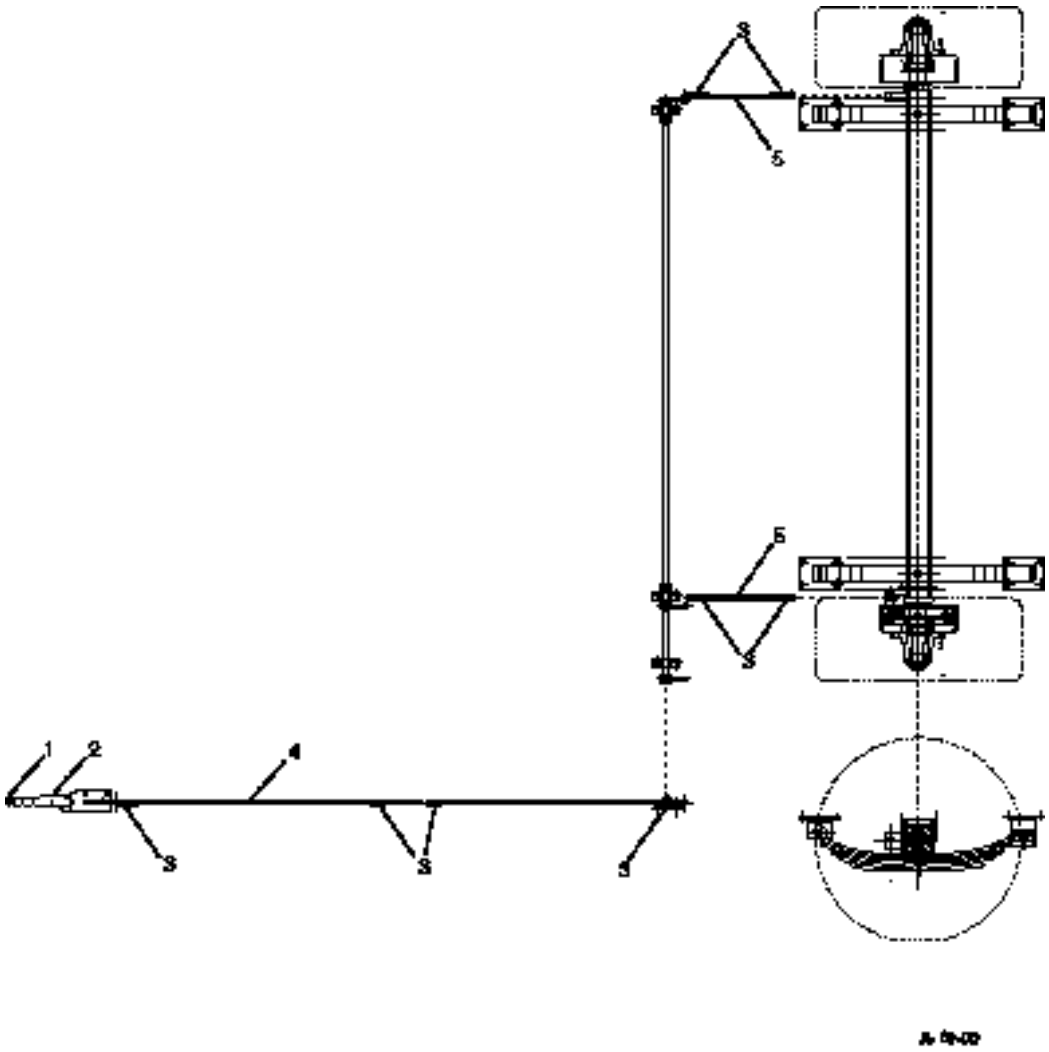
Major adjustment to the parking brakes is needed when routine adjustment fails to restore proper brake operation, or when brake components (brake shoes, linkage, or operating handle) have been replaced.

Major adjustment to the brakes requires that the brakes be released. Before working under the unit, chock the wheels to immobilize the unit.

To ensure maximum brake holding power, make equal adjustments to both cable assemblies.

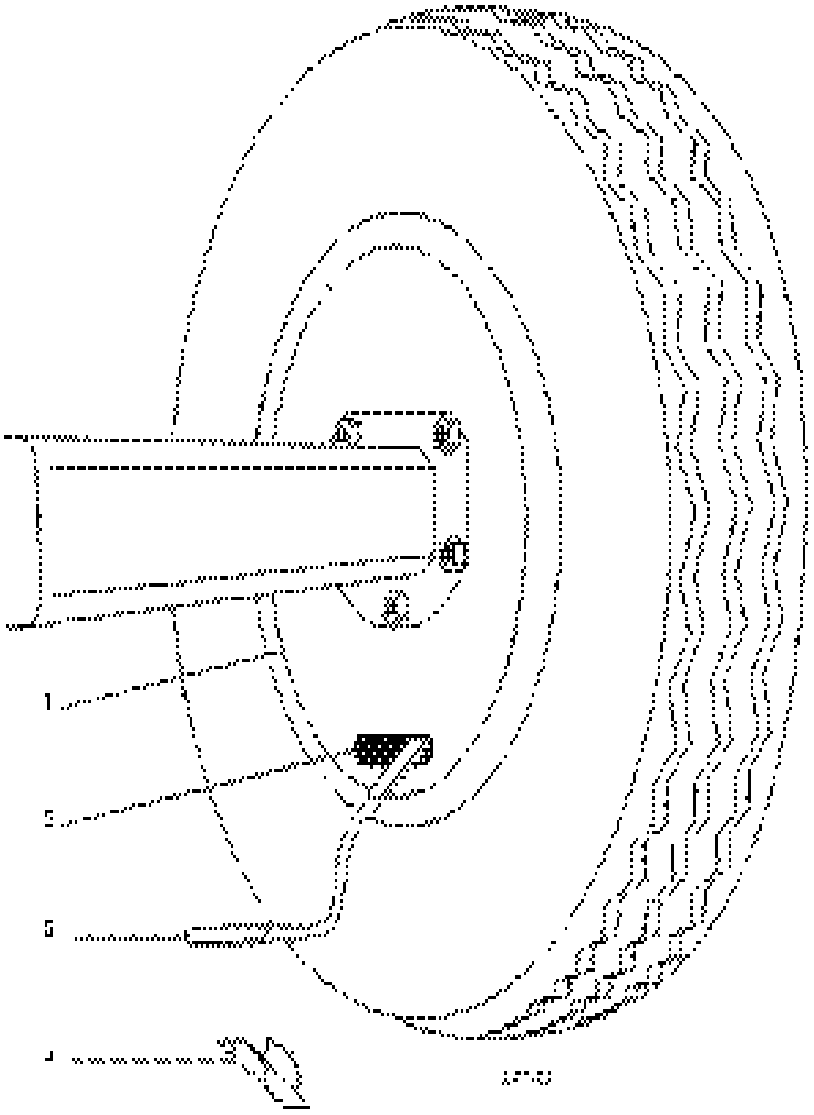
a. Major Adjustment:

1. Block tires with chocks to immobilize unit.
2. Jack up rear axle and support with jack stands rated for at least 25,000 lb (11,340 kg).
3. Disengage parking brake and turn knurled adjustment knob (1, Figure 1) fully counterclockwise to loosen linkage.
4. Adjust rod (4) by loosening jamnuts on clevis (3) and rotating rod in or out of clevises (3). Tighten jamnuts when complete.
5. Ensure rods (5) are adjusted equally. Tighten jamnuts on clevises (3).
6. Perform routine adjustment procedure to finalize brake linkage adjustment.
7. Verify adjustment by operating parking brake handle. Handle operation should be smooth, and should engage brakes without excessive force. Test brake engagement by attempting to rotate tires while the unit is on stands. Make fine adjustment, if necessary, per Routine Adjustment procedure.
8. Re-check brake operation.
9. Remove unit from jack stands. If adjustment is satisfactory, return the unit to service.



1. Knurled Adjustment Knob
2. Parking Brake Handle
3. Clevis
4. Control Rod
5. Control Rod

Figure 1 Parking Brake Adjustment



1. Backing Plate
2. Shoe Adjustment Slot
3. Adjustment Tool
4. Slot Plug

Figure 2 Brake Shoe Adjustment

b. Brake Shoe Adjustment (at axle):

1. Block front tires with chocks to immobilize unit.

Never work beneath a unit or vehicle that is supported only by jacks. Make sure unit is stable and firmly supported on stands before working under it. A falling unit would likely cause severe or fatal crushing injuries.

2. Jack up rear axle and support with jack stands rated for at least 25,000 lb (11,340 kg).
3. Remove cotter pin from clevis pin. Remove clevis pin from clevises (Figure 1, item 3).
4. Remove plug (Figure 2, item 4) from forward brakeshoe adjustment slot (item 2) in backing plate (item 1).
5. Insert brake adjusting tool (item 3), or large flat-tip screwdriver blade through forward adjustment slot (item 2) to contact teeth of brake adjuster screw.
6. Pry upward on adjuster teeth to tighten brake shoes.
7. Spin wheel assembly of adjusted brake shoes to detect drag.
8. Repeat steps (6) and (7) until brake shoes begin to drag slightly, then loosen adjustment (pry downward on adjuster) just enough to eliminate most of the drag.
9. Replace plug (item 4) into adjustment slot in backing plate.
10. Repeat steps (3) through (9) for opposite rear wheel.
11. Adjust cable per Cable Adjustment Procedure.
12. Jack unit up off stands, remove jack stands, and lower unit to ground.
13. Return unit to service.

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TECHNICAL PROCEDURES

FUEL/WATER SEPARATOR, DRAIN WATER

Effectivity: P/N 1000FG (Optional Equipment)

Total Number of Pages in this MI is 2.

1. TOOLS/EQUIPMENT:

   a. Container

   b. Clean rag

2. MATERIAL:

   None required

3. PROCEDURE:

   The optional fuel/water separator may be used upstream of the standard primary fuel filter or in place of it. Drain the fuel/water separator as follows:

   a. Apply the parking brake.

   b. Place a warning tag on the control panel stating: “Unit Out of Service.”

   c. Check the clear collection bowl (Figure 1, item 1) on the bottom of the fuel/ water separator assembly for accumulated water once a day. If water is present, perform the following steps:

      1. Place a small container below the fuel/water separator to catch drainage.

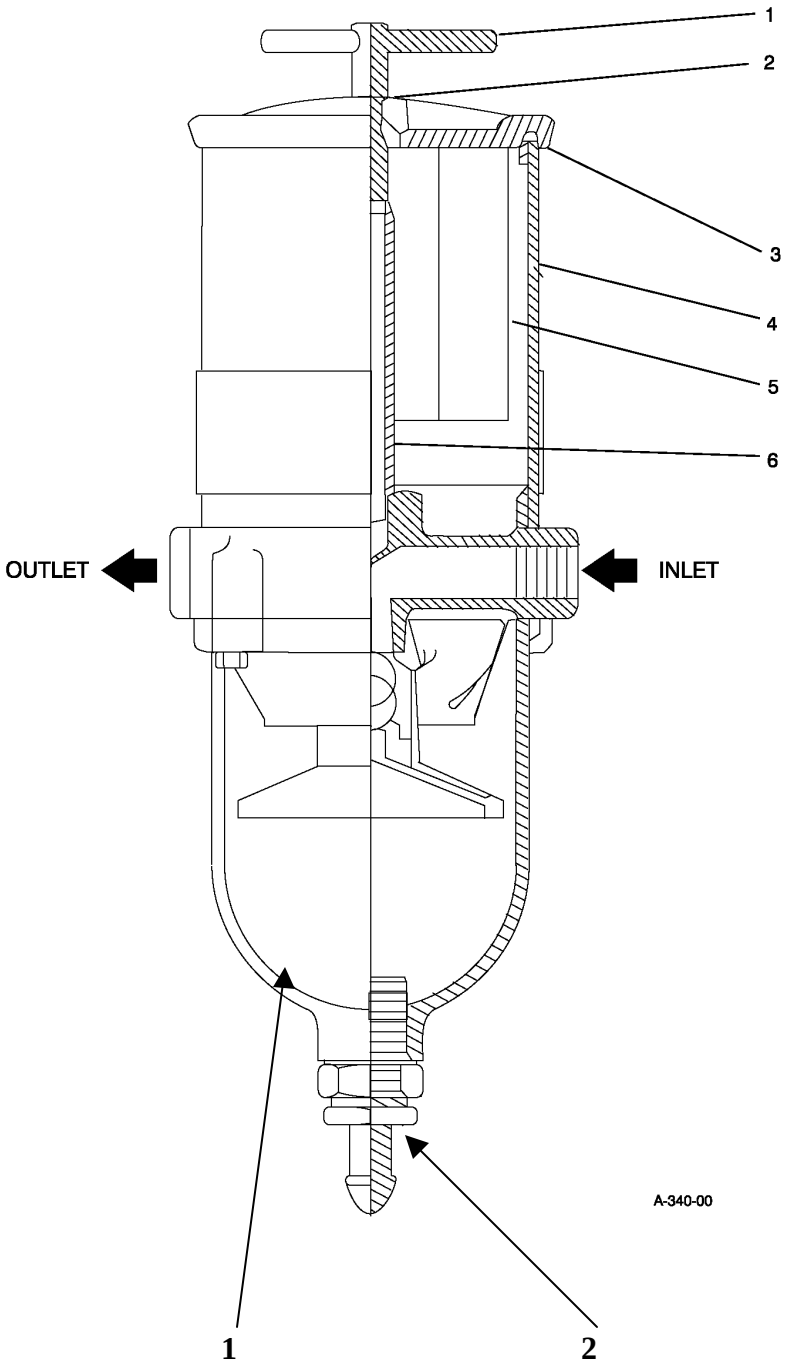
      2. Open the fuel/water separator assembly drain (item 2). Drain any water into the container. Close the drain (item 2) once all water has been removed.

      3. Properly dispose of all fluids.

   d. Wipe any excess or spilled fuel from around the fuel filter/water separator.

   e. Start the unit, and check it for leaks.

   f. Remove the warning tag, and return the unit to service.



1. Bowl
2. Drain

Figure 1 Fuel Filter/Water Separator (Option)

MAINTENANCE INSTRUCTION 04005A

TECHNICAL PROCEDURES

FUEL FILTER/WATER SEPARATOR, CHANGE ELEMENT P/N 1000FG (Optional Equipment)

Total Number of Pages in this MI is 2.

1. TOOLS/EQUIPMENT:

   Container suitable for collecting small quantities of spilled fuel

   Clean rag

2. MATERIAL:

   Filter element, P/N 2020SM-OR (1000FG)

3. PROCEDURE:

   a. Apply the parking brake.

   b. Place a warning tag on the control panel stating: “Unit Out of Service.”

   c. Disconnect batteries.

   d. Place a container under the separator to collect spilled fuel.

   e. Turn the T-handle (Figure 1, item 1) counterclockwise and remove the T-handle and lid (item 2).

   f. Remove the element (item 5) by slowly pulling the molded handle upward with a turning motion.

   g. Insert the replacement element over the center tube (item 6) with a downward, turning motion.

   h. Pour clean diesel fuel into the filter/separator housing (item 4) until it is full.

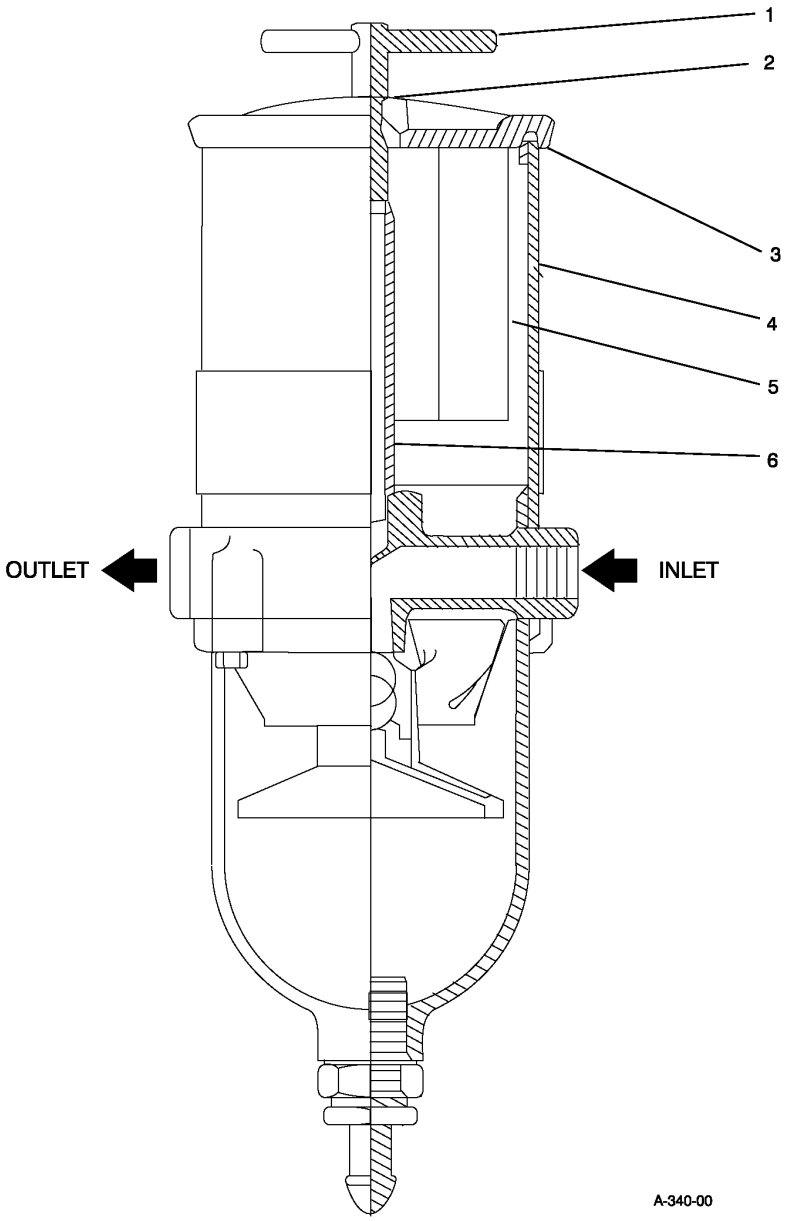
   i. Inspect the lid seal (item 3) and replace it if necessary.

   j. Replace the lid (item 2) and hand-tighten the T-handle (item 1).

   k. Remove the fuel container and wipe up any excess fuel.

   l. Start the engine, and check the filter/separator assembly for leaks.

   m. Remove the warning tag and return the unit to service.



1. T-Handle
2. Lid
3. Seal
4. Housing
5. Element
6. Center Tube

Figure 1 Fuel Filter/Water Separator (Option)

MAINTENANCE INSTRUCTION 06002A

TECHNICAL PROCEDURES

ENGINE OIL AND FILTER, CHANGE

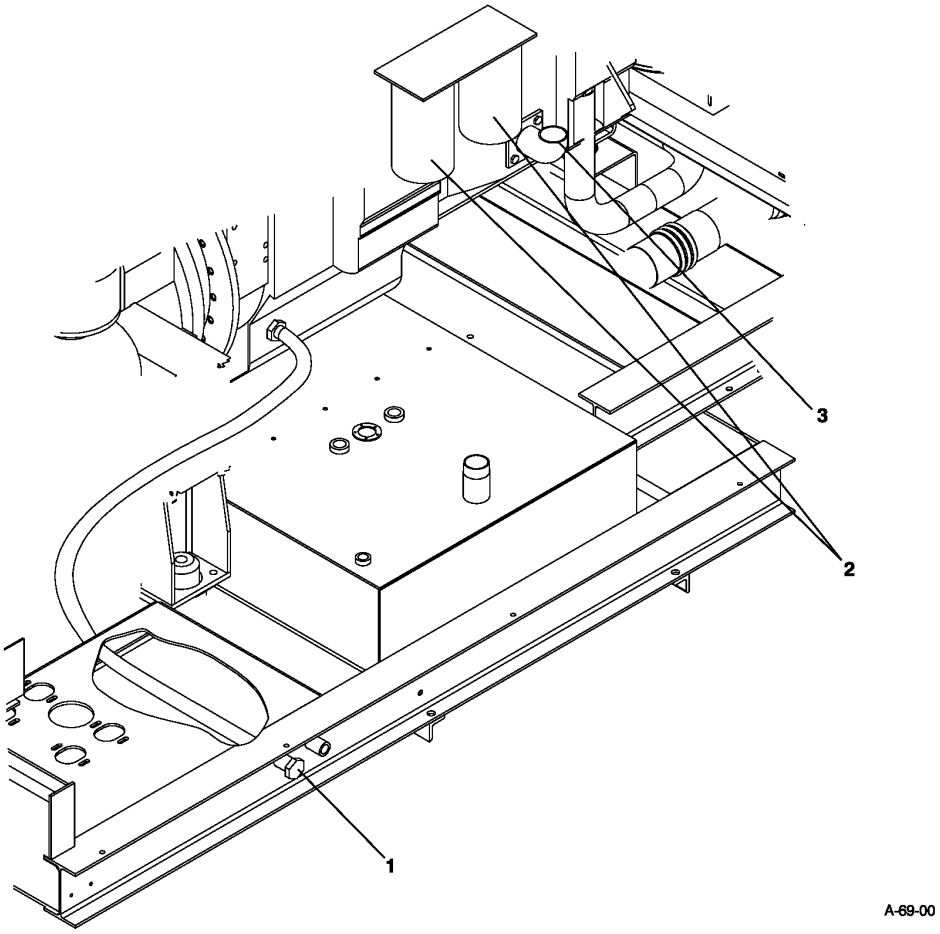
Total Number of Pages in this MI is 4.

1. TOOLS/EQUIPMENT:

    a. Filter wrench (strap-type or equivalent)

    b. Standard automotive mechanics hand toolset

    c.



1. Plug
2. Engine Oil Filter(s)
3. Engine Oil Fill

Figure 1 Engine Oil Component Assembly

e. Place a catch pan below the drain plug at the oil pan or the remote drain plug (Figure 1, item 1).

f. Loosen and remove the oil drain plug.

g. Allow the oil to drain. Clean drain plug threads, and once all oil has drained out, install and tighten the oil drain plug.

h. Place the catch pan beneath the engine's oil filters (item 2).

i. Use a filter strap wrench to loosen both oil filters. Remove the filters and drain it into the catch pan.

j. Inspect the filter mounting base assembly for deposits and dirt. Scrape off any deposits on the filter gasket's sealing surface. Wipe the filter gasket's sealing surface clean.

k. Apply a thin coat of oil to a new filter gasket.

l. Carefully thread the new oil filters (item 2) onto the mounting base assembly and tighten it hand tight.

Do not mix oils from different refiners or of different viscosities, and avoid overfilling the engine crankcase. Check the crankcase oil level frequently while filling to prevent overfilling. Oil leaks and bearing damage could result if the crankcase is overfilled.

m. Fill the engine crankcase through the filler neck (item 3) with approximately 35 quarts (33 liters) of an oil as recommended in the *Detroit Diesel Engine Service Fluid and Filter Requirements* (7SE273) provided in Chapter 6. Check the crankcase oil level by using the dipstick.

n. Start the unit, and check the engine's oil filter for leakage. If needed, use a strap wrench to tighten the filter element just enough to stop any leaks.

o. Remove the warning tag, and return the unit to service.

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MAINTENANCE INSTRUCTION 08003A

TECHNICAL PROCEDURES

ENGINE AND COMPRESSOR AIR FILTERS, CHANGE ELEMENTS

Total Number of Pages in this MI is 4.

1. TOOLS/EQUIPMENT:

   Clean rag

2. MATERIAL:

   a. Engine air filter elements (two), P/N P15-0695

   b. Compressor air filter elements P/N 484P

3. PROCEDURE:

   a. Engine Air Filter Replacement.

      1. Set the parking brake, and chock the wheels.

      2. Place a warning tag on the control panel stating: “Unit Out of Service.”

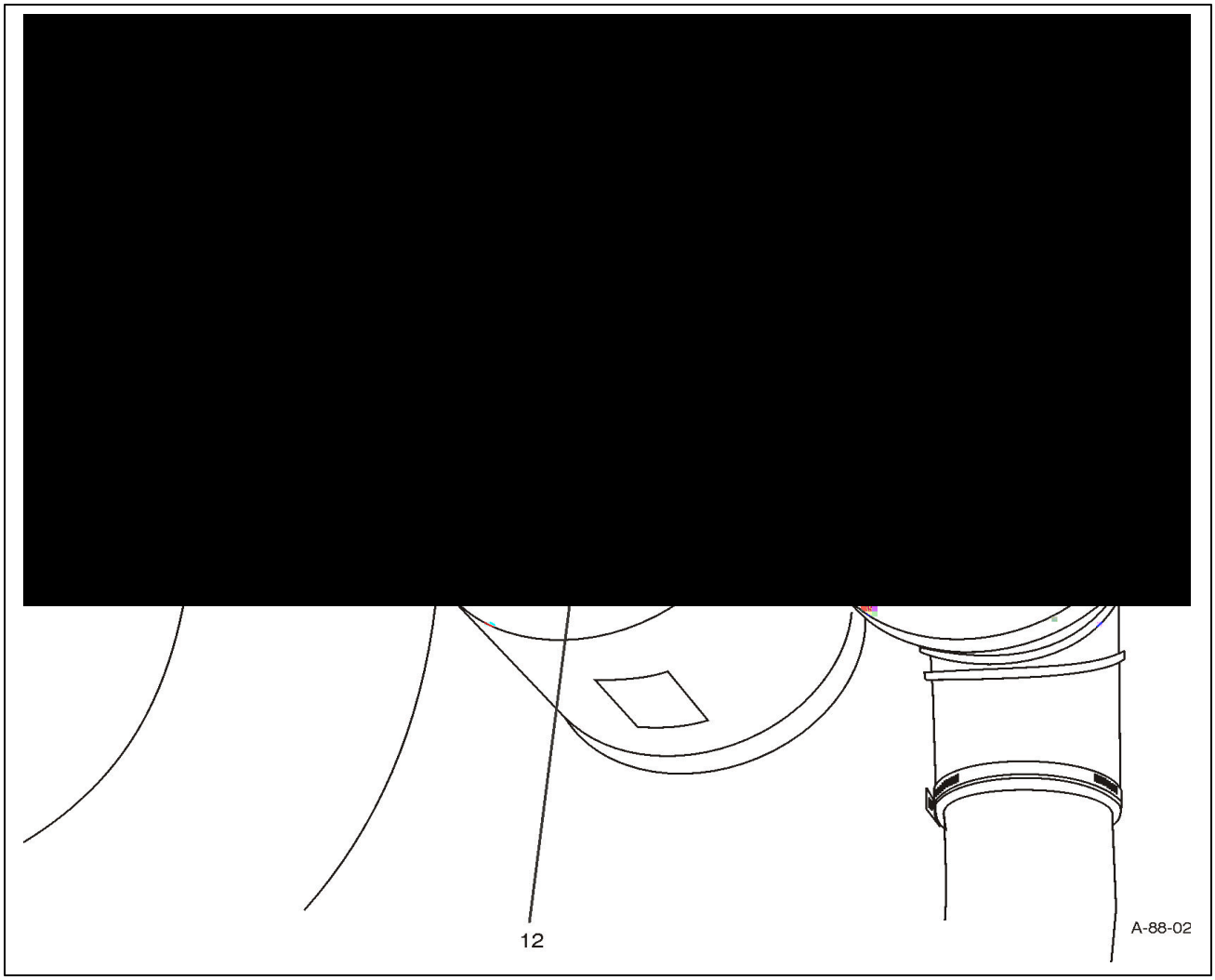
      3. Release the three retaining levers (Figure 1, item 1) that secure the air filter element to its housing.

      4. Remove the air filter element (item 2).

Do not allow any debris or dirt to enter the turbocharger inlet. Ingested dirt or debris can damage the turbocharger and the engine.

      5. Remove any accumulated dirt or debris from the filter housing. Wipe the housing clean to ensure there is an airtight seal with the new filter element.

      6. Install the new filter element (item 2).



1. Air Cleaner Assembly
2. Filter Element

Figure 1 Engine Air Cleaner Assembly

b. Compressor Intake Filter Replacement.

1. Loosen and remove the tie-rod wing nuts.

2. Remove the access cover on the roof and lift the element (Figure 2, item 2) out of the base.

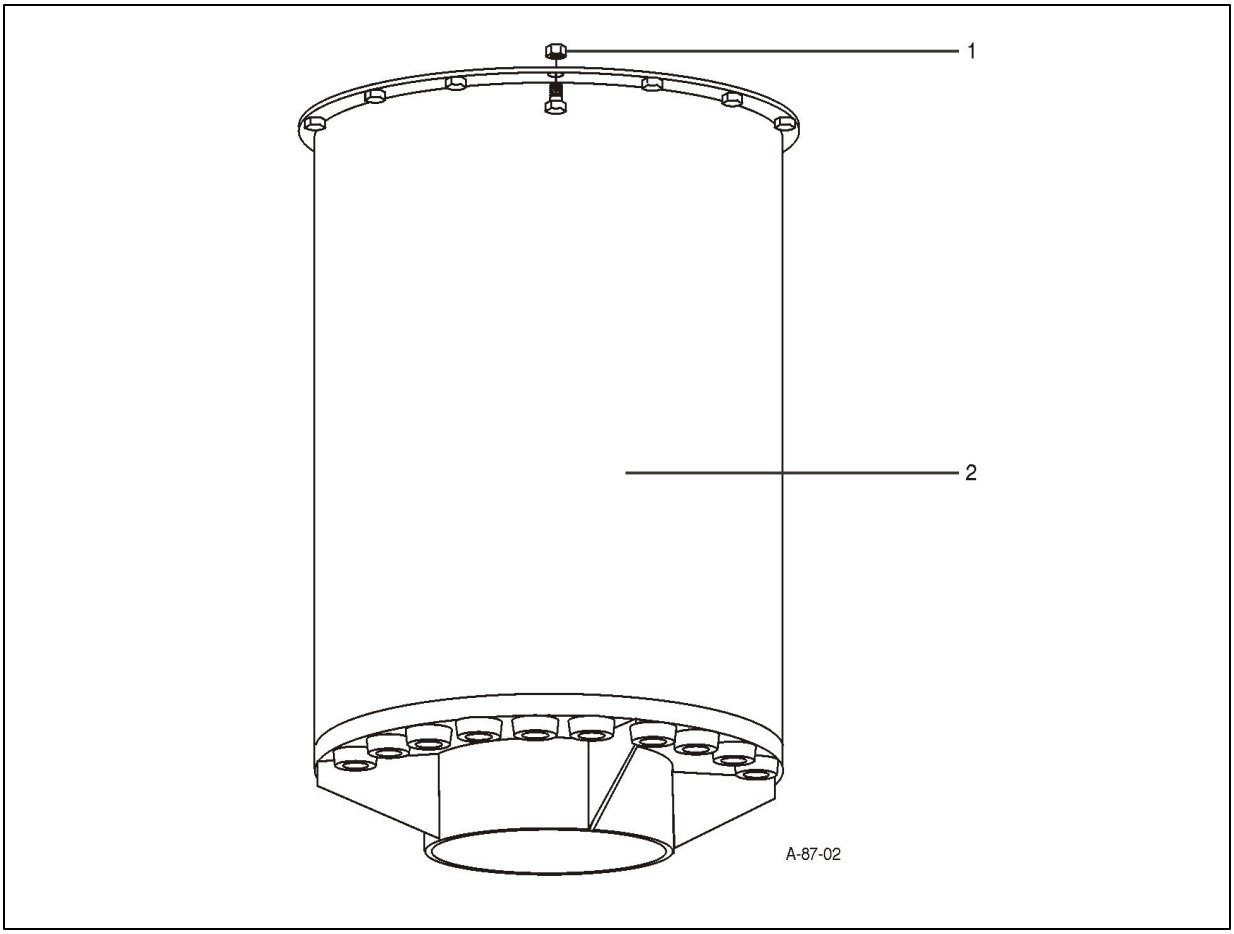
CAUTION

Do not allow any debris or dirt to enter the turbocharger inlet. Ingested dirt or debris can damage the turbocharger and the engine.

3. Remove any accumulated dirt or debris from the filter housings. Wipe the housings clean to ensure airtight seals with the new filter elements.

4. Install new filter element (item 2) with its retaining hardware (item 1).

5. Remove the warning tag, and return the unit to service.



1. Retaining Nut
2. Air Filter Element

Figure 2 Compressor Air Cleaner Assembly

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MAINTENANCE INSTRUCTION 11002A

TECHNICAL PROCEDURES

COMPRESSOR OIL AND FILTER, CHANGE

Total Number of Pages in this MI is 4.

1. TOOLS/EQUIPMENT:

    a. Standard automotive mechanic's hand toolset

    b. Strap wrench

    c. Drain pan 42 quarts (40 liters)

2. MATERIALS:

    a. Filter; oil; P/N:

    b. Oil, 32 quarts (30 liters) for TMD 300
    48 quarts (45 liters) for TMD 400

3. PROCEDURE:

    a. Park the unit on a level surface.

    b. Apply the hand parking brake and chock wheels.

    c. Operate the unit until it reaches its normal operating temperature.

    d. Shut down unit.

    e. Place a warning tag on the unit's start switch, advising that the unit must not be started.

    f. Disconnect batteries.

    g. Place a pan or container under the compressor remote oil drain (Figure 2, item 4).

    h. Remove the remote oil drain plug (Figure 1, item 3).

Hot oil can burn severely. When performing an oil change, protect yourself by wearing rubber gloves.

    i. Allow the compressor oil to thoroughly drain. Clean the threads of the drain plug, then install and tighten.

j. Place the oil pan below the compressor lube oil filter (Figure 2, item 1).

k. Loosen and remove the spin-on–type compressor lube oil filter. (Use a strap wrench to loosen the filter.)

l. Inspect the filter mounting base assembly. To provide a leak-free seal, the sealing surface must be flat, smooth, and free of deposits. Scrape off any deposits, and wipe the filter mounting base sealing surface clean.

Do not mix oils from different refiners or of different viscosities, and avoid overfilling compressor sump. Check the sump oil level frequently while filling the compressor to prevent overfilling it. Gear and bearing damage could otherwise result.

m. Coat the new filter gasket with a thin coat of clean oil.

n. Screw the new filter onto the filter head assembly. Hand turn the filter until its gasket contacts the filter mounting base, then tighten it an additional 1/2 to 3/4 turn.

o. Fill the compressor through the fill tube (Figure 1, item 6) with an approved lube oil and replace filler/breather cap (Figure 1, item 7). If the oil is below the halfway point of the sightglass, add enough oil through the oil fill to bring the level up to the halfway point on the sight level glass. Refer to GHH Rand information provided in Chapter 6.

p. Check the compressor's oil level on the sightglass (Figure 1, item 8). Ensure that the oil is at the proper operating level.

q. Start the unit. Check that the compressor oil pressure gauge reads from 15 to 45 psi (103 to 220 kPa) with the MODE SELECTOR switch in the JET START position and no load on the unit. Operate the unit until it reaches its normal operating temperature, and then check the compressor oil filter and remote drain plug for leakage. If needed, tighten the filter element with a strap wrench just enough to stop any leaks.

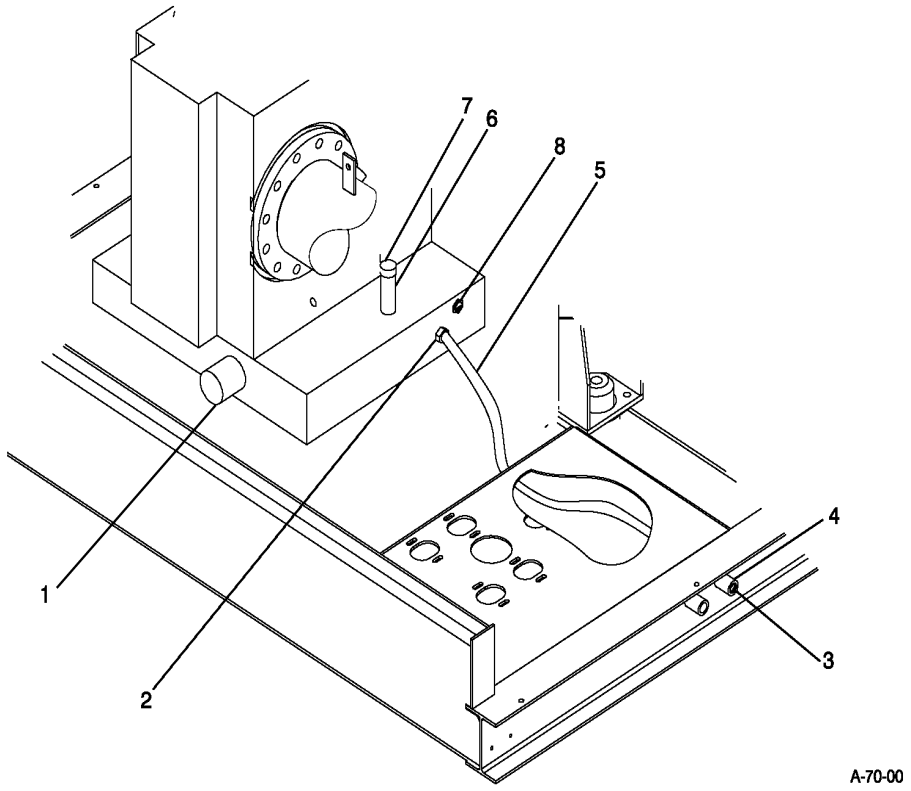
r. Recheck the compressor oil level. Add oil as required.

s. Place the MODE SELECT switch in UNLOAD. Shut down the unit or continue operating it, as desired.

t. Remove the warning tag from the unit's start switch.

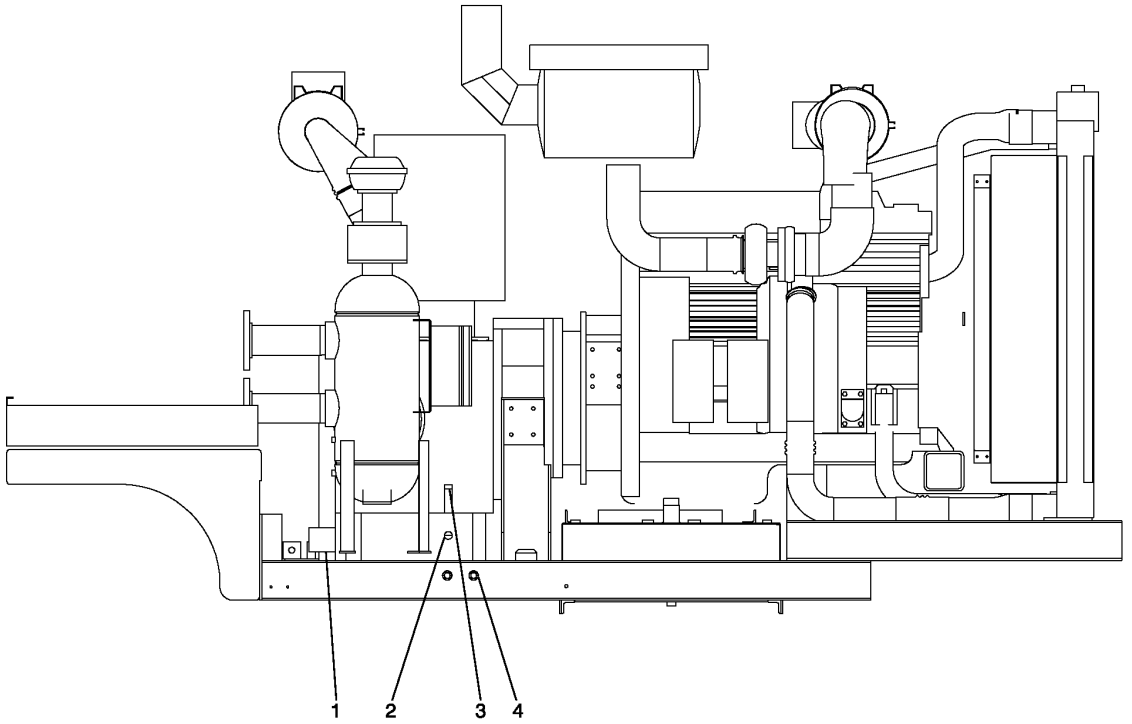
u. Remove chocks from unit's wheels.

v. The unit is now ready for normal operation.



1. Compressor Oil Filter
2. Straight Adapter
3. Plug
4. Straight Adapter
5. Compressor Remote Drain Hose Assembly
6. Compressor Sump/Breather/Fill Standpipe
7. Push-on Breather/Filler
8. Sightglass

Figure 1 Compressor Oil Component Assembly



1. Compressor Oil Filter
2. Compressor Oil Sight Level
3. Compressor Oil Fill
4. Compressor Oil Drain

Figure 2 Compressor Fluid Level and Fill Locations

MAINTENANCE INSTRUCTION 99002A

TECHNICAL PROCEDURES

FLUID LEVELS, CHECK

Total Number of Pages in this MI is 4.

1. TOOLS/EQUIPMENT:

   Clean rag

2. MATERIAL:

   As required. See specification page or procedural steps.

3. REFERENCE:

   Detroit Diesel *DDC/MTU Series 2000 Service Manual* (under separate cover).

4. PROCEDURE:

   Make all fluid level checks with the unit parked on level ground and the unit's parking brake set.

   a. Fuel Tank Level:

      1. Check the fuel tank's level.

      2. Fill the tank as required through the fill tube (Figure 1, item 2) using either Diesel Fuel Grade No. 1-D or Grade No. 2-D, as defined by the *Detroit Diesel Engine Service Fluid and Filter Requirements* (7SE273) located in Chapter 6.

   b. Engine Oil Level:

      1. Locate the engine dipstick.

      2. Pull the engine's dipstick out of its tube and wipe it clean.

      3. Reinsert the dipstick and then withdraw it and check the oil level.

Overfilling the engine crankcase can result in oil leaks or bearing damage. When adding oil, check the engine's oil level frequently to avoid overfilling it.

      4. If the oil level is down to the ADD mark on the dipstick, add it through the filler (Figure 1, item 4) enough to bring the level up to near the FULL level.

   c. Compressor Lube Oil Level: Check the compressor lube oil level daily or before operating the unit

      1. Locate the compressor sight level glass.

Overfilling the compressor sump can result in oil leaks or bearing damage. When adding oil, check the compressor's oil level frequently to avoid overfilling it.

2. If the oil level is below the halfway point of the sightglass, add enough oil through the oil fill (item 3) to bring the level up to the halfway point on the sight level glass.

d. Engine Coolant Level: Check the engine coolant level daily or before each operation of the unit.

1. Check the engine coolant temperature. If necessary, wait until the coolant temperature drops below 165 °F (79 °C) before proceeding.

Escaping steam and hot coolant can cause severe burns. The cooling system is pressurized. Never open a radiator cap when coolant is hot, and use a cloth or wear a glove to handle a hot radiator pressure cap. Ethylene glycol antifreeze is toxic and can irritate skin. Wash any part of body that comes in contact with antifreeze solution as soon as possible.

2. Look into the upper radiator tank through the sight level glass. The coolant level should fill the sight level glass. The coolant level should just cover the sightglass, not fill the entire top tank. This is to allow room for coolant expansion in the tank as it warms.

Note: Some minor coolant loss due to thermal expansion after refilling the radiator is normal. Very low coolant level (down to, or below, core tubes) indicates a serious leak in the system that must be located and corrected.

3. If needed, remove radiator cap, prepare a coolant solution per Detroit Diesel *Series 2000 Engine Service Fluid and Filter Requirements* (7SE273) located in Chapter 6. Add coolant solution as required to restore the coolant level as in step 2 above.

4. If the coolant level was unusually low, refill the radiator at fill point (item 1), then:

   a. Carefully inspect all cooling system hoses and connections for leaks.

   b. Start the unit, allow it to reach normal operating temperature, and inspect the cooling system again. Repair any leaks before returning unit to service.

5. Once the coolant level is satisfactory, replace and tighten the radiator cap.

6. Return the unit to service.

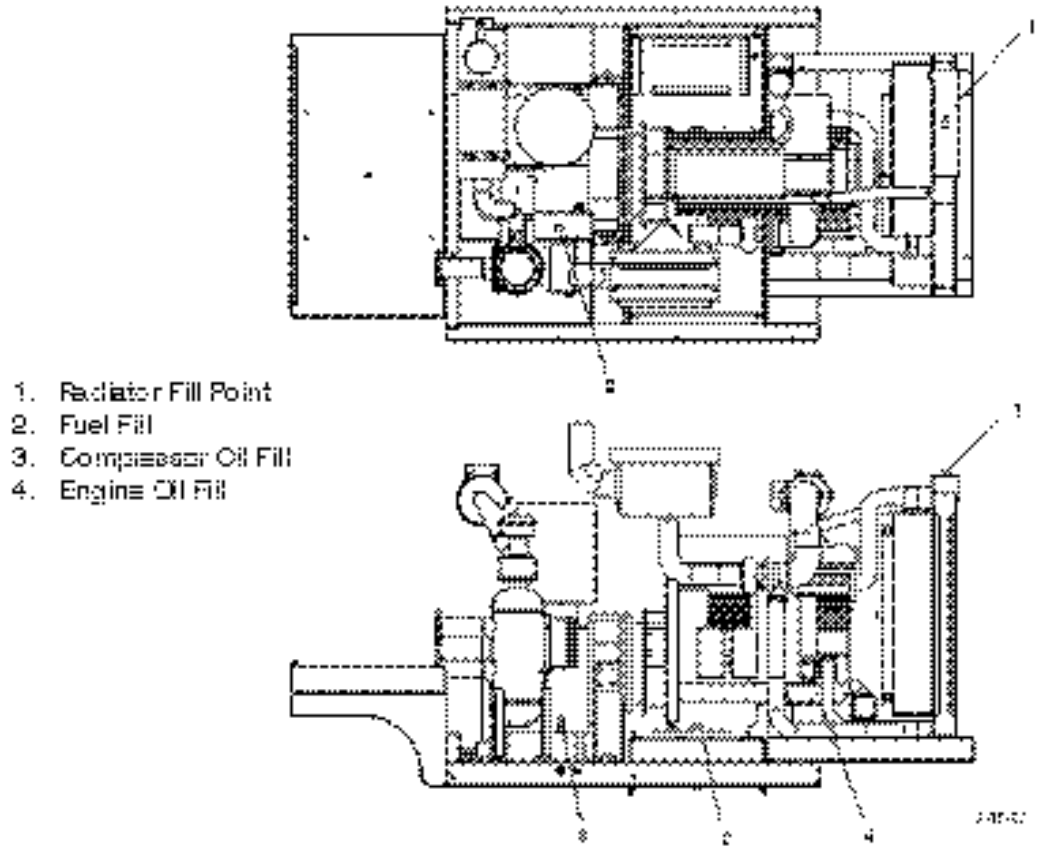


Figure 1 Fluid Level and Fill Locations

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Chapter 3 Table Of Contents

Overhaul

TABLE OF CONTENTS

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Chapter 3, Section 1

Overhaul Data

1.1 AIR START UNIT OVERHAUL

1.1.1 The TR/TMD-300/400 Air Start Unit must be maintained by strict adherence to the preventive maintenance schedule, and timely repair, and overhaul. Proper servicing, maintenance, following manufacturer's recommendations, and record keeping are important activities that establish the overhaul intervals.

1.1.2 Stewart & Stevenson TUG provides preventive maintenance recommendations in Chapter 2, Section 1, of this manual. Maintenance instructions provided in Chapter 2, Section 3, detail how to perform maintenance on specific components or how to perform specific maintenance tasks. The troubleshooting tables in Chapter 2, Section 2, are specific to this equipment and will assist the operator and maintenance personnel in quickly isolating and correcting most common malfunctions.

1.2 ENGINE

1.2.1 For engine maintenance and overhaul procedures, refer to the Detroit Diesel *DDC/MTU Series 2000 Service Manual* provided under separate cover with this manual.

1.3 AIR COMPRESSOR

1.3.1 For air compressor overhaul procedures, refer to the GHH-RAND *Service Information* located in Chapter 6 of this manual.

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Chapter 3, Section 2

Removal and Installation

2.1 GENERAL

2.1.1 The following procedures will assist the maintenance technician in removing and replacing major items. Refer to the Maintenance Instructions in Chapter 2, Section 3, of this manual for removal and replacement procedures for minor items.

2.2 PREPARATION FOR ENGINE/COMPRESSOR REMOVAL

2.2.1 The engine and air compressor need to be removed as a single unit.

2.2.2 Enclosure Removal. Before attempting engine/compressor removal, remove the unit's enclosure to provide adequate access for a lifting crane. Disconnect and label wiring, air lines, hoses, and piping, leading to or from the engine and compressor, and remove the enclosure as follows:

Remove the battery's ground cable before removing the ungrounded cable to prevent electrical sparks and possible burns. Remove the ground cable from its grounding point before removing the ground cable from the battery.

a. Tag and disconnect the battery cables. Ensure that the battery ground cable is disconnected first.

b. Drain the engine's coolant.

c. Disconnect and remove the radiator hoses from the engine and the radiator.

d. Tag and disconnect all pressure lines and electrical wires leading to and from the Gauge and Meter panel. Cap any disconnected pressure lines to prevent contamination from entering them.

e. Tag and disconnect all fuel lines, drain lines, oil cooler hoses, drain hoses, fuel, and any other lines or hoses that would interfere with the enclosure's removal or with engine/compressor removal. Cap any disconnected fuel and oil lines to prevent contamination from entering them.

f. Tag and disconnect the electrical wiring between engine/compressor and enclosure, including wiring that runs to the Control and Indicator panel.

g. Remove the exhaust piping between the engine manifold and the muffler.

h. Remove the air piping between the discharge valve and the silencer.

i. Remove the air discharge piping and flange, with shutoff valves, by unbolting the pipe flange.

j. Remove the discharge manifold. Separate the discharge manifold from the compressor outlet. Tag the bolts by type and location so that they are easily reinstalled.

k. Remove the bolts that secure the enclosure to the frame. Tag the bolts by type and location so that they are easily reinstalled.

Always use lifting equipment, supports, and chains with a rated capacity of at least one and a half times that of the object being lifted or supported to avoid injury to personnel or damage to the equipment.

l. Carefully lift the enclosure from the unit.

2.3 ENGINE/COMPRESSOR REMOVAL

Always use lifting equipment, supports, and chains with a rated capacity of at least one and a half times that of the object being lifted or supported to avoid injury to personnel or damage to the equipment.

2.3.1 Remove the engine/compressor assembly from the frame as follows:

a. Remove the mounting bolts that secure the engine and compressor to the frame.

b. Attach a chain and hoist to the front engine lift ring and the two compressor lifting eyes.

c. Take the slack out of the chain. Check the hoist connections.

d. Carefully lift the engine/compressor assembly from the frame. Once it is clear, move it to a location suitable for separating the engine from the compressor.

2.4 ENGINE/COMPRESSOR INSTALLATION

2.4.1 Install the engine/compressor assembly to the frame as follows:

a. Attach the chain and hoist to the front engine lift ring and the two compressor lifting eyes.

b. Take the slack out of chain. Check the hoist connections.

c. Carefully lift the engine/compressor assembly over the frame and lower it into position for mounting.

d. Install the mounting bolts and secure the engine/compressor assembly to the frame.

2.5 INSTALLATION AND RECONNECTION OF OTHER EQUIPMENT

2.5.1 Install and connect other equipment and/or hoses and wires as follows:

a. Lift the enclosure and position it above the engine/compressor assembly.

b. Carefully lower the enclosure into position on the trailer frame.

c. Using the bolts removed in step (k) of paragraph 2.2.2, secure the enclosure to the frame.

d. Install the air pressure sensing lines on the discharge manifold.

e. Install the air discharge flange and piping.

f. Install the piping between the discharge valve and the silencer.

g. Install the exhaust pipe between the engine's exhaust manifold and its muffler.

h. Reconnect the electrical wiring tagged in step (f) of paragraph 2.2.2.

i. Reconnect all fuel lines, drain lines, oil cooler hoses, drain hoses, fuel, and any other disconnected lines or hoses removed and tagged in step (e) of paragraph 2.2.2.

j. Reconnect all pressure lines and electrical wires to the Gauge and Meter panel that were tagged and disconnected in step (d) of paragraph 2.2.2.

k. Install all engine-to-radiator hoses and clamps.

l. Fill the cooling system with a proper coolant mixture, as specified in the Detroit Diesel *DDC/MTU Series 2000 Service Manual*, (under separate cover).

Install the battery's positive cable before the ground cable to prevent burns and electrical sparks. Connect the ground cable to the battery terminal before reconnecting it to its grounding point

m. Reconnect the battery cables. Connect the ungrounded cable first. Tighten all connections.

2.6 REMOVAL OF PNUEMATIC DISCHARGE UNLOADER VALVE

The battery's ground cable must be removed before the positive cable to prevent burns and electrical sparks. The ground cable must be removed from its ground point before removing the ground cable from the battery.

2.6.1 Refer to Figure 3.1. Remove the pneumatic unloader valve:

a. Tag and disconnect battery cables. Disconnect the battery ground cable first.

b. Label and disconnect the air signal hoses (1) from the fittings (2) at unlaoder valve diaphragm.

c. Label and disconnect both solenoid wires from the connectors at the solenoid (3).

d. Remove the bolts (4) mounting the discharge silencer to the unloader valve.

e. Loosen the bolts on the discharge silencer mounting band and remove the discharge silencer

f. Remove the bolts (5) mounting the discharge manifold to the unloader valve and remove the valve from the unit for repair or replacement.

2.7 INSTALLATION OF PNEUMATIC DISCHARGE UNLOADER VALVE

2.7.1 Refer to Figure 3.1. Install the air pressure regulator as follows:

a. Install adapter fittings and solenoid assembly (6) into the unloader diaphragm assembly into

b. Position the unloader valve on the discharge manifold flange and install the bolts(5)

c. Install the discharge silencer into the mounting band and install the bolts (4)into the unloader valve assembly. After the bolts securing the unloader valve to the manifold and silencer, tighten, the bolt on the silencer mounting band.

d. Connect air signal hoses (1) to the appropriate fittings as labeled in step 2.6.1, and.

e. Connect both solenoid valve wires (3) to the solenoid as labeled in step 2.6.1. Be sure to reinstall both wires into the same location from which they were removed.

f. Reconnect the battery cables. Connect the negative cable first. Tighten all connections.

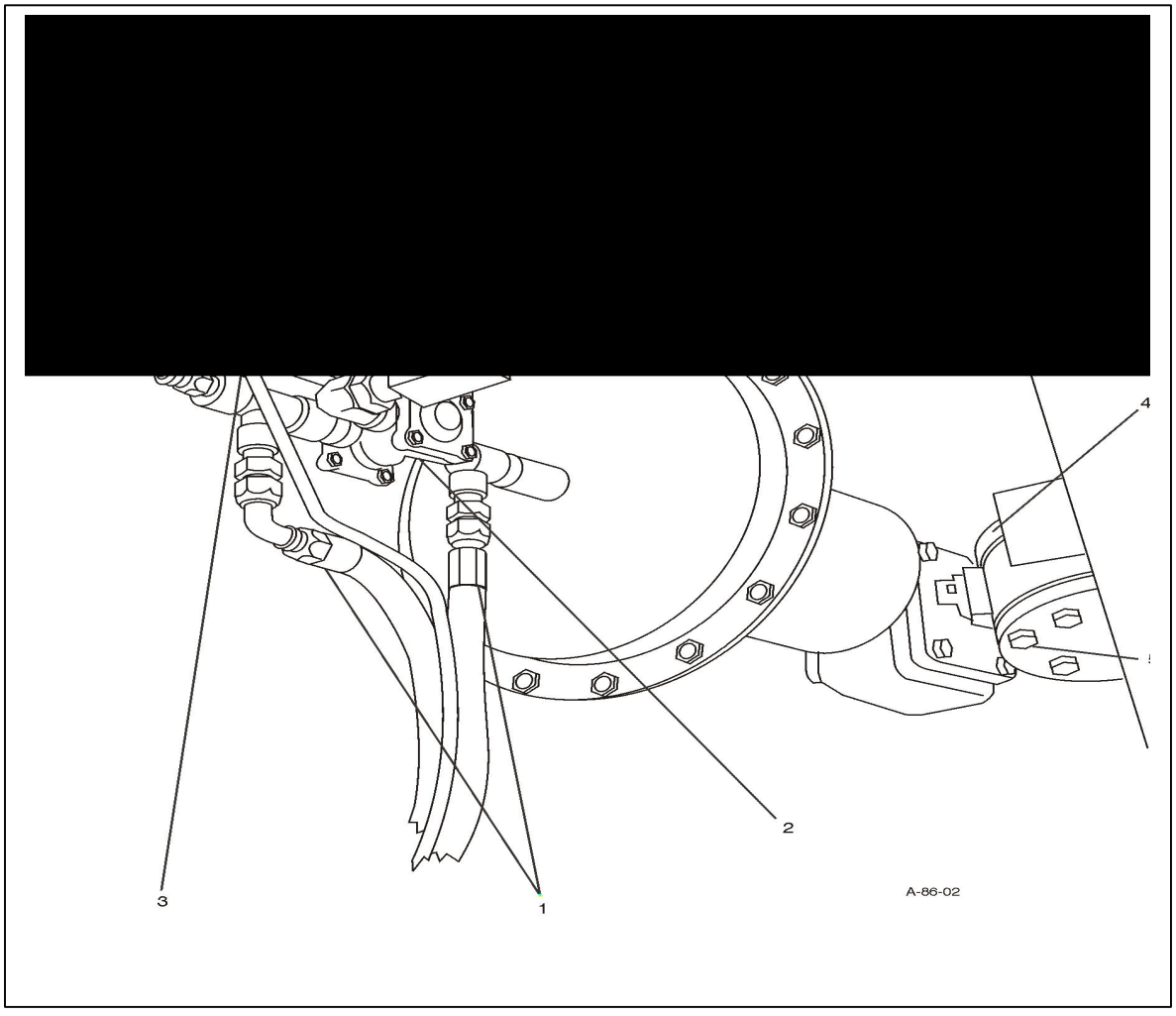

Figure 3.1 Discharge Unloader Valve/Solenoid Assembly.

Chapter 5

Drawings

Table of contents

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DRAWINGS NOT AVALIABLE AT TIME OF PRODUCTION

PLEASE INCLUDE A LIST OF DRAWINGS ENGINEERING FEELS NEEDED FOR THE COSTOMERS NEEDS

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Subject:
Author: STEWART & STEVENSON
Keywords:
Comments:
Creation Date: 01/17/2002 9:53 AM
Change Number: 6
Last Saved On: 03/27/2002 10:55 AM
Last Saved By: Stewart & Stevenson
Total Editing Time: 62 Minutes
Last Printed On: 07/11/2002 11:12 AM
As of Last Complete Printing
Number of Pages: 3
Number of Words: 89 (approx.)
Number of Characters: 508 (approx.)

Chapter 4

Illustrated Parts Breakdown

TABLE OF CONTENTS

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Chapter 4, Section 1

Parts List

1.1 INTRODUCTION

1.1.1 Your Air Start Unit was manufactured by Stewart & Stevenson TUG. The finest quality materials, selected through years of research and experience, have been combined with precision workmanship and careful inspection to deliver a product that will provide you with many years of dependable, trouble-free operation.

1.1.2 This parts breakdown has been prepared to help you locate parts required to maintain your Air Start Unit. An alphanumeric index is included in Section 3 of this chapter.

{ EMBED Wor

For your own protection, do not use substitute parts without the approval of Stewart & Stevenson TUG.

1.2 PARTS LIST DETAIL

1.2.1 The Parts List illustrates, lists, and identifies components, assemblies, subassemblies, sub-subassemblies, and detailed parts required for maintenance of the equipment. The Parts Lists, cross-indexed for reference and illustrated, are presented in tabular form. The columns, reading from left to right, are headed: Figure & Index Number, Part Number, Manufacturer's Code, Description, Quantity, and Usable On Code. (Refer to Table 4.1)

Table 4.1 Example, Parts List

Fig & Ind #	Part Number	MFR Code	Description	Qty	Usable On Code
5.1			COOLING SYSTEM		
-1	5122482	71582	Pulley Assembly	1	B
-2	311D	19090	Pulley	1	
-3	NO NUMBER	COML	Nut, Hex Lock, 5/16-24, Steel Cadmium Plated	AR	
-4	8921105	72582	Water Pump	REF	

1.2.2 Figure And Index Number Column.

a. The first item in the Figure and Index Number column is the figure number of the illustration. Each subsequent "dash number" corresponds to the illustration's index number.

b. Identical parts occurring in the same illustration are illustrated and indexed once except when identical parts need to be identified for clarity. Identical parts occurring in other illustrations are identified and listed for that illustration.

1.2.3 Part Number Column.

a. Part numbers used in this column are selected according to the following order of preference: Original Manufacturer, Commercial Manufacturer, Prime Design Manufacturer.

b. "No Number" appearing in the Part Number column indicates that the part or assembly is of common usage and usually can be purchased locally.

1.2.4 Manufacturer's Code Column. The Manufacturer's Code column lists the five-number code assigned to the manufacturers in the Federal Supply Codes for Manufacturers Handbook. This number represents the name and address of the vendor. Refer to Section 2 for the list of code numbers referenced to each manufacturer's name and address. If "COML" appears as a Manufacturer's Code, the item is of common usage and usually can be purchased locally.

1.2.5 Description Column.

a. The Description column gives the parts' names as assigned by the manufacturer plus any additional modifiers necessary to ensure they can be identified. Items that are part of an assembly are preceded by one dot. Each dot associates the part to the previously-listed item without a dot. Items which are part of a subassembly are preceded by two dots, which associate the part to the previously-listed item with one dot. Attaching parts are listed beneath the item they attach. They are captioned, ATTACHING PARTS, and are followed by the separation symbol "*****" to distinguish them from subsequent listings of assemblies or detail parts.

b. Items that are available commercially also are identified in this column; e.g., "Nut, Hex, Lock, 5/16-24, Steel, Cadmium Plated".

1.2.6 Quantity Column. The Quantity column indicates the number of units per component, assembly, subassembly, and/or sub-subassemblies. The quantity required for one item is given except when identical parts are used. When items are listed for reference purposes, "REF" is used in the quantity column. This indicates that the item appears elsewhere in the manual where the units per assembly are given. "AR" in the quantity column stands for "As Required".

1.2.7 Usable On Code. Part variations are indicated by a letter in this column. Applicability of the letter codes given in the USABLE ON CODE column are given in the manual's introduction. When this column is left blank, the parts listed apply to all units.

1.3 HOW TO LOCATE PARTS

1.3.1 Parts may be readily located in this IPB by referring to the Group Index, Chapter 4, Section 4. Determine the group number in which the part appears and refer to the group in the Parts List. Illustrations are included to aid you in identifying parts.

1.4 HOW TO ORDER PARTS

1.4.1 Place parts orders with Stewart & Stevenson TUG, Inc. 815 Algood Rd. Marietta Ga. 30062. Stewart & Stevenson TUG maintains a large stock of repair parts to assure prompt delivery of needed parts.

1.4.2 When ordering parts, list the quantity, part number, manufacturer's code, and complete description of the needed part(s) to ensure fast delivery.

1.4.3 In case of difficulty, wire or write Stewart & Stevenson TUG, Inc., 815 Algood Rd. Marietta Ga.30062. Be sure to list the equipment model number, rating, specific nature of the problem, and the suspected area of malfunction.

For emergency assistance, call:

For Airline Parts: 800-989-8499 (Georgia Residents 770-422-7230)

For Airline Service: 770-422-7230 (ask for Warranty Dept.)

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Chapter 4, Section 2

Manufacturers Identification

2.1 INTRODUCTION

2.1.1 The Manufacturers Identification table (Table 4.2) lists the code and contact information for manufacturers referenced in the parts list.

Table 4.2 Manufacturers Identification

CODE	NAME AND ADDRESS
81381	Stewart & Stevenson Services, Inc. 8631 East Freeway Houston, Texas 77029

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Chapter 4, Section 3

Alphanumeric Index

3.1 INTRODUCTION

3.1.1 The Alphanumeric Index (Table 4.3) consists of four columns: FIGURE & INDEX NO., PART NUMBER, QUANTITY, AND TUG (Stewart & Stevenson TUG) PART NO.

3.1.2 The Figure & Index Number matches each part number with the exact figure and callout number that depicts that part. The number before the dash indicates the figure number, and the number after the dash is the callout number on the figure. For example, if number 2.1-7 is listed, refer to Figure 2.1and locate item 7.

3.1.3 The Part Number column lists the part number assigned or used by Stewart & Stevenson for stocking or ordering purposes.

3.1.4 The Quantity column lists the amount of parts used in that particular listing. “REF” (reference) indicates the quantity of that part has been listed in another Figure and Index column.

3.1.5 The Stewart & Stevenson TUG Part Number column is provided for the customer’s use only and, therefore, has been left blank.

Fig & Index No.	Part Number	Quantity	TUG Part Number
6.1-6	A46	Set/3	
8.4-15	BL-50	4	
8.5-12	BL-50	4	
8.2-8	BNDN1000	1-Cut	
8.2-9	BNL5	4	
8.4-14	CGB193	2	
8.5-11	CGB193	2	
10.1-10	CT450	2	
6.3-6	CT450	6	
8.4-26	FHAC-1	2	
9.1-8	GG106-NP-12-08	1	
9.1-3	GG106-NP-12-16	2	
4.1-1	G112401	1	
8.1-3	G2OUB4-FTG-7342	1	
10.1-2	H000349	1	
8.1-20	IN4006	1	
8.2-23	IN4006	17	
8.3-14	LE000005	1	
8.3-16	LE000018	1	
8.1-12	LE000062	10	
8.1-14	LE000063	8	
8.1-13	LE000064	10	
8.1-15	LE000065	2	
8.1-10	LE000106	1	

Fig & Index No.	Part Number	Quantity	TUG Part Number
8.1-16	LE000108	2	
8.2-22	LE000131	24	
8.1-19	LE000133	1	
8.3-4	LE000151	3	
8.3-5	LE000152	2	
8.3-39	LE000157	REF	
8.2-28	LE000191	2	
8.2-29	LE000192	2	
8.1-17	LE000249	1	
8.2-14	LE000252	1	
8.1-22	LE000307	1	
8.2-21	LE000318	10	
8.4-9	LE000318	1	
8.1-2	LE000321	3	
6.2-7	MB9426T75S283F	4	
8.1-18	MS24523-26	0	
8.1-21	MS35058-22	1	
8.1-9	MS35058-26	1	
8.2-24	MS37TB24-VF-10	1	
8.2-26	MS37TB24-VF-40	1	
8.2-18	MS37TB31-10	1	
8.2-20	MS37TB31-40	1	
4.1-5	P004079	2	
4.1-7	P105535	1	
4.1-2	P105695	1	
7.1-2	P270543	1	
8.2-5	RY4S-ULDC24V	17	
10.1-7	SA000008	1	
1.1-1	SA000009	1	
1.1-2	SA000010	2	
1.6-1	SA000010	2	
9.1-9	SA000018	1	
9.1-10	SA000019	1	
9.1-11	SA000020	1	
9.1-12	SA000021	1	
3.1-12	SA000022	1	
3.2-12	SA000022	1	
3.1-5	SA000023	1	
3.2-5	SA000023	1	
3.2-17	SA000025	1	
3.2-21	SA000026	1	
10.1-27	SA000034	1	
3.1-1	SA000037	1	
2.1-1	SA000042	REF	
2.1-3	SA000049	1	
2.1-1	SA000051	REF	
2.1-1	SA000052	REF	

Fig & Index No.	Part Number	Quantity	TUG Part Number
3.2-1	SA00037	1	
10.3-3	SD000005	1	
10.1-20	SD000006	1	
2.1-2	SD000024	1	
2.1-2	SD000024	1	
2.1-6	SD000033	1	
6.2-2	SD000055	1	
10.1-9	SD000073	1	
10.1-12	SD000074	1	
6.1-3	SD000079	1	
10.1-13	SD000083	3	
10.1-14	SD000084	3	
6.3-4	SD000086	1	
6.3-3	SD000089	2	
6.3-5	SD000099	1	
6.3-8	SD000100	1	
10.1-11	SD000105	1	
6.3-7	SD000105	2	
9.1-1	SD000108	1	
10.1-22	SD000109	1	
1.6-2	SD000145	1	
1.6-5	SD000146	2	
1.6-6	SD000148	1	
1.6-7	SD000149	1	
9.1-2	SD000177	1	
6.1-5	SD000196	1	
1.7-3	SD000199	1	
1.7-1	SD000200	1	
1.7-2	SD000201	1	
10.1-20	SD000214	1	
10.1-5	SD000216	2	
8.4-19	SD000238	1	
6.2-1	SD000284	1	
8.2-16	SD000285	1	
1.6-12	SD000345	1	
1.6-13	SD000346	1	
7.1-6	SD000369	1	
7.1-4	SD000370	1	
8.2-3	SD000390	1	
8.2-4	SD000391	1	
8.2-17	SD000392	1	
8.4-23	SE000001	1	
8.5-19	SE000001	1	
8.5-17	SE000002	1	
8.5-18	SE000003	1	
8.4-24	SE000004	1	
8.5-20	SE000004	1	

Fig & Index No.	Part Number	Quantity	TUG Part Number
8.2-31	SE000006	1	
8.3-32	SE000007	1	
8.4-11	SE000008	1	
8.5-8	SE000008	1	
8.4-12	SE000009	1	
8.5-9	SE000009	1	
8.4-13	SE000010	1	
8.5-10	SE000010	1	
8.1-1	SE000013	1	
8.5-16	SE000015	1	
8.5-6	SE000017	1	
8.5-2	SE000023	1	
8.3-6	SE000027	1	
8.2-11	SE000031	1	
8.2-12	SE000032	1	
8.2-13	SE000033	1	
8.3-12	SE000034	REF	
8.4-10	SE000035	1	
8.5-7	SE000035	1	
8.5-3	SE000036	1	
8.1	SE000038	1	
8.2-30	SE000039	1	
8.5-1	SE000039	1	
8.2	SE000040	1	
8.2-15	SE000041	1	
8.2-27	SE000042	1	
8.3-1	SE000043	1	
8.3-3	SE000044	REF	
8.4-3	SE000044	REF	
8.3-13	SE000045	1	
8.3-19	SE000046	1	
8.3-20	SE000047	1	
8.3-42	SE000048	1	
8.3-43	SE000050	1	
8.3-40	SE000052	1	
8.3-41	SE000052	1	
10.1-8	SG000008	1	
8.3-8	SM-2C-12F-AU	1	
1.6-10	SPD-1007	2	
1.6-11	SPD-1008	2	
1.6-9	SPD-3100200	2	
2.1-2	SP000006	1	
2.1-2	SP000007	1	
2.1-2	SP000008	1	
10.1-1	SP000011	1	
7.1-1	SP000014	1	
10.3-1	SP000015	1	

Fig & Index No.	Part Number	Quantity	TUG Part Number
4.1-4	SP000021	1	
4.1-6	SP000022	1	
6.1-1	SP000031	1	
6.3-2	SP000037	4	
10.1-6	SW000002	1	
3.1-14	SW000006	1	
3.2-14	SW000006	1	
1.1-10	SW000008	1	
1.1-9	SW000012	1	
6.1-4	SW000014	1	
6.1-2	SW000017	1	
10.1-24	SW000019	1	
10.1-4	SW000021	1	
6.3-1	SW000023	1	
1.1-3	SW000035	1	
10.1-25	SW000037	1	
6.1-7	SW000058	1	
1.1-5	SW000078	1	
8.2-6	SY4S-05	17	
8.2-7	SY4S-51F1	17	
8.3-11	TT-2A-0100-176R	1	
10.1-3	X005832	2	
7.1-3	X005833	1	
1.2-2	01-10027	2	
8.1-23	02011-10	5	
1.4-11	020-20706	1	
1.3-24	02-02370	1	
1.4-4	02-02370	1	
1.2-18	02-03207	2	
1.3-4	02-03207	2	
1.2-17	02-03916	2	
1.3-3	02-03916	2	
1.4-13	02-12103	6	
1.1-8	02-20143	1	
1.4-3	02-20143	1	
1.3-12	02-20212	1	
1.3-2	02-20322	2	
1.3-11	02-20409	1	
1.2-7	02-20704	2	
1.2-8	02-20705	2	
1.4-7	02-20707	1	
1.4-9	02-20731	2	
1.4-8	02-20732	2	
1.2-11	02-20735	2	
1.1-6	02-20737	4	
1.4-14	02-20737	4	
1.4-10	03-18451	1	

Fig & Index No.	Part Number	Quantity	TUG Part Number
1.3-1	03-30241	1	
1.2-1	03-30548	1	
1.1-7	04-40379	1	
1.4-1	04-40379	1	
1.1-4	04-40380	1	
1.4-2	04-40380	1	
1.2-26	06-11814	2	
1.3-9	06-12016	2	
1.2-28	06-12103	10	
1.3-20	03-12103	6	
1.3-21	06-12104	6	
1.4-12	06-12104	6	
1.3-26	06-13144	10	
1.2-29	06-60136	4	
1.3-22	06-60295	3	
1.3-13	06-60403	1	
1.3-10	06-60440	10	
1.3-18	06-60479	1	
1.3-19	06-60538	6	
1.2-23	06-60591	2	
1.2-27	06-60591	10	
1.2-10	06-61435	8	
1.2-4	06-61819	2	
1.2-9	06-61835	4	
1.4-15	06-61849	2	
1.2-16	06-61900	3	
1.2-3	06-61901	4	
8.4-20	10478980	1	
1.7-4	1078-3”	2	
8.3-2	1110	4	
8.6-2	1110	4	
8.3-32	12065287	REF	
8.3-32	12103881	REF	
10.1-29	121901382	2.5	
10.2-14	12313910	1	
6.2-3	12892909	6.5	
6.2-6	12901644	2	
8.3-34	12911262	1	
6.3-9	12912045	1	
8.6-4	12922244	1	
8.1-8	12930787	1	
8.6-1	12941659	1	
10.1-15	12950251	1	
2.1-2	12950282	2	
2.1-2	12950282	2	
2.1-2	12950282	2	
2.1-2	12950284	1	

Fig & Index No.	Part Number	Quantity	TUG Part Number
2.1-2	12950284	1	
1.6-3	12950501	1	
1.6-8	12950502	1	
1.6-4	12950503	1	
10.1-18	12950531	1	
8.2-32	12950802	1	
8.3-33	12950803	REF	
10.1-23	12970123	1	
8.1-4	12980039	1	
2.1-5	12980044	2	
1.2-22	130355100	2	
1.3-17	130355100	1	
1.3-8	130355100	2	
1.2-21	130360200	2	
1.3-16	130360200	1	
1.3-7	130360200	2	
1.2-20	130395200	2	
1.3-6	130395200	2	
1.2-19	130400100	2	
1.3-5	130400100	2	
1.3-15	130405200	1	
1.3-14	130580500	1	
10.1-28	169X6X6	1	
8.4-4	19010182	1	
8.6-3	2MJ7	4	
3.1-9	208007-4-2S	1	
3.2-9	208007-4-4S	1	
3.1-10	2081-4-2S	1	
3.2-10	2081-4-2S	1	
3.1-4	2083-12-8S	1	
3.2-4	2083-12-8S	1	
3.1-8	2089-4-2S	1	
3.2-8	2089-4-2S	1	
3.2-19	2092-8-8S	1	
9.1-5	2216-12-16S	1	
6.2-4	2256-4RL	3.7	
3.2-3	232B-4P	1	
3.1-3	232B-4PP	1	
7.1-5	23506159	1	
6.2-9	23515397	1	
8.4-1	23515397	1	
8.3-21	23518254	1	
3.1-7	23518482	1	
3.2-7	23518482	1	
8.3-23	23520025	1	
8.4-22	23520025	1	
8.4-8	24063-09	1	

Fig & Index No.	Part Number	Quantity	TUG Part Number
8.4-7	240-903	2	
8.4-17	257005	1	
8.5-14	257005	1	
8.4-16	257010	1	
8.5-13	257010	1	
8.4-18	257015	2	
8.5-15	257015	2	
8.1-10	301-904	1	
8.1-5	310-910	2	
1.2-15	3202224100	8	
1.3-25	320700140	1	
1.2-24	321415140	2	
1.3-23	321415140	3	
1.4-5	321415140	1	
1.2-5	321510110	8	
1.2-13	321800090	8	
1.2-30	322400100	4	
8.4-5	323-093	1	
1.2-6	324000110	8	
1.2-25	324612100	2	
1.4-6	324612100	1	
8.1-11	332-902	1	
8.1-6	350-902	1	
8.1-7	350-906	2	
8.3-9	360-003	1	
8.4-6	360-086	2	
8.3-10	360-094	1	
8.2-25	37TB-24	2	
8.2-19	37TB-31	2	
1.2-12	390908028	2	
1.5-5	390908028	1	
1.5-1	41-308664	2	
1.5-3	41-308665	1	
1.5-4	41-308743	1	
1.5-2	41-415200	2	
8.1-24	44204LN	1	
6.2-11	4738-4-4B	1	
10.3-2	484P	1	
3.2-15	5110760	1	
2.1-4	512-3-N-S	2	
2.1-2	516-5-N-S	2	
10.2-2	55AA532	1	
10.2-5	55AA533	1	
10.1-30	56AA546	1	
10.1-31	56AB252	1	
10.2-11	56AB252	1	
10.1-21	57AC518	1	

Fig & Index No.	Part Number	Quantity	TUG Part Number
10.2	57AC884	REF	
10.2-4	58AA050	1	
10.2-6	58AA051	1	
10.2-1	58AB052	1	
8.6-6	70018	2	
8.2-2	70120C	2	
8.2-1	7022OF	1	
10.2-8	71068	1	
10.2-13	73807	1	
10.2-12	73821	1	
10.2-9	74626	1	
9.1-4	76941	4	
3.1-11	77006	1	
3.2-11	77006	1	
3.2-22	77735	1	
3.1-13	77738	1	
3.2-13	77738	1	
6.2-8	77741	1	
6.2-12	77746	1	
10.1-16	78175	1	
9.1-6	78175	1	
4.1-3	78603	4	
3.2-16	78886	2	
10.1-26	78890	1	
3.2-20	78890	1	
3.1-6	78894	1	
3.2-6	78894	1	
3.2-18	78896	1	
3.1-2	78898	1	
3.2-2	78898	1	
9.1-7	78904	3	
6.2-5	79382	2	
8.3-35	837-N1	1	
10.1-17	88110	1	
6.2-10	8924187	1	
10.2-10	94859	1	
10.1-19	97904	1	
10.2-7	97905	1	

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Chapter 4, Section 4

Group Index

GROUP INDEX (CONT.)

Group 1

TMD-300/400 Air Start Unit

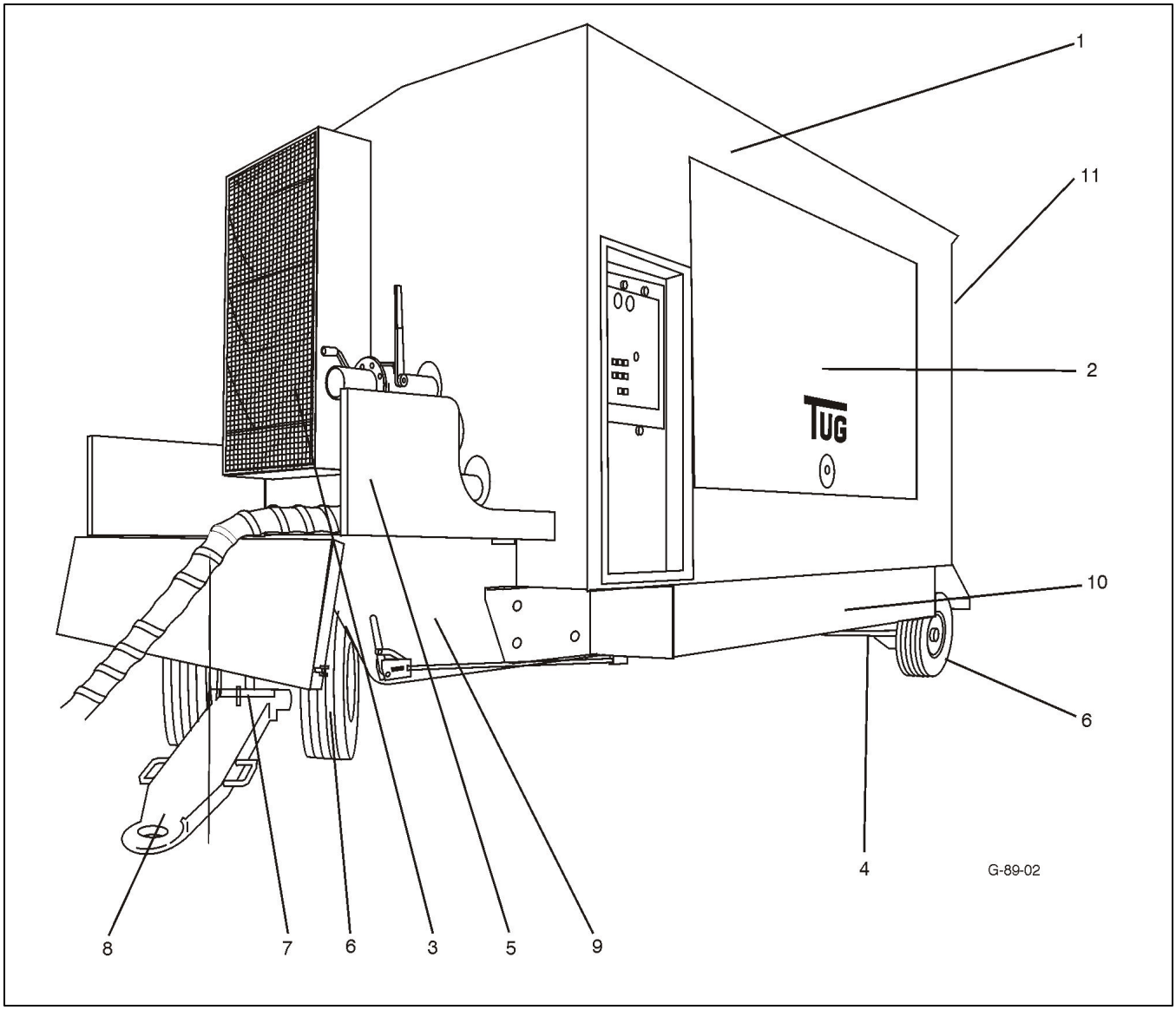

Figure 1.1 TMD-300/400 Overall Assembly

Table 1.1 TMD-300/400 Air Start Unit

Fig & Ind #	Part Number	MFR Code	Description	Qty	Usable On Code
1.1			TMD-300/400 AIRSTART UNIT OVERALL ASSEMBLY		
-1	SW000097	81381	Enclosure Assembly (AL-290812)	1	
-2	SA000010	81381	Door Assembly	2	
-3	SD000495	81381	Air Foils, Inlet	1	
	H1200	81381	Inlet, Hood Air Ram	2	
-4	04-40391	81381	Rear Axle Assembly	1	
-5	SW000078	81381	Hose Basket Assembly	1	
-6	02-20726	81381	Tire, 7.50-10 NHS, 16 Ply, Tube Type, Rear	2	
	02-20725	81381	Tire, 7.50-10 NHS, 16 Ply, Tube Type, Front	2	
-7	SP000030	81381	Front 5th Wheel Assembly (04-40386)	1	
	SA000142	81381	Trailer Assembly, TMD 300/400 *(Not Shown)*	1	
-8	04-40385	81381	Towbar Assembly	1	
-9	SW000012	81381	Front Gooseneck Assembly	1	
-10	SW000010	81381	Assembly, Sub Frame	1	
-11	SW000099	81381	Panel, Exhaust Louvered	1	

Figure 1.2 TMD 300/400 Overall Rear Axle Assembly

Table 1.2 TMD-300/400 Overall Rear Axle Assembly

Fig & Ind #	Part Number	MFR Code	Description	Qty	Usable On Code
1.2					
-1	03-40391	81381	Rear Axle Weldment	1	
-2	01-10027	81381	Leaf Spring, 5 Leaf	2	
-3	06-61901	81381	U-Bolt, 5/8-18	4	
-4	06-61819	81381	Tie Plate	2	
-5	321510110	81381	Nut, 5/8-18 UNF Hex	8	
-6	324000110	81381	5/8 Lock Washer	8	
-7	02-20704	81381	Front Shackle Weldment	2	
-8	02-20705	81381	Rear Shackle Weldment	2	
-9	02-20705	81381	Dust Shield for 9" Brake	4	
-10	06-61435	81381	Dust Shield Spacer	8	
-11	02-20735	81381	Brake Lever Weldment, w/ 3/4 offset	2	
-12	390908028	81381	9 x 2 Mechanical Parking Brake	2	
-13	321800090	81381	1/2-13 Nut	8	
-14	NOT USED				
-15	3202224100	81381	Bolt, 1/2-13 x 2.00	8	
-16	06-61900	81381	9 x 2 Brake Drum, 3.13 Long	3	
-17	02-03916	81381	Hub, #623 5 on 5.5 bolt pattern	2	
-18	02-03207	81381	Grease Seal	2	
-19	130400100	81381	Inner Cone, #24780	2	
-20	130395200	81381	Inner Cup, #24720	2	
-21	130360200	81381	Outer Cup, #15245	2	
-22	130355100	81381	Outer Cone, #15123	2	
-23	06-60591	81381	1" Tongued Washer	2	
-24	321415140	81381	Nut, Slotted Hex, 1-14	2	
-25	324612100	81381	Cotter Pin, 1/8 x 1.50	2	
-26	06-11814	81381	Grease Cap, #623	2	
-27	06-60591	81381	Wheel Stud, 1/2-20	10	
-28	06-12103	81381	Wheel Nut, 1/2-20	10	
-29	06-60136	81381	Shackle Bolt, 9/16-18	4	
-30	322400100	81381	Nut, 9/16-18 Locking Jam	4	

Figure 1.3 Fifth Wheel Hub Assemblies

Table 1.3 Fifth Wheel Hub Assemblies

Fig & Ind #	Part Number	MFR Code	Description	Qty	Usable On Code
1.3			FIFTH WHEEL HUB ASSEMBLIES		
-1	03-30241	81381	Front Axle Weldment, T.I. STND. 5th Wheel	1	
-2	02-20322	81381	Hub Assembly, #623	2	
-3	02-03916	81381	Hub, #623 Cupped and Studded	2	
-4	02-03207	81381	Grease Seal, #623	2	
-5	130400100	81381	Inner Cone, #24780	2	
-6	130395200	81381	Inner Cup, #24720	2	
-7	130360200	81381	Outer Cup, #15245	2	
-8	130355100	81381	Outer Cone, #15123	2	
-9	06-12016	81381	Grease Cap, #623	2	
-10	06-60440	81381	Wheel Stud, 1/2-20 UNF	10	
-11	02-20409	81381	Hub Assembly, 655/#42 Idler	1	
-12	02-20212	81381	Hub, Cupped and Studded, #655 Idler	1	
-13	06-60403	81381	Grease Seal, #22550	1	
-14	130580500	81381	Inner Cone, #25580	1	
-15	130405200	81381	Inner Cup, #25520	1	
-16	130360200	81381	Outer Cup, #15245	1	
-17	130355100	81381	Outer Cone, #15123	1	
-18	06-60479	81381	Grease Cap, #1520	1	
-19	06-60538	81381	Wheel Stud, 1/2-20 UNF	6	
-20	06-12103	81381	Nut, 1/2-20 Hex Nut	6	
-21	06-12104	81381	Washer, 1/2 Lock	6	
-22	06-60295	81381	Washer, 1" Tongue Spindle	3	
-23	321415140	81381	Nut, 1-14 UNF Slotted Hex Spindle	3	
-24	02-02370	81381	Queen Bolt, 1-14 x 8.75	1	
-25	320700140	81381	Nut, 1-14 Hex Jam	1	
-26	06-13144	81381	Nut, 1/2-20 Tapered Hex Wheel	10	

Figure 1.4 Overall Axle Assembly

Table 1.4 Overall Axle Assembly

Fig & Ind #	Part Number	MFR Code	Description	Qty	Usable On Code
1.4	04-40378		OVERALL AXLE ASSEMBLY		
-1	04-40386	81381	Front Axle Assembly	1	
-2	04-40391	81381	Rear Axle Assembly	1	
-3	04-40385	81381	Drawbar Assembly, 6 x 48	1	
-4	02-20719	81381	Towbar Pin Weldment	1	
-5	321700160	81381	Nut, 1-14 Slotted	1	
-6	324612100	81381	Cotter Pin, 1/8 x 150	1	
-7	02-20723	81381	Cross Shaft	1	
-8	02-20644	81381	Short Brake Rod Assembly, 13.00 LG	2	
-9	02-20727	81381	Long Brake Rod, 90.5" LG	2	
-10	03-18451	81381	Brake Lever, Orscheln	1	
-11	02-20721	81381	Trunnion Weldment	1	
-12	06-12104	81381	1/2" Lock Washer	6	
-13	02-12103	81381	Wheel Nut, 1/2-20	6	
-14	02-20725	81381	Tire Assembly,7.5 x 10 x 12 Ply	2	
	02-20726	81381	Tire Assembly, 7.5 x 10 x 16 Ply	2	
-15	06-61849	81381	Shaft Locking Collar	2	

Figure 1.5 Brake Assembly

Table 1.5 Brake Assembly

Fig & Ind #	Part Number	MFR Code	Description	Qty	Usable On Code
1.5			BRAKE ASSEMBLY		
-1	41-308664	81381	Spring, Shoe Return	2	
-2	41-415200	81381	Shoe and Lining	2	
-3	41-308665	81381	Spring, Retaining	1	
-4	41-308743	81381	Support Plate	1	
-5	390908028	81381	Brake Assembly, 9 x 2	1	

Figure 1.6 Door Assembly

Table 1.6 Door Assembly

Fig & Ind #	Part Number	MFR Code	Description	Qty	Usable On Code
1.6			DOOR ASSEMBLY		
-1	SA000010	81381	Assembly, Door, Gull-Wing, w/ Hinge	2	
-2	SD000145	81381	Hinge, Gull-Wing Door	1	
-3	12950501	81381	Latch for D-Ring	1	
-4	279L	81381	D-Ring, S.S., for Latch, Locking	1	
-5	SD000146	81381	Insulation Panel, RS-LS	2	
-6	SD000148	81381	Insulation Panel, Top	1	
-7	SD000149	8138	Insulation Panel, Bottom	1	
-8	12950502	81381	Striker, for Door Latch	1	
-9	SPD-3100200	81381	Strut, Gas, 200 LBF, 10-inch stroke	2	
-10	SPD-1007	81381	Stud, Ball, 13mm	2	
-11	SPD-1008	81381	Clip, Safety, 13mm	2	
-12	SD000345	81381	Retaining Sheet, Top 2" Perf. *(NOT SHOWN)*	1	
-13	SD000346	81381	Retaining Sheet, Bottom 2" Perf. *(NOT SHOWN)*	1	
-14	12903169	81381	Cover Plate, Door Strap *(Not Shown)*	1	
-15	12931829	81381	Hook, Door Strap *(Not Shown)*	1	
-16	12903263	81381	Hook, Door Strap *(Not Shown)*	1	

Figure 1.7 Hose Basket Parts Assembly

Table 1.7 Hose Basket Parts Assembly

Fig & Ind #	Part Number	MFR Code	Description	Qty	Usable On Code
1.7	SW000073	81381	HOSE BASKET PARTS ASSEMBLY		
-1	SD000373	81381	. Basket, Hose	1	
-2	SD000374	81381	. Door, Hose Basket	1	
-3	SD000372	81381	. Hinge, Hose Basket	1	
-4	AD-100	81381	. Latch, Hood Fastener, Rubber	2	

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Group 2

Engine and Compressor

Figure 2.1 Engine and Compressor Assembly

Table 2.1 Engine Assembly, TR/TMD-300/400

Fig & Ind #	Part Number	MFR Code	Description	Qty	Usable On Code
2.1			DETROIT DIESEL ENGINE ASSEMBLY		
-1	SA000145	81381	Engine Assembly, TR/TMD-400	REF	
-2	SP000010	81381	Engine, Detroit, Series DDC/MTU 2000, 12V2000	1	
	SD000024	81381	Mount, Vibration	1	
	SD000027	81381	Mount, Vibration	1	
	SD000028	81381	Mount, Vibration	1	
	12950282	81381	Washer, Snubbing	2	
	SD000029	81381	Washer, Snubbing	2	
	SD000030	81381	Mount, Vibration	2	
-3	SP000005	81381	Compressor, 400 ppm, A/S GHH CD42	1	
	SD000218	81381	Stand Pipe, Compressor Sump Breather / Fill	1	
-1	change	81381	Engine Assembly, TR/TMD-300	REF	
-2	SP000009	81381	Engine, Detroit, Series DDC/MTU 2000, 12V2000	1	
	SD000025	81381	Mount, Vibration	1	
	SD000024	81381	Isolator, Compressor Vibration RH	1	
	SD000026	81381	Mount, Vibration	1	
	12950284	81381	Isolator, Compressor Vibration LH	1	
	12950285	81381	Washer, Snubbing	2	
	SD000029	81381	Washer, Snubbing	2	
	SD000030	81381	Mount, Vibration	2	
-3	SP000004	81381	Compressor, 300 ppm, A/S GHH CD42	1	
	SD000218	81381	Stand Pipe, Compressor Sump Breather / Fill	1	
			USED ON TR/TMD-300/400		
	SA000049	81381	Mount, Assembly, Detroit/GHH	1	
	512-3-N-S	81381	Isolator, Engine Vibration	2	
	12980044	81381	Washer, Snubbing	2	
	SD000033	81381	Mount, Engine, Detroit, Series DDC/MTU 2000	1	

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Group 3

Fuel System

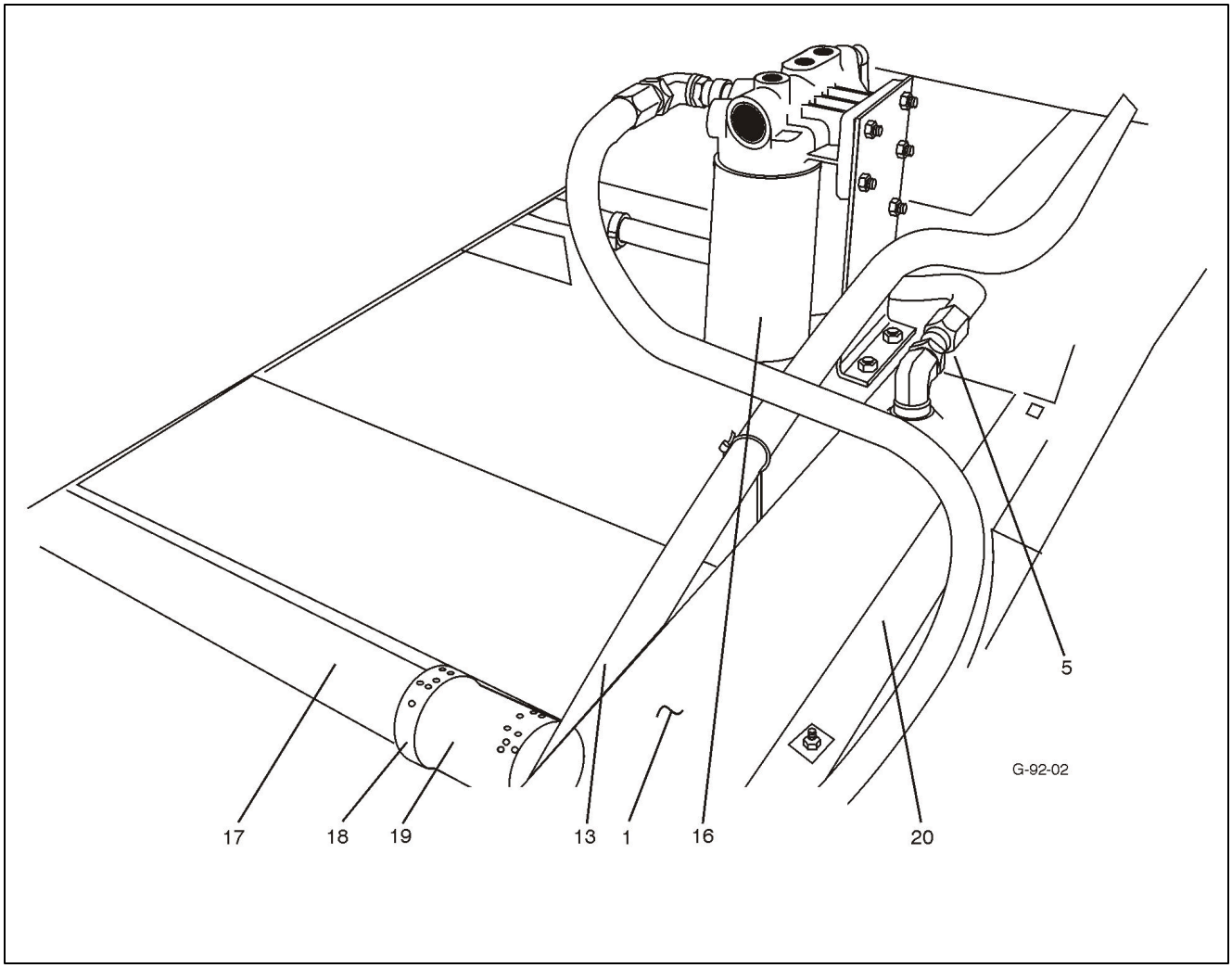

Figure 3.1 Standard Fuel Kit Assembly

Table 3,1 Standard Fuel Kit Assembly

Fig & Ind #	Part Number	MFR Code	Description	Qty	Usable On Code
3.1			STANDARD FUEL KIT ASSEMBLY		
-1	SA000107	81381	Tank, Fuel, W/Fill Pipe (Left)	1	
-2	SA000108	81381	Tank, Fuel (Right) *(Not Shown)*	1	
-	SA000143	81381	Assembly, Fuel Tank (Trailer Unit)	1	
-3	78898	81381	Adapter, Connector, Male, Aeroquip 2021-8-8S	1	
-4	232B-4PP	81381	Valve, Check, 1/2" NPT	1	
-5	2083-12-8S	81381	Adapter, Nipple, 3/4" MNPT x 1/2" MNPT	1	
-6	SA000023	81381	Assembly, Hose, Fuel Pick-	1	
-7	78894	81381	Adapter, Connector, Male, Aeroquip 2021-6-8S	1	
-8	23518529	81381	Filter, Fuel, Secondary (Engine Mounted)	1	
-9	2089-4-2S	81381	Elbow, Reducing 90	1	
-10	208007-4-2S	81381	Cross	1	
-11	2081-4-2S	81381	Bushing, Reducer	1	
-12	77006	81381	Adapter, Elbow 90 Degree, Aeroquip 2024-12-8S	1	
-13	SA000022	81381	Assembly, Hose, Fuel Return	1	
-14	77738	81381	Clamp, Support, Hose, Clamp ID=.938	1	
-15	SW000006	81381	Mount/Fuel Tank *(Not Shown)*	1	
-16	23518528	81381	Filter, Fuel, Primary (Remote Mounted)	1	
-17	P206334	81381	Pipe, Cross over	AR	
-18		81381	Clamp, Hose	4	
-19	28348	81381	Hose	2	
-20	SD000490	81381	Strap, Fuel Tank Hold Down	2	
-21	SW000110	81381	Weldment, Fuel Cooler Mount *(Not Shown)*	1	
-22	DB-1294	81381	Cooler, Fuel *(Not Shown)*	1	

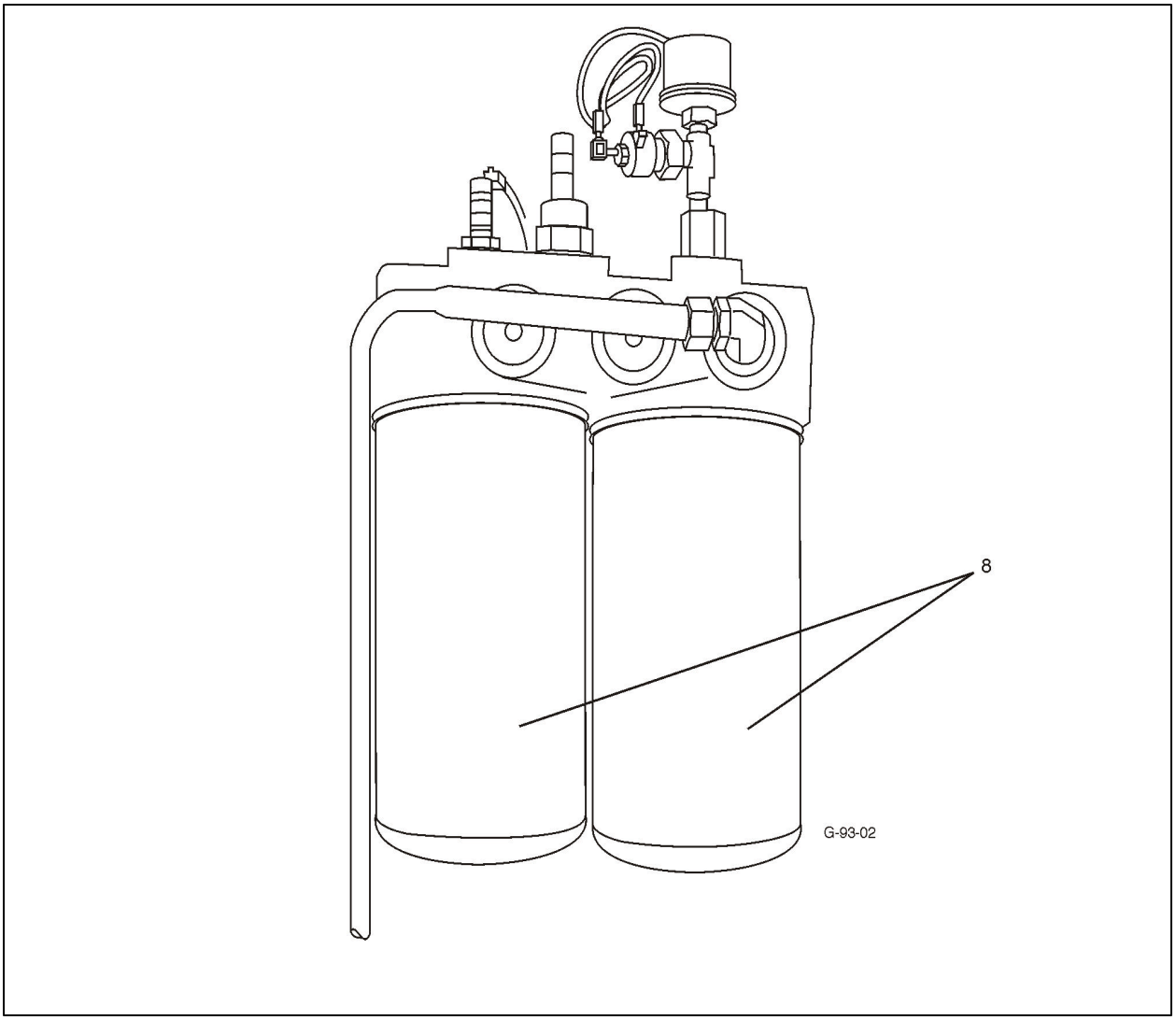

Figure 3.2 Standard Fuel Kit Assembly

Table 3,1 Standard Fuel Kit Assembly (Cont)

Fig & Ind #	Part Number	MFR Code	Description	Qty	Usable On Code
3.1			STANDARD FUEL KIT ASSEMBLY		
-1	SA000107	81381	Tank, Fuel, W/Fill Pipe (Left)	1	
-2	SA000108	81381	Tank, Fuel (Right) *(Not Shown)*	1	
-	SA000143	81381	Assembly, Fuel Tank (Trailer Unit)	1	
-3	78898	81381	Adapter, Connector, Male, Aeroquip 2021-8-8S	1	
-4	232B-4PP	81381	Valve, Check, 1/2" NPT	1	
-5	2083-12-8S	81381	Adapter, Nipple, 3/4" MNPT x 1/2" MNPT	1	
-6	SA000023	81381	Assembly, Hose, Fuel Pick-	1	
-7	78894	81381	Adapter, Connector, Male, Aeroquip 2021-6-8S	1	
-8	23518529	81381	Filter, Fuel, Secondary (Engine Mounted)	1	
-9	2089-4-2S	81381	Elbow, Reducing 90	1	
-10	208007-4-2S	81381	Cross	1	
-11	2081-4-2S	81381	Bushing, Reducer	1	
-12	77006	81381	Adapter, Elbow 90 Degree, Aeroquip 2024-12-8S	1	
-13	SA000022	81381	Assembly, Hose, Fuel Return	1	
-14	77738	81381	Clamp, Support, Hose, Clamp ID=.938	1	
-15	SW000006	81381	Mount/Fuel Tank *(Not Shown)*	1	
-16	23518528	81381	Filter, Fuel, Primary (Remote Mounted)	1	
-17	P206334	81381	Pipe, Cross over	AR	
-18		81381	Clamp, Hose	4	
-19	28348	81381	Hose	2	
-20	SD000490	81381	Strap, Fuel Tank Hold Down	2	
-21	SW000110	81381	Weldment, Fuel Cooler Mount *(Not Shown)*	1	
-22	DB-1294	81381	Cooler, Fuel *(Not Shown)*	1	

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Group 4

Engine Air Intake

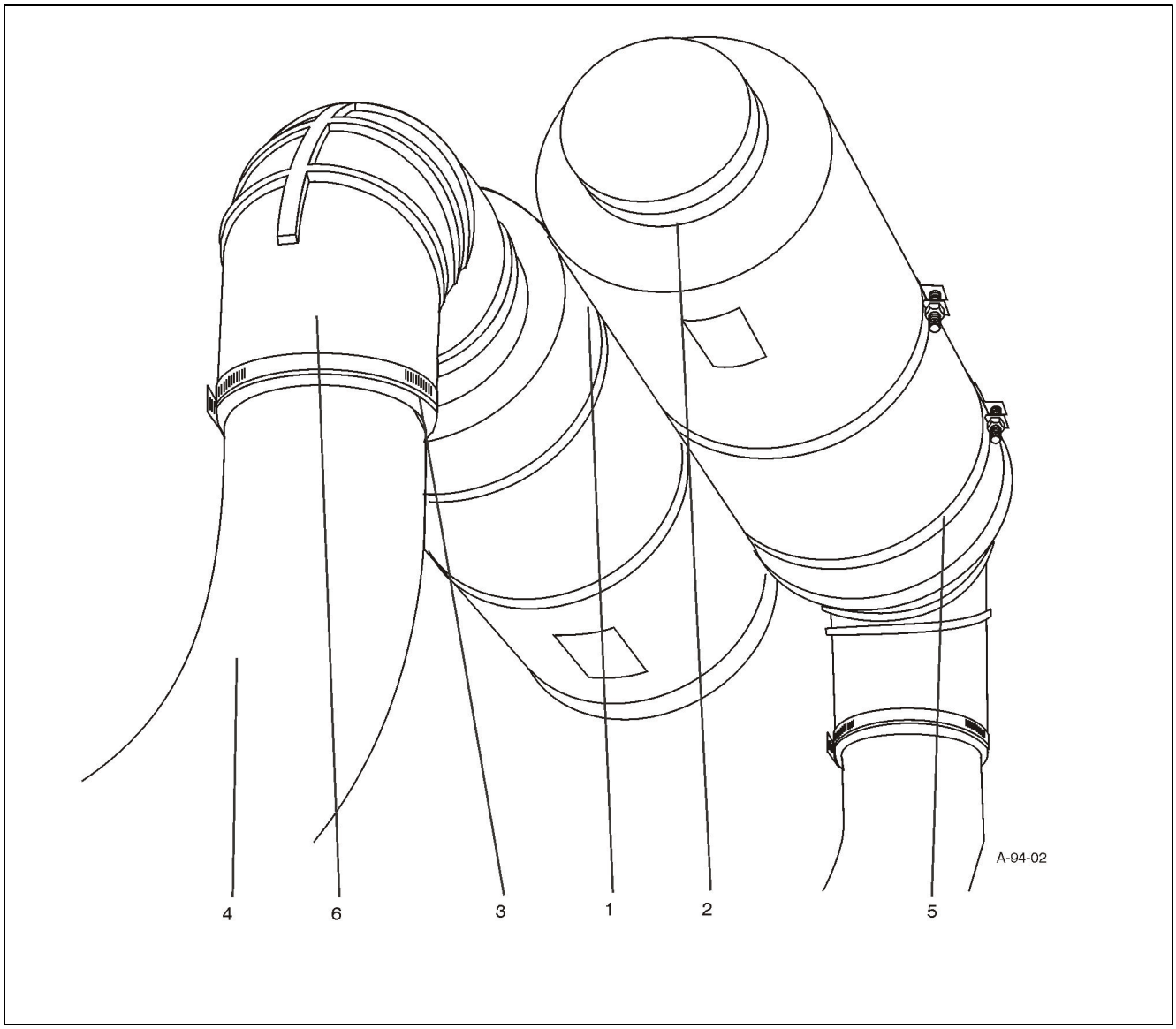

Figure 4.1 Engine Air Intake Assembly

Figure 4.1 Engine Air Intake Assembly

Fig & Ind #	Part Number	MFR Code	Description	Qty	Usable On Code
4.1	SD000484		ENGINE AIR INTAKE ASSEMBLY		
-1	ECG11-2401	81381	Assembly, Air Cleaner, Extended Life Filter	2	
-2	P15-0862	81381	Cover, 2400 Series	2	
	P15-0694	81381	Element, Filter Replacement, Series 2400	2	
	5-0695	81381	Element, Filter Replacement, Series 2400	2	
-3	78603	81381	Clamp, Worm	8	
-4	P207341	81381	Elbow, Steel 90	2	
-5	H000349	81381	Band, Mounting	4	
-6	SP000021	81381	Elbow, Rubber, 90°	2	
-7	P112611	81381	Hose, Expansion *(Not Shown)*	2	
-8	H1200	81381	Inlet Hood, Air Ram *(Not Shown)*	2	

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Group 5

Engine Lubrication System

The engine lubrication system is completely contained within the engine assembly; refer to the Detroit Diesel *Custom Parts Catalogue* for detailed parts information on the engine lubrication system.

NOTE: The Detroit Diesel *Custom Parts Catalogue* is provided to assist in the ordering of parts and replacement items.

Ind. #	Part Number	MFR Code	Description	Qty.
-1	23526919	81381	Filter, Lube Oil, Full Flow	3
-2	SH000001	81381	Oil Filter with Head	1

Group 6

Engine Cooling System

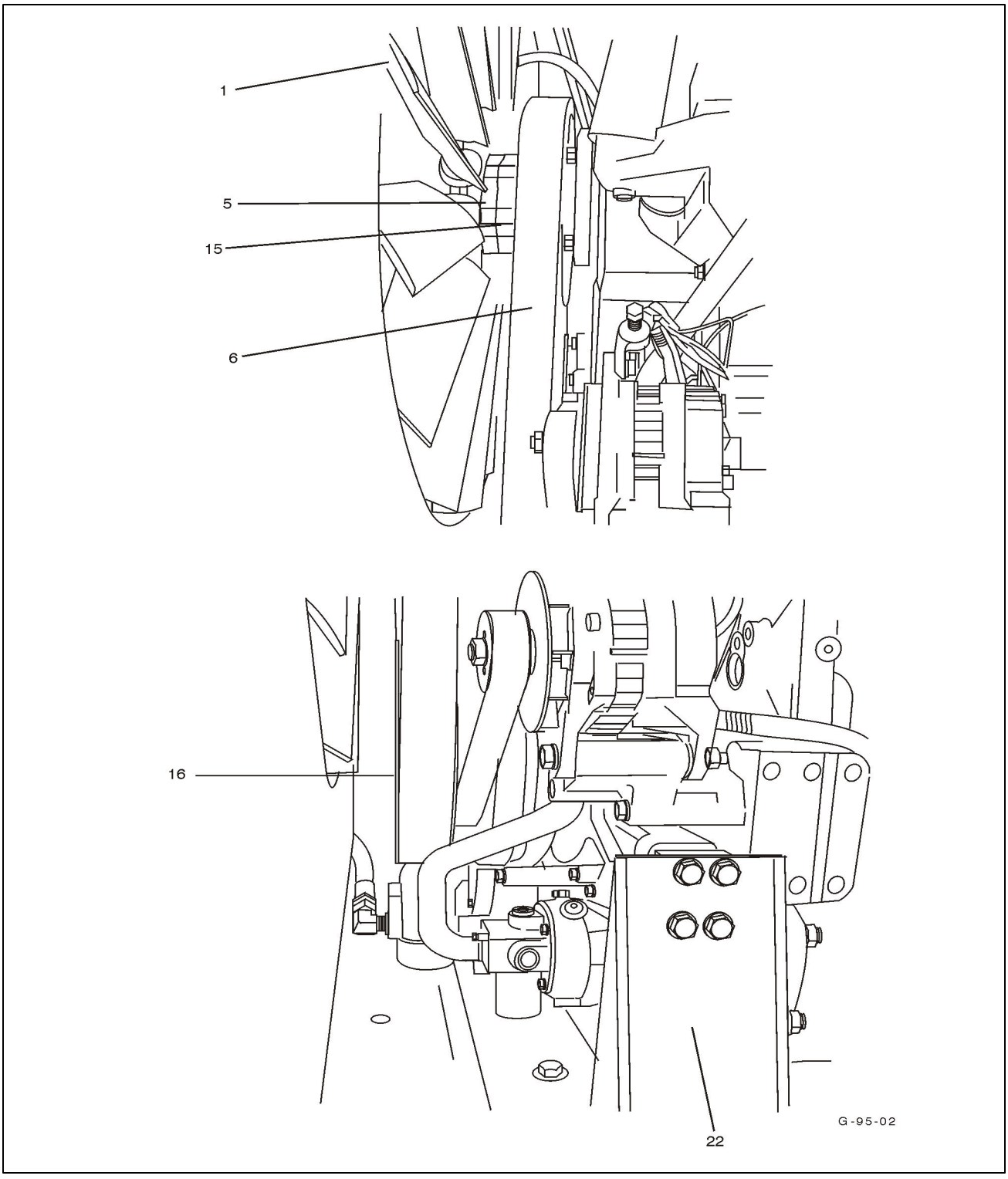

Figure 6.1 Fan Drive Parts Assembly

Table 6.1 Fan Drive Parts Assembly and Jacket Water Parts Assembly

Fig & Ind #	Part Number	MFR Code	Description	Qty	Usable On Code
6.1			FAN DRIVE PARTS ASSEMBLY		
-1	SP000035	81381	Fan, 40" 8 Blade Aluminum	1	
-2	SW000017	81381	Weldment, Engine Fan Ring RH	1	
-3	SD000079	81381	Adapter, Engine Fan Ring	1	
-4	SW000109	81381	Weldment, Base Fan Shroud	1	
-5	5141289	81381	Spacer, Engine Fan	1	
-6	795L12	81381	Belts, Fan, Poly Rib	Set/3	
-7	SW000058	81381	Weldment, Engine Fan Ring LH	1	
-8	11501754	81381	Bolts, Pulley *(Not Shown)*	10	
-9	75W4	81381	Hose, Water, 4"	2	
-10	28336	81381	Hose, Radiator 2 ¼"	12 ft.	
-11	28348	81381	Hose, 3"	12 ft.	
-12	SD000219	81381	Ring, Engine Fan *(Not Shown)*	1	
-13	U5124143	81381	Guard, ASM, Fan 6V71-8V92	1	
-14	23525959	81381	Tensioner	1	
-15	5142149	81381	Pulley, Fan	1	
-16	53603205	81381	Pulley	1	
-17	531206004	81381	Bracket	1	
-18	11505299	81381	Bolt *(Not Shown)*	3	
-19	1150953	81381	Bolt *(Not Shown)*	4	
-20	23526008	81381	Bolt *(Not Shown)*	1	
-21	8929068	81381	Bolt *(Not Shown)*	14	
-22	SW000052	81381	Weldment, Engine Mount, Front	2	

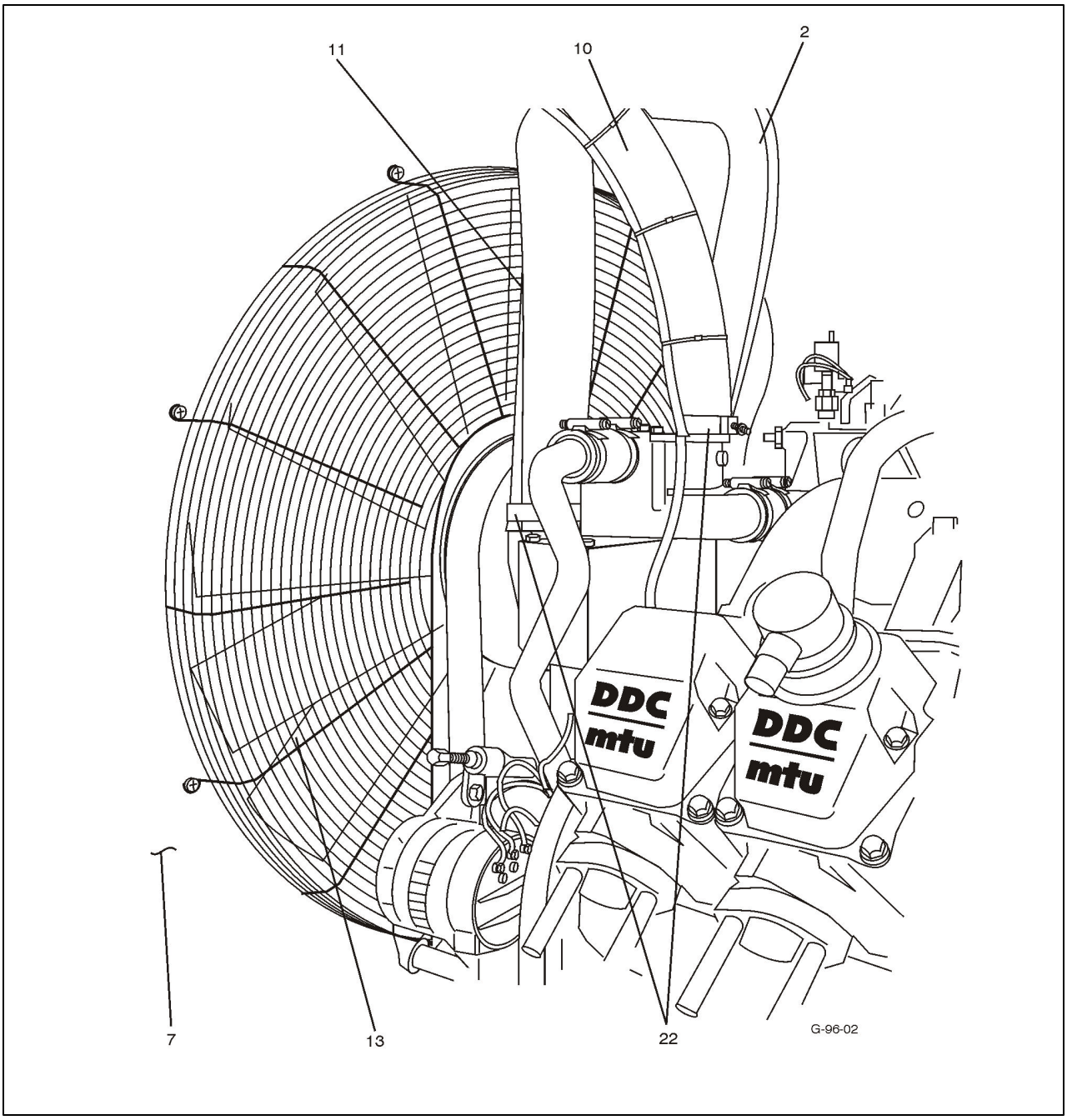

Figure 6.2 Jacket Water Parts Assembly

Radiator Components.

Table 6.1 Fan Drive Parts Assembly and Jacket Water Parts Assembly (Cont)

Fig & Ind #	Part Number	MFR Code	Description	Qty	Usable On Code
6.1			FAN DRIVE PARTS ASSEMBLY		
-1	SP000035	81381	Fan, 40" 8 Blade Aluminum	1	
-2	SW000017	81381	Weldment, Engine Fan Ring RH	1	
-3	SD000079	81381	Adapter, Engine Fan Ring	1	
-4	SW000109	81381	Weldment, Base Fan Shroud	1	
-5	5141289	81381	Spacer, Engine Fan	1	
-6	795L12	81381	Belts, Fan, Poly Rib	Set/3	
-7	SW000058	81381	Weldment, Engine Fan Ring LH	1	
-8	11501754	81381	Bolts, Pulley *(Not Shown)*	10	
-9	75W4	81381	Hose, Water, 4" *(Not Shown)*	2	
-10	28336	81381	Hose, Radiator 2 ¼"	12 ft.	
-11	28348	81381	Hose, 3"	12 ft.	
-12	SD000219	81381	Ring, Engine Fan *(Not Shown)*	1	
-13	U5124143	81381	Guard, ASM, Fan 6V71-8V92	1	
-14	23525959	81381	Tensioner *(Not Shown)*	1	
-15	5142149	81381	Pulley, Fan	1	
-16	53603205	81381	Pulley	1	
-17	531206004	81381	Bracket *(Not Shown)*	1	
-18	11505299	81381	Bolt *(Not Shown)*	3	
-19	1150953	81381	Bolt *(Not Shown)*	4	
-20	23526008	81381	Bolt *(Not Shown)*	1	
-21	8929068	81381	Bolt *(Not Shown)*	14	
-22	MB9425T75S283F	81381	Clamp, T-Bolt, 3"	6	

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Group 7

Engine Exhaust System

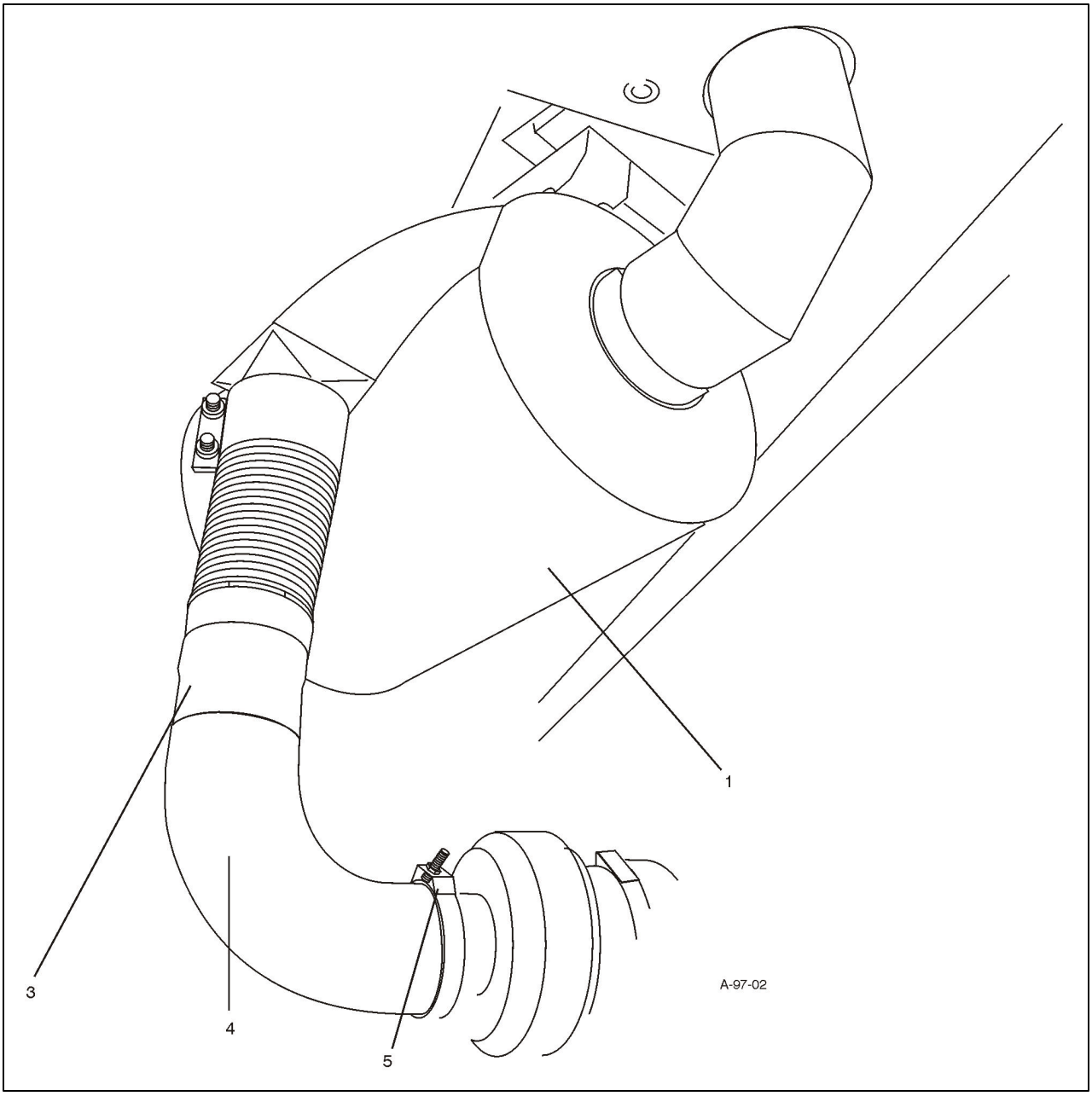

Figure 7.1 Engine Exhaust Parts Assembly

Table 7.1 Engine Exhaust Parts Assembly

Fig & Ind #	Part Number	MFR Code	Description	Qty	Usable On Code
7.1			ENGINE EXHAUST PARTS ASSEMBLY		
-1	SP000014	81381	Spiral Silencer	2	
-2	P270543	81381	Rain Cap, 6" Exhaust *(Not Shown)*	2	
-3	X005833	81381	Seal Clamp, 5"	2	
-4	SD000370	81381	Exhaust Elbow, Turbo to Muffler	2	
-5	23506159	81381	Clamp, Turbo, 5"	2	
-6	SD000369	81381	Blanket, Heat Dissipation, Muffler *(Not Shown)*	2	

NOTE: Refer to the Detroit Diesel *Custom Parts Catalogue* located in the appendix of this manual for engine exhaust parts information.

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Group 8

Electrical System

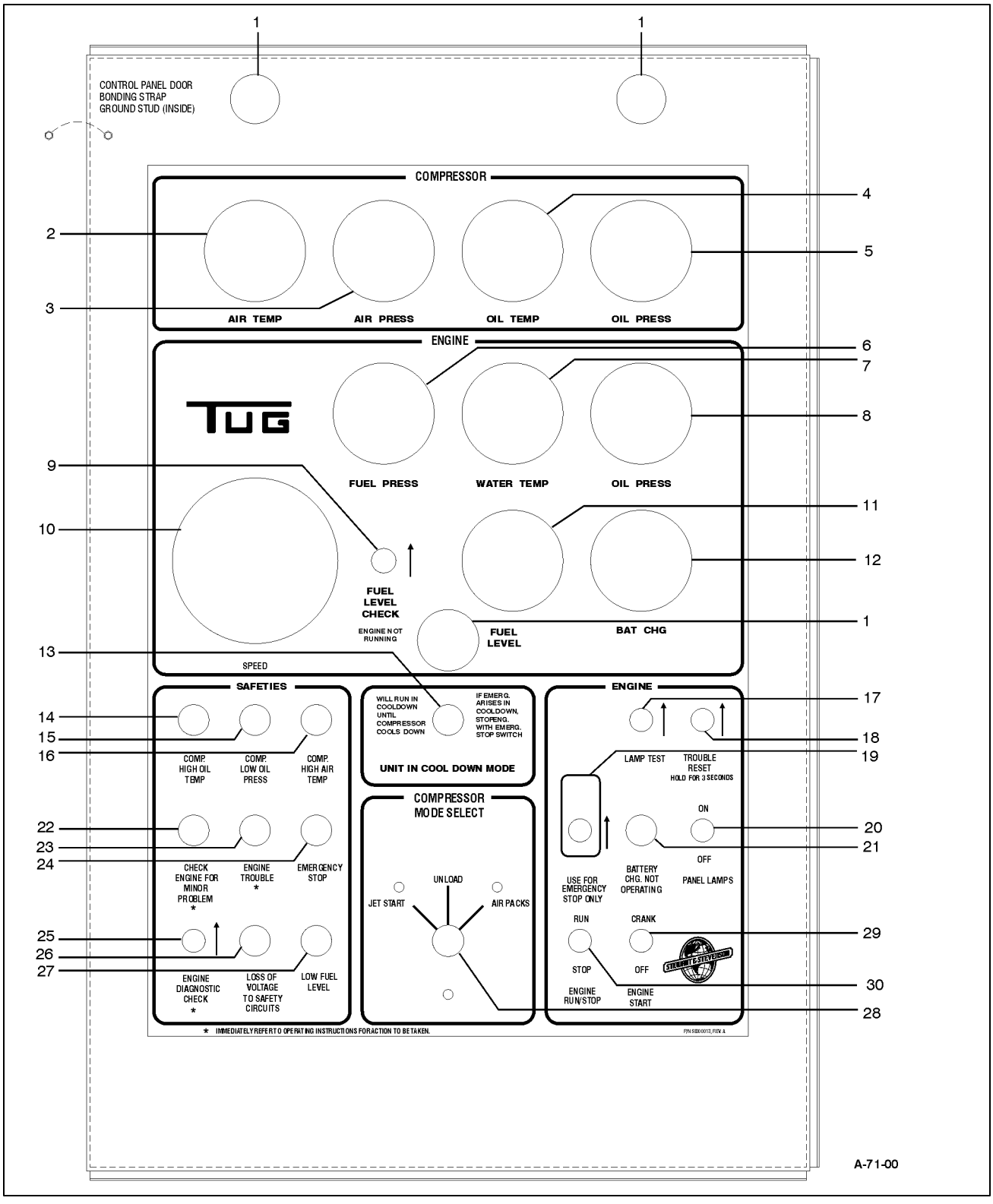


Figure 8.1 Control Panel, Assembly (Sheet 1 of 2)

Table 8.1 Control Panel, Assembly

Fig & Ind #	Part Number	MFR Code	Description	Qty	Usable On Code
8.1	SE000105	81381	CONTROL PANEL, ASSEMBLY	1	
-1	SE000013	81381	Faceplate, Control Panel	1	
	SE000062	81381	Harness, Elect, Control Panel *(Not Shown)*	1	
-2	LE000321	81381	Assembly, Utility Lamp with 24V Bulb (DS12A, DS12B, DS12C)	3	
	LE000320	81381	Bulb, 12V, GE PL 303	1	
-3	G2OUB4-FTG-7342	81381	Gauge, Air Temperature, 150-750 °F, Mechanical	1	
-4	12980039	81381	Gauge, Air Pressure, 0-60 psi, Mechanical	1	
-5	310-910	81381	Gauge, Temperature, 100-250 °F (40-120 °C), 24V, with 24v (P/N 600-826) Bulb, for use with 10-180 Ohm Sender (GA4, GA6, GL4, GL6)	2	
-6	350-902	81381	Gauge, Pressure, 0-80 psi, 5 Bar, 24V, with 24V (P/N 600-826) Bulb, for use with 10-180 Ohm Sender (GA5, GL5)	1	
-7	350-906	81381	Gauge, Pressure, 0-100 psi, 7 Bar, 24V, with 24V (P/N 600-826) Bulb, for use with 10-180 Ohm Sender (GA2, GA3, GL2, GL3)	2	
-8	12930787	81381	Tachometer, 0-3500 rpm, with Hourmeter, for use with Electronic Engines (DDEC, etc.) with 24V Bulb (GA7, GL7)	1	
-9	MS35058-26	81381	Switch, Toggle, SPDT, Momentary (On-None-On) Screw Terminals (S16)	1	
-10	301-904	81381	Gauge, Fuel Level, E-1/2-F, for use with 240-33 Ohm Sender, 240 Ohm with Empty Tank, with 24V (P/N 600-826) Bulb (GA1, GL1)	1	
-11	332-902	81381	Voltmeter, 18-32V, with 24V (P/N 600-826) Bulb (M1, GL8)	1	
-12	LE000062	81381	Lampholder with Screw Terminals, Oil Tight, Dialight P/N 125-1310-11-103 (DS1-DS6, DS8-11)	10	
-13	LE000064	81381	Bulb, 24V-DC (Type T3 1/4, 1819) (DS1-DS6, DS8-11)	10	
-14	LE000063	81381	Lens, Red, Stovepipe, Internal Fluted, Dialight P/N 125-1191-403 (DS1, DS3-DS6, DS8-DS10)	8	

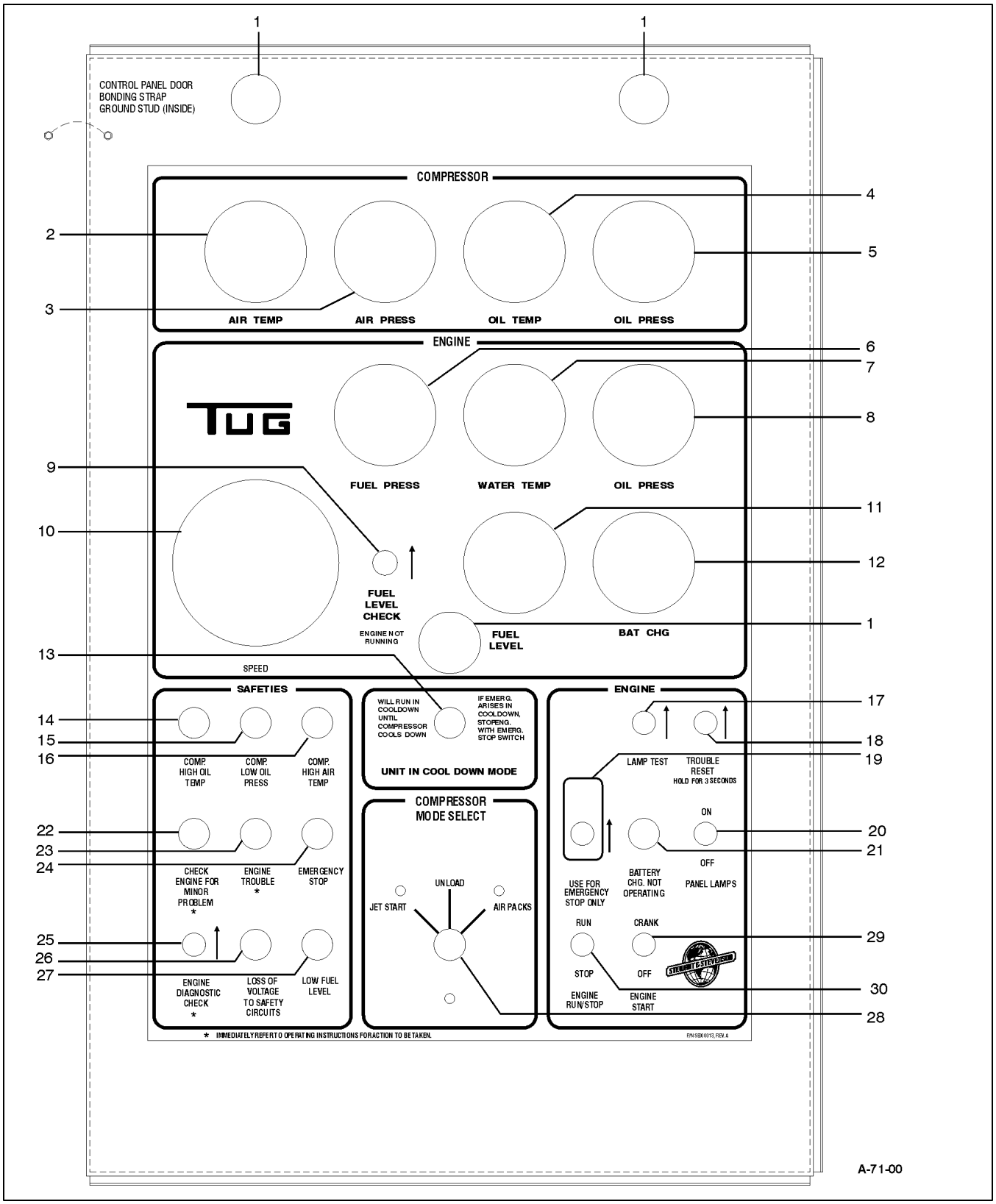
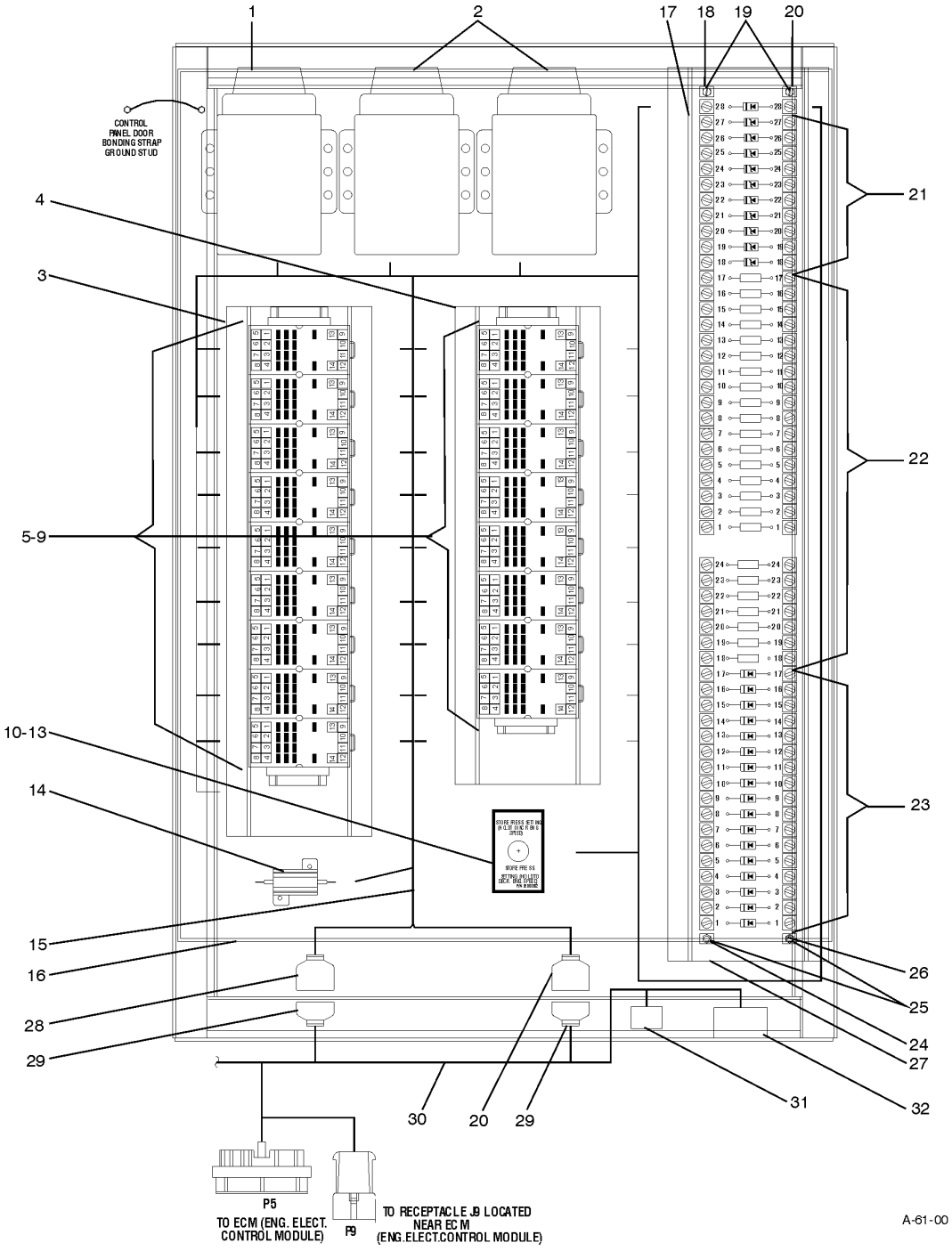


Figure 8.1 Control Panel, Assembly (Sheet 2 of 2)

Table 8.1 Control Panel, Assembly (Cont.)

Fig & Ind #	Part Number	MFR Code	Description	Qty	Usable On Code
-15	LE000065	81381	Lens, Amber, Stovepipe, Internal Fluted, Dialight P/N 125-1193-403 (DS2, DS11)	2	
-16	LE000108	81381	Switch, Toggle, SPST Momentary On (Off-None-On) Environmentally Sealed, Cutler Hammer P/N MS24523-30 (S1, S6)	2	
-17	LE000249	81381	Switch, Toggle, 4PDT, Momentary On (On-None-On). Environmentally Sealed, Screw Terminals, Cutler Hammer P/N MS24525-26 (was MS2452) (S13)	1	
-18	MS24523-26	81381	Switch, Toggle, SPST, Momentary Off (On-None-Off) Environmentally Sealed, Screw Terminals (S15 - Not Used)	1	
-19	3SB02-K4R11	81381	Switch, Emergency Stop, Red Mushroom	1	
-	SL000003	81381	Label, Emergency Stop Switch, Yellow Background	1	
	8497K1	81381	Guard, Toggle Switch, Red	1	
-20	IN4006	81381	Rectifier, 1 Amp, 600 P.R.V., Motorola (CR1)	1	
-21	MS35058-22	81381	Switch, Toggle, SPST Maintained (On-None-Off) Screw Terminals (S12)	1	
-22	LE 000307	81381	Switch, Toggle, 4PDT, Maintained, On-None-On, Environmentally Sealed, Cutler Hammer P/N MS24525-23 (S2)	1	
-23	02011-10	81381	Jumper, for Adjacent Contact on Same Deck, for Series 24 Switch (S10)	5	
-24	44204LN	81381	Switch, Rotary Type, Series 24, with 4 Sections, 2 Poles per Section, contact Assembly 2, 3 POS. Maintained Contacts, with Waterproof Mounting Kit for 0.125 to 0.1875 Thick Panel, 2 Stop Screws Installed in Stop Holes 2 and 7, with P/N 02000-11 Oval Handle (S10)	1	



Control Panel, Assembly, Main Relay Panel (Sheet 1 of 2)

Table 8.2 Control Panel, Assembly, Main Relay Panel

Fig & Ind #	Part Number	MFR Code	Description	Qty	Usable On Code
8.2	SE000047	81381	CONTROL PANEL, ASSEMBLY, MAIN RELAY PANEL	1	
-1	7022OF	81381	Time Delay Relay, 24VDC Coil, 1 to 10 Minute Delay on De-energization (TD1)	1	
-2	70120C	81381	Time Delay Relay, 24VDC Coil, 1.5 to 15 Second Delay on Energization (TD2, TD3)	2	
-3	SD000390	81381	Subplate, Relay Mounting (K1, K2, K5-K9, K11, K12)	1	
-4	SD000391	81381	Subplate, Relay Mounting (K13A, K13B, K15-K19)	1	
-5	RY4S-ULDC24V	81381	Relay, 4PDT, 5 Amp, with 24VDC Coil, with Built-in Indicator Light, Plug-in Type (K1, K2, K5-K9, K11, K12, K13A, K13B, K14-K19)	17	
-6	SY4S-05	81381	Socket, Relay, for Plug-in 4PDT Relay, DIN Rail Snap Mount Type Furn. with (2) Y778-011 Hand Down Spring Anchors (Horse Shoe Clips) (K1, K2, K5-K9, K11, K12, K13A, K13B, K14-K19)	17	
-7	SY4S-51F1	81381	Hold Down Spring, Relay (K1, K2, K5-K9, K11, K12, K13A, K13B, K14-K19)	17	
-8	BNDN1000	81381	Relay Mounting DIN Rail, 1 Meter Long (K1, K2, K5-K9, K11, K12, K13A, K13B, K14-K19)	1-Cut	
-9	BNL5	81381	DIN Rail End Stop (K1, K2, K5-K9, K11, K12, K13A, K13B, K14-K19)	4	
-10	LE000106	81381	Switch, Toggle, SPDT Momentary On (On-Off-On) Environmentally Sealed, Screw Terminals, Cutler Hammer P/N MS24523-27 (S14)	1	
-11	SE000031	81381	Bracket, Switch Mounting (S14)	1	
-12	SE000032	81381	Nameplate, Store Pressure Setting (increase/decrease) (S14)	1	
-13	SE000033	81381	Cover, Switch, Tamper Resistant (S14)	1	
-14	LE000252	81381	Resistor, 25 Ohm, 50 Watt, Dale P/N RH5025 (R12)	1	
-15	SE000041	81381	Assembly, Electrical Harness, Main Relay Panel	1	
-16	BB200	81381	Bushing, Insulation, Male, 2" *(Not Shown)*	1	
-17	BL200	81381	Lock Nut, Conduit, 2" *(Not Shown)*	1	

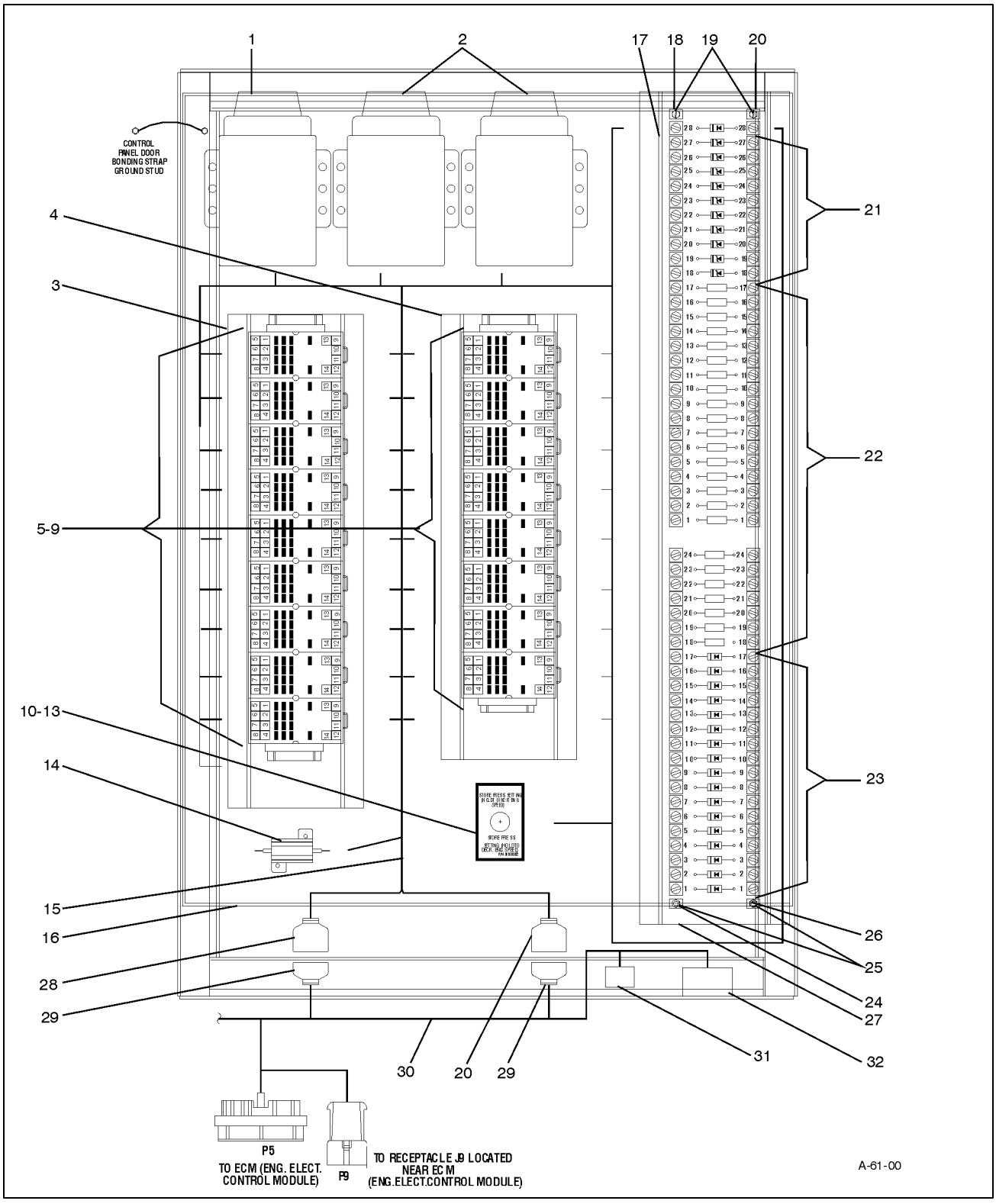


Figure 7.18 Control Panel, Assembly, Main Relay Panel (Sheet 2 of 2)

Table 8.2 Control Panel, Assembly, Main Relay Panel (Cont.)

Fig & Ind #	Part Number	MFR Code	Description	Qty	Usable On Code
-16	SD000285	81381	Subplate, Main Back Plate, Relay-Resistor-Rectifier Mounting	1	
-17	SD000392	81381	Subplate, Terminal Board Mounting (CR2-CR18, R1-R11, R13-R25, Z2-Z8, Z10, Z11)	1	
-18	FB12801A	81381	Marker Strip, 31 Point, Printing Style No. 10 (TB3 - Cut Down to 28 Points)	1	
-19	670A-RZ-28	81381	Terminal Board, 31 Point, with 6-32 Brass Plated Screws (TB3, TB4 28 Points)	2	
-20	FB128048	81381	Marker Strip, 28 Point, Printing Style No. 40 (TB4)	1	
-21	LE000318	81381	Voltage Surge Suppressor, Breakdown Voltage, 33 Volts, 1500 Watts, Uni-Directional, General Instruments P/N 1.5KE33A (Z1-Z8, Z10, Z11)	10	
-22	LE000131	81381	Resistor, 220 Ohm, 5 Watt, Ohmite Mfg. P/N 95J220 (R1-R11, R13-R25)	24	
-23	7859	81381	Rectifier, 1 Amp, 800 P.R.V. (CR2-CR18)	17	
-24	FB12404A	81381	Marker Strip, 24 Point, Printing Style No. 10 (TB1)	1	
-25	670A-RZ-24	81381	Terminal Board, 24 Point, with 6-32 Brass Plated Screws (TB1, TB2)	2	
-26	MS37TB24-VF-40	81381	Marker Strip, 24 Point, Printing Style No. 40 (TB2)	1	
-27	SE000042	81381	Assembly, Resistor-Rectifier-Suppressor	1	
-28	LE000191	81381	Connector, 19 Contacts (for Female Sockets) ITT Cannon P/N SLEB19S2S (P19, P20)	2	
-29	LE000192	81381	Connector, 19 Contacts (for Male Pins) ITT Cannon P/N SLEB19P4S (Use P/N LE000138 Pins & P/N LE000195 Cavity Plugs) (J19, J20)	2	
-30	SE000039	81381	Assembly, Electrical Harness, Control Panel & ECM Interface	1	
-31	SE000006	81381	Receptacle Assembly, 6 Pin, Male Contacts (J4)	1	
-32	12950802	81381	Respectable, Male, 35 Pin, ITT Cannon P/N CA3102R32-7PBA176109 (J3)	1	
	77738	81381	Clamp, Hose *(Not Shown)*	1	
	79646	81381	Insulator, Marker Strip *(Not Shown)*	1	
	600J	81381	Jumper, Terminal Board *(Not Shown)*	23	
	67486	81381	Terminal Board 20 amp, 4 Point *(Not Shown)*	1	

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Table 8.3 Compressor, Fuel Tank, and Skid Electrical Components

Fig & Ind #	Part Number	MFR Code	Description	Qty	Usable On Code
8.3		81381			
-1	SE000043	81381	Assembly, Engine & Compressor	1	
-2	1110	81381	Battery (BT1A, BT1B, BT2A, BT2B)	4	
-3	SE000044	81381	Assembly, Electrical Harness, Engine & Compressor (NOT SHOWN)	REF	
-4	LE000151	81381	Connector, Assy., 3 Pin, Female Contacts, 16-18 AWG Wire, 2.03-2.85 mm Wire O.D., Metri-Pack Type 150 (J11, J13, J21)	3	
-5	LE000152	81381	Connector Assy., 4 Pin, Female Contacts, 16-18 AWG Wire, 2.03-2.85 mm Wire O.D., Metri-Pack Type 150 (J10, J12)	2	
-6	SE000027	81381	Connector, Assy., 2 Pin, Female Contacts, 16 AWG Wire, 2.03-2.85 mm Wire O.D., Metri-Pack Type 280 (J16)	1	
-7		81381	Connector, Assy., For Optional Engine Running Beacon, Female (J17)	1	
-8	SM-2C-12F-AU	81381	Switch, Pressure, SPDT, 5 Amp, Gold Plated, Contacts Adjusted to Close at 12 psi on Falling Pressure, 1/8-27 NPT Male Threads (S5)	1	
-9	360-003	81381	Sender, 0-80 psi, 10-180 Ohm, 1/8-27 NPT Male Threads (SE5)	1	
-10	360-094	81381	Sender, 250 °F, 10-180 Ohm, 3/8-18 NPT Male Threads (SE6)	1	
-11	TT-2A-0100-176R	81381	Switch, Temperature, N/O Contact Adjusted to Close at 176 °F on Rising Temp., with 3/8 NPT 1" Long Male Threads, 8-32 Electrical Connections (S3)	1	
-12	SE000034	81381	Kit, Low Fuel Level, with Switch & Blue Beacon Option (OPTION)	REF	
-13	SE000045	81381	Assembly, Electrical Harness, Low Fuel Level Beacon Option	1	
-14	LE000005	81381	Lamp Assembly, Flashing Incandescent, 24V, with Blue Lens (Optional) (DS7, FL1)	1	
-15		81381	Flasher, Beacon, Low Level Fuel, 24V (Optional) (FL1)	1	

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Table 8.3 Compressor, Fuel Tank, and Skid Electrical Components (Cont.)

Fig & Ind #	Part Number	MFR Code	Description	Qty	Usable On Code
-16	LE000018	81381	Relay, 40A Control, 24VCD Coil, Potter & Brumfield P/N VF4-15H11 (Optional) (K4)	1	
-17		81381	Resistor, Burden, 220 Ohm (Optional) (R26)	1	
-18		81381	Plug, For Low Level Fuel Beacon, Male (Optional) (P13)	1	
-19	SE000046	81381	Assembly, Comp. Low Discharge Pressure Pilot Assist Switches	1	
-20	SE000047	81381	Assembly, Electrical Harness, Compressor Low Discharge Pressure Pilot Assist Switches (P21)	1	
-21	23518254	81381	Transducer, Air Pressure, 0-300 psig, 0.5-4.5VDC Operating Voltage (APTD)	1	
-22	SM-2C-34F/BT	81381	Switch, Pressure, SPDT, Contacts Adjust to Actuate at 34 psi on Falling Pressure, 1/8-27 NPT Male Threads (S18)	1	
-23	23520025	81381	Switch, Pressure, SPDT, Contacts Adjust to Actuate at 20 psi on Falling Pressure, 1/8-27 NPT Male Threads (S17)	1	
-24		81381	Plug, For Switches S17 and S18, Male (P21)	1	
-25		81381	Kit, Engine Running, with Switch and Amber Beacon Option (OPTION)	REF	
-26		81381	Assembly, Electrical Harness, Engine Running Beacon Option	1	
-27		81381	Lamp, Assembly, Flashing Incandescent, 24V, with Amber Lens (Optional) (DS13, FL2)	1	
-28		81381	Flasher, Beacon, Engine Running, 24V (Optional) (FL2)	1	
-29		81381	Relay, 24VDC Coil, Engine Running Beacon (Optional) (K20)	1	
-30		81381	Resistor, Burden, 220 Ohm (Optional) (R27)	1	
-31		81381	Plug, For Low Level Fuel Beacon, Male (Optional) (P17)	1	
	SE000069	81381	Harness, Engine, Unfused *(Not Shown)*	1	
	SE000070	81381	Harness, Engine *(Not Shown)*	1	

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Table 8.3 Compressor, Fuel Tank, and Skid Electrical Components (Cont.)

Fig & Ind #	Part Number	MFR Code	Description	Qty	Usable On Code
-32	SE000007	81381	Connector Assy., 3 Pin, Female Contacts (P6)	1	
	12065287	81381	Connector, 3 Pin, Female, with Cable Seal (P6)	REF	
	12103881	81381	Terminal, Female, for 16-14 AWG Wire Size (P6)	REF	
-33	12950803	81381	Plug, Female, 35 Pin, ITT Cannon P/N CA3106E32-7SBF80A (P3, NOT SHOWN - LOCATED ON CONTROL PANEL)	REF	
-34	12911262	81381	Switch, Air Temperature, N/O Contact Adjusted to Close at 460 °F on Rising Temp. (S4)	1	
-35	837-N1	81381	Well, Separable Temperature (S4)	1	
-36		81381	Solenoid, Air Packs Mode Valve, N/C Orifice, 24V Coil (L2)	1	
-37		81381	Solenoid, Low Pressure Assist; Adds Additional Pilot Pressure to Air Comp. discharge Valve to Increase Discharge Pressure, Air Packs Mode Valve, N/C Orifice, 24V Coil (L4)	1	
-38		81381	Solenoid, Compressor Jet Start Mode Valve, N/C Orifice, 24V Coil (L3)	1	
-39	LE000157	81381	Connector Assy., 4 Pin, Male Contacts, 16-18 AWG Wire, 2.03-2.85 mm Wire O.D., Metri-Pack Type 150 (P10 - Ref., Furnished by Vendor)	REF	
-40	SE000052	81381	Plug, For Switch S7, Male (P11)	1	
-41	SE000052	81381	Assembly, Low Fuel Level Warning Switch Option (P11, S7)	1	
-42	SA000147	81381	Assembly, Fuel Level Sender, including Harness (SE1)	1	
	SE000073	81381	.. Sender, Fuel Level, 240-33 Ohms	1	
-43	SE000050	81381	Assembly, Low Fuel Level Shutdown Switch Option, Includes Harness (S8)	1	
-44		81381	Plug, For Switch S8, Male (P12)	1	
-45		81381	Plug, For Sender SE1, Male (P16)	1	

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Table 8.4 Engine Electrical Components

Fig & Ind #	Part Number	MFR Code	Description	Qty	Usable On Code
8.4		81381	ENGINE ELECTRICAL COMPONENTS		
-1	23515397	81381	Assembly, Sensor, Low Coolant Level, Detroit Diesel P/N 23520380, 1/4 NPT Fitting, Variable Resistance Type, Furn. with Electrical Connector Kit (LT1, P7)	1	
-2		81381	Plug, Coolant Level Probe, Female (P7)	1	
-3	SE000044	81381	Assembly, Electrical Harness, Engine & Compressor (NOT SHOWN)	REF	
-4	19010182	81381	Alternator, With Internal Voltage Regulator (Battery Charging) 24V (G1)	1	
-5	323-093	81381	Sender, 250 °F, 10-180 Ohm, 1/2-14 NPT Male Threads (SE4)	1	
-6	360-086	81381	Sender, 0-100 psi, 10-180 Ohm, 1/8-27 NPT Male Threads (SE2, SE3)	2	
-7	240-903	81381	Kit, Bushing, with 1 each Female 1/8-27 to 1/4, 3/8, & 1/2 Bushings (SE2, SE3)	2	
-8	24063-09	81381	Relay (Contactor) 24VDC Coil, N/O SPST (K3)	1	
-9	SA000146	81381	Voltage Surge Suppressor, Breakdown voltage, 33 Volts, 1500 Watts, Uni-Directional, General Instruments P/N 1.5KE33A (Z9)	1	
-10	SE000035	81381	Assembly, Engine Fuse Box	1	
-11	SE000008	81381	Assembly, Fuse Block, 4 Pole, for Type ATO Fuses (XFA)	1	
-12	SE000009	81381	Box, NEMA 3R, 6" Wide x 8" High x 4" Deep (F1-F4, XFA)	1	
-13	SE000010	81381	Cover, Nameplate, Fuse Identification (F1-F4) (NOT SHOWN)	1	
-14	CGB193	81381	Cable Fitting (NOT SHOWN)	2	
-15	BL-50	81381	Lock Nut (NOT SHOWN)	4	
-16	257010	81381	Fuse, 10 Amp Automotive Blade Type, Type ATO (F1)	1	
-17	257005	81381	Fuse, 5 Amp Automotive Blade Type, Type ATO (F2)	1	

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Table 8.4 Engine Electrical Components (Cont.)

Fig & Ind #	Part Number	MFR Code	Description	Qty	Usable On Code
-18	257015	81381	Fuse, 25 Amp, Automotive Blade Type, Type ATO (F3, F4)	2	
-19	SD000238	81381	Bracket, Fuse Box (K3, Fuse Box -- F1-F4, XFA)	1	
-20	10478980	81381	Motor, Engine Starting, 24V (B1)	1	
-21		81381	Solenoid, Engine Starting, 24V (L1)	1	
-22	23520025	81381	Switch, Pressure, SPDT, Contacts adjust to Actuate at 20 psi, 1/8-27 NPT Male Threads (S11)	1	
-23	SE000001	81381	Connector Assy., 5 Pin, Female, Series 280, Metri-Pack (P8)	1	
-24	SE000004	81381	Connector Assy., 30 Pin, Female (P5)	1	
-25		81381	Fuse, In-Line, 5 Amp (F5, F6)	2	
-26	FHAC-1	81381	Fuseholder, In-Line, with Protective Cap, Rated up to 20 Amps (XFB, XFC)	2	

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Table 8.5 Engine ECM and Fuse Box

Fig & Ind #	Part Number	MFR Code	Description	Qty	Usable On Code
8.5		81381	ENGINE ECM AND FUSE BOX		
-1	SE000039	81381	Assembly, Electrical Harness, Control Panel & ECM Interface	1	
-2	SE000023	81381	Connector Assy., 2 Pin, Male Contacts, 12 AWG Wire, 2.81-3.49 mm Wire O.D., Metri-Pack Type 280 (P15)	1	
-3	SE000072	81381	Assembly, Electrical Harness, Fuse Box to Battery	1	
-4	SE000022	81381	Connector Assy., 2 Pin, Female (J15)	1	
-5	SE000016	81381	Connector Assy., 4 Pin, Female (J14)	1	
-6	SE000017	81381	Connector Assy., 4 Pin, Male Contacts, 12 AWG Wire, 2.81-3.49 mm Wire O.D., Metri-Pack Type 280 (P14)	1	
-7	SE000065	81381	Assembly, Engine Fuse Box	1	
-8	SE000008	81381	Assembly, Fuse Block, 4 Pole, for Type ATO Fuses (XFA)	1	
-9	SE000009	81381	Box, NEMA 3R, 6" Wide x 8" High x 4" Deep (F1-F4, XFA)	1	
-10	SE000010	81381	Cover, Nameplate, Fuse Identification (F1-F4) *(NOT SHOWN)*	1	
-11	CGB192	81381	Connector, Cable and Cord *(NOT SHOWN)*	2	
	CGB194	81381	Connector, Cable and Cord *(Not Shown)*	1	
-12	BL-50	81381	Lock Nut *(NOT SHOWN)*	4	
-13	257010	81381	Fuse, 10 Amp Automotive Blade Type, Type ATO (F1)	1	
-14	257005	81381	Fuse, 5 Amp Automotive Blade Type, Type ATO (F2)	1	
-15	257015	81381	Fuse, 15 Amp, Automotive Blade Type, Type ATO (F3, F4)	2	
-16	SE000063	81381	Assembly, Electrical Harness, Interface, Power to DDEC	1	
-17	SE000002	81381	Connector Assy., 2 Pin, Female (J9)	1	
-18	SE000003	81381	Connector Assy., 2 Pin, Male (P9)	1	
-19	SE000001	81381	Connector Assy., 5 Pin, Female, Series 280, Metri-Pack (P8)	1	
-20	SE000004	81381	Connector Assy., 30 Pin, Female (P5)	1	

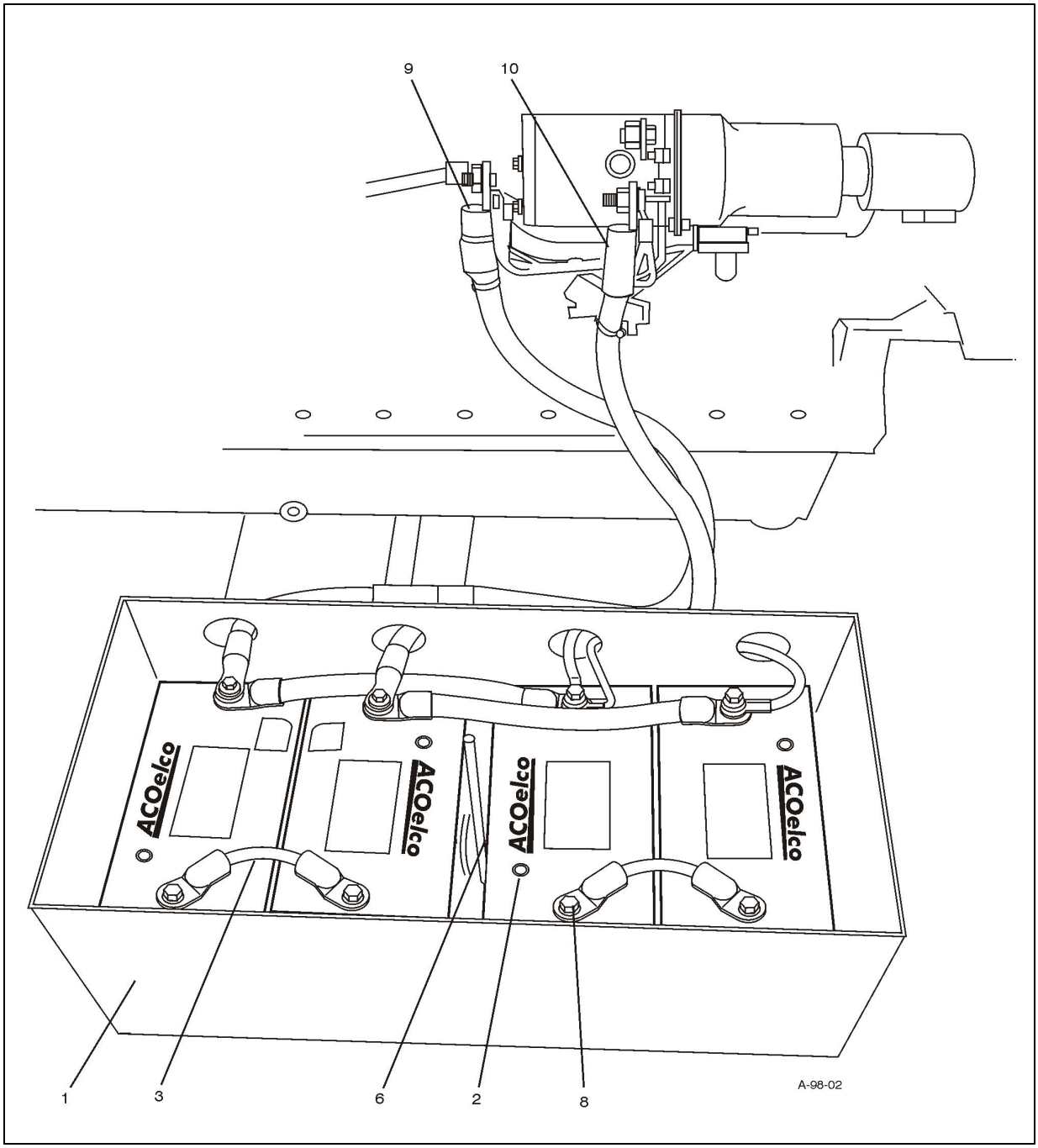

Figure 8.6 Battery Parts Assembly

Table 8.6 Battery Parts Assembly

Fig & Ind #	Part Number	MFR Code	Description	Qty	Usable On Code
8.6			BATTERY PARTS ASSEMBLY		
-1	SW000079	81381	Box, Battery	1	
	SW000087	81381	Tray, Battery *(Not Shown)*	1	
-2	1110	81381	Battery, 12VDC, Hybrid Lead	4	
-3	2MJ7	81381	Cable, Battery Jumper 2 GA.x7"	4	
-4	SW000080	81381	Cover, Battery Assembly *(Not Shown)*	1	
-5	COMMERCIAL	81381	Nut, 5/16" UNC *(Not Shown)*	1	
-6	70018	81381	Bolt, J	2	
-7	COMMERCIAL	81381	Flat Washer, 5/16" Diameter *(Not Shown)*	1	
-8	7802	81381	Nut, used on Battery Cable	8	
-9	SE000060	81381	Battery Cable, Negative, 50”	1	
-10	SE000059	81381	Battery Cable Positive, 50”	1	

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Group 9

Air Compressor Cooling and Lubrication

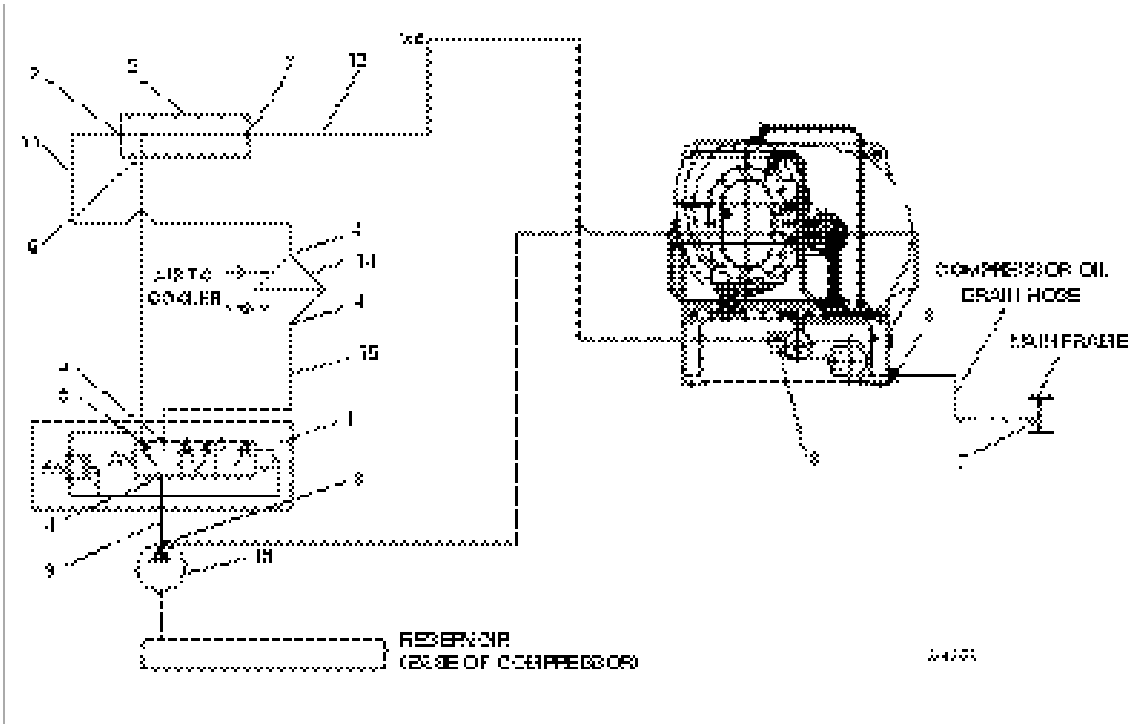

Figure 9.1 Lube Oil GHH Compressors

Table 9.1 Lube Oil GHH Compressors

Fig & Ind #	Part Number	MFR Code	Description	Qty	Usable On Code
9.1			LUBE OIL GHH COMPRESSORS		
-1	SD000108	81381	Valve, thermostatic, 120 °F Crack, Bruning	1	
-2	SD000177	81381	Manifold, Compressor, Oil Temperature Sensors	1	
-3	GG106-NP-12-16	81381	Adapter, Straight, JIC12M - BSPP16M	2	
-4	76941	81381	Adapter, Straight, SAE16M - JIC16M	4	
-5	2216-12-16S	81381	Adapter, Straight, NPT12F - SAE16M	1	
-6	78175	81381	Nipple, Close, NPT12M - NPT12M	1	
-7	78904	81381	Adapter, Straight, NPT12M - JIC12M	3	
-8	GG106-NP-12-08	81381	Adapter, Straight, JIC12M - BSPP08M	1	
-9	SA000018	81381	Assembly, Hose, Compressor Pump to Thermal Valve	1	
-10	SA000019	81381	Assembly, Hose, Thermal Valve to Oil Cooler	1	
-11	SA000020	81381	Assembly, Hose, Oil Cooler to Oil Manifold	1	
-12	SA000021	81381	Assembly, Hose, Oil Manifold to Compressor	1	
-13	p/o compressor		Pump, Lube Oil	1	
-14	SP000026	81381	Cooler, Lube Oil	1	
-15	MEP-30-10	81381	Filter, Oil *(Not Shown)*	1	

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Group 10

Compressor Air Distribution and Regulation System

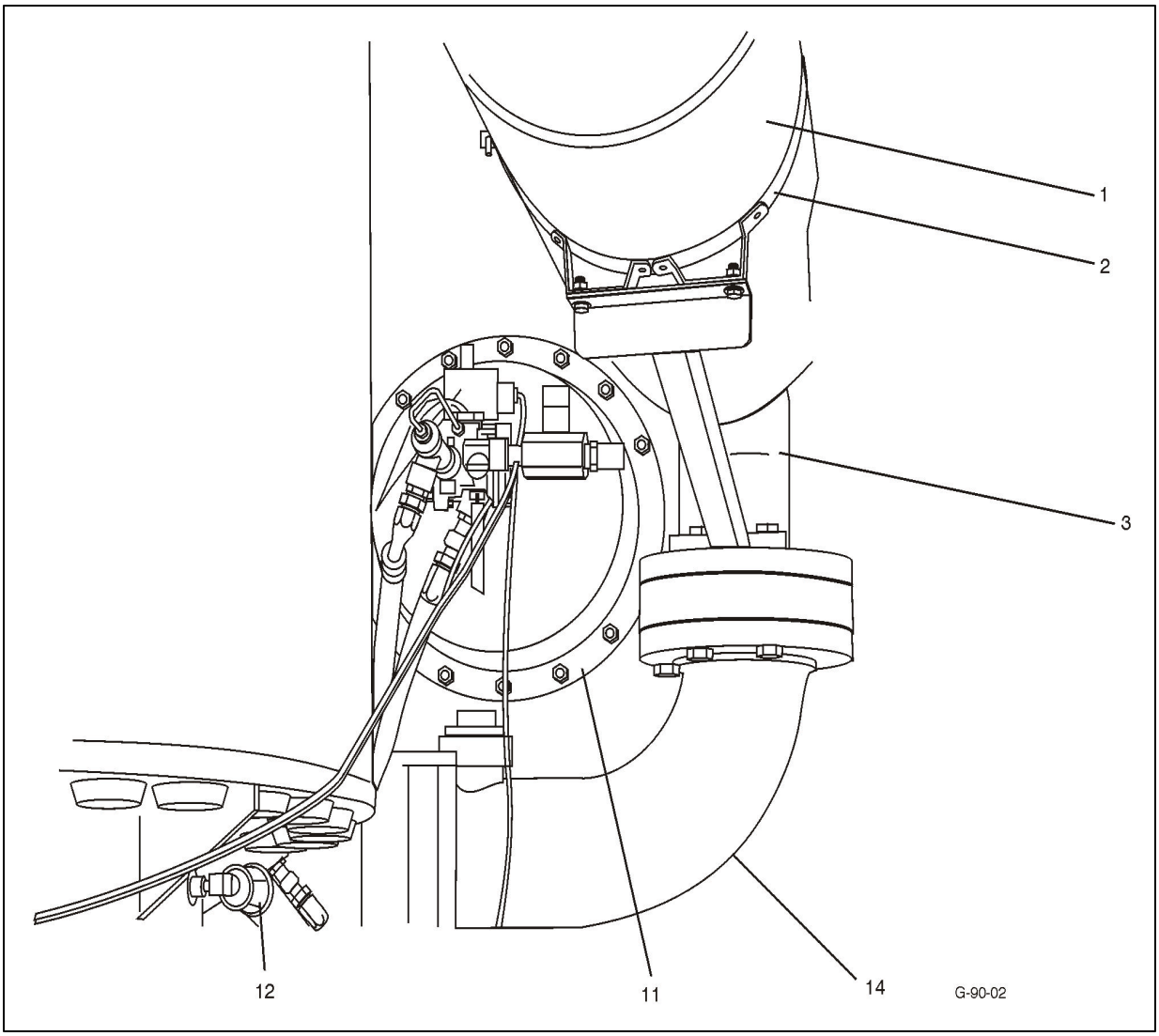

Figure 10.1 Discharge/Regulator Parts Assembly

Table 10.1 Discharge/Regulator Parts Assembly

Fig & Ind #	Part Number	MFR Code	Description	Qty	Usable On Code
10.1			DISCHARGE/UNLOADER PARTS ASSY		
-1	SP000011	81381	Silex Absorptive Silencer	1	
-2	H000349	81381	Discharge Silencer Mounting Band	1	
-3	P206338	81381	Discharge Tube, Silencer Side 90°	1	
-4	12950251	81381	Valve, Ball, ¾" Internal Pipe	3	
-5	78175	81381	Nipple, Pipe, ¾" MNPT	3	
-6	88110	81381	Elbow, Pipe, Street, 150# 90°, ¾" NPT	3	
-7	12950531	81381	Adapter, Flanged, Air Start Hose	3	
-8	SD000416	81381	Valve, 4"Butterfly Discharge	3	
-9	SD000007	81381	Gasket, Flange, 350 MM Dia.	1	
-10	57AC518	81381	Rain Cap, Air Start Silencer	1	
-11	SA000199	81381	Valve, Discharge Relief, 6"	1	
-12	1356501-00408	81381	Indicator, Air Filter Restriction	1	
-13	SA000014	81381	Assembly, 50 ft. Discharge hose	3	
-14	SW000096	81381	Manifold, Air Outlet	1	

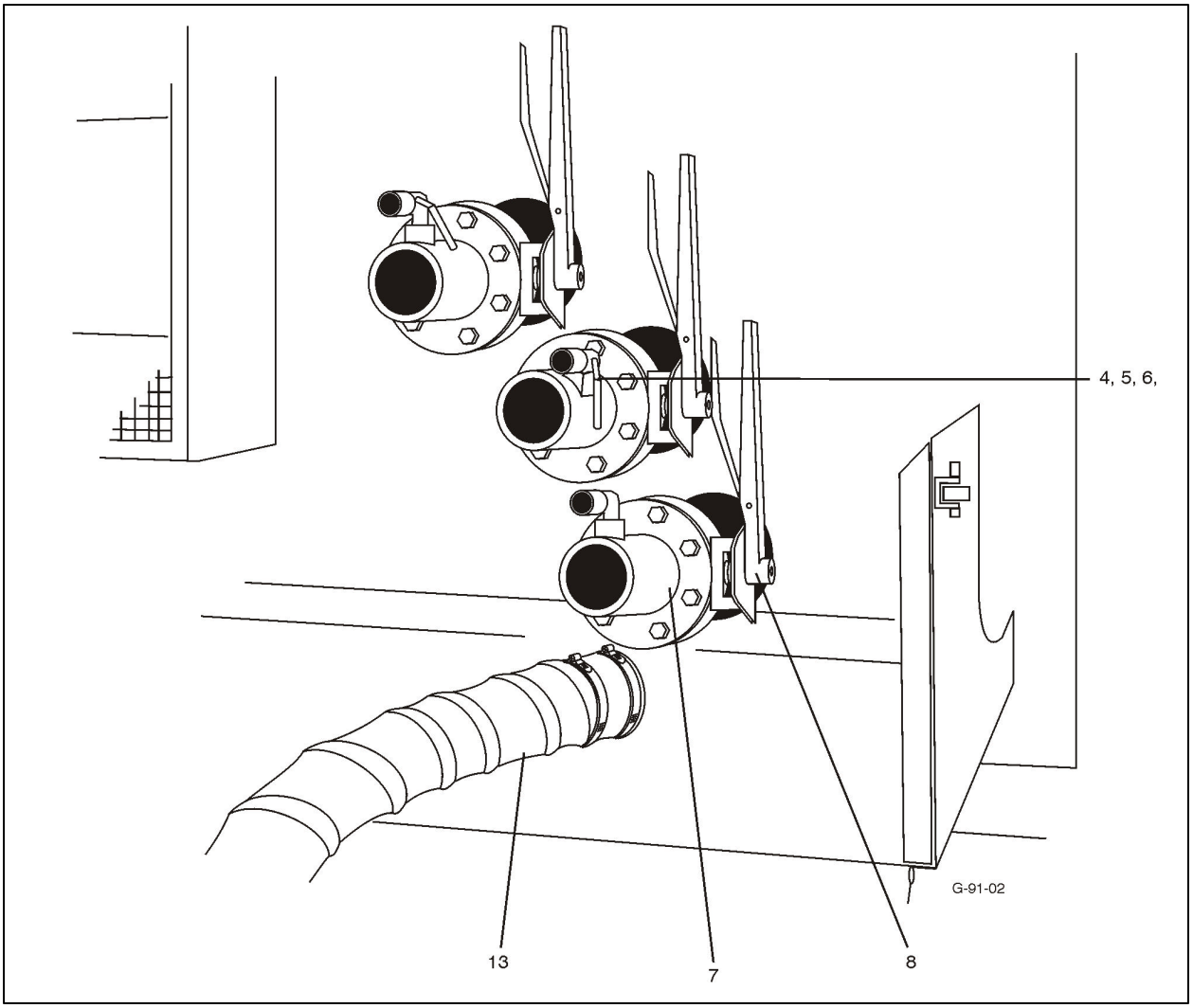

Figure 10.2 Discharge/Regulator Parts Assembly

Table 10.1 Discharge/Regulator Parts Assembly (Cont)

Fig & Ind #	Part Number	MFR Code	Description	Qty	Usable On Code
10.1			DISCHARGE/UNLOADER PARTS ASSY		
-1	SP000011	81381	Silex Absorptive Silencer	1	
-2	H000349	81381	Discharge Silencer Mounting Band	1	
-3	P206338	81381	Discharge Tube, Silencer Side 90°	1	
-4	12950251	81381	Valve, Ball, ¾" Internal Pipe	3	
-5	78175	81381	Nipple, Pipe, ¾" MNPT	3	
-6	88110	81381	Elbow, Pipe, Street, 150# 90°, ¾" NPT	3	
-7	12950531	81381	Adapter, Flanged, Air Start Hose	3	
-8	SD000416	81381	Valve, 4"Butterfly Discharge	3	
-9	SD000007	81381	Gasket, Flange, 350 MM Dia.*(Not Shown)*	1	
-10	57AC518	81381	Rain Cap, Air Start Silencer	1	
-11	SA000199	81381	Valve, Discharge Relief, 6"	1	
-12	1356501-00408	81381	Indicator, Air Filter Restriction	1	
-13	SA000014	81381	Assembly, 50 ft. Discharge hose	3	
-14	Commercial	81381	Bolt, M16-2.0 x 40 mm, GR 8.8. HHCS, Torque to 60 ft-lb *(Not Shown)*	12	

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Chapter 5

Drawings

Table of contents

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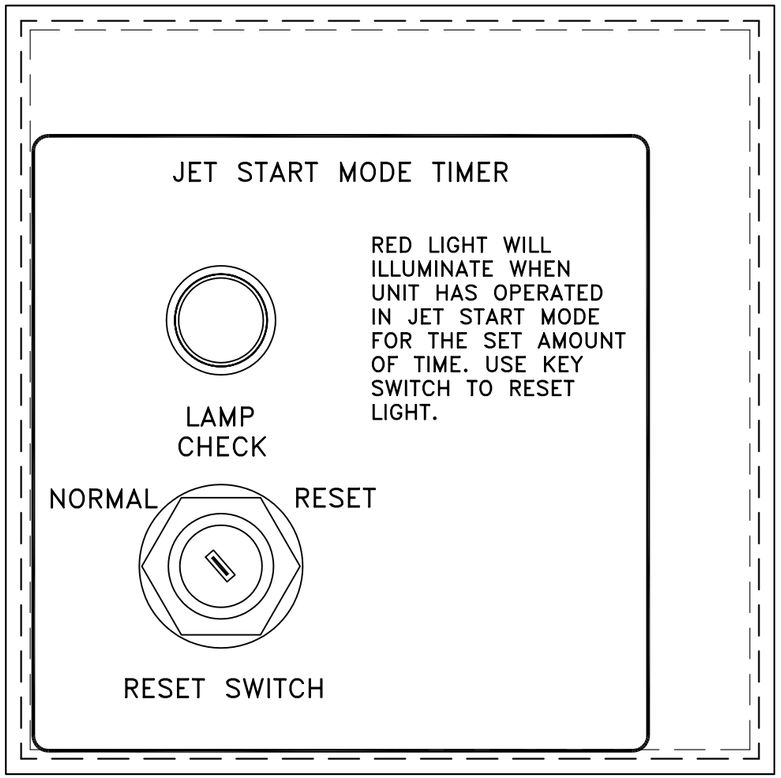
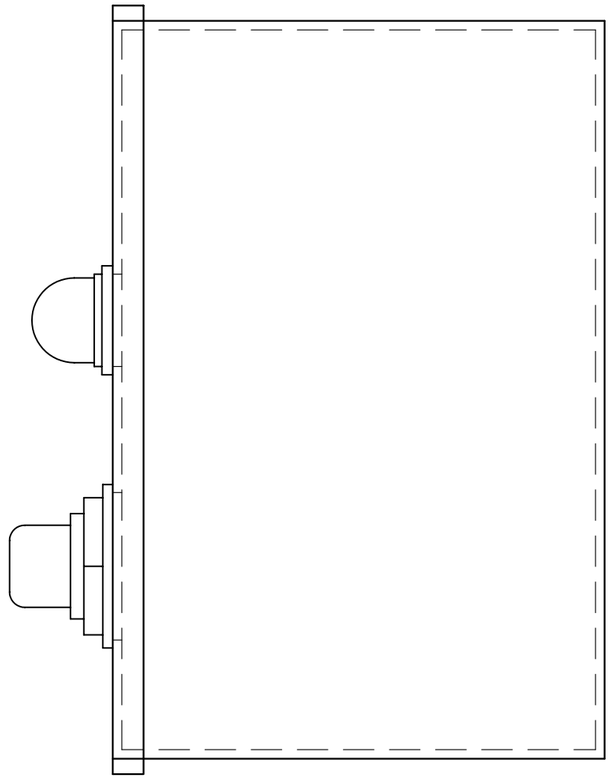
REVISIONS

	REV	DESCRIPTION	DATE	APPROVED
ERB	–	RELEASED FROM ENGINEERING		
ACU-0184	A	REV., DELETED ITEM 7 AND ADDED ONE ITEM 6	10-01-03	RTS





QTY REQ	ITEM NO	PART NO.	DESCRIPTION	MATERIAL/SPECIFICATION
1	13	78590	DIODE	
1	12	SL000008	LABEL	
1	11	SD000504	ENCLOSURE & BACKPLATE	
2	10	LE000064	BULB	
2	9	LE000063	LENS, RED	
2	8	LE000062	LAMPHOLDER	
~~1~~	~~7~~	~~CDC000301~~	~~CONTACT BLOCK, N.O.~~	
2	6	CDC000401	CONTACT BLOCK, N.C.	
1	5	CDC00154	SWITCH, KEYED	
1	4	70120F	TIME DELAY	
1	3	LE000131	RESISTOR	
1	2	LE000318	DIODE	
1	1	37TB-4	TERMINAL BOARD	

MATERIAL

NEXT ASSY. | USED ON
APPLICATION

INTERPRET DRAWING PER ANSI Y14.5

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
DEBURRED AND BROKEN EDGES N/A RAD
CONCENTRICITY OF COAXIAL DIA'S .003 TIR
ALL MACHINED SURFACES ✓ PER ANSI B46.1 (EXCLUDES DRILLED HOLES)
DIMENSIONS AND SURFACE TEXTURE APPLY AFTER ANY FINISH COATING OR TREATMENT
TOLERANCES UNLESS NOTED OTHERWISE
.X = ± .1
.XX = ± .06
.XXX = ± .010
ANGLES = ±0.0°
FRACTIONS = ±

THIRD ANGLE PROJECTION

CONTRACT NO.

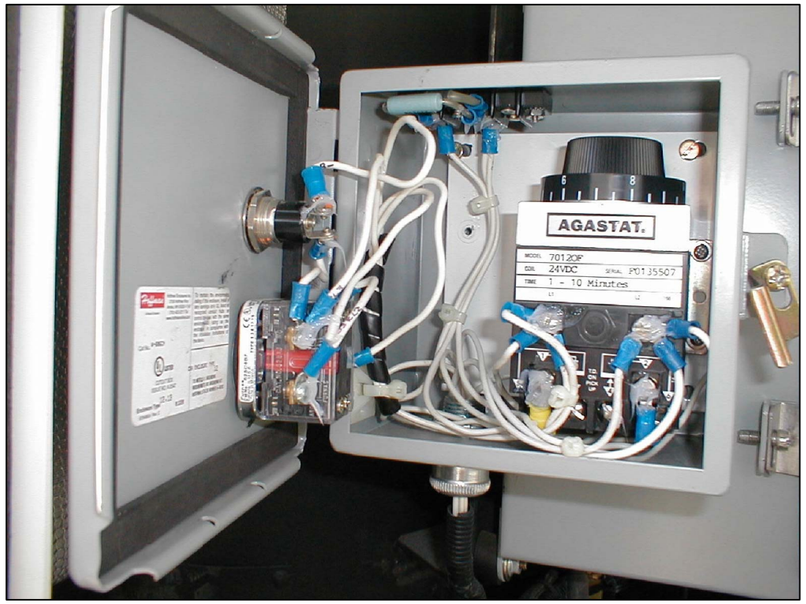
DRAWN	R.T.Smith	9/19/01
CHECKED		
MFG ENG		
PROJ ENG		

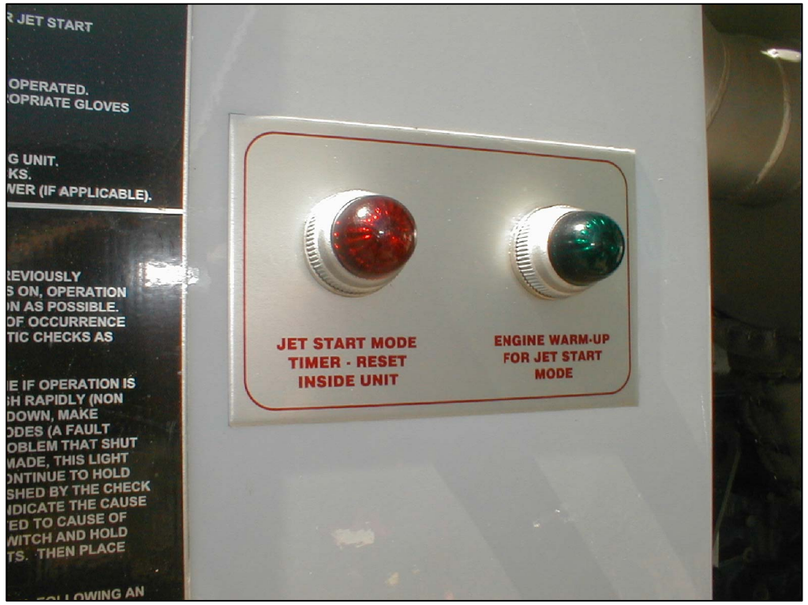
STEWART & STEVENSON SERVICES
4516 HARRISBURG BLVD., HOUSTON, TX. 77011

TITLE
LIGHT
JET START TIMER
TMD AIR STARTS

SIZE	CAGE CODE	DWG. NO.	REV
D	81381	SA000206	A

SCALE NONE | WEIGHT | SHEET 1 OF 4





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REVISIONS

REV	DESCRIPTION	DATE	APPROVED
–	RELEASED FROM ENGINEERING		

MATERIAL

NEXT ASSY. | USED ON
APPLICATION

INTERPRET DRAWING PER ANSI Y14.5

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
DEBURRED AND BROKEN EDGES N/A RAD
CONCENTRICITY OF COAXIAL DIA'S .003 TIR
ALL MACHINED SURFACES ✓ PER ANSI B46.1 (EXCLUDES DRILLED HOLES)
DIMENSIONS AND SURFACE TEXTURE APPLY AFTER ANY FINISH COATING OR TREATMENT
TOLERANCES UNLESS NOTED OTHERWISE
.X = ± .1 ANGLES = ±0.0°
.XX = ± .06 FRACTIONS = ±
.XXX = ± .010

THIRD ANGLE PROJECTION

CONTRACT NO.

DRAWN	R.T.Smith	9/19/01
CHECKED		
MFG ENG		
PROJ ENG		

STEWART & STEVENSON SERVICES
4516 HARRISBURG BLVD., HOUSTON, TX. 77011

TITLE
LIGHT
JET START TIMER
TMD AIR STARTS

SIZE	CAGE CODE	DWG. NO.	REV
D	81381	SA000206	A

SCALE NONE | WEIGHT | SHEET 2 OF 4

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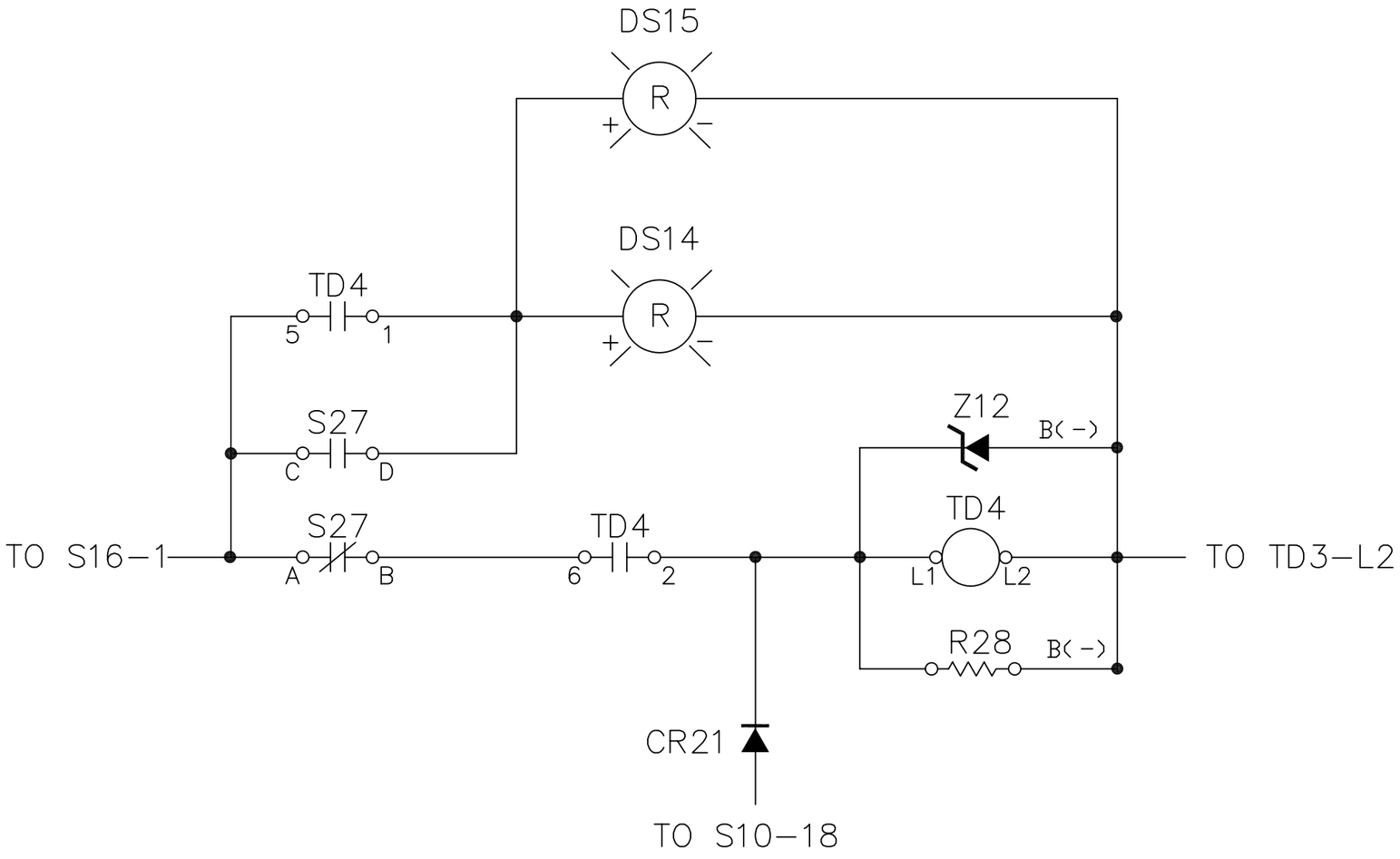
REVISIONS

REV	DESCRIPTION	DATE	APPROVED
–	RELEASED FROM ENGINEERING		



SCHEMATIC

MATERIAL		INTERPRET DRAWING PER ANSI Y14.5		CONTRACT NO.	STEWART & STEVENSON SERVICES 4516 HARRISBURG BLVD., HOUSTON, TX. 77011	
		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES DEBURRED AND BROKEN EDGES N/A RAD CONCENTRICITY OF COAXIAL DIA'S .003 TIR ALL MACHINED SURFACES ✓ PER ANSI B46.1 (EXCLUDES DRILLED HOLES) DIMENSIONS AND SURFACE TEXTURE APPLY AFTER ANY FINISH COATING OR TREATMENT TOLERANCES UNLESS NOTED OTHERWISE .X = ± .1 ANGLES = ±0.0° .XX = ± .06 FRACTIONS = ± .XXX = ± .010	THIRD ANGLE PROJECTION	DRAWN R.T.Smith 9/19/01 CHECKED MFG ENG PROJ ENG	TITLE: LIGHT JET START TIMER TMD AIR STARTS	
NEXT ASSY.	USED ON					
APPLICATION				SIZE D	CAGE CODE 81381	DWG. NO. SA000206 REV A
				SCALE NONE	WEIGHT	SHEET 3 OF 4

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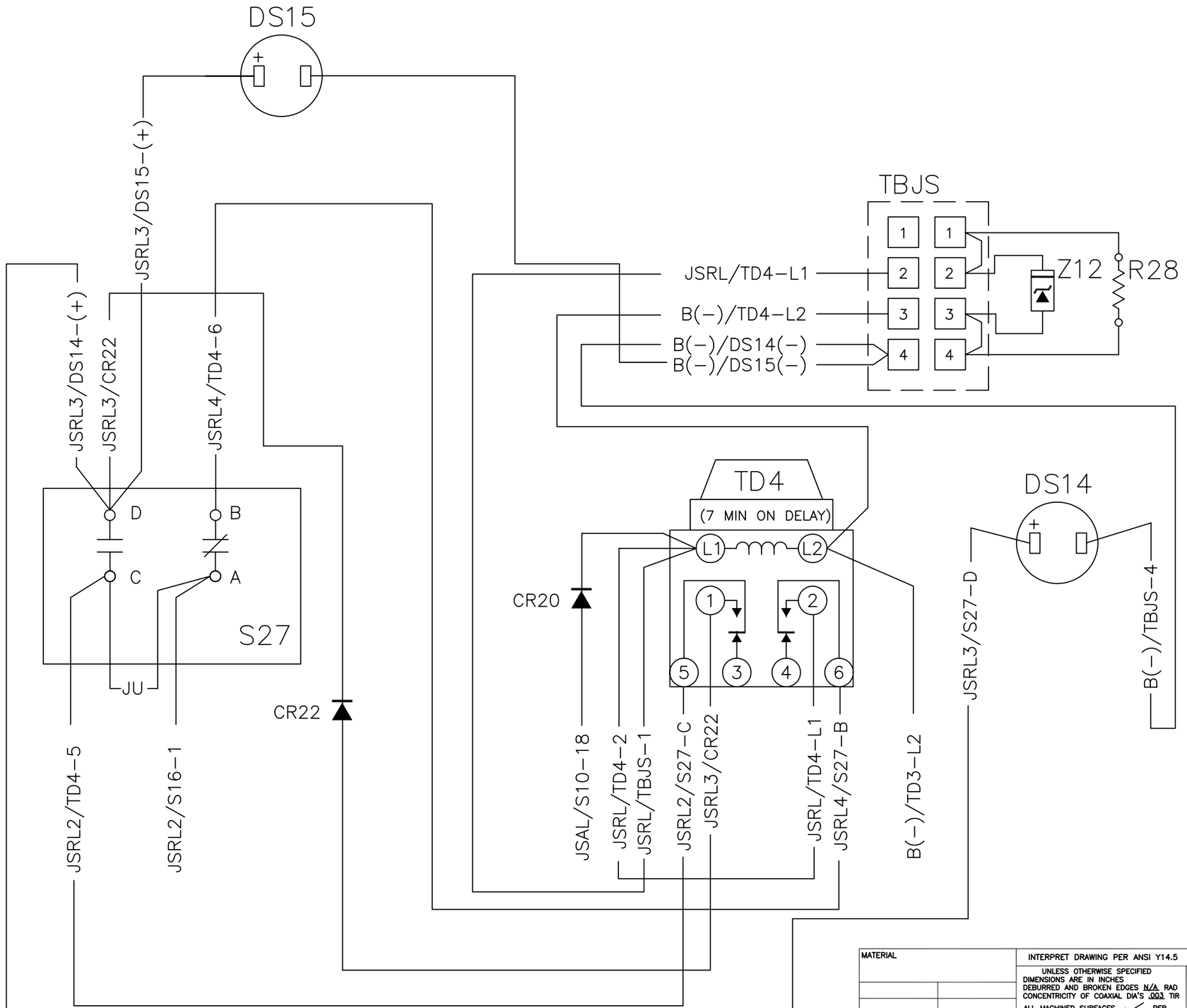

WIRING DIAGRAM

MATERIAL		INTERPRET DRAWING PER ANSI Y14.5	CONTRACT NO.	STEWART & STEVENSON SERVICES 4516 HARRISBURG BLVD., HOUSTON, TX. 77011
		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES DEBURRED AND BROKEN EDGES N/A RAD CONCENTRICITY OF COAXIAL DIA'S .003 TIR ALL MACHINED SURFACES ✓ PER ANSI B46.1 (EXCLUDES DRILLED HOLES) DIMENSIONS AND SURFACE TEXTURE APPLY AFTER ANY FINISH COATING OR TREATMENT TOLERANCES UNLESS NOTED OTHERWISE .X = ± .1 ANGLES = ±0.0° .XX = ± .06 FRACTIONS = ± .XXX = ± .010	THIRD ANGLE PROJECTION	DRAWN R.T.Smith 9/19/01 CHECKED MFG ENG PROJ ENG	TITLE: LIGHT JET START TIMER TMD AIR STARTS
NEXT ASSY. USED ON	APPLICATION			SIZE D · CAGE CODE 81381 · DWG. NO. SA000206 · REV A SCALE NONE · WEIGHT · SHEET 4 OF 4

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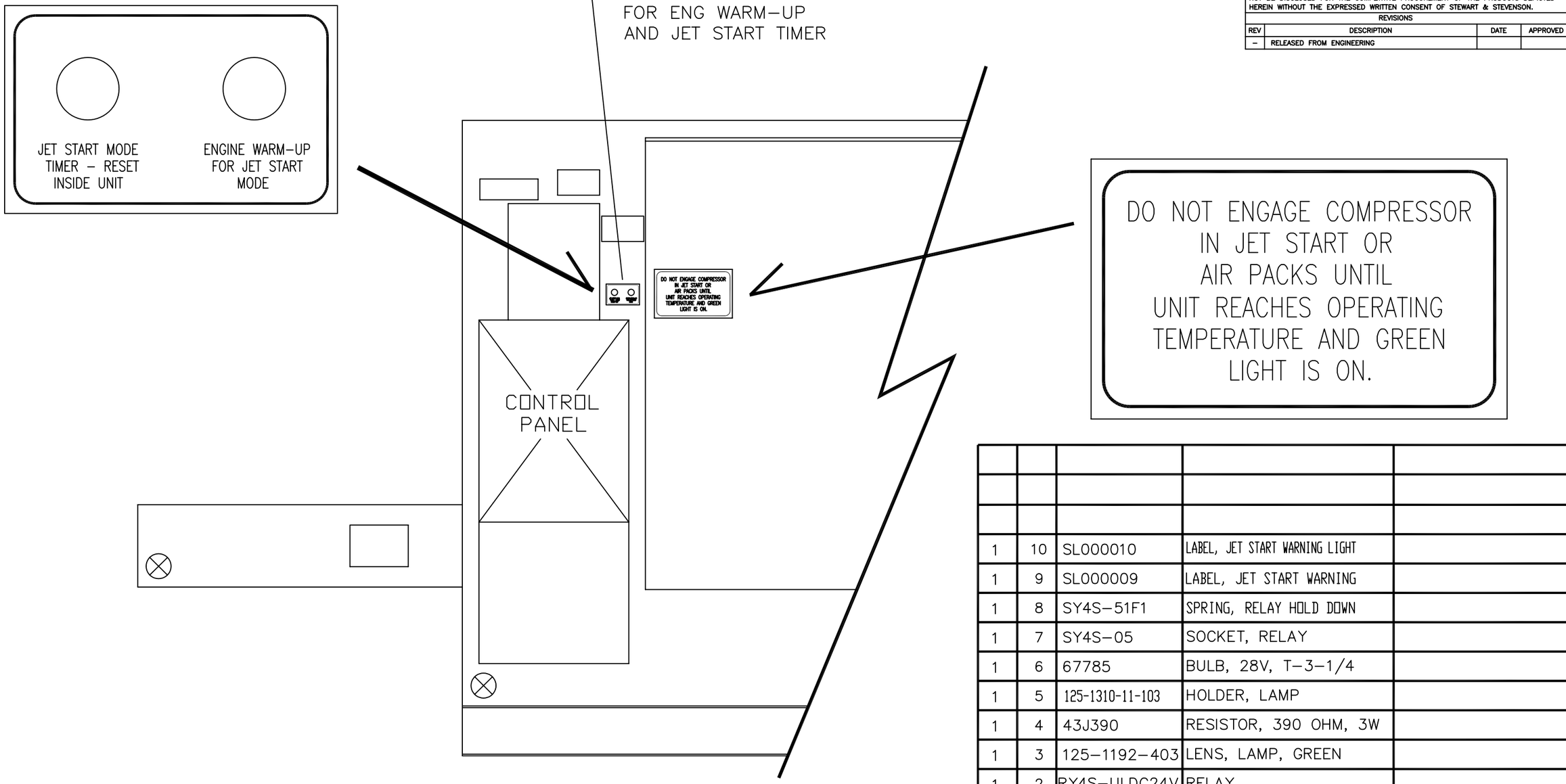
REVISIONS			
REV	DESCRIPTION	DATE	APPROVED
–	RELEASED FROM ENGINEERING		



QTY REQ	ITEM NO	PART NO.	DESCRIPTION	MATERIAL/SPECIFICATION
1	10	SL000010	LABEL, JET START WARNING LIGHT	
1	9	SL000009	LABEL, JET START WARNING	
1	8	SY4S–51F1	SPRING, RELAY HOLD DOWN	
1	7	SY4S–05	SOCKET, RELAY	
1	6	67785	BULB, 28V, T–3–1/4	
1	5	125-1310-11-103	HOLDER, LAMP	
1	4	43J390	RESISTOR, 390 OHM, 3W	
1	3	125–1192–403	LENS, LAMP, GREEN	
1	2	RY4S–ULDC24V	RELAY	
1	1	SE001000	SWITCH, TEMPERATURE	

MATERIAL

NEXT ASSY. USED ON APPLICATION

INTERPRET DRAWING PER ANSI Y14.5

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
DEBURRED AND BROKEN EDGES N/A RAD
CONCENTRICITY OF COAXIAL DIA'S .003 TIR

ALL MACHINED SURFACES ✓ PER ANSI B46.1 (EXCLUDES DRILLED HOLES) DIMENSIONS AND SURFACE TEXTURE APPLY AFTER ANY FINISH COATING OR TREATMENT
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.XXX = ± .010
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FRACTIONS = ±

THIRD ANGLE PROJECTION

CONTRACT NO.

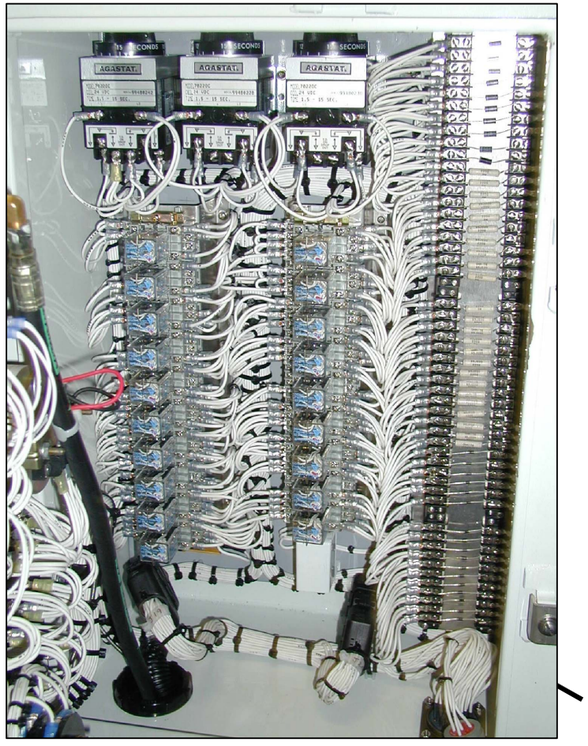
DRAWN	R.T.Smith	9/19/01
CHECKED		
MFG ENG		
PROJ ENG		

STEWART & STEVENSON SERVICES
4516 HARRISBURG BLVD., HOUSTON, TX. 77011

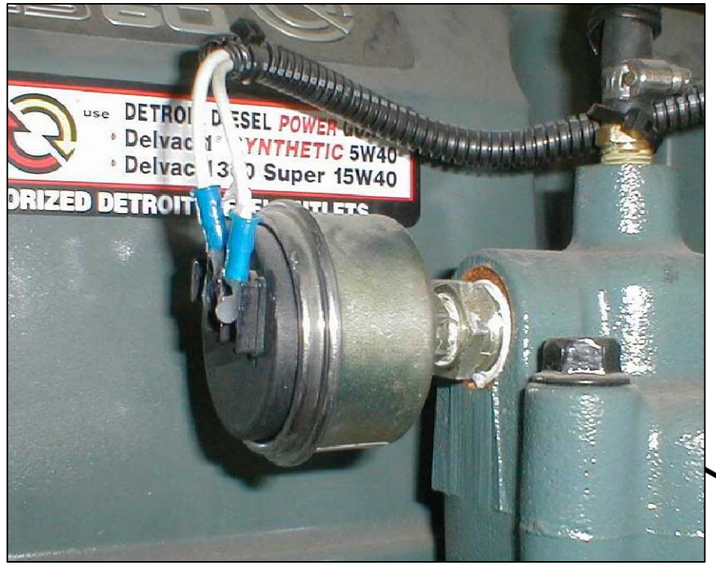
TITLE
CIRCUIT
ENGINE WARM–UP
TMD AIR STARTS

SIZE	CAGE CODE	DWG. NO.
D	81381	SA000207

SCALE NONE WEIGHT SHEET 1 OF 4



ADDED K22 RELAY



ADDED TEMPERATURE SWITCH

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REVISIONS

REV	DESCRIPTION	DATE	APPROVED
–	RELEASED FROM ENGINEERING		

MATERIAL

NEXT ASSY. | USED ON

APPLICATION

INTERPRET DRAWING PER ANSI Y14.5

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THIRD ANGLE PROJECTION

CONTRACT NO.

DRAWN	R.T.Smith	9/19/01
CHECKED		
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PROJ ENG		

STEWART & STEVENSON SERVICES
4516 HARRISBURG BLVD., HOUSTON, TX. 77011

TITLE
CIRCUIT
ENGINE WARM-UP
TMD AIR STARTS

SIZE	CAGE CODE	DWG. NO.
D	81381	SA000207

SCALE NONE | WEIGHT | SHEET 2 OF 4

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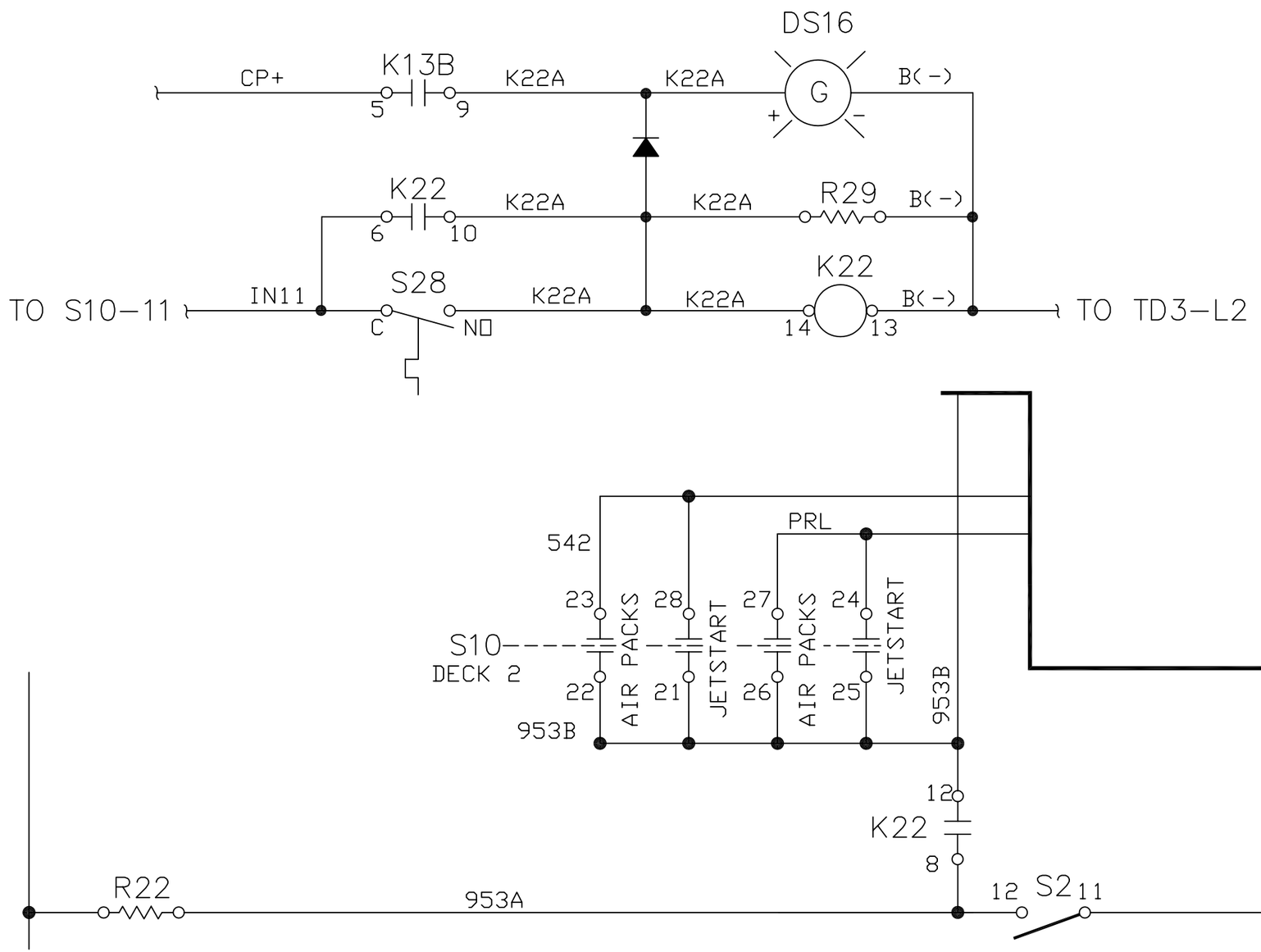

SCHEMATIC

MATERIAL	INTERPRET DRAWING PER ANSI Y14.5	CONTRACT NO.	STEWART & STEVENSON SERVICES
SEE NOTE	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES DEBURRED AND BROKEN EDGES N/A RAD CONCENTRICITY OF COAXIAL DIA'S .003 TIR ALL MACHINED SURFACES ✓ PER ANSI B46.1 (EXCLUDES DRILLED HOLES) DIMENSIONS AND SURFACE TEXTURE APPLY AFTER ANY FINISH COATING OR TREATMENT TOLERANCES UNLESS NOTED OTHERWISE X = ± .1 ANGLES = ±0.0° .XX = ± .06 FRACTIONS = ± .XXX = ± .010 THIRD ANGLE PROJECTION	DRAWN R.T.Smith 9/19/01 CHECKED MFG ENG PROJ ENG	4516 HARRISBURG BLVD., HOUSTON, TX. 77011
NEXT ASSY. USED ON APPLICATION			TITLE: OPTION ENGINE WARM–UP TMD AIR STARTS
			SIZE D · CAGE CODE 81381 · DWG. NO. SA000207
			SCALE NONE · WEIGHT · SHEET 3 OF 4

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REVISIONS			
REV	DESCRIPTION	DATE	APPROVED
–	RELEASED FROM ENGINEERING		

K22A/K22-10 — 1 — R29 — 2 — B(-)/DS16-(-)

B(-)/TD3-L2 (or equal B- term.)

MOVE CP+ TO TERM 5 AND ADD JUMPER FROM TERM 5 TO TERM 6

CP+/K13A-8

CP+/K14-6

K13B

(EXISTING)

B(-)/K13A-13
B(-)/K14-13
K22A/DS16-(+)
□P9/K9-10
□P7/K8-10
□P6/K18-10
IN13/K13A-14
IN13/TB3-5

(SE001000)

S28

C
NO
NC

IN11/K22-6
K22A/K22-14

DS16

\+

K22A/K13B-9
K22A/K22-10
B(-)/R29-2
B(-)/K22-13

953A/S2-12
IN11/S28-C
IN11/S10-11

K22

953B/S10-21
K22A/S28-NO
K22A/K22-10
K22A/R29-1
K22A/K22-14
K22A/DS16-(+)
B(-)/DS16-(-)

S2

(MAINTAINED)

14 AWG

TRSB/S10-32
TRSC/S10-33
24V1A/J19-3
□P2/DS2
24V1/J3-R
24V1/S12
24V1/J19-1
24V44/S1-2
24V44/J19-5
953A/J20-13
953A/K22-8
953/S10-15

S10

JET START
AIR PACKS
JET START
DECK 1

IN11/K22-6
24V4/S10-46
IN11/J20-12
JSAL/TD4-L1
510/P5-D1
953/S13-11
953/P9-A
953/S2-11
544/P5-F2

542
PRL
953B
DECK 2

542/P5-F1
953B/K22-12
953B
PRL/J20-1

REMOVE EXISTING WIRE 953A
FROM S10-21 TO S2-12

WIRING DIAGRAM

MATERIAL	
NEXT ASSY.	USED ON
APPLICATION	

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THIRD ANGLE PROJECTION

CONTRACT NO.

DRAWN	R.T.Smith	9/19/01
CHECKED		
MFG ENG		
PROJ ENG		

STEWART & STEVENSON SERVICES
4516 HARRISBURG BLVD., HOUSTON, TX. 77011

TITLE
CIRCUIT
ENGINE WARM-UP
TMD AIR STARTS

SIZE	CAGE CODE	DWG. NO.
D	81381	SA000207
SCALE NONE	WEIGHT	SHEET 4 OF 4

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REVISIONS

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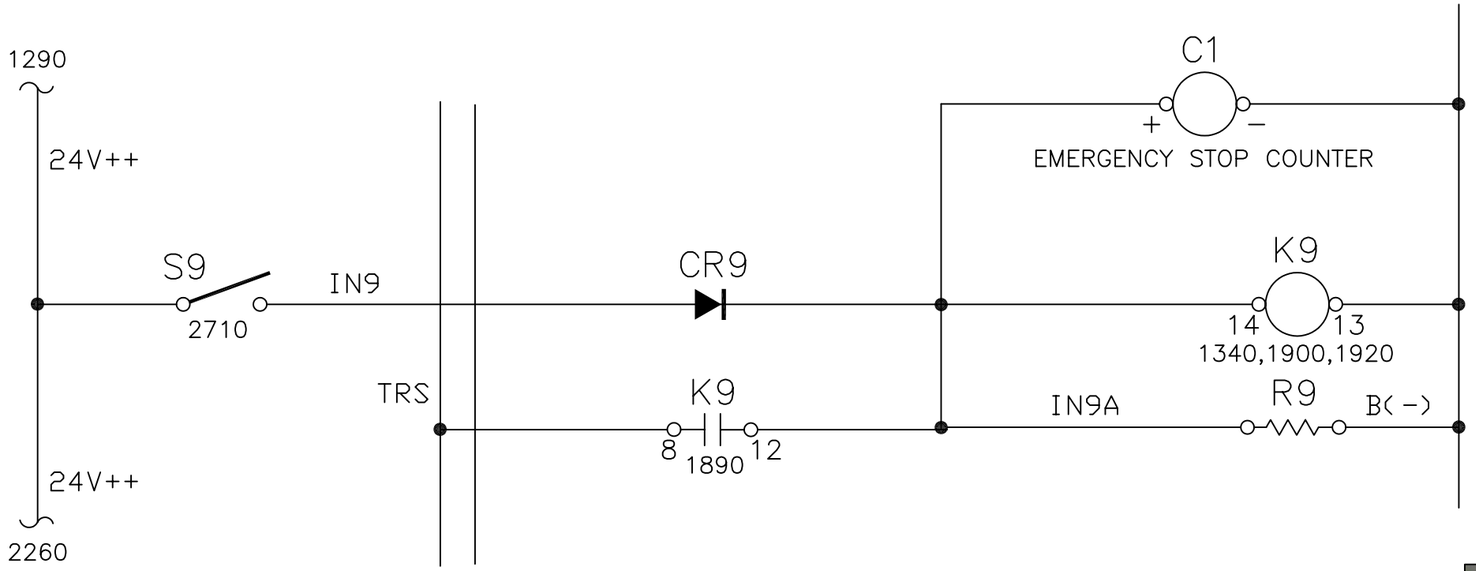

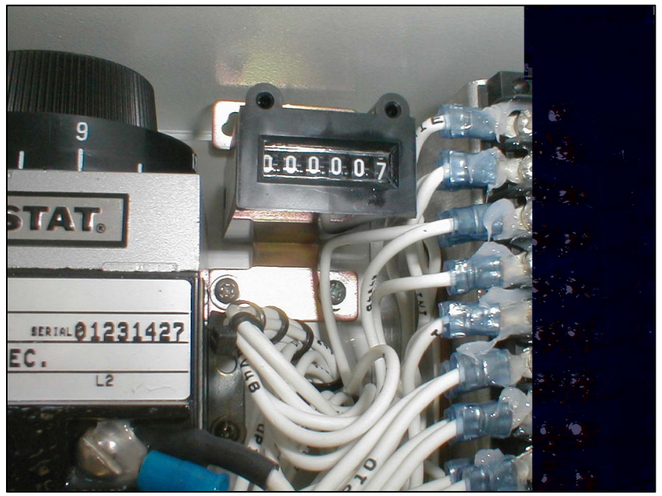

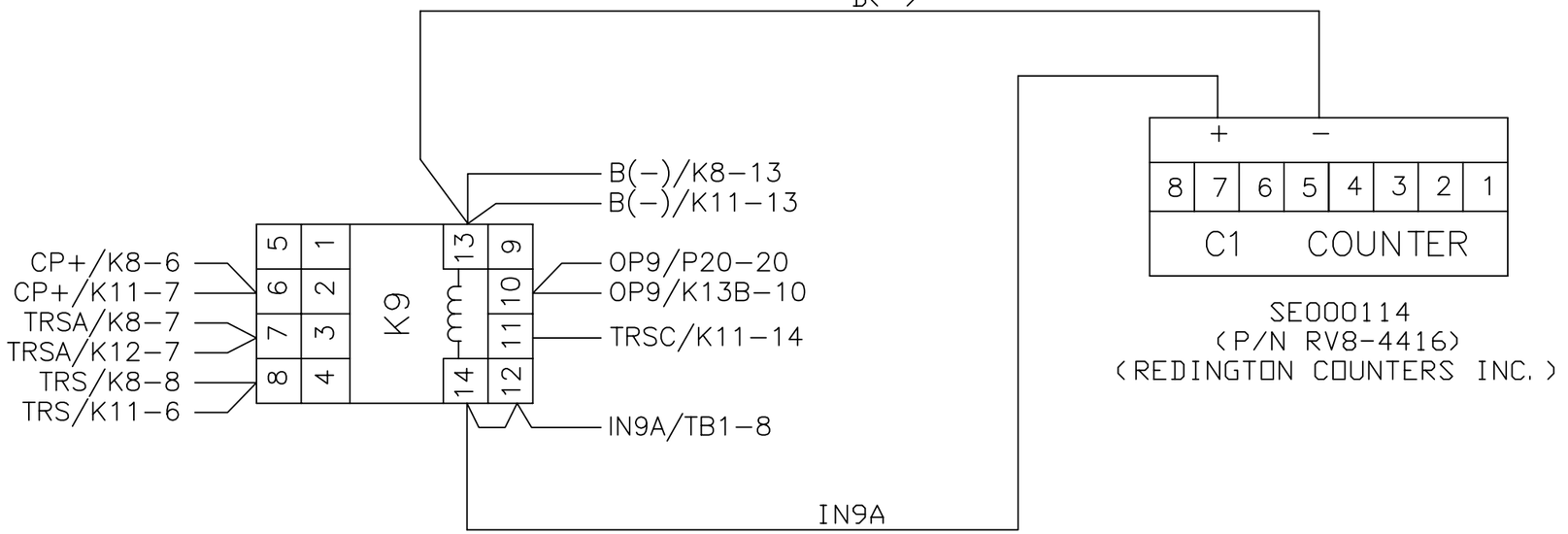

SE000114
(P/N RV8-4416)
(REDINGTON COUNTERS INC.)

1. ALL WIRING 16 AWG. TYPE GXL (WHITE).

MATERIAL	
NEXT ASSY.	USED ON
APPLICATION	

INTERPRET DRAWING PER ANSI Y14.5

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CONCENTRICITY OF COAXIAL DIA'S .003 TIR
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ANGLES = ±0.0°
FRACTIONS = ±

THIRD ANGLE PROJECTION

CONTRACT NO.

DRAWN	R.T.Smith	3/3/02
CHECKED		
MFG ENG		
PROJ ENG		

STEWART & STEVENSON SERVICES
4516 HARRISBURG BLVD., HOUSTON, TX. 77011

TITLE
COUNTER AND LABEL
EMERGENCY STOP
TMD AIR STARTS

SIZE	CAGE CODE	DWG. NO.
D	81381	SA000209

SCALE NONE | WEIGHT | SHEET 1 OF 2

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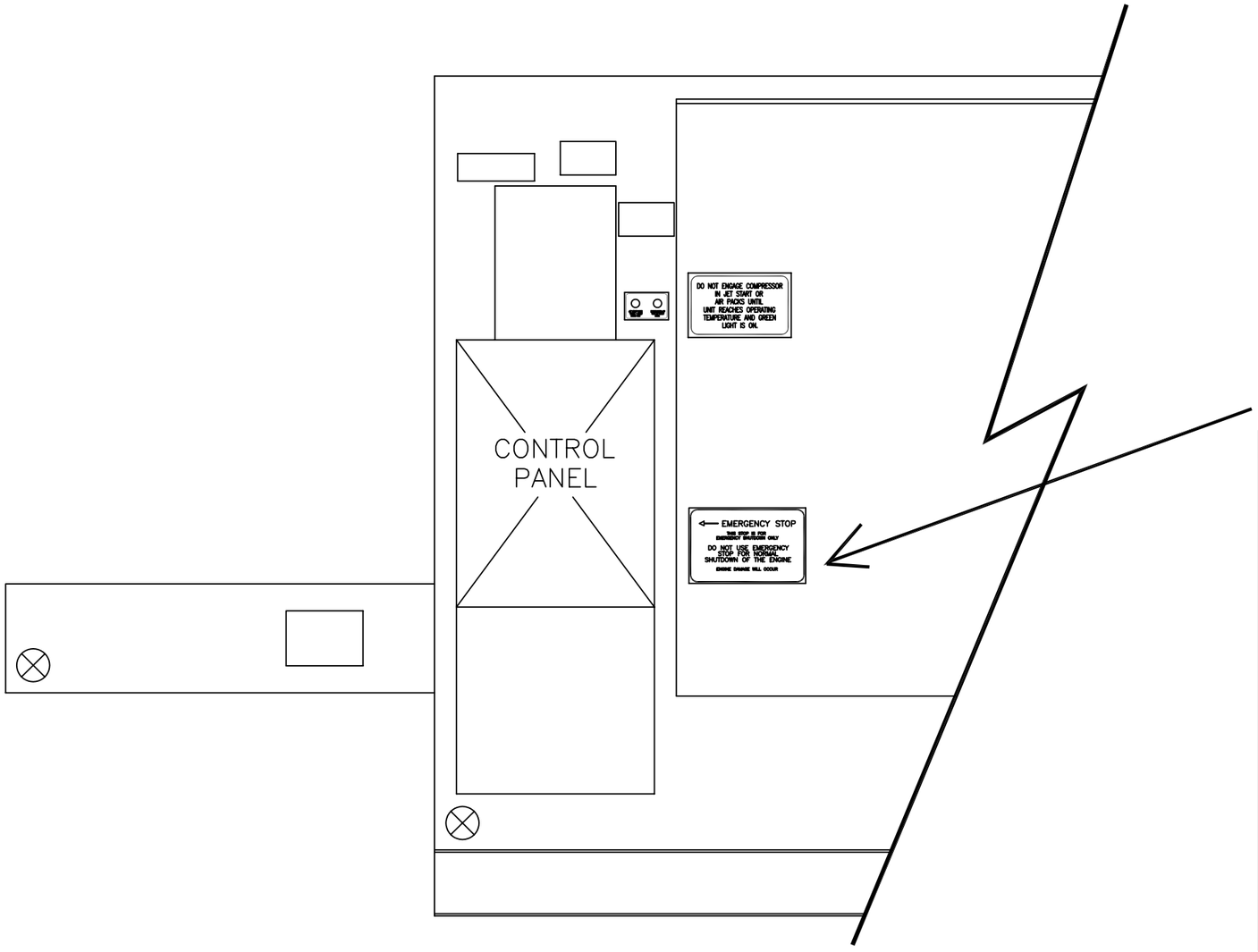

EMERGENCY STOP

THIS STOP IS FOR
EMERGENCY SHUTDOWN ONLY

DO NOT USE EMERGENCY
STOP FOR NORMAL
SHUTDOWN OF THE ENGINE

ENGINE DAMAGE WILL OCCUR

QTY REQ	ITEM NO	PART NO.	DESCRIPTION	MATERIAL/SPECIFICATION
1	2	SL000007	LABEL	
1	1	SE000114	COUNTER	

MATERIAL	
NEXT ASSY.	USED ON
APPLICATION	

INTERPRET DRAWING PER ANSI Y14.5

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THIRD ANGLE PROJECTION

CONTRACT NO.

DRAWN	R.T.Smith	3/3/02
CHECKED		
MFG ENG		
PROJ ENG		

STEWART & STEVENSON SERVICES
4516 HARRISBURG BLVD., HOUSTON, TX. 77011

TITLE
COUNTER AND LABEL
EMERGENCY STOP
TMD AIR STARTS

SIZE	CAGE CODE	DWG. NO.
D	81381	SA000209
SCALE NONE	WEIGHT	SHEET 2 OF 2

LEGEND

SH. NO. - ZONE	ITEM	DESCRIPTION	
7 - 2910	APTD	TRANSDUCER	COMPRESSOR DISCHARGE AIR PRESSURE, PROVIDES ELECTRICAL REFERENCE SIGNAL FOR CONTROLLING ENGINE SPEED AS REQUIRED TO MAINTAIN RATED AIR PRESSURE
3 - 1020	B1	MOTOR	ENGINE STARTING, 24V
3,3 - 1000, 1010	BT1A, 1B	BATTERY	24V BATTERY SYSTEM (4 - 12V BATTERIES IN SERIES/PARALLEL)
3,3 - 1000, 1010	BT2A, 2B		
3,7 - 1060, 2790	CR1, 2	RECTIFIER	BLOCKING, P. N. IN4006
3 - 1220	CR3	RECTIFIER	BLOCKING, P. N. IN4006
4,4 - 1600, 1670	CR4, 5	RECTIFIER	BLOCKING, P. N. IN4006
5,4 - 1970, 1710	CR6, 7	RECTIFIER	BLOCKING, P. N. IN4006
5,5 - 1830, 1890	CR8, 9	RECTIFIER	BLOCKING, P. N. IN4006
3,3 - 1180, 1300	CR10, 11	RECTIFIER	BLOCKING, P. N. IN4006
4 - 1560	CR12	RECTIFIER	BLOCKING, P. N. IN4006
3,3 - 1310, 1355	CR13, 14	RECTIFIER	BLOCKING, P. N. IN4006
4,4 - 1665, 1655	CR15, 16	RECTIFIER	BLOCKING, P. N. IN4006
4,4 - 1500, 1520	CR17, 18	RECTIFIER	BLOCKING, P. N. IN4006
4 - 1430	CR19	RECTIFIER	BLOCKING, P. N. IN4006
3 - 1050	DS1	LAMP, RED	BATTERY CHARGER NOT OPERATING, 24V
3 - 1360	DS2	LAMP, AMBER	UNIT OPERATING IN COOLDOWN MODE, 24V
4 - 1580	DS3	LAMP, RED	COMPRESSOR HIGH OIL TEMPERATURE, 24V
4 - 1620	DS4	LAMP, RED	COMPRESSOR HIGH DISCHARGE AIR TEMPERATURE, 24V
4 - 1690	DS5	LAMP, RED	COMPRESSOR LOW OIL PRESSURE, 24V
5 - 1990	DS6	LAMP, RED	LOSS OF VOLTAGE TO SAFETY CIRCUITS, 24V
4 - 1780	DS7	LAMP, BLUE	BEACON, FLASHING, LOW FUEL LEVEL, 24V (OPTIONAL)
4 - 1730	DS8	LAMP, RED	LOW FUEL LEVEL, 24V (OPTIONAL)
5 - 1920	DS9	LAMP, RED	EMERGENCY STOP, 24V
7 - 2790	DS10	LAMP, RED	ENGINE TROUBLE, 24V
7 - 2770	DS11	LAMP, AMBER	CHECK ENGINE, 24V
3,3 - 1070, 1075	DS12A, B	LAMP	GAUGE PANEL ILLUMINATION, 24V
3 - 1095	DS12C	LAMP	CONTROL PANEL ILLUMINATION, 24V
5 - 2040	DS13	LAMP, AMBER	BEACON, FLASHING, ENGINE RUNNING, 24V (OPTIONAL)
7 - 2610	ECM	MODULE	ENGINE ELECTRONIC CONTROL, TYPE DDEC IV, 24V
3 - 1040	F1	FUSE	24V-DC CONTROL CIRCUIT PROTECTION, 10 AMP
3 - 1000	F2	FUSE	24V-DC IGNITION VOLTAGE TO ECM, 5 AMP
3,3 - 1000, 1000	F3, 4	FUSE	24V-DC POWER TO ECM, 15 AMP
4 - 1780	F5	FUSE	BEACON, LOW FUEL LEVEL, 5 AMP
5 - 2040	F6	FUSE	BEACON, ENGINE RUNNING, 5 AMP
4 - 1780	FL1	FLASHER	BEACON, LOW FUEL LEVEL, 24V (OPTIONAL)
5 - 2040	FL2	FLASHER	BEACON, ENGINE RUNNING, 24V (OPTIONAL)
3 - 1040	G1	ALTERNATOR	WITH INTERNAL VOLTAGE REGULATOR (BATTERY CHARGING) 24V
6 - 2230	GA1	GAUGE	FUEL LEVEL, 24V
6 - 2270	GA2	GAUGE	ENGINE FUEL PRESSURE, 24V
6 - 2310	GA3	GAUGE	ENGINE OIL PRESSURE, 24V
6 - 2350	GA4	GAUGE	ENGINE COOLANT TEMPERATURE, 24V
6 - 2390	GA5	GAUGE	COMPRESSOR OIL PRESSURE, 24V
6 - 2430	GA6	GAUGE	COMPRESSOR OIL TEMPERATURE, 24V
7 - 2950	GA7	GAUGE	TACHOMETER, WITH HOURMETER, 24V
6 - 2220	GL1	LIGHT, GAUGE	FUEL LEVEL, 24V
6 - 2260	GL2	LIGHT, GAUGE	ENGINE FUEL PRESSURE, 24V
6 - 2300	GL3	LIGHT, GAUGE	ENGINE OIL PRESSURE, 24V
6 - 2340	GL4	LIGHT, GAUGE	ENGINE COOLANT TEMPERATURE, 24V
6 - 2380	GL5	LIGHT, GAUGE	COMPRESSOR OIL PRESSURE, 24V
6 - 2420	GL6	LIGHT, GAUGE	COMPRESSOR OIL TEMPERATURE, 24V
7 - 2940	GL7	LIGHT, GAUGE	TACHOMETER, 24V
3 - 1085	GL8	LIGHT, GAUGE	VOLTMETER, 24V
3 - 1210	J3	RECEPTACLE	CONTROL PANEL, MALE
7 - 2950	J4	RECEPTACLE	FOR CONNECTING ENGINE DIAGNOSTIC DATA READER TO ECM UNIT, MALE
3 - 1210	J19, 20	RECEPTACLE	MAIN RELAY PANEL
7 - 2890	K1	RELAY	ENGINE RUNNING INDICATION AND CRANK DISCONNECT, ENERGIZED BY ENGINE ECM AT APPROX. 500 RPM, 24V-DC COIL
3 - 1210	K2	RELAY	ENGINE RUN/ECM IGNITION, 24V-DC COIL
4 - 1430	K3	CONTACTOR	AUXILIARY STARTING, 24V-DC COIL
4 1760	K4	RELAY	LOW FUEL LEVEL BEACON, 24V-DC COIL (OPTIONAL)
7 - 2780	K5	RELAY	MAINTAINS IGNITION VOLTAGE ON ECM AFTER ECM SHUTS ENGINE DOWN FROM ENGINE TROUBLE, ENERGIZED BY ECM, 24V-DC COIL
5 - 1960	K6	RELAY	LOSS OF VOLTAGE TO SAFETY CIRCUITS DETECTION, 24V-DC COIL
4 - 1710	K7	RELAY	LOW FUEL LEVEL WARNING, 24V-DC COIL
5 - 1830	K8	RELAY	LOW FUEL LEVEL SHUTDOWN, 24V-DC COIL
5 - 1890	K9	RELAY	EMERGENCY STOP, 24V-DC COIL
N/S	K10	RELAY	NOT USED
3 - 1300	K11	RELAY	ENG. STOP ON COMPRESSOR SAFETIES, MANUAL EMERG. STOP, LOW FUEL LEVEL, 24V-DC COIL
4 - 1560	K12	RELAY	COMPRESSOR HIGH OIL TEMP., 24V-DC COIL
3 - 1120	K13A	RELAY	LAMP TEST, 24V-DC COIL
3 - 1140	K13B	RELAY	LAMP TEST, 24V-DC COIL
3 - 1160	K14	RELAY	ENGINE RUNNING, 24V-DC COIL
4 - 1600	K15	RELAY	COMPRESSOR HIGH DISCHARGE AIR TEMP., 24V-DC COIL
4 - 1470	K16	RELAY	OVERRIDES LOW FUEL SHUTDOWN IN JET START MODE, 24V-DC COIL
4 - 1670	K17	RELAY	COMPRESSOR LOW OIL PRESSURE, 24V-DC COIL
5 - 1970	K18	RELAY	LOSS OF VOLTAGE TO SAFETY CIRCUITS, 24V-DC COIL
4 - 1500	K19	RELAY	COMPRESSOR UNLOAD, DE-ENERGIZED BY ECM AT HIGH DISCHARGE AIR PRESS., 24V-DC COIL
5 - 2020	K20	RELAY	ENGINE RUNNING BEACON, 24V-DC COIL (OPTIONAL)

LEGEND (CONT.)

SH. NO. - ZONE	ITEM	DESCRIPTION	
3 - 1030	L1	SOLENOID	ENGINE STARTING, 24V
4 - 1450	L2	SOLENOID	COMPRESSOR AIR PACKS MODE VALVE, N/C ORIFICE, 24V COIL
4 - 1480	L3	SOLENOID	COMPRESSOR JET START MODE VALVE, N/C ORIFICE, 24V COIL
4 - 1550	L4	SOLENOID	LOW PRESSURE ASSIST. ADDS ADDITIONAL PILOT PRESS TO AIR COMP UNLOADER VALVE TO INCREASE DISCH. PRESS, N/C ORIFICE, 24V COIL
7 - 2970	LT1	SENSOR	ENGINE COOLANT LEVEL PROBE (LOW COOLANT LEVEL)
3 - 1050	M1	METER	VOLTMETER, BATTERY CHARGER OUTPUT
3 - 1210	P3	PLUG	CONTROL PANEL, FEMALE
7 - 2600	P5	PLUG	ECM (ENGINE ELECTRONIC CONTROL MODULE) FEMALE
7 - 2910	P6	PLUG	MATES WITH APTD, FEMALE
7 - 2970	P7	PLUG	COOLANT LEVEL PROBE, FEMALE
7 - 2690	P8	PLUG	ECM POWER, FEMALE
3 - 1210	P19, 20	PLUG	MAIN RELAY PANEL
4,3 - 1415, 1370	R1, 2	RESISTOR	BURDEN, 390 OHM
4,4 - 1570, 1620	R3, 4	RESISTOR	BURDEN, 390 OHM
4,5 - 1680, 1940	R5, 6	RESISTOR	BURDEN, 390 OHM
4,5 - 1720, 1840	R7, 8	RESISTOR	BURDEN, 390 OHM
5 - 1900	R9	RESISTOR	BURDEN, 390 OHM
N/S	R10	RESISTOR	NOT USED
3 - 1310	R11	RESISTOR	BURDEN, 390 OHM
3 - 1060	R12	RESISTOR	BURDEN, 100 OHM, 25 WATT
3,3 - 1130, 1150	R13, 14	RESISTOR	BURDEN, 390 OHM
3,3 - 1200, 1175	R15, 16	RESISTOR	BURDEN, 390 OHM
7 - 2750	R17	RESISTOR	BURDEN, 390 OHM
N/S	R18	RESISTOR	NOT USED
3 - 1220	R19	RESISTOR	BURDEN, 390 OHM
5,4 - 1980, 1650	R20, 21	RESISTOR	BURDEN, 390 OHM
7,4 - 2880, 1460	R22, 23	RESISTOR	BURDEN, 390 OHM
4,4 - 1490, 1540	R24, 25	RESISTOR	BURDEN, 390 OHM
4,5 - 1750, 2010	R26, 27	RESISTOR	BURDEN, 220 OHM (OPTIONAL)
6 - 2230	SE1	SENDER, GAUGE	FUEL LEVEL, ELECT. WITH LOCAL MECH. GAUGE, DIESEL DAY TANK
6 - 2270	SE2	SENDER, GAUGE	ENGINE FUEL PRESSURE
6 - 2310	SE3	SENDER, GAUGE	ENGINE OIL PRESSURE
6 - 2350	SE4	SENDER, GAUGE	ENGINE COOLANT TEMP.
6 - 2390	SE5	SENDER, GAUGE	COMPRESSOR OIL PRESSURE
6 - 2430	SE6	SENDER, GAUGE	COMPRESSOR OIL TEMP.
4 - 1430	S1	SWITCH	ENGINE CRANK, TOGGLE TYPE, MOMENTARY CONTACTS
3,7 - VAR	S2	SWITCH	ENGINE RUN/STOP
4 - 1560	S3	SWITCH	COMPRESSOR HIGH OIL TEMPERATURE, N/O, 176°F MAKE
4 - 1600	S4	SWITCH	COMPRESSOR HIGH DISCHARGE AIR TEMPERATURE, N/O, 500°F MAKE
4 - 1670	S5	SWITCH	COMPRESSOR LOW OIL PRESSURE, N/C, 12 PSI BREAK
7 - 3000	S6	SWITCH	ENGINE DIAGNOSTIC CHECK, MOMENTARY CONTACTS
4 - 1710	S7	SWITCH	LOW FUEL LEVEL WARNING, DAY TANK, N/C, CLOSED ON LOW LEVEL (OPTIONAL)
5 - 1830	S8	SWITCH	LOW FUEL LEVEL SHUTDOWN, DAY TANK, N/C, CLOSED ON LOW LEVEL (OPTIONAL)
5,7 - 1890, 2710	S9	SWITCH	EMERGENCY STOP, MAINTAINED CONTACTS
3,4,7 - VAR	S10	SWITCH	COMPRESSOR MODE SELECTOR, JET START/UNLOAD/AIR PACKS (SHOWN IN UNLOAD MODE)
4 - 1430	S11	SWITCH	CRANK LOCK-OUT, ENGINE FUEL PRESSURE, N/C, 20 PSI BREAK
3 - 1070	S12	SWITCH	PANEL LAMP
3,7 - VAR	S13	SWITCH	LAMP TEST, MOMENTARY CONTACTS
7 - 2870	S14	SWITCH	RAISE/LOWER ENGINE AIR PRESSURE REGULATING SET POINT, MOM. CONTACTS (TO BE USED ONLY BY AUTHORIZED MAINTENANCE PERSONNEL. REFER TO TECHNICAL MANUAL.)
3,7 - 1280, 2720	S15	SWITCH	TROUBLE RESET, MOMENTARY CONTACTS (HOLD FOR 3 SECONDS)
6 - 2230	S16	SWITCH	FUEL LEVEL CHECK, TOGGLE TYPE, MOMENTARY CONTACTS
4 - 1530	S17	SWITCH	SENSES LOW DISCHARGE PRESS IN AIR PACKS, N/C, CLOSES AT 27 PSI ON FALLING PRESS.
4 - 1540	S18	SWITCH	SENSES LOW DISCHARGE PRESS IN JET START, N/C, CLOSES AT 32 PSI ON FALLING PRESS.
3 - 1180	TD1	RELAY	TIME DELAY, CONTROL SYSTEM POWER SUPPLY/COOLDOWN, 24V-DC COIL, 3 MIN. DELAY ON DE-ENERGIZATION
4 - 1660	TD2	RELAY	TIME DELAY, COMPRESSOR LOW OIL PRESSURE AND LOSS OF VOLTAGE TO SAFETY, 10 SEC. DELAY ON ENERGIZATION, 24V-DC COIL
4 - 1530	TD3	RELAY	TIME DELAY, COMPRESSOR LOW DISCH. PRESS ASSIST, 8 SEC. DELAY ON ENERGIZATION, 24V-DC COIL
3 - 1190	Z1	SUPPRESSOR	VOLTAGE SURGE, VOLTAGE BREAKDOWN, 33V, UNI-DIRECTIONAL, P. N. 1.5KE33A
3,3 - 1170, 1380	Z2, 3	SUPPRESSOR	VOLTAGE SURGE, VOLTAGE BREAKDOWN, 33V, UNI-DIRECTIONAL, P. N. 1.5KE33A
7,7 - 2900, 2775	Z4, 5	SUPPRESSOR	VOLTAGE SURGE, VOLTAGE BREAKDOWN, 33V, UNI-DIRECTIONAL, P. N. 1.5KE33A
4,4 - 1440, 1485	Z6, 7	SUPPRESSOR	VOLTAGE SURGE, VOLTAGE BREAKDOWN, 33V, UNI-DIRECTIONAL, P. N. 1.5KE33A
4,4 - 1640, 1420	Z8, 9	SUPPRESSOR	VOLTAGE SURGE, VOLTAGE BREAKDOWN, 33V, UNI-DIRECTIONAL, P. N. 1.5KE33A
4,4 - 1545, 1520	Z10, 11	SUPPRESSOR	VOLTAGE SURGE, VOLTAGE BREAKDOWN, 33V, UNI-DIRECTIONAL, P. N. 1.5KE33A

THIS DRAWING HAS BEEN GENERATED AND IS MAINTAINED BY A CAD SYSTEM. CHANGES SHALL ONLY BE INCORPORATED AS DIRECTED BY THE DESIGN ACTIVITY.

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REVISIONS

REV	DESCRIPTION	DATE	APPROVED
-	RELEASED FROM ENGINEERING		
A	SHT3, REROUTE CONN S12 -1070 TO S12 -1180	11-05-02	AS-00152

LEGEND
SEE SHEET 2 FOR NOTES

MATERIAL

NEXT ASSY. USED ON
APPLICATION

INTERPRET DRAWING PER ANSI Y14.5

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
DEBURRED AND BROKEN EDGES .03 RAD
CONCENTRICITY OF COAXIAL DIA'S .003 TIR
ALL MACHINED SURFACES 125 PER ANSI B46.1 (EXCLUDES DRILLED HOLES)
DIMENSIONS AND SURFACE TEXTURE APPLY AFTER ANY FINISH COATING OR TREATMENT
TOLERANCES UNLESS NOTED OTHERWISE
.X = ± .1
.XX = ± .06
.XXX = ± .010
ANGLES = ± 1°
FRACTIONS = ±

THIRD ANGLE PROJECTION

CONTRACT NO.

DRAWN	R. SOUTHARD	3/31/00
CHECKED		
MFG ENG		
PROJ ENG		

STEWART & STEVENSON SERVICES
4516 HARRISBURG BLVD., HOUSTON, TX. 77011

TITLE
SCHEMATIC,
AIR START CONTROL CIRCUITS
WITH DDEC IV ENGINE

SIZE	CAGE CODE	DWG. NO.
D	81381	SS000009
SCALE N/A	WEIGHT -	SHEET 1 OF 7

NOTES:

1. ALL SWITCHES AND RELAYS SHOWN OFF, DE-ACTUATED (DE-ENERGIZED).

2. ENGINE SAFETIES WILL ENERGIZE LAMP DS10 AND OPERATE TO SHUT ENGINE DOWN, WHEN SAFE OPERATING CONDITIONS ARE EXCEEDED BY SHUTTING OFF FUEL (THRU ECM), IN ALL MODES OF OPERATION EXCEPT FOR JET-START:
   a. IN JET-START MODE, ENGINE MUST CONTINUE TO RUN BUT LAMP DS10 WILL ILLUMINATE TO ALERT OPERATING PERSONNEL THAT UNIT IS BEING OPERATED UNDER CONDITION THAT COULD DAMAGE ENGINE.
   b. CHECK ENGINE LAMP DS11 IS FOR WARNING AND UNIT MAY BE OPERATED WITH THIS LAMP LIT. WHEN RELAY K2 FIRST PULLS IN, ENERGIZING WIRE 439, THE ECM ENERGIZES BOTH LAMPS DS11 AND DS10 FOR APROX. FIVE SECONDS, PROVIDING AUTOMATIC LAMP CHECK.
   c. LAMPS DS11 AND DS10 WILL ALSO FLASH FAULT CODES WHEN DIAGNOSTIC SWITCH IS ACTUATED. REFER TO TECHNICAL MANUAL AND UNIT OPERATING INSTRUCTIONS FOR DETAILS.

3. ENGINE SPEEDS ARE AS FOLLOWS:
   1. UNLOAD (IDLE) ------- 1200 RPM
   2. AIR PACKS MODE ------ 1200-2100 RPM
   3. JET START MODE ------ 1200-2100 RPM

4. COMPRESSOR DISCHARGE AIR PRESSURE ARE AS FOLLOWS:
   1. UNLOAD (IDLE) ------- 0 psi
   2. AIR PACKS MODE ------ 24 psi
   3. JET START MODE ------ 42 psi

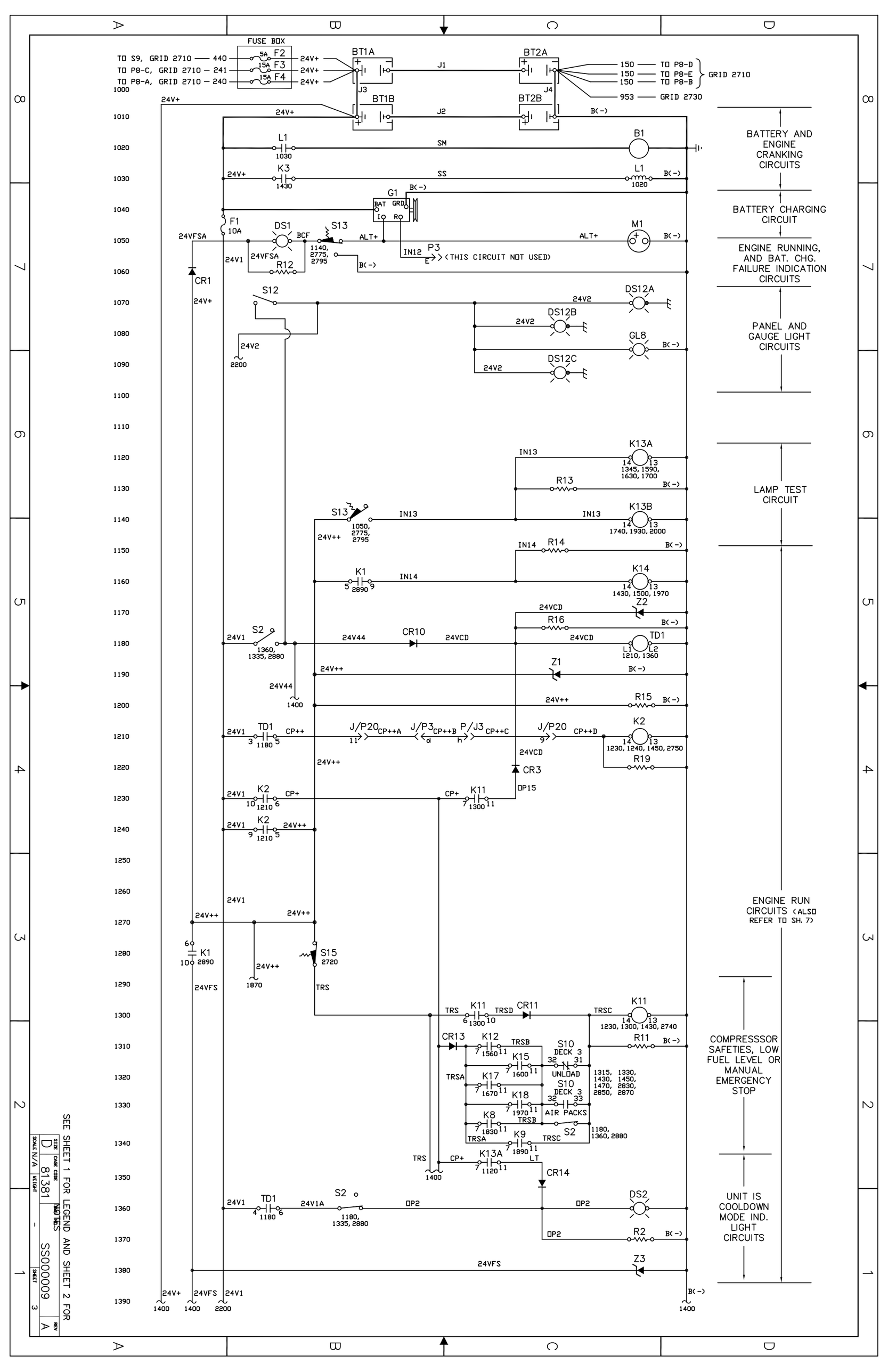
5. REFER TO S&S DWG. SS000010 FOR UNIT WIRING DIAGRAM.

6. REFER TO S&S DWG. SS000011 FOR CONTROL PANEL ASSEMBLY. (FOR REFERENCE ONLY, CONSTRUCTION OF PANEL MAY VARY.)

7. THIS DRAWING DOES NOT SHOW WIRING TO ECM FURNISHED BY ENGINE MANUFACTURER (ENGINE SENSORS, FUEL INJECTION SOLENOIDS, ETC.). FOR THOSE DRAWINGS, REFER TO TECHNICAL MANUAL.

NOTES
SEE SHEET 1 FOR LEGEND

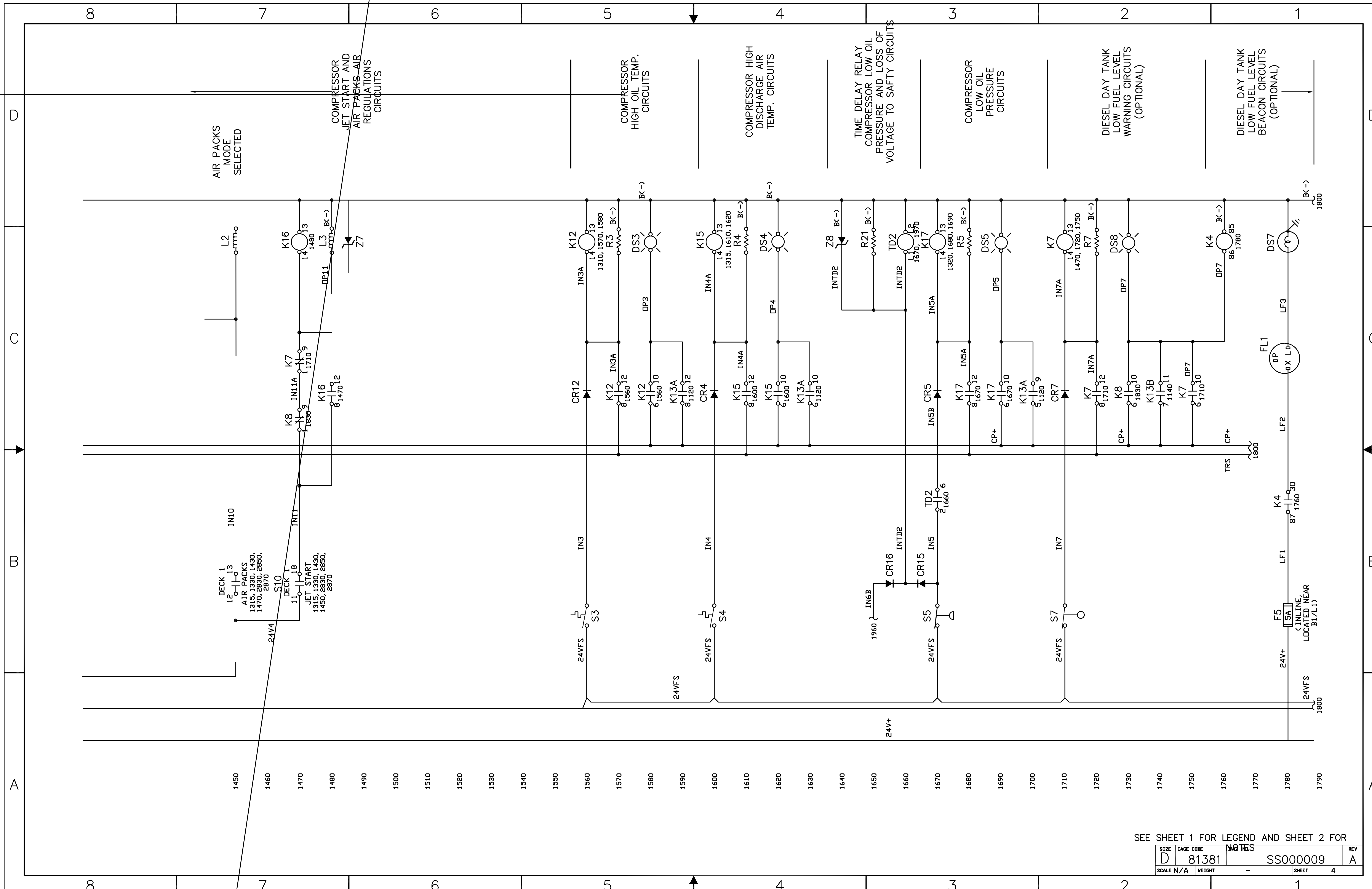
SIZE	CAGE CODE	DWG. NO.	REV
D	81381	SS000009	A
SCALE N/A	WEIGHT –	SHEET 2	



SEE SHEET 1 FOR LEGEND AND SHEET 2 FOR

SIZE	CAGE CODE	DWG NO.	REV
D	81381	SS000009	A

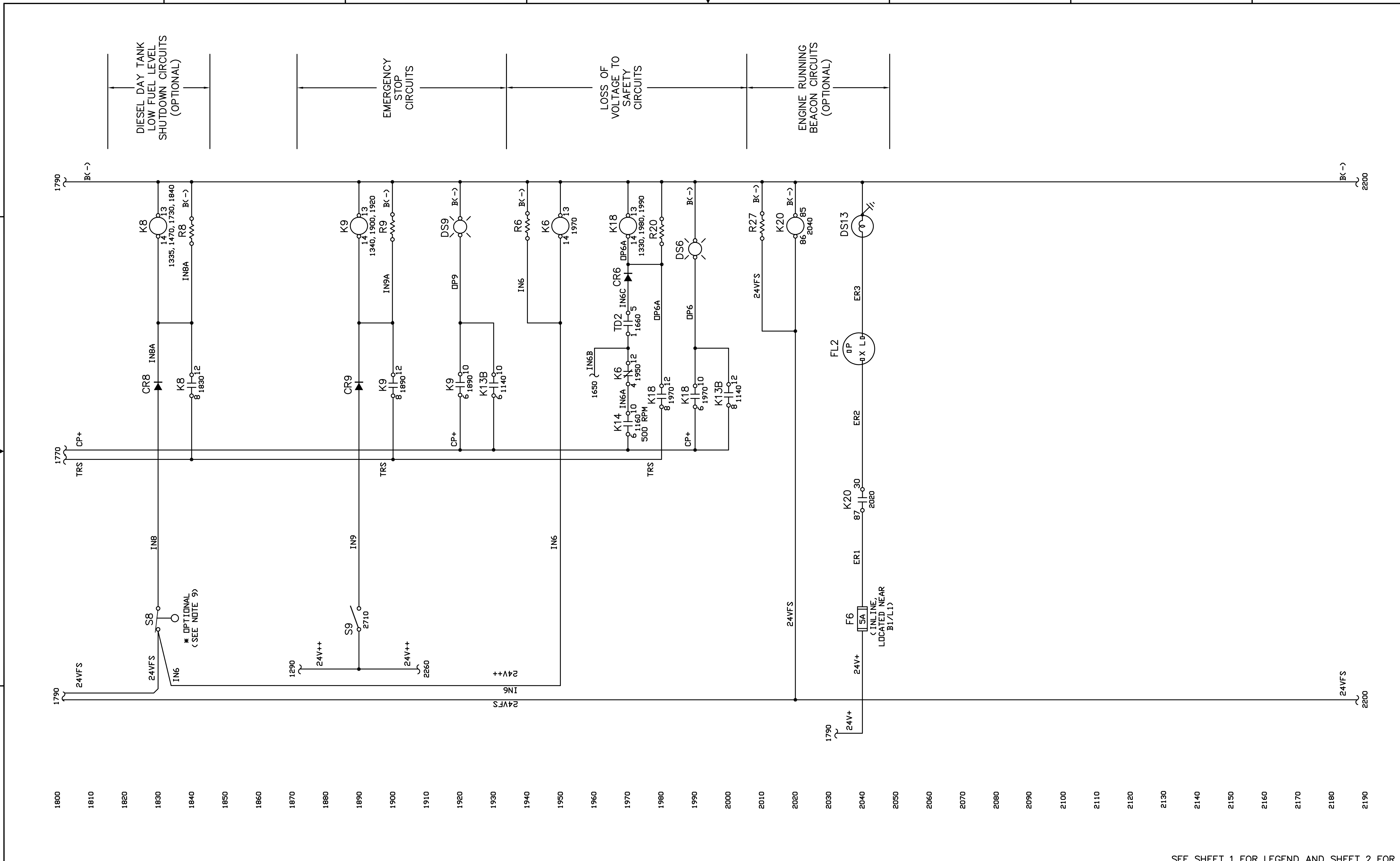
SCALE N/A | WEIGHT - | SHEET 3



AIR PACKS MODE SELECTED
COMPRESSOR JET START AND AIR PACKS AIR REGULATIONS CIRCUITS
COMPRESSOR HIGH OIL TEMP. CIRCUITS
COMPRESSOR HIGH DISCHARGE AIR TEMP. CIRCUITS
TIME DELAY RELAY COMPRESSOR LOW OIL PRESSURE AND LOSS OF VOLTAGE TO SAFTY CIRCUITS
COMPRESSOR LOW OIL PRESSURE CIRCUITS
DIESEL DAY TANK LOW FUEL LEVEL WARNING CIRCUITS (OPTIONAL)
DIESEL DAY TANK LOW FUEL LEVEL BEACON CIRCUITS (OPTIONAL)
B(-)
L2
K16
L3
Z7
K12
R3
DS3
K15
R4
DS4
Z8
R21
TD2
K17
R5
DS5
K7
R7
DS8
K4
DS7
FL1
CR12
CR4
CR5
CR7
K13A
K13B
K8
S10
DECK 1
AIR PACKS
JET START
S3
S4
S5
S7
CR16
CR15
F5
5A
(INLINE, LOCATED NEAR B1/L1)
IN10
IN11
IN11A
IN3
IN3A
IN4
IN4A
IN5
IN5A
IN5B
IN6B
IN7
IN7A
INTD2
LF1
LF2
LF3
CP+
TRS
24V4
24VFS
24V+
1800
1960
1450 1460 1470 1480 1490 1500 1510 1520 1530 1540 1550 1560 1570 1580 1590 1600 1610 1620 1630 1640 1650 1660 1670 1680 1690 1700 1710 1720 1730 1740 1750 1760 1770 1780 1790

SEE SHEET 1 FOR LEGEND AND SHEET 2 FOR NOTES

SIZE	CAGE CODE	DWG NO.	REV
D	81381	SS000009	A
SCALE N/A	WEIGHT –	SHEET 4	



SEE SHEET 1 FOR LEGEND AND SHEET 2 FOR NOTES

SIZE	CAGE CODE	DWG NO.	REV
D	81381	SS000009	A
SCALE N/A	WEIGHT -	SHEET 5	

DIESEL DAY TANK FUEL LEVEL CIRCUITS

ENGINE FUEL PRESSURE GAUGE CIRCUITS

ENGINE OIL PRESSURE GAUGE CIRCUITS

ENGINE COOLANT TEMP. GAUGE CIRCUITS

COMPRESSOR OIL PRESSURE GAUGE CIRCUITS

COMPRESSOR OIL TEMP. GAUGE CIRCUITS

2190 B(->) — B(->) 2950

SE1 SE2 SE3 SE4 SE5 SE6

GL1 GL2 GL3 GL4 GL5 GL6

GA1 GA2 GA3 GA4 GA5 GA6

B(->) SE1 SE2 SE3 SE4 SE5 SE6

24V2 24V3 24V++ 24VFS

S16

24V1 24VFS

1090 24V2

1390 24V1

2190 24VFS

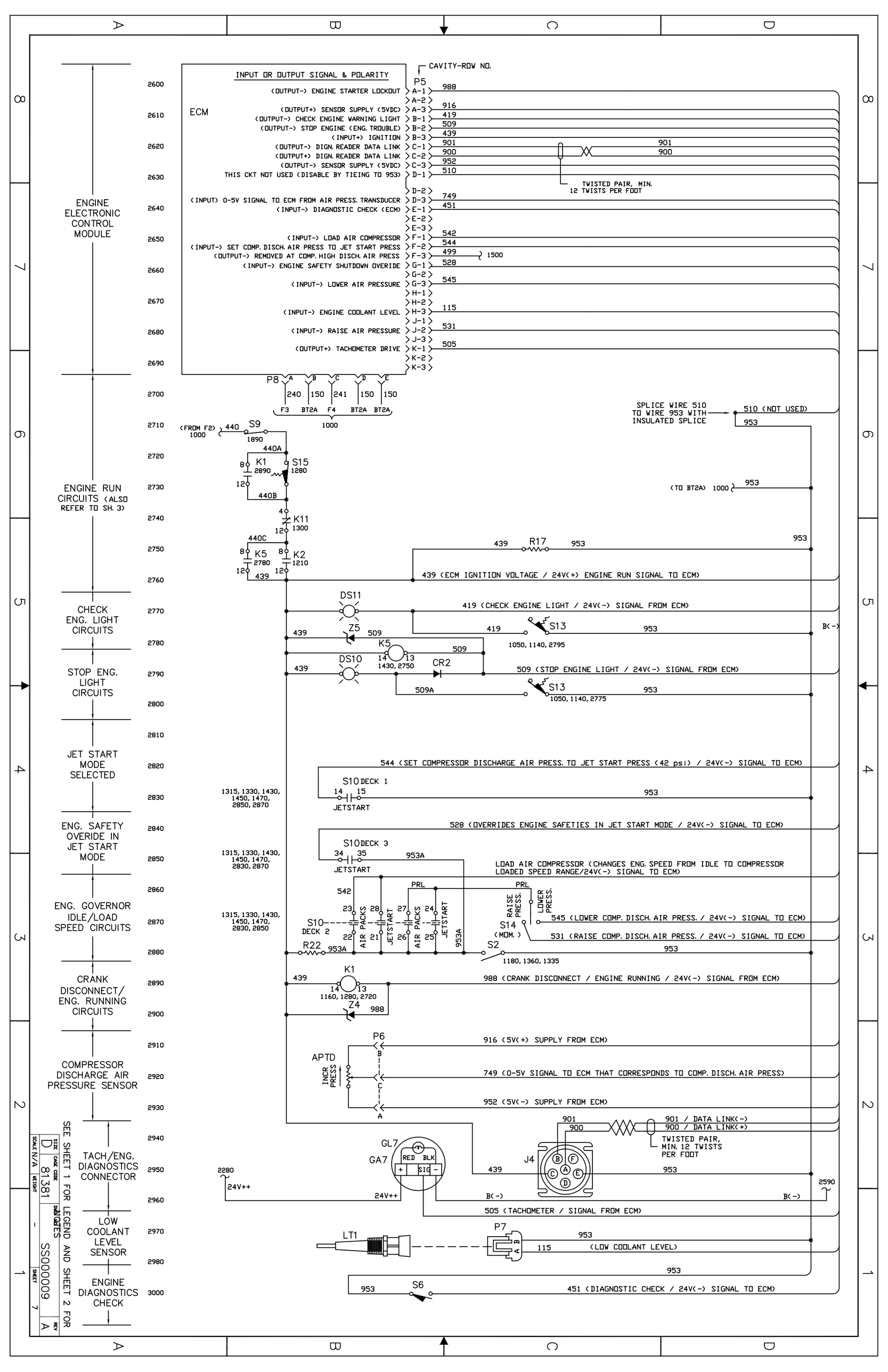
1910 24V++ 2950

24V2 24VFS

2200 2210 2220 2230 2240 2250 2260 2270 2280 2290 2300 2310 2320 2330 2340 2350 2360 2370 2380 2390 2400 2410 2420 2430 2440 2450 2460 2470 2480 2490 2500 2510 2520 2530 2540 2550 2560 2570 2580 2590

SEE SHEET 1 FOR LEGEND AND SHEET 2 FOR NOTES

SIZE	CAGE CODE		REV
D	81381	SS000009	A
SCALE N/A	WEIGHT –	SHEET 6	


INPUT OR OUTPUT SIGNAL & POLARITY
CAVITY-ROW NO.
ECM
P5
(OUTPUT-) ENGINE STARTER LOCKOUT A-1 988
A-2
(OUTPUT+) SENSOR SUPPLY (5VDC) A-3 916
(OUTPUT-) CHECK ENGINE WARNING LIGHT B-1 419
(OUTPUT-) STOP ENGINE (ENG. TROUBLE) B-2 509
(INPUT+) IGNITION B-3 439
(OUTPUT-) DIGN. READER DATA LINK C-1 901
(OUTPUT+) DIGN. READER DATA LINK C-2 900
(OUTPUT-) SENSOR SUPPLY (5VDC) C-3 952
THIS CKT NOT USED (DISABLE BY TIEING TO 953) D-1 510
D-2
(INPUT) 0-5V SIGNAL TO ECM FROM AIR PRESS. TRANSDUCER D-3 749
(INPUT-) DIAGNOSTIC CHECK (ECM) E-1 451
E-2
E-3
(INPUT-) LOAD AIR COMPRESSOR F-1 542
(INPUT-) SET COMP. DISCH. AIR PRESS TO JET START PRESS F-2 544
(OUTPUT-) REMOVED AT COMP. HIGH DISCH. AIR PRESS F-3 499 1500
(INPUT-) ENGINE SAFETY SHUTDOWN OVERIDE G-1 528
G-2
(INPUT-) LOWER AIR PRESSURE G-3 545
H-1
H-2
(INPUT-) ENGINE COOLANT LEVEL H-3 115
J-1
(INPUT-) RAISE AIR PRESSURE J-2 531
J-3
(OUTPUT+) TACHOMETER DRIVE K-1 505
K-2
K-3
901
900
TWISTED PAIR, MIN. 12 TWISTS PER FOOT
P8 A B C D E
240 150 241 150 150
F3 BT2A F4 BT2A BT2A
1000
ENGINE ELECTRONIC CONTROL MODULE
ENGINE RUN CIRCUITS (ALSO REFER TO SH. 3)
CHECK ENG. LIGHT CIRCUITS
STOP ENG. LIGHT CIRCUITS
JET START MODE SELECTED
ENG. SAFETY OVERIDE IN JET START MODE
ENG. GOVERNOR IDLE/LOAD SPEED CIRCUITS
CRANK DISCONNECT/ ENG. RUNNING CIRCUITS
COMPRESSOR DISCHARGE AIR PRESSURE SENSOR
TACH/ENG. DIAGNOSTICS CONNECTOR
LOW COOLANT LEVEL SENSOR
ENGINE DIAGNOSTICS CHECK
SEE SHEET 1 FOR LEGEND AND SHEET 2 FOR
(FROM F2) 1000
440 S9 1890
440A
K1 2890
S15 1280
440B
K11 1300
440C
K5 2780
K2 1210
439
SPLICE WIRE 510 TO WIRE 953 WITH INSULATED SPLICE
510 (NOT USED)
953
(TO BT2A) 1000
R17
439 (ECM IGNITION VOLTAGE / 24V(+) ENGINE RUN SIGNAL TO ECM)
DS11
419 (CHECK ENGINE LIGHT / 24V(-) SIGNAL FROM ECM)
S13
1050, 1140, 2795
Z5
509
DS10
CR2
509 (STOP ENGINE LIGHT / 24V(-) SIGNAL FROM ECM)
509A
1050, 1140, 2775
544 (SET COMPRESSOR DISCHARGE AIR PRESS. TO JET START PRESS (42 psi) / 24V(-) SIGNAL TO ECM)
S10 DECK 1
JETSTART
1315, 1330, 1430, 1450, 1470, 2850, 2870
528 (OVERRIDES ENGINE SAFETIES IN JET START MODE / 24V(-) SIGNAL TO ECM)
S10 DECK 3
953A
LOAD AIR COMPRESSOR (CHANGES ENG. SPEED FROM IDLE TO COMPRESSOR LOADED SPEED RANGE/24V(-) SIGNAL TO ECM)
S10 DECK 2
AIR PACKS
JETSTART
PRL
RAISE PRESS.
LOWER PRESS.
S14 (MOM.)
545 (LOWER COMP. DISCH. AIR PRESS. / 24V(-) SIGNAL TO ECM)
531 (RAISE COMP. DISCH. AIR PRESS. / 24V(-) SIGNAL TO ECM)
R22
S2
1180, 1360, 1335
988 (CRANK DISCONNECT / ENGINE RUNNING / 24V(-) SIGNAL TO ECM)
Z4
1160, 1280, 2720
P6
916 (5V(+) SUPPLY FROM ECM)
APTD
INCR PRESS
749 (0-5V SIGNAL TO ECM THAT CORRESPONDS TO COMP. DISCH. AIR PRESS)
952 (5V(-) SUPPLY FROM ECM)
901 / DATA LINK(-)
900 / DATA LINK(+)
TWISTED PAIR, MIN. 12 TWISTS PER FOOT
GL7
GA7
RED BLK
+ SIG -
J4
2280
24V++
B(-)
2590
505 (TACHOMETER / SIGNAL FROM ECM)
LT1
P7
115
(LOW COOLANT LEVEL)
S6
451 (DIAGNOSTIC CHECK / 24V(-) SIGNAL TO ECM)
SIZE D
CAGE CODE 81381
SCALE N/A
WEIGHT
SHEET 7
REV A
SS000009

SH. NO. – ZONE	ITEM	DESCRIPTION
7 – B7	APTD	TRANSDUCER COMPRESSOR DISCHARGE AIR PRESS., PROVIDES ELECTRICAL REFERENCE SIGNAL FOR CONTROLLING ENG. SPEED AS REQUIRED TO MAINTAIN RATED AIR PRESSURE
6 – C3	B1	MOTOR ENGINE STARTING, 24V
6 – A3, A3 6 – A3, A3	BT1A, 1B BT2A, 2B	BATTERY 24V BATTERY SYSTEM (4 – 12V BATTERIES IN SERIES/PARALLEL)
3 – A3	CR1	RECTIFIER BLOCKING, P.N. IN4006
5 – D2	CR2	RECTIFIER BLOCKING, P.N. IN4006
5 – D3	CR3-13	RECTIFIER BLOCKING, P.N. IN4006
5 – D4, D7	CR14-19	RECTIFIER BLOCKING, P.N. IN4006
3 – A3	DS1	LAMP, RED BATTERY CHARGER NOT OPERATING, 24V
3 – C4	DS2	LAMP, AMBER UNIT OPERATING IN COOLDOWN MODE, 24V
3 – D4	DS3	LAMP, RED COMPRESSOR HIGH OIL TEMPERATURE, 24V
3 – C4	DS4	LAMP, RED COMPRESSOR HIGH DISCHARGE AIR TEMPERATURE, 24V
3 – D4	DS5	LAMP, RED COMPRESSOR LOW OIL PRESSURE, 24V
3 – D2	DS6	LAMP, RED LOSS OF VOLTAGE TO SAFETY CIRCUITS, 24V
7 – D8	DS7	LAMP, BLUE BEACON, FLASHING, LOW FUEL LEVEL, 24V (OPTIONAL)
3 – C2	DS8	LAMP, RED LOW FUEL LEVEL, 24V (OPTIONAL)
3 – C3	DS9	LAMP, RED EMERGENCY STOP, 24V
3 – D3	DS10	LAMP, RED ENGINE TROUBLE, 24V
3 – D3	DS11	LAMP, AMBER CHECK ENGINE, 24V
3 – C8, B8	DS12A, B	LAMP GAUGE PANEL ILLUMINATION, 24V
3 – C5	DS12C	LAMP CONTROL PANEL ILLUMINATION, 24V
7 – B8	DS13	LAMP, AMBER BEACON, FLASHING, ENGINE RUNNING, 24V (OPTIONAL)
8 – B7	ECM	MODULE ENGINE ELECTRONIC CONTROL, TYPE DDEC IV, 24V
8 – B1	F1	FUSE 24V-DC CONTROL CIRCUIT PROTECTION, 10 AMP
8 – B1	F2	FUSE 24V-DC IGNITION VOLTAGE TO ECM, 5 AMP
8 – B1, B1	F3, 4	FUSE 24V-DC POWER TO ECM, 15 AMP
6 – B4	F5	FUSE BEACON, LOW FUEL LEVEL, 5 AMP
6 – B4	F6	FUSE BEACON, ENGINE RUNNING, 5 AMP
7 – C8	FL1	FLASHER BEACON, LOW FUEL LEVEL, 24V (OPTIONAL)
7 – A8	FL2	FLASHER BEACON, ENGINE RUNNING, 24V (OPTIONAL)
6 – C6	G1	ALTERNATOR WITH INTERNAL VOLTAGE REGULATOR (BATTERY CHARGING) 24V
3 – B5	GA1	GAUGE FUEL LEVEL, 24V
3 – C6	GA2	GAUGE ENGINE FUEL PRESSURE, 24V
3 – A6	GA3	GAUGE ENGINE OIL PRESSURE, 24V
3 – B6	GA4	GAUGE ENGINE COOLANT TEMPERATURE, 24V
3 – A7	GA5	GAUGE COMPRESSOR OIL PRESSURE, 24V
3 – B7	GA6	GAUGE COMPRESSOR OIL TEMPERATURE, 24V
3 – D5	GA7	GAUGE TACHOMETER, WITH HOURMETER, 24V
3 – B5	GL1	LIGHT, GAUGE FUEL LEVEL, 24V
3 – C6	GL2	LIGHT, GAUGE ENGINE FUEL PRESSURE, 24V
3 – A6	GL3	LIGHT, GAUGE ENGINE OIL PRESSURE, 24V
3 – B6	GL4	LIGHT, GAUGE ENGINE COOLANT TEMPERATURE, 24V
3 – A7	GL5	LIGHT, GAUGE COMPRESSOR OIL PRESSURE, 24V
3 – B7	GL6	LIGHT, GAUGE COMPRESSOR OIL TEMPERATURE, 24V
3 – D5	GL7	LIGHT, GAUGE TACHOMETER, 24V
3 – A5	GL8	LIGHT, GAUGE VOLTMETER, 24V
4 – C2	J3	RECEPTACLE CONTROL PANEL, MALE
4 – D1	J4	RECEPTACLE FOR CONNECTING ENG. DIAGNOSTIC DATA READER TO ECM UNIT, MALE
8 – B4	J9	RECEPTACLE FEMALE
7 – A5	J10	RECEPTACLE FOR SOLENOIDS L2, L3, & L4, FEMALE
7 – B4	J11	RECEPTACLE FOR SWITCH S7, FEMALE
7 – A2	J12	RECEPTACLE FOR SWITCH S8, FEMALE
7 – D7	J13	RECEPTACLE FOR OPTIONAL LOW FUEL LEVEL BEACON, FEMALE
8 – B1	J14	RECEPTACLE FOR FUSE BLOCK, FEMALE
8 – C1	J15	RECEPTACLE FOR FUSE BLOCK, FEMALE
7 – A2	J16	RECEPTACLE FOR SENDER SE1, FEMALE
7 – A7	J17	RECEPTACLE FOR OPTIONAL ENGINE RUNNING BEACON, FEMALE
N/S	J18	RECEPTACLE NOT USED
4 – B3, C3	J19, 20	RECEPTACLE MAIN RELAY PANEL
7 – A6	J21	RECEPTACLE FOR SWITCHES S17 & S18, FEMALE
5 – A7	K1	RELAY ENGINE RUNNING INDICATION AND CRANK DISCONNECT, ENERGIZED BY ENGINE ECM AT APPROX. 500 RPM, 24V-DC COIL
5 – A7	K2	RELAY ENGINE RUN/ECM IGNITION, 24V-DC COIL
6 – C2	K3	CONTACTOR AUXILIARY STARTING, 24V-DC COIL
7 – D8	K4	RELAY LOW FUEL LEVEL BEACON, 24V-DC COIL (OPTIONAL)
5 – A6	K5	RELAY MAINTAINS IGNITION VOLTAGE ON ECM AFTER ECM SHUTS ENGINE DOWN FROM ENGINE TROUBLE, ENERGIZED BY ECM, 24V-DC COIL
5 – A6	K6	RELAY LOSS OF VOLTAGE TO SAFETY CIRCUITS DETECTION, 24V-DC COIL
5 – A5	K7	RELAY LOW FUEL LEVEL WARNING, 24V-DC COIL
5 – A5	K8	RELAY LOW FUEL LEVEL SHUTDOWN, 24V-DC COIL
5 – A4	K9	RELAY EMERGENCY STOP, 24V-DC COIL
5 – A4	K10	RELAY NOT USED
5 – A4	K11	RELAY ENG. STOP ON COMPRESSOR SAFETIES, MANUAL EMERG. STOP, LOW FUEL LEVEL, 24V-DC COIL
5 – A3	K12	RELAY COMPRESSOR HIGH OIL TEMP., 24V-DC COIL
5 – B7	K13A	RELAY LAMP TEST, 24V-DC COIL
5 – B7	K13B	RELAY LAMP TEST, 24V-DC COIL
5 – B6	K14	RELAY ENGINE RUNNING, 24V-DC COIL
5 – B6	K15	RELAY COMPRESSOR HIGH DISCHARGE AIR TEMP., 24V-DC COIL
5 – B5	K16	RELAY OVERRIDES LOW FUEL SHUTDOWN IN JET START MODE, 24V-DC COIL
5 – B5	K17	RELAY COMPRESSOR LOW OIL PRESSURE, 24V-DC COIL
5 – B4	K18	RELAY LOSS OF VOLTAGE TO SAFETY CIRCUITS, 24V-DC COIL

SH. NO. – ZONE	ITEM	DESCRIPTION
5 – B4	K19	RELAY COMPRESSOR UNLOAD, DE-ENERGIZED BY ECM AT HIGH DISCHARGE AIR PRESSURE, 24V-DC COIL
7 – A8	K20	RELAY ENGINE RUNNING BEACON, 24V-DC COIL (OPTIONAL)
6 – C3	L1	SOLENOID ENGINE STARTING, 24V
7 – B6	L2	SOLENOID COMPRESSOR AIR PACKS MODE VALVE, N/C ORIFICE, 24V COIL
7 – B5	L3	SOLENOID COMPRESSOR JET START MODE VALVE, N/C ORIFICE, 24V COIL
7 – B5	L4	SOLENOID LOW PRESSURE ASSIST. ADDS ADDITIONAL PILOT PRESS TO AIR COMP UNLOADER VALVE TO INCREASE DISCH. PRESS, N/C ORIFICE, 24V COIL
6 – D8	LT1	SENSOR ENGINE COOLANT LEVEL PROBE (LOW COOLANT LEVEL)
3 – A5	M1	METER VOLTMETER, BATTERY CHARGER OUTPUT
–	P1, 2	PLUG NOT USED
6 – A8	P3	PLUG CONTROL PANEL, FEMALE
4 – A2	P5	PLUG ECM (ENGINE ELECTRONIC CONTROL MODULE) FEMALE
7 – B7	P6	PLUG MATES WITH APTD, FEMALE
6 – D7	P7	PLUG COOLANT LEVEL PROBE, FEMALE
8 – C6	P8	PLUG ECM POWER, FEMALE
4 – B1	P9	PLUG MALE
7 – B5	P10	PLUG FOR SOLENOIDS L2, L3, & L4, MALE
7 – B4	P11	PLUG FOR SWITCH S7, MALE
7 – A2	P12	PLUG FOR SWITCH S8, MALE
7 – D7	P13	PLUG FOR LOW FUEL LEVEL BEACON, MALE (OPTIONAL)
8 – B2, C2	P14, 15	PLUG FOR FUSE BLOCK, MALE
7 – A2	P16	PLUG FOR SENDER SE1, MALE
7 – A7	P17	PLUG FOR ENGINE RUNNING BEACON, MALE (OPTIONAL)
N/S	P18	PLUG NOT USED
5 – B2, C2	P19, 20	PLUG MAIN RELAY PANEL
7 – A6	P21	PLUG FOR SWITCHES S17 & S18, MALE
5 – D4	R1-6	RESISTOR BURDEN, 390 OHM
5 – D5	R7-11	RESISTOR BURDEN, 390 OHM
5 – A3	R12	RESISTOR BURDEN, 100 OHM, 25 WATT
5 – D5	R13-16	RESISTOR BURDEN, 390 OHM
5 – D6	R17-25	RESISTOR BURDEN, 390 OHM
7 – D8, A8	R26, 27	RESISTOR BURDEN, 220 OHM (OPTIONAL)
7 – A3	SE1	SENDER, GAUGE FUEL LEVEL, ELEC. WITH LOCAL MECH. GAUGE, DIESEL DAY TANK
6 – B3	SE2	SENDER, GAUGE ENGINE FUEL PRESSURE
6 – C2	SE3	SENDER, GAUGE ENGINE OIL PRESSURE
6 – C4	SE4	SENDER, GAUGE ENGINE COOLANT TEMP.
7 – C6	SE5	SENDER, GAUGE COMPRESSOR OIL PRESSURE
7 – D7	SE6	SENDER, GAUGE COMPRESSOR OIL TEMP.
3 – A2	S1	SWITCH ENGINE CRANK, TOGGLE TYPE, MOMENTARY CONTACTS
3 – B2	S2	SWITCH ENGINE RUN/STOP
7 – D7	S3	SWITCH COMPRESSOR HIGH OIL TEMPERATURE, N/O, 176°F MAKE
7 – B6	S4	SWITCH COMPRESSOR HIGH DISCHARGE AIR TEMPERATURE, N/O, 500°F MAKE
7 – C6	S5	SWITCH COMPRESSOR LOW OIL PRESSURE, N/C, 12 PSI BREAK
3 – D2	S6	SWITCH ENGINE DIAGNOSTIC CHECK, MOMENTARY CONTACTS
7 – A3	S7	SWITCH LOW FUEL LEVEL WARNING, DAY TANK, N/C, CLOSED ON LOW LEVEL (OPTIONAL)
7 – A3	S8	SWITCH LOW FUEL LEVEL SHUTDOWN, DAY TANK, N/C, CLOSED ON LOW LEVEL (OPTIONAL)
3 – B3	S9	SWITCH EMERGENCY STOP, MAINTAINED CONTACTS
3 – C2	S10	SWITCH COMPRESSOR MODE SELECTOR, JET START/UNLOAD/AIR PACKS (SHOWN IN UNLOAD MODE)
6 – B3	S11	SWITCH CRANK LOCK-OUT, ENGINE FUEL PRESSURE, N/C, 20 PSI BREAK
3 – A3	S12	SWITCH PANEL LAMP
3 – A4	S13	SWITCH LAMP TEST, MOMENTARY CONTACTS
5 – B3	S14	SWITCH RAISE/LOWER ENGINE AIR PRESSURE REGULATING SET POINT, MOM. CONTACTS (TO BE USED ONLY BY AUTHORIZED MAINTENANCE PERSONNEL. REFER TO TECHNICAL MANUAL.)
3 – A4	S15	SWITCH TROUBLE RESET, MOMENTARY CONTACTS (HOLD FOR 3 SECONDS)
3 – C5	S16	SWITCH FUEL LEVEL CHECK, TOGGLE TYPE, MOMENTARY CONTACTS
7 – B6	S17	SWITCH SENSES LOW DISCHARGE PRESS IN AIR PACKS, N/C, CLOSES AT 27 PSI ON FALLING PRESS.
7 – B6	S18	SWITCH SENSES LOW DISCHARGE PRESS IN JET START, N/C, CLOSES AT 32 PSI ON FALLING PRESS.
5 – D2	TB1, 2	TERMINAL BOARD
5 – D5	TB3, 4	TERMINAL BOARD
4 – D3	TB5	TERMINAL BOARD, FOR APTD
5 – A8	TD1	RELAY TIME DELAY, CONTROL SYSTEM POWER SUPPLY/COOLDOWN, 24V-DC COIL, 3 MIN. DELAY ON DE-ENERGIZATION
5 – B8	TD2	RELAY TIME DELAY, COMPRESSOR LOW OIL PRESSURE AND LOSS OF VOLTAGE TO SAFETY, 10 SEC. DELAY ON ENERGIZATION, 24V-DC COIL
5 – B8	TD3	RELAY TIME DELAY, COMPRESSOR LOW DISCH. PRESS ASSIST, 8 SEC. DELAY ON ENERGIZATION, 24V-DC COIL
5 – D6	Z1, 2	SUPPRESSOR VOLTAGE SURGE, VOLTAGE BREAKDOWN, 33V, UNI-DIRECTIONAL, P.N. 1.5KE33A
5 – D7	Z3-8	SUPPRESSOR VOLTAGE SURGE, VOLTAGE BREAKDOWN, 33V, UNI-DIRECTIONAL, P.N. 1.5KE33A
6 – C2	Z9	SUPPRESSOR VOLTAGE SURGE, VOLTAGE BREAKDOWN, 33V, UNI-DIRECTIONAL, P.N. 1.5KE33A
5 – D7	Z10, 11	SUPPRESSOR VOLTAGE SURGE, VOLTAGE BREAKDOWN, 33V, UNI-DIRECTIONAL, P.N. 1.5KE33A
8 – B1	XFA	ASSEMBLY FUSE HOLDER
6 – B4, B4	XFB, XFC	ASSEMBLY FUSE HOLDER

LEGEND

THIS DRAWING HAS BEEN GENERATED AND IS MAINTAINED BY A CAD SYSTEM. CHANGES SHALL ONLY BE INCORPORATED AS DIRECTED BY THE DESIGN ACTIVITY.

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REVISIONS

REV	DESCRIPTION	DATE	APPROVED
–	RELEASED FROM ENGINEERING		
A	SHT 3, ZA3, S12 WIRE 241/J19-C WAS CONNECTED, ZB2, S2 WIRE 24V1/S12 WAS CONNECTED TO TERMINAL No. 9 SHT 5, ZA8, REMOVED WIRE 24V1/P19-2 FROM TERM No. 4	11-05-02	AS-00153

MATERIAL

A-90041 – 90045

NEXT ASSY. USED ON APPLICATION

INTERPRET DRAWING PER ANSI Y14.5

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
DEBURRED AND BROKEN EDGES .03 RAD
CONCENTRICITY OF COAXIAL DIA'S .003 TIR
ALL MACHINED SURFACES 125 PER ANSI B46.1 (EXCLUDES DRILLED HOLES)
DIMENSIONS AND SURFACE TEXTURE APPLY AFTER ANY FINISH COATING OR TREATMENT
TOLERANCES UNLESS NOTED OTHERWISE
.X = ± .1
.XX = ± .06
.XXX = ± .010
ANGLES = ± 1°
FRACTIONS = ±

THIRD ANGLE PROJECTION

CONTRACT NO.

DRAWN	R. SOUTHARD	3/30/00
CHECKED		
MFG ENG		
PROJ ENG		

STEWART & STEVENSON SERVICES
4516 HARRISBURG BLVD., HOUSTON, TX. 77011

TITLE
WIRING DIAGRAM,
AIR START CONTROL CIRCUITS
WITH DDEC IV ENGINE

SIZE	CAGE CODE	DWG. NO.
D	81381	SS000010
SCALE N/A	WEIGHT –	SHEET 1 OF 8

NOTES:

1. ALL SWITCHES AND RELAYS SHOWN OFF, DE-ACTUATED (DE-ENERGIZED).

2. ENGINE SAFETIES WILL ENERGIZE LAMP DS10 AND OPERATE TO SHUT ENGINE DOWN, WHEN SAFE OPERATING CONDITIONS ARE EXCEEDED BY SHUTTING OFF FUEL (THRU ECM), IN ALL MODES OF OPERATION EXCEPT FOR JET-START:
   a. IN JET-START MODE, ENGINE MUST CONTINUE TO RUN BUT LAMP DS10 WILL ILLUMINATE TO ALERT OPERATING PERSONNEL THAT UNIT IS BEING OPERATED UNDER CONDITION THAT COULD DAMAGE ENGINE.
   b. CHECK ENGINE LAMP DS11 IS FOR WARNING AND UNIT MAY BE OPERATED WITH THIS LAMP LIT. WHEN RELAY K2 FIRST PULLS IN, ENERGIZING WIRE 439, THE ECM ENERGIZES BOTH LAMPS DS11 AND DS10 FOR APROX. FIVE SECONDS, PROVIDING AUTOMATIC LAMP CHECK.
   c. LAMPS DS11 AND DS10 WILL ALSO FLASH FAULT CODES WHEN DIAGNOSTIC SWITCH IS ACTUATED. REFER TO TECHNICAL MANUAL AND UNIT OPERATING INSTRUCTIONS FOR DETAILS.

3. ENGINE SPEEDS ARE AS FOLLOWS:
   1. UNLOAD (IDLE) ------- 1200 RPM
   2. AIR PACKS MODE ------ 1200-2100 RPM
   3. JET START MODE ------ 1200-2100 RPM

4. COMPRESSOR DISCHARGE AIR PRESSURE ARE AS FOLLOWS:
   1. UNLOAD (IDLE) ------- 0 psi
   2. AIR PACKS MODE ------ 24 psi
   3. JET START MODE ------ 42 psi

5. REFER TO S&S DWG. SS000009 FOR UNIT SCHEMATIC DIAGRAM.

6. REFER TO S&S DWG. SS000011 FOR CONTROL PANEL ASSEMBLY. (FOR REFERENCE ONLY, CONSTRUCTION OF PANEL MAY VARY.)

7. A. ALL WIRING TO BE 16 AWG, TYPE GXL, UNLESS OTHERWISE NOTED.
   B. ALL ELECTRICAL WIRING HARNESSES LOCATED OUTSIDE MAIN CONTROL PANEL SHALL BE PROTECTED WITH 120°C LOOM (OR EQUIVALENT).
   C. ALL ELECTRICAL RECEPTACLES AND PLUGS SHALL BE PERMANENTLY IDENTIFIED BY THEIR REFERENCE DESIGNATION (ITEM) NUMBERS. THE IDENTIFICATION MARKS ARE TO BE LOCATED ON THE ELECTRICAL HARNESS JUST BEHIND THE RECEPTACLE/PLUG.

8. THIS DRAWING DOES NOT SHOW WIRING TO ECM FURNISHED BY ENGINE MANUFACTURER (ENGINE SENSORS, FUEL INJECTION SOLENOIDS, ETC.). FOR THOSE DRAWINGS, REFER TO TECHNICAL MANUAL.

9. REFER TO TECHNICAL MANUAL FOR ELECTRICAL WIRING HARNESS AND PARTS LIST.

NOTES
SEE SHEET 1 FOR LEGEND

SIZE	CAGE CODE	DWG. NO.	REV
D	81381	SS000010	A
SCALE N/A	WEIGHT –	SHEET 2	

CONTROL PANEL DOOR
– REAR VIEW –

TO GROUNDING BOLT, REF SH. 4, ZONE A8

14 AWG, GREEN

MECH. GAUGE COMP. AIR TEMP.

MECH. GAUGE COMP. AIR PRESS.

DS12A — 20 AWG 24V2/DS12B — COVER SPLICE WITH CLEAR HEAT SHRINK

DS12B — 20 AWG 24V2/DS12A 24V2/GL5 — COVER SPLICE WITH CLEAR HEAT SHRINK

GL2 GA2 — 20 AWG — BK(-) — BK(-)/GL4 — 24V2/GL4 — 24V2/GL8 20 AWG — SE2/J3-J — BK(-)/GL1 20 AWG — 24V++/GA7-(+)

GL7 GA7 — SIG — BK(-)/M1-(-) BK(-)/S13-4 BK(-)/J19-20 505/P5-K1 — 24V++/GA2-(+) 24V++/S13-2

S16 (MOMENTARY) — 24VFS/GA4-(+) 24VFS/J19-6 — 24V3/GA1-(+) — 24V1/S12 14 AWG

DS12C — COVER SPLICE WITH CLEAR HEAT SHRINK — 20 AWG 24V2/GL1 24V2/S12

DS3 — BK(-)/DS9 — DP3/J19-24
DS5 — BK(-)/DS3 — BK(-)/DS4 — DP5/J19-26
DS4 — BK(-)/DS5 — BK(-)/DS2 — DP4/J19-25
DS2 — BK(-)/S13-4 — DP2/J19-23 — DP2/S2-4

DS11 — 439/DS10 — 419/S13-7 — 419/P5-B1
DS10 — 439/DS11 — 439/J20-2 — 509A/S13-10
DS9 — BK(-)/DS6 — BK(-)/DS3 — DP9/J20-20
DS8 — BK(-)/DS6 — DP7/J19-28 — DP7/J3-1
DS6 — BK(-)/DS8 — BK(-)/DS9 — DP6/J19-27

S6 (MOMENTARY) — 953/J20-16 — 953/S13-8 — 451/P5-E1

TO SH. 4, ZONE A2

DECK 1 — DECK 2 — DECK 3 — DECK 4

JET START — 544/P5-F2 — 953/J4-E — 953/S2-11 — 953/P9-A — 953/S13-11 — 510/P5-D1
PRL — PRL/J20-1 — 953A
AIR PACKS — IN11/J20-12 — 24V4/S10-46 — IN10/J20-21 — 542/P5-F1
953A/S2-12
TRSC — 542/P5-F1 — TRSC/S2-2 — TRSC/J20-28
TRSB/S2-1 — TRSB/J20-27
UNLOAD — IN1/S1-1 — IN1A/J19-12
528/P5-G1
IN10B/J20-25 — IN10B/J3-V — 24V4/J19-11 — 24V4/S10-11
IN10A/J20-24 — IN10A/J3-D

S10 — JET START / AIR PACKS

USE METAL JUMPERS MFGD. BY SWITCH MANUFACTURER BETWEEN TERMINALS: 15-16, 22-21, 26-25, AND 46-45. (DECKS 1-4)

WIRE HARNESS ROUTING (TYP)

GL6 GA6 — 20 AWG — 24V2/DS12B 24V2/GL6 20 AWG — BK(-)/GL3 24V2/GL5 24V2/GL3 20 AWG — SE6/J3-c — BK(-)/GA5-(-) 20 AWG — 24VFS/GA5-(+)
GL5 GA5 — 20 AWG — 24V2/DS12B 24V2/GL6 20 AWG — BK(-)/GL6 24V2/GL6 24V2/GL4 20 AWG — SE5/J3-a — BK(-)/GA6-(-) 20 AWG — 24VFS/GA6-(+) 24VFS/GA3-(+)
GL4 GA4 — 20 AWG — BK(-)/GL2 24V2/GL3 24V2/GL2 20 AWG — SE4/J3-L — BK(-)/GA3-(-) 20 AWG — 24VFS/GA3-(+) 24VFS/S16-3
GL3 GA3 — 20 AWG — BK(-)/GL6 24V2/GL6 24V2/GL4 20 AWG — SE3/J3-K — BK(-)/GA4-(-) 20 AWG — 24VFS/GA5-(+) 24VFS/GA4-(+)
GL1 GA1 — 20 AWG — BK(-)/GA1-(-) 24V2/GL2 24V2/GL1 20 AWG — BK(-)/GA2-(-) 24V2/GL8 24V2/DS12C 20 AWG — SE1/J3-D — BK(-)/GL8 20 AWG — 24V3/S16-2
GL8 M1 — 20 AWG — BK(-)/GA7-(-) BK(-)/J19-10 — ALT+/S13-6 ALT+/J3-A

S13 (MOMENTARY) — ALT+/M1-(+) — BCF/J19-22 — 24V++/GA7-(+) — 24V++/J19-4 — 24V++/S15-3 — 14 AWG — IN13/J20-14 — BCF/DS1 — BK(-)/J3-T — BK(-)/GA7-(-) — BK(-)/DS2 — 953/S6-2 — 419/DS11 — 509A/J20-7 — 509A/DS10 — 953/S10-16

S15 (MOMENTARY) — 440A/S9-4 — 440B/J20-15 — TRS/J20-26 — 24V++/S13-2 — 24V++/S9-3

S9 (MAINTAINED) — 440A/P9-B — 440A/J20-5 — 440A/S15-6 — 14 AWG — 24V++/S15-3 — 24V++/CR1 — IN9/J20-10

DS1 — COVER CR1 WITH CLEAR HEAT SHRINK — BCF/S13-5 — 24V++/S9-3 — 24VFSA/J19-8 — CR1

S12 (MAINTAINED) — 14 AWG — 20 AWG — 24V2/DS12C — 24V1/S2-8 — 24V1/S16-1

S2 (MAINTAINED) — 953A/S10-15 — 953A/S10-21 — 953A/J20-13 — 24V44/J19-5 — 24V44/S1-P — 24V1/J19-1 — 24V1/S12 — 24V1/J3-R — DP2/DS2 — 24V1A/J19-3 — 14 AWG — TRSC/S10-33 — TRSB/S10-32

S1 (MOMENTARY) — IN1/S10-41 — 24V44/S2-9

CONTROL PANEL
SEE SHEET 1 FOR LEGEND
AND SHEET 2 FOR NOTES

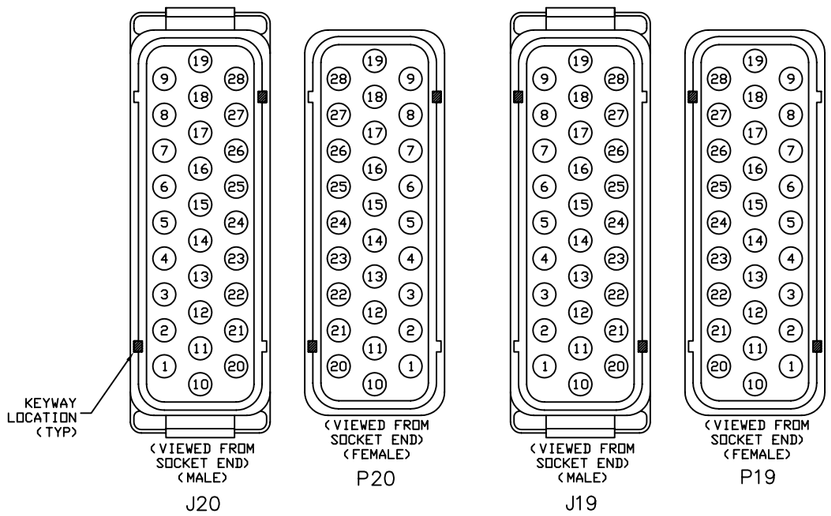
SIZE	CAGE CODE	DWG. NO.	REV
D	81381	SS000010	A
SCALE N/A	WEIGHT –	SHEET 3	

TO CONTROL PANEL DOOR BONDING GND BOLT, SH. 3, ZONE D8

GRN

14 AWG, GREEN

GROUNDING BOLT LOCATED ON LEFT WALL OF CONTROL PANEL

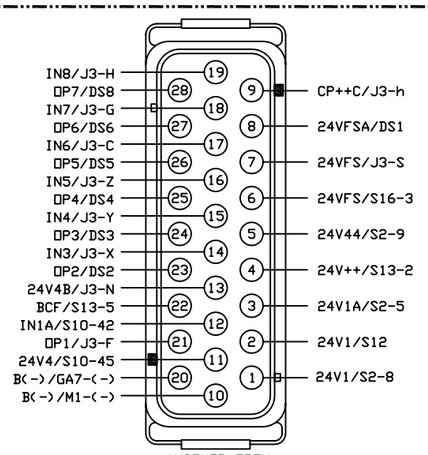


DETAIL A

J19, P19, J20, & P20 ARE TO BE KEYED AS SHOWN, BY S&S, TO PREVENT MISMATCHING OF THESE CONNECTORS. USE KEYS THAT ARE FURNISHED WITH J19 & J20, BY ITT CANNON.

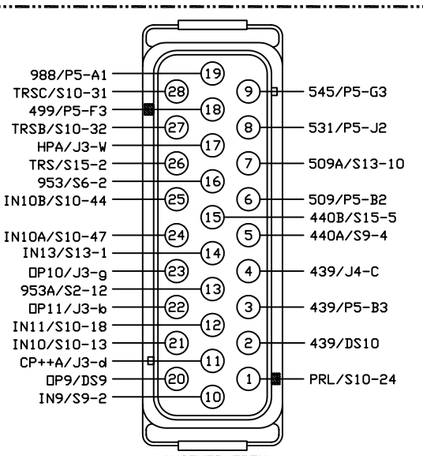
CONTROL PANEL COMPARTMENT FRONT VIEW

(SEE SHEET 5 FOR MAIN RELAY PANEL WIRING)



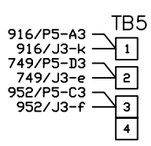
J19

(PLUG J19 MATES WITH PLUG P19 SHOWN ON SH. 5, ZONE B2) (SEE DETAIL A)



J20

(PLUG J20 MATES WITH PLUG P20 SHOWN ON SH. 5, ZONE C2) (SEE DETAIL A)



TO SH. 3, ZONE D1

NOTE: SP1 & SP2 WIRES ARE SPARES, CAP & TAPE EACH END, SEPARATELY, JUST BELOW J3 AND P5.

ENGINE

SP1
SP2

CONTROL PANEL BOTTOM

CONTROL PANEL RIGHT SIDE

P5 (FEMALE)

P5 MATES WITH ECM PLUG, SEE SH. 8, ZONE D8 FOR P5 PLUG DETAIL & MATING WITH ECM PLUG

A1	988/J20-19
A3	916/TB5-1
B1	419/DS11
B2	509/J20-6
B3	439/J20-3
C1	901/J4-B
C2	900/J4-A
C3	952/TB5-3
D1	510/S10-16
D3	749/TB5-2
E1	451/S6-1
F1	542/S10-23
F2	544/S10-14
F3	499/J20-18
G1	528/S10-34
G3	545/J20-9
H1	
H3	115/J3-M
J2	531/J20-8
K1	505/GA7-SIG

901
900

TWISTED PAIR, MIN. 12 TWISTS PER FOOT

14 AWG

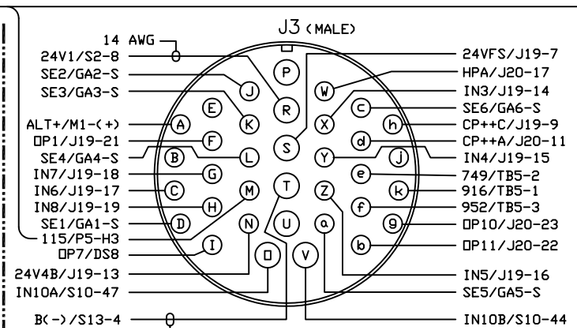
440/S9-5

953/S10-16

P9 (MALE)

P9 MATES WITH J9 ON SH. 8, ZONE B4

J3 (MALE)



(J3 SHOWN FROM WIRE END) (RECEPTACLE J3 MATES WITH PLUG P3 SHOWN ON SH. 6, ZONE A8)

TWISTED PAIR, MIN. 12 TWISTS PER FOOT

900/P5-C2

901/P5-C1

900

901

J4 (MALE)

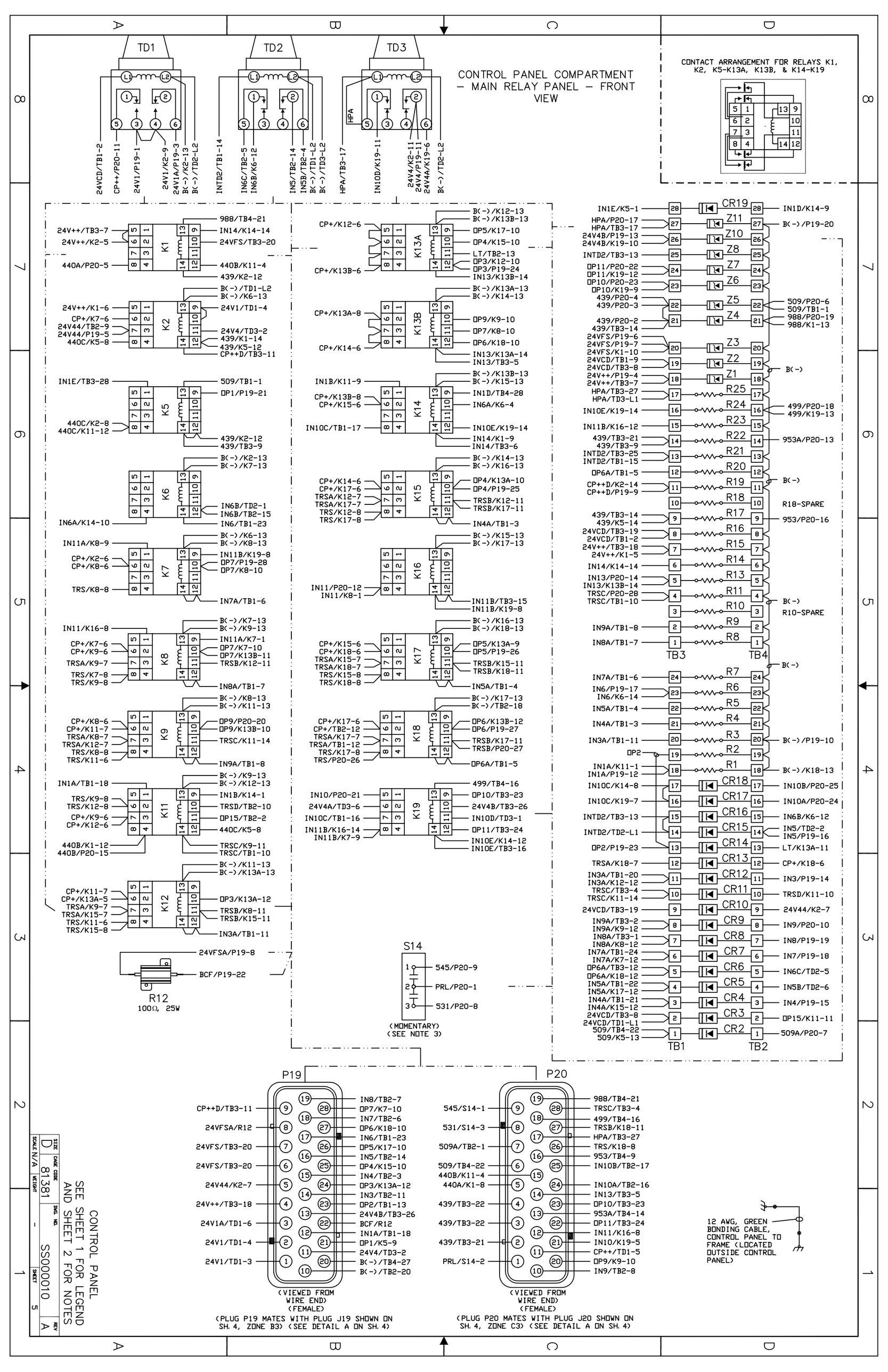
953/S10-15

(SHOWN FROM WIRE END)

439/J20-4

CONTROL PANEL
SEE SHEET 1 FOR LEGEND
AND SHEET 2 FOR NOTES

SIZE	D
SCALE	N/A
WEIGHT	
DWG. NO.	SS000010
SHEET	4
REV	A
CAGE CODE	81381


CONTROL PANEL COMPARTMENT – MAIN RELAY PANEL – FRONT VIEW
CONTACT ARRANGEMENT FOR RELAYS K1, K2, K5-K13A, K13B, & K14-K19
TD1
TD2
TD3
24VCD/TB1-2
CP++/P20-11
24V1/P19-1
24V1/K2-9
24V1A/P19-3
B(-)/K2-13
B(-)/TD2-L2
INTD2/TB1-14
IN6C/TB2-5
IN6B/K6-12
IN5/TB2-14
IN5B/TB2-4
B(-)/TD1-L2
B(-)/TD3-L2
HPA/TB3-17
IN10D/K19-11
24V4/K2-11
24V4/P19-11
24V4A/K19-6
B(-)/TD2-L2
CR19
Z11
Z10
Z8
Z7
Z6
Z5
Z4
Z3
Z2
Z1
R25
R24
R23
R22
R21
R20
R19
R18
R17
R16
R15
R14
R13
R11
R10
R9
R8
R7
R6
R5
R4
R3
R2
R1
TB3
TB4
TB1
TB2
K1
K2
K5
K6
K7
K8
K9
K11
K12
K13A
K13B
K14
K15
K16
K17
K18
K19
S14
(MOMENTARY)
(SEE NOTE 3)
R12
100Ω, 25W
P19
P20
(VIEWED FROM WIRE END)
(FEMALE)
(PLUG P19 MATES WITH PLUG J19 SHOWN ON SH. 4, ZONE B3) (SEE DETAIL A ON SH. 4)
(PLUG P20 MATES WITH PLUG J20 SHOWN ON SH. 4, ZONE C3) (SEE DETAIL A ON SH. 4)
12 AWG, GREEN BONDING CABLE, CONTROL PANEL TO FRAME (LOCATED OUTSIDE CONTROL PANEL)
CONTROL PANEL
SEE SHEET 1 FOR LEGEND
AND SHEET 2 FOR NOTES
SIZE D
CAGE CODE 81381
SCALE N/A
WEIGHT
DWG NO. SS000010
SHEET 5
REV A

LT1

P7

BLK 953/BT2A-(-)

YEL 115/P3-M

(FEMALE)

RADIATOR

FAN

ALT+/P3-A

IN12/P3-E

GRD

I

BAT

R

G1

(MOUNTED ON OPPOSITE SIDE)

24V+/L1

B(-)/B1

8 AWG, UNFUSED HARNESS, DO NOT RUN WITH OTHER HARNESSES

(MOUNTED ON OPPOSITE SIDE)

SE4

SE4/P3-L

10 AWG

24V+/L1

SS/L1

UNFUSED HARNESS, DO NOT RUN WITH OTHER HARNESSES

B(-)/J16-B

B(-)/K3

24V+/K3

SS/K3

10 AWG

B(-)/J17-B

B(-)/J13-B

B(-)/G1-GRD

8 AWG, UNFUSED HARNESS, DO NOT RUN WITH OTHER HARNESSES

B(-)/BT2B-(-)

24V+/BT1B-(+)

4/0 AWG BAT CABLE

24V+/G1-BAT

8 AWG, UNFUSED HARNESS, DO NOT RUN WITH OTHER HARNESSES

B1

SW

L1

B(-)

SM

INLINE LOCATED NEAR B1

14 AWG

F5, XFB

5A

LF1/J13-C

24V+

F6, XFC

5A

ER1/J17-C

24V+

S11

NO

NC

C

OP1/P3-F

OP1A/K3

SE2

SE2/P3-J

(MOUNTED ON OPPOSITE SIDE)

SE3

SE3/P3-K

K3

Z9

B(-)/B1

B(-)/J10-D

OP1A/S11

ENGINE FUSE BOX

ENGINE FUSE BOX BRACKET

F1 10A

F2 5A

F3 15A

F4 15A

XFA

(SEE SH. 8, ZONE B1 FOR F1-F4 WIRING)

ECM

(SEE SH. 8 FOR ECM'S, P5 & P8 WIRING DETAIL)

P8 (SEE SH. 8 FOR P8 WIRING)

P5 (SEE SH. 4 FOR P5 WIRING)

ENGINE MANUFACTURERS WIRING TO ECM NOT SHOWN. SEE NOTE 9.

CONTROL PANEL

(MOUNTED ON OPPOSITE SIDE)

(PLUG P3 MATES WITH RECEPTACLE J3 SHOWN ON SH. 4, ZONE C2)

(P3 SHOWN FROM WIRE SIDE)

P3

(FEMALE)

14 AWG 24VFS/S3

HPA/J21-C

IN3/S3

SE6/SE6

CP++B

IN4/S4-B

749/P6-C

916/P6-B

952/P6-A

OP10/J10-B

OP11/J10-A

18 AWG IN5/S5-C

SE5/SE5

IN10B/J21-B

IN10A/J21-A

12 AWG 24V1/P15-A

TO FUSE BOX, SH. 8, ZONE C2

SE2/SE2

SE3/SE3

IN12/G1-R

ALT+/G1-I

OP1/S11

SE4/SE4

IN7/J11-B

IN6/J12-SPL

IN8/J12-A

SE1/J16-A

115/P7-A

OP7/J13-A

24V4B/J10-C

B(-)/BT2A-(-)

12 AWG

12 AWG

TO FUSE BOX HARNESS, SH. 8, ZONE C2

24V+/F1

24V+/F2

24V+/F3

24V+/F4

USE 1 LUG FOR TERMINATING

UNFUSED HARNESS, DO NOT RUN WITH OTHER HARNESSES

2/0 BAT CABLE

4/0 BAT CABLE

B(-)/B1

24V+/L1

J3

J4

24V

12 AWG

B(-)/P3-T

953/P7-B

14 AWG

953/J9-A

150/P8-D

150/P8-E

150/P8-B

12 AWG

TO DDEC IV POWER HARNESS, SH. 8, ZONE B3

USE 1 LUG FOR TERMINATING

BT1B

BT2B

BT1A

BT2A

2/0 BAT CABLE

J2

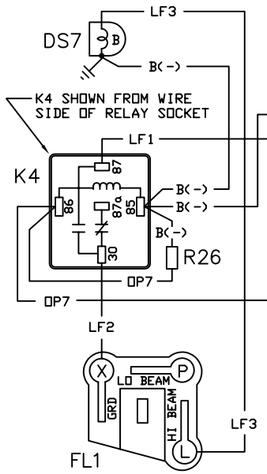
J1

8 AWG, GREEN, BONDING CABLE, FLYWHEEL HOUSING TO FRAME

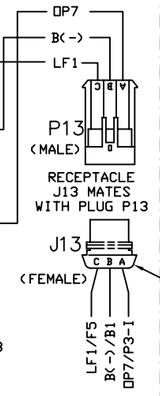
ENGINE

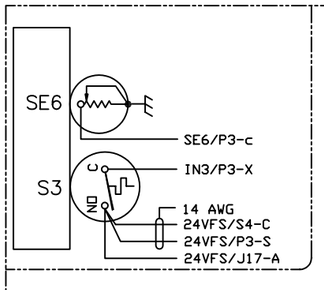
SEE SHEET 1 FOR LEGEND AND SHEET 2 FOR NOTES

SIZE	CAGE CODE	DWG. NO.	REV
D	81381	SS000010	A
SCALE N/A	WEIGHT –	SHEET 6	



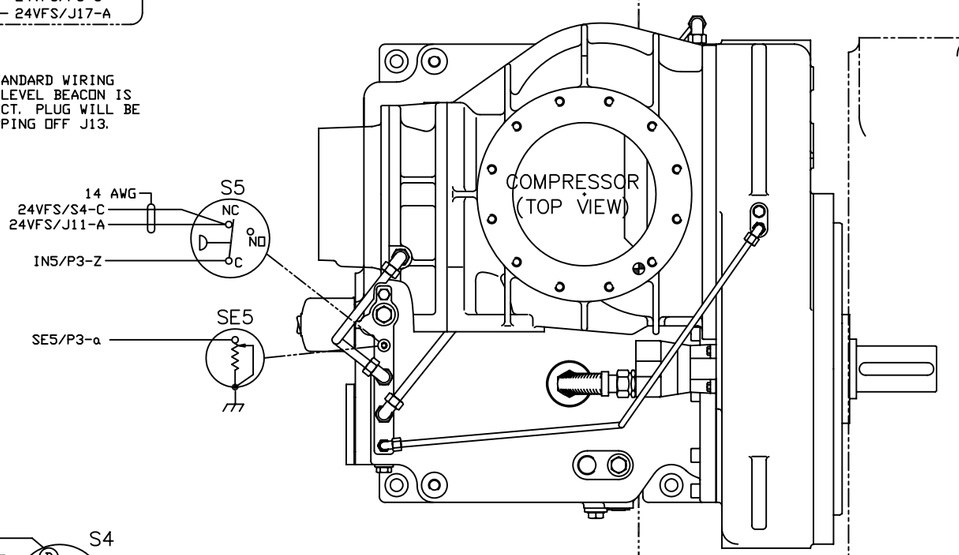
WIRING FOR DIESEL DAY TANK LOW FUEL LEVEL BEACON OPTION

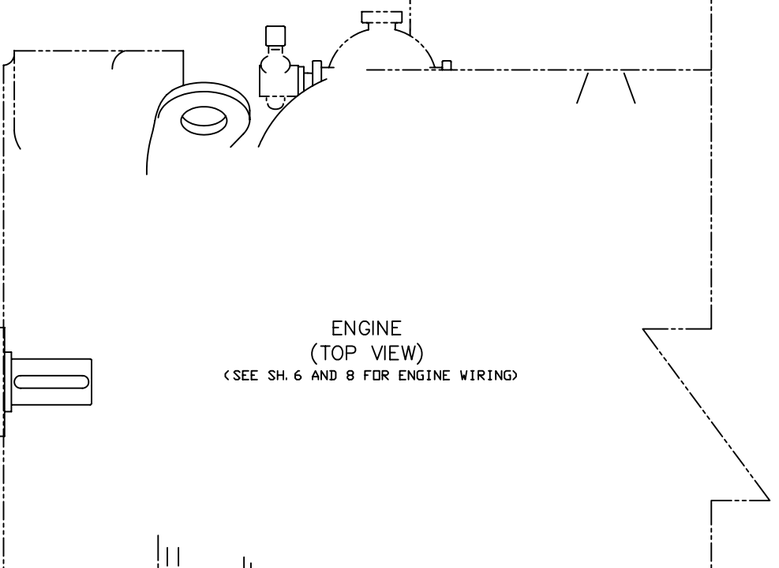


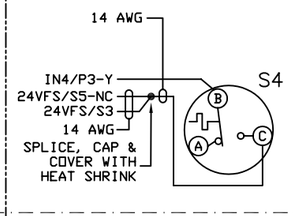


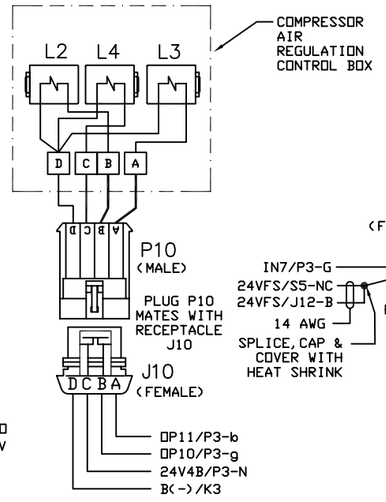
J13 IS PART OF STANDARD WIRING HARNESS. IF FUEL LEVEL BEACON IS NOT FURNISHED ELECT. PLUG WILL BE FURNISHED FOR CAPPING OFF J13.

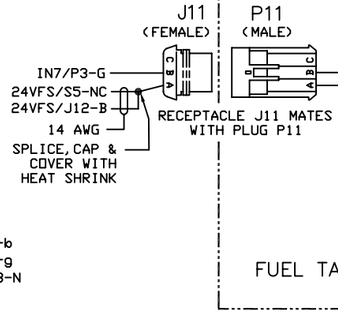
BT1A, BT1B, BT2A, BT2B LOCATION
(SEE SH. 6 FOR BATTERY WIRING)

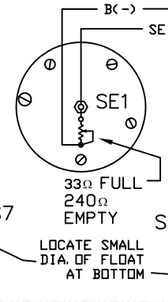


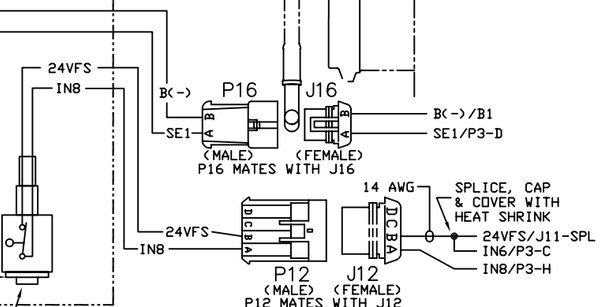






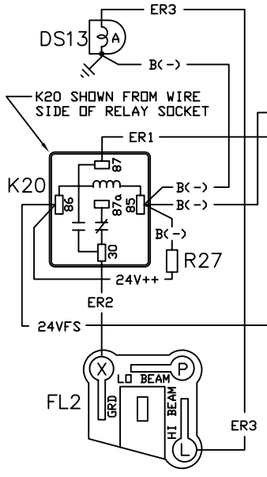


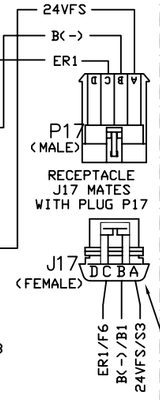




FUEL TANK

CONTROL PANEL LOCATION – P3
(SEE SH. 6 FOR P3 WIRING)



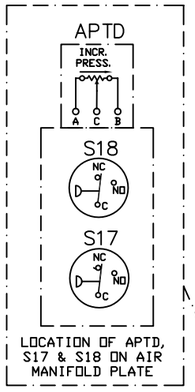


WIRING FOR ENGINE RUNNING BEACON OPTION

J17 IS PART OF STANDARD WIRING HARNESS. IF ENGINE RUNNING BEACON IS NOT FURNISHED ELECT. PLUG WILL BE FURNISHED FOR CAPPING OFF J17.

S7 & S8 ARE OPTIONAL. IF NOT FURNISHED, ELECT. PLUGS WILL BE FURNISHED FOR CAPPING OFF J11 & J12.

CONTROLS FOR OPTIONAL BEACONS LOCATED ON ENCLOSURE WALL (INSIDE) ABOVE AIR DISCHARGE PIPES.



LOCATION OF APTD, S17 & S18 ON AIR MANIFOLD PLATE

COMPRESSOR, FUEL TANK AND SKID
SEE SHEET 1 FOR LEGEND AND SHEET 2 FOR NOTES

SIZE	CAGE CODE	DWG. NO.	REV
D	81381	SS000010	A
SCALE N/A	WEIGHT –	SHEET 7	

LABEL 'S&S P. N. SE000039'

LABEL 'P5'

SP1

SP2

NOTE: SP1 & SP2 WIRES ARE SPARES. CAP & TAPE EACH END, SEPARATELY, JUST BELOW P5.

PLUG UNUSED CAVITIES

1	2	3	
505			K
	531		J
		115	H
528		545	G
542	544	499	F
			E
451			D
510		749	C
901	900	952	B
419	509	439	A
988		916	

TORQUE CONNECTOR LOCKING SCREW TO 7-13 IN. LBS.

P5
(FEMALE)
PLUG P5 VIEWED FROM WIRE END.
(SEE SH. 4, ZONE A2 FOR WIRE ROUTING.)

NOTE: SP1 & SP2 WIRES ARE SPARES, CAP & TAPE EACH END, SEPARATELY, JUST BELOW P3.

SP2
SP1

TO CONTROL PANEL, SEE SH. 4, ZONE A/B1 FOR P5 & P9 WIRE ROUTING.

LABEL 'S&S P. N. SE000039'

P8
(FEMALE)

A	240
B	150
C	241
D	150
E	150

ECM POWER CONNECTOR

12 AWG

LABEL 'S&S P. N. SE000015'

LABEL 'P8'

SHOWN FROM WIRE END

LABEL 'P9'

P9 (MALE)
SEE SH. 4, ZONE B1 FOR WIRE ROUTING.

J9
(FEMALE)

14 AWG
953/BT2A-(-)
440/P14-C
12 AWG

LABEL 'J9'

LOCATED ON RIGHT SIDE OF ECM. SEE SH. 6, ZONE B4 FOR LOCATION OF ECM.

ECM

NOT USED

1 2 3

K

A

TO BATTERY BT2A (-) TERMINAL, SH. 6, ZONE A2

953/J9-A
150/P8-B
150/P8-D
150/P8-E

14 AWG

12 AWG

LABEL 'S&S P. N. SE000015'

P15
(MALE)

J15
(FEMALE)

P15 MATES WITH J15

TO P3, SH. 6, ZONE A7

12 AWG
24V1/P3-R

12 AWG
24V1/F1

TO BATTERY BT1A (+) TERMINAL, SH. 6, ZONE A3

ENGINE FUSE BOX

24V+/BT1A-(+)
24V1/J15-A

24V+/BT1A-(+)
440/J14-C

24V+/BT1A-(+)
241/J14-B

24V+/BT1A-(+)
240/J14-A

F1
F2
F3
F4

12 AWG
UNFUSED HARNESS DO NOT RUN WITH OTHER HARNESSES

12 AWG

XFA
FUSE BLOCK VIEWED FROM FRONT

P14
(MALE)

J14
(FEMALE)

440/J9-B
241/P8-C
240/P8-A
12 AWG

440/F2
241/F3
240/F4
12 AWG

ENGINE ECM AND FUSE BOX
SEE SHEET 1 FOR LEGEND AND SHEET 2 FOR NOTES

SIZE	CAGE CODE	DWG. NO.	REV
D	81381	SS000010	A
SCALE N/A	WEIGHT –	SHEET 8	

LEGEND

ITEM	DESCRIPTION	
CR1	RECTIFIER	BLOCKING, P. N. IN4006 (MOUNTED ON DS1)
CR2-19	RECTIFIER	BLOCKING, P. N. IN4006
DS1	LAMP, RED	BATTERY CHARGER NOT OPERATING, 24V
DS2	LAMP, AMBER	UNIT OPERATING IN COOLDOWN MODE, 24V
DS3	LAMP, RED	COMPRESSOR HIGH OIL TEMPERATURE, 24V
DS4	LAMP, RED	COMPRESSOR HIGH DISCHARGE AIR TEMPERATURE, 24V
DS5	LAMP, RED	COMPRESSOR LOW OIL PRESSURE, 24V
DS6	LAMP, RED	LOSS OF VOLTAGE TO SAFETY CIRCUITS, 24V
DS8	LAMP, RED	LOW FUEL LEVEL, 24V (OPTIONAL)
DS9	LAMP, RED	EMERGENCY STOP, 24V
DS10	LAMP, RED	ENGINE TROUBLE, 24V
DS11	LAMP, AMBER	CHECK ENGINE, 24V
DS12A, B	LAMP	GAUGE PANEL ILLUMINATION, 24V
DS12C	LAMP	CONTROL PANEL ILLUMINATION, 24V
GA1	GAUGE	FUEL LEVEL, 24V
GA2	GAUGE	ENGINE FUEL PRESSURE, 24V
GA3	GAUGE	ENGINE OIL PRESSURE, 24V
GA4	GAUGE	ENGINE COOLANT TEMPERATURE, 24V
GA5	GAUGE	COMPRESSOR OIL PRESSURE, 24V
GA6	GAUGE	COMPRESSOR OIL TEMPERATURE, 24V
GA7	GAUGE	TACHOMETER, WITH HOURMETER, 24V
GL1	LIGHT, GAUGE	FUEL LEVEL, 24V
GL2	LIGHT, GAUGE	ENGINE FUEL PRESSURE, 24V
GL3	LIGHT, GAUGE	ENGINE OIL PRESSURE, 24V
GL4	LIGHT, GAUGE	ENGINE COOLANT TEMPERATURE, 24V
GL5	LIGHT, GAUGE	COMPRESSOR OIL PRESSURE, 24V
GL6	LIGHT, GAUGE	COMPRESSOR OIL TEMPERATURE, 24V
GL7	LIGHT, GAUGE	TACHOMETER, 24V
GL8	LIGHT, GAUGE	VOLTMETER, 24V
J3	RECEPTACLE	CONTROL PANEL, MALE
J4	RECEPTACLE	FOR CONNECTING ENG. DIAGNOSTIC DATA READER TO ECM UNIT, MALE
J19, 20	RECEPTACLE	MAIN RELAY PANEL
K1	RELAY	ENGINE RUNNING INDICATION AND CRANK DISCONNECT, ENERGIZED BY ENGINE ECM AT APPROX. 500 RPM, 24V COIL
K2	RELAY	ENGINE RUN/ECM IGNITION, 24V COIL
K5	RELAY	MAINTAINS IGNITION VOLTAGE ON ECM AFTER ECM SHUTS ENGINE DOWN FROM TROUBLE, ENERGIZED BY ECM, 24V COIL
K6	RELAY	LOSS OF VOLTAGE TO SAFETY CIRCUITS DETECTION, 24V COIL
K7	RELAY	LOW FUEL LEVEL WARNING, 24V COIL
K8	RELAY	LOW FUEL LEVEL SHUTDOWN, 24V COIL
K9	RELAY	EMERGENCY STOP, 24V COIL
K10	RELAY	NOT USED
K11	RELAY	ENG. STOP ON COMPRESSOR SAFETIES, MANUAL EMERG. STOP, LOW FUEL LEVEL, 24V COIL
K12	RELAY	COMPRESSOR HIGH OIL TEMP., 24V COIL
K13A	RELAY	LAMP TEST, 24V COIL
K13B	RELAY	LAMP TEST, 24V COIL
K14	RELAY	ENGINE RUNNING, 24V COIL
K15	RELAY	COMPRESSOR HIGH DISCHARGE AIR TEMP., 24V COIL
K16	RELAY	OVERRIDES LOW FUEL SHUTDOWN IN JET START MODE, 24V COIL
K17	RELAY	COMPRESSOR LOW OIL PRESSURE, 24V COIL
K18	RELAY	LOSS OF VOLTAGE TO SAFETY CIRCUITS, 24V COIL
K19	RELAY	COMPRESSOR UNLOAD, DE-ENERGIZED BY ECM AT HIGH DISCHARGE AIR PRESS., 24V-DC COIL
M1	METER	VOLTMETER, BATTERY CHARGER OUTPUT
P5	PLUG	ECM (ENGINE ELECTRONIC CONTROL MODULE) FEMALE
P9	PLUG	MALE
P19, 20	PLUG	MAIN RELAY PANEL
R1-11	RESISTOR	BURDEN, 390 OHM
R12	RESISTOR	BURDEN, 100 OHM, 25 WATT
R13-25	RESISTOR	BURDEN, 390 OHM
S1	SWITCH	ENGINE CRANK, TOGGLE TYPE, MOMENTARY CONTACTS
S2	SWITCH	ENGINE RUN/STOP
S6	SWITCH	ENGINE DIAGNOSTIC CHECK, MOMENTARY CONTACTS
S9	SWITCH	EMERGENCY STOP, MAINTAINED CONTACTS
S10	SWITCH	COMPRESSOR MODE SELECTOR, JET START/UNLOAD/AIR PACKS
S12	SWITCH	PANEL LAMP
S13	SWITCH	LAMP TEST, MOMENTARY CONTACTS
S14	SWITCH	RAISE/LOWER ENGINE AIR PRESSURE REGULATING SET POINT, MOMENTARY CONTACTS (TO BE USED ONLY BY AUTHORIZED MAINTENANCE PERSONNEL. REFER TO TECH. MANUAL)
S15	SWITCH	TROUBLE RESET, MOMENTARY CONTACTS (HOLD FOR 3 SECONDS)
S16	SWITCH	FUEL LEVEL CHECK, TOGGLE TYPE, MOMENTARY CONTACTS
TB1-5	TERMINAL BOARD	
TD1	RELAY	TIME DELAY, CONTROL SYSTEM POWER SUPPLY/COOLDOWN, 24V COIL, 3 MIN. DELAY ON DE-ENERGIZATION
TD2	RELAY	TIME DELAY, COMPRESSOR LOW OIL PRESSURE AND LOSS OF VOLTAGE TO SAFETY, 10 SEC. DELAY ON ENERGIZATION, 24V-DC COIL
TD3	RELAY	TIME DELAY, COMPRESSOR LOW DISCH. PRESS ASSIST, 8 SEC. DELAY ON ENERGIZATION, 24VDC COIL
Z1-8	SUPPRESSOR	VOLTAGE SURGE, VOLTAGE BREAKDOWN, 33V, UNI-DIRECTIONAL, P. N. 1. 5KE33A
Z10, 11	SUPPRESSOR	VOLTAGE SURGE, VOLTAGE BREAKDOWN, 33V, UNI-DIRECTIONAL, P. N. 1. 5KE33A

NOTES:

1. REFERENCE DESIGNATORS ARE FOR REFERENCE ONLY AND ARE NOT PART OF THE FACEPLATE.
2. THIS DRAWING FOR REFERENCE ONLY. NOT TO SCALE.
3. REFER TO TECHNICAL MANUAL FOR ELECTRICAL WIRING HARNESSES AND PARTS LIST.

THIS DRAWING HAS BEEN GENERATED AND IS MAINTAINED BY A CAD SYSTEM. CHANGES SHALL ONLY BE INCORPORATED AS DIRECTED BY THE DESIGN ACTIVITY.

THE INFORMATION CONTAINED HEREIN IS PROPRIETARY AND CONFIDENTIAL IT IS THE EXCLUSIVE PROPERTY OF STEWART & STEVENSON AND MAY NOT BE DISCLOSED TO ANY PARTY WITHOUT THE EXPRESS WRITTEN CONSENT OF STEWART & STEVENSON.

REVISIONS

REV	DESCRIPTION	DATE	APPROVED
-	RELEASED FROM ENGINEERING		

MATERIAL

NEXT ASSY. | USED ON

APPLICATION

INTERPRET DRAWING PER ANSI Y14.5

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
DEBURRED AND BROKEN EDGES .03 MAX
CONCENTRICITY OF COAXIAL DIA'S .003 TIR
ALL MACHINED SURFACES 125/ PER ANSI B46.1 (EXCLUDES DRILLED HOLES)
DIMENSIONS AND SURFACE TEXTURE APPLY AFTER PLATING AND PAINTING
TOLERANCES UNLESS NOTED OTHERWISE
X = ± .1
.XX = ± .06
.XXX = ± .010
ANGLES = ± 1°
FRACTIONS = ±

THIRD ANGLE PROJECTION

CONTRACT NO.

	NAME	DATE
DRAWN	R. SOUTHARD	4/14/00
CHECKED		
MFG ENG		
PROJ ENG		

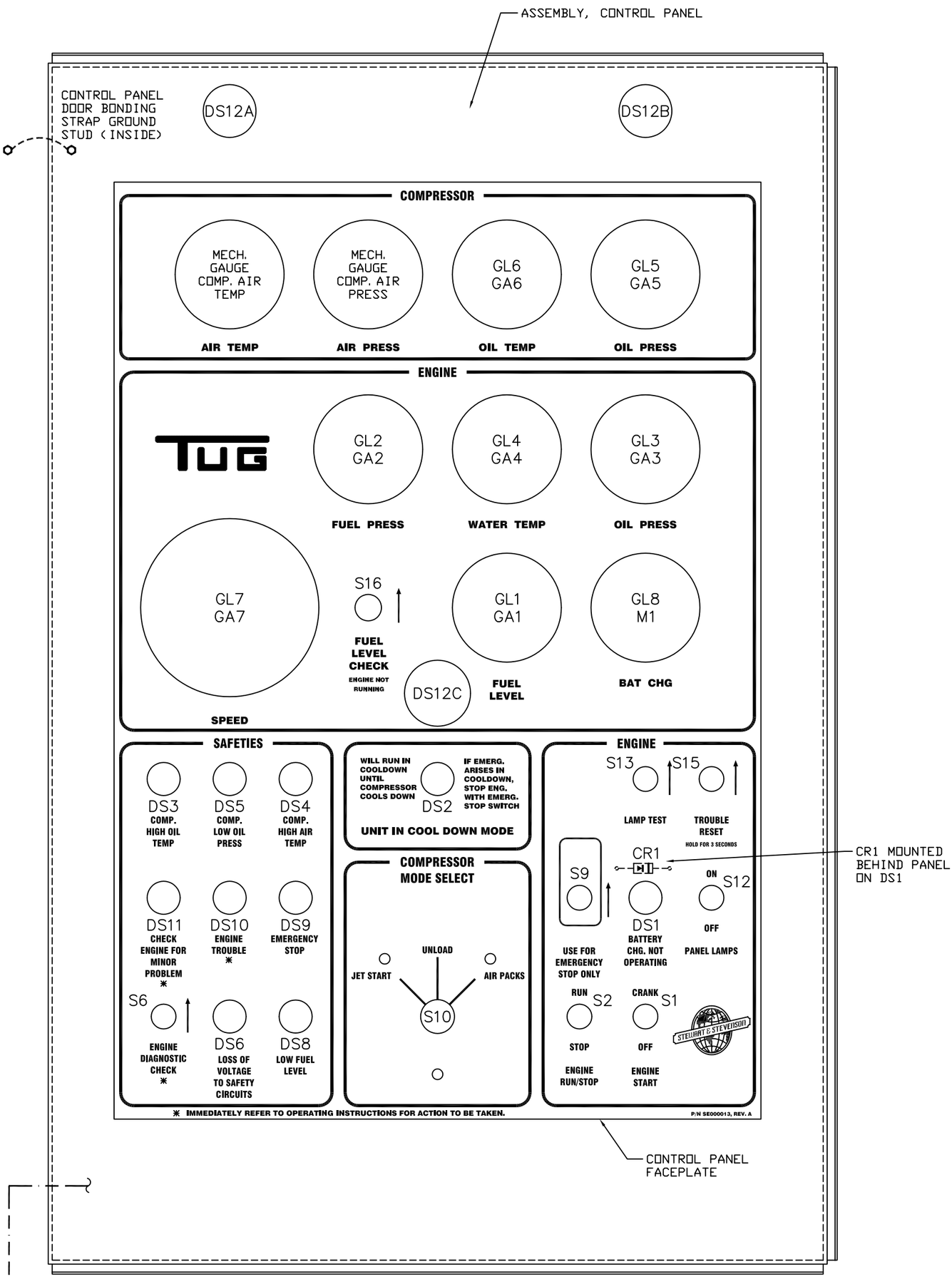
STEWART & STEVENSON SERVICES
4516 HARRISBURG BLVD., HOUSTON, TX. 77011

TITLE

LAYOUT,
CONTROL PANEL,
AIR START UNIT WITH DDEC IV ENGINE

SIZE	CAGE CODE	DWG. NO.	REV
D	81381	SS000011	-
SCALE	WEIGHT	SHEET	
1/1		1 OF 3	

A

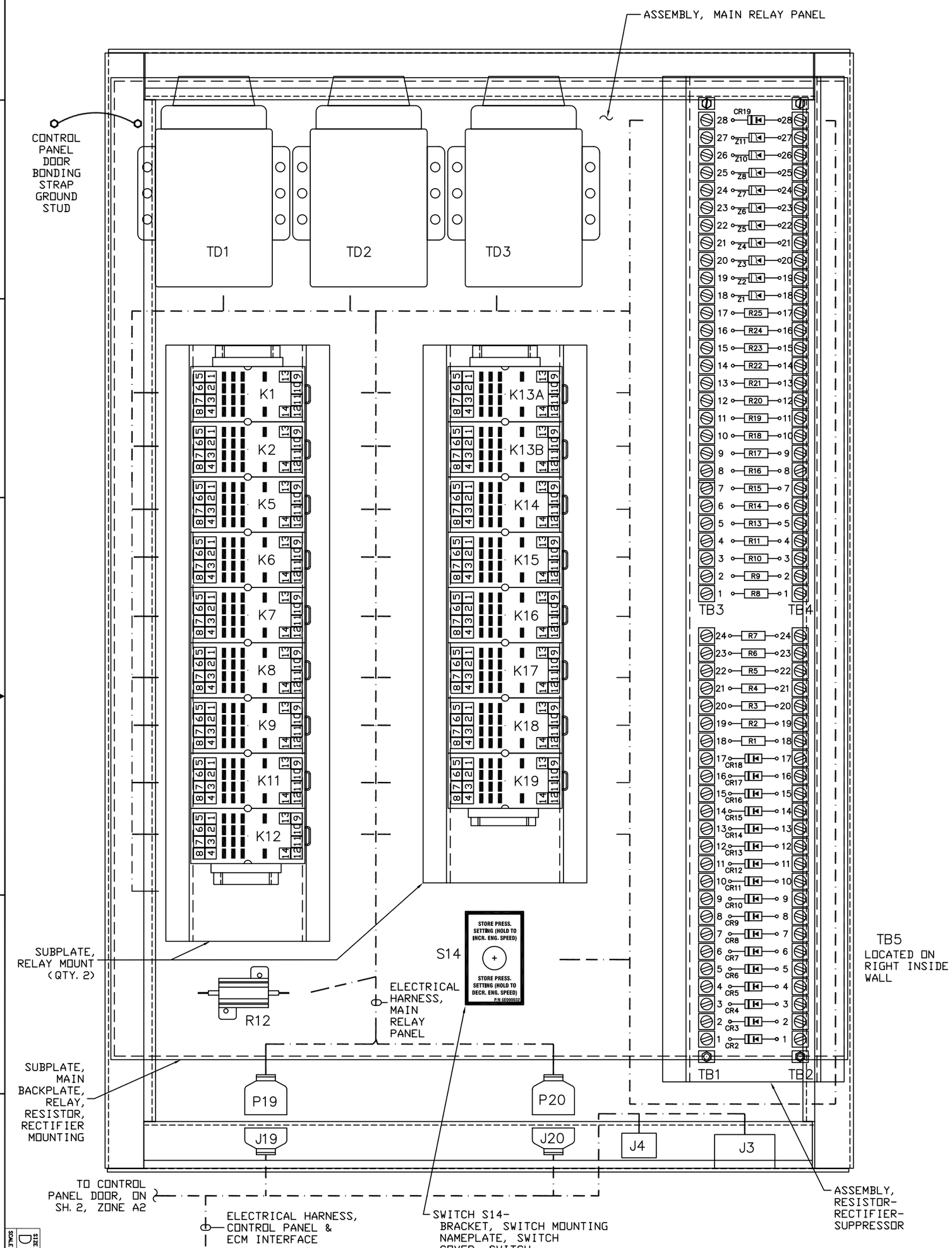


CONTROL PANEL DOOR
FRONT VIEW

SEE SHEET 1 FOR LEGEND AND NOTES

SIZE	CAGE CODE	WEIGHT	DWG. NO.	SHEET	REV
D	81381	-	SS000011	2	-

SCALE 1/1



CONTROL PANEL –
MAIN RELAY PANEL COMPARTMENT –
FRONT VIEW

SEE SHEET 1 FOR LEGEND AND NOTES

SIZE	CAGE CODE	DWG. NO.	REV
D	81381	SS000011	–

SCALE 1/1 WEIGHT – SHEET 3

Chapter 6

Optional Equipment and Manufacturer's Reference Data

The Table of Contents for Chapter 6 lists all the options, which are offered. This chapter is divided into sections and each section covers one option.

Information in Chapter 6 is to be used in conjunction with Chapters 1 through 5. Each section of Chapter 6 covers additional information that is not covered in the main text. For example, if an option changes or adds to the operation procedure, the new procedure will be included in the appropriate option section of Chapter 6. Instructions in Chapter 6 supersede those corresponding instructions in Chapters 1 through 5.

TABLE OF CONTENTS

MANUFACTURER'S DATA

The following is a list of manufacturer's service literature included in the appendices of this manual.

A. GHH-Rand *Service Manual for Oil Free Single Stage Air Compressor (Type CD26S, CD42S, and CD72S) (with Installation Drawings and Performance Data)*
*GHH-Rand Spare Parts List CD26S Gear Set**
*GHH-Rand Spare Parts List CD42S Gear Set***

B. *Detroit Diesel Engine Operators Guide, DDC/MTU Series 2000* (6SE2011)
TR/TMD 300/400 Detroit Diesel Recommended Parts List (Eng. Model No. R1237K37) (905HP)
Detroit Diesel *DDC/MTU Series 2000 Service Manual* (6SE2000) (Two volumes, shipped separately)
Detroit Diesel *DDEC III/IV Troubleshooting Guide* (6SE496) (One volume, shipped separately)
Detroit Diesel Engine Service Fluids and Filter Requirements (7SE273 9903)

*CD26S Gear Set applies to TR/TMD-400 Air Start Unit.
**CD42S Gear Set applies to TR/TMD-300 Air Start Unit.

Chapter 6, Option 1

Fuel Filter/Water Separator

1.1 DESCRIPTION

1.1.1 The fuel filter/water separator uses a primary-stage separator, a secondary-stage, and a final-stage filtration process. It has an internal check valve to prevent bleed-back, and a turbine centrifuge. The clear bowl is convenient for visual checks for contaminant in the fuel.

1.2 MAINTENANCE

1.2.1 The bowl must be drained before the contaminants reach the bottom of the centrifuge assembly. See Figure 6.4. If the inlet to the filter/separator is plugged, disconnect the inlet line, open drain valve (1), and blow out with compressed air. In case of severe stoppage, remove the bowl and centrifuge (4) and clean with compressed air.

1.2.2 To change the element (See Figure 6.4), remove T-handle (14) and lid (12). Remove element (10) by pulling bail (wire handle). Install new element, with a turning motion, over the center return table

1.3 PARTS LIST

1.3.1 Refer to Table 1.1.

PHOTO TO FOLLOW

Figure 1.1 Standard Fuel Kit Assembly with Racor Filter Option

Fig & Ind #	Part Number	MFR Code	Description	Qty	Usable On Code
1.1			STANDARD FUEL KIT ASSEMBLY WITH RACOR FILTER OPTION		
-1	SA000037	81381	Assembly, Fuel Tank (Trailer Unit)	1	
-2	78898	81381	Adapter, Connector, Male, Aeroquip 2021-8-8S	1	
-3	232B-4PP	81381	Valve, Check, 1/2” NPT	1	
-4	2083-12-8S	81381	Adapter, Nipple, 3/4” MNPT x 1/2” MNPT	1	
-5	SA000023	81381	Assembly, Hose, Fuel Pick-UP, 150-250 w/ S60	1	
-6	78894	81381	Adapter, Connector, Male, Aeroquip 2021-6-8S	1	
-7	23518482	81381	Filter, Fuel, Secondary	1	
-8	2089-4-2S	81381	Elbow, Reducing 90, Aeroquip 2089-4-2S	1	
-9	208007-4-4S	81381	Cross, Aeroquip 208007-4-2S	1	
-10	2081-4-2S	81381	Bushing, Reducer Aeroquip 2084-4-2S	1	
-11	77006	81381	Adapter, Elbow 90 Degree, Aeroquip 2024-12-8S	1	
-12	SA000022	81381	Assembly, Hose, Fuel Return, 150-250 w/ S60	1	
-13	77738	81381	Clamp, Support, Hose, Clamp ID=.938	1	
-14	SW000006	81381	Mount/Fuel Tank	1	
-15	210292-8S	81381	Cap, Aeroquip 210292-8S	1	
-16	900599-8S	81381	Plug, Swivel, #8, Aeroquip 900599-8S	1	
-17	76927	81381	Adapter, Connector, Aeroquip 202702-10-8S	2	
-18	1000FG	81381	Filter, Fuel/Water Separator	1	
-19	SD000072	81381	Bracket, Racor	1	
-20	SA000024	81381	Assembly, Hose, Fuel Tank-Racor	1	

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Chapter 6, Option 2

TR/TMD-300/400 Air Start Unit Low Fuel Level in Fuel Tank

2.1 DISCRIPTION

2.1.1 The low fuel level option provides the operator of the air start unit with a warning of when the fuel drops below a predetermined level in the fuel tank.

2.2 OPERATION

2.2.1 A low fuel level switch (S7) is located in the tank and is activated in the event the fuel drops below a predetermined level. The switch (S7) closes, causing the low fuel level relay (K4) and LOW FUEL LEVEL lamp (DS7) to energize. The blue flashing lamp that is mounted on the roof of the unit provides a visual indication the fuel tank is low on fuel. Relay (K4) and LOW FUEL LEVEL lamp (DS7) will remain energized until the TROUBLE RESET switch (S15) on the control panel is actuated. The low fuel level shutdown switch (S8) will cause the unit to shut down once the fuel level reaches an unsafe running level in the fuel tank.

2.3 PARTS LIST

2.3.1 Refer to Table 2.1 for a complete list of component parts.

Fig & Ind #	Part Number	MFR Code	Description	Qty	Usable On Code
2.1			LOW FUEL LEVEL OPTION		
-1	SE000034	81381	Kit, Low Fuel Level, with Switch and Blue Beacon	1	
-2	SE000045	81381	Harness Assembly, Electrical, Low Fuel Level	1 ea.	
-3	SE000029	81381	Connector Assembly, 2 Pin Male	1 ea.	
-4	6T41-0000379	81381	Sender, Fuel Level, 240-30	1 ea.	
-5	SE000050	81381	Switch Assembly, Low Fuel Level Shutdown (S8)	1 ea.	
-6	SE000012	81381	Switch Assembly, Low Fuel Level Float Position	1 ea.	
-7	SE000052	81381	Switch Assembly, Low Fuel Level Warning	1 ea.	
-8	SE000053	81381	Harness Assembly, Low Fuel Level Warning	1ea.	

Chapter 6, Option 3

Air Delivery Hoses

3.1 DESCRIPTION

3.1.1 The function of the air delivery hose is to direct the compressor discharge air to the aircraft. Air delivery hoses are available in lengths of 20, 30, 40, 50, and 60 feet.

3.2 PARTS LIST

3.2.1 Refer to Table 3.1 for a complete list of component parts.

Figure 3.1 Air Delivery Hoses

Fig & Ind #	Part Number	MFR Code	Description	Qty	Usable On Code
3.1			AIR DELIVERY HOSES		
-1	81585	81381	Hose Assembly, Air Delivery, 20 ft.	1	
-2	82652	81381	Hose Assembly	1	
-3	12871501-1	81381	Hose	1	
-4	58AA298-1	81381	Fitting, Air Hose, Female	1	
-5	58AA298-2	81381	Fitting, Air Hose, Male	1	
-6	81681	81381	Clamp, T-Bolt	4	
-7	81680	81381	Clamp, V-Type	2	
-8	81666	81381	Nozzle, Aircraft Connect	1	
ITEMS NOT SHOWN					
-9	81813	81381	Hose Assembly, Air Deliver, 30 ft.	1	
-10	82650	81381	Hose Assembly	1	
-11	12871501-2	81381	Hose	1	
-12	12882976	81381	Hose Assembly, Air Delivery, 40 ft.	1	
-13	12882975	81381	Hose Assembly	1	
-14	12871501-5	81381	Hose	1	
-15	81814	81381	Hose Assembly, Air Deliver, 50 ft.	1	
-16	82651	81381	Hose Assembly	1	
-17	12871501-3	81381	Hose	1	
-18	12873581	81381	Hose Assembly, Air Delivery, 60 ft.	1	
-19	12873579	81381	Hose Assembly	1	
-20	12871501-4	81381	Hose	1	

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Chapter 6, Option 4

Engine Running Beacon

6.1 DESCRIPTION

6.1.1 The flashing engine running beacon option provides a visual warning when the unit is operating. The amber lamp is mounted on the unit's roof.

6.2 OPERATION

6.2.1 The engine fuel pressure sensor (SE2) closes at 5 psi which energizes the relay (K20) and flasher (FL2) that, in turn, energize the flashing beacon (DS13). The system is protected by a 5-amp fuse (F6) which is located inline near the battery starting motor (B1) and the engine starting solenoid (L1).

6.3 PARTS LIST

6.3.1 Refer to Table 4.1 for a complete list of component parts.

Figure 4.1 Engine Running Beacon

Fig & Ind #	Part Number	MFR Code	Description	Qty	Usable On Code
4.1	12913029	81381	ENGINE RUNNING BEACON	REF	
-1	876-3193-24V	81381	Beacon, Amber, 24V (DS13)	1	
-2	NO NUMBER	COML	Screw, #6-20 x 5/8"	3	
-3	8471-011	81381	Lens, Amber	1	
-4	35958-001	81381	Gasket, Mounting Pad	1	
-5	1683	81381	Bulb, 24V	1	
-6	32779-001	81381	Gasket, Beacon Mounting	1	
ITEMS NOT SHOWN					
-7	12913140	81381	Flasher, Super Duty (FL2)	1	
-8	155020	81381	Fuseholder, In-line, 1/4 x 1"	1	
-9	311015	81381	Fuse, 5 Amp (F6)	1	
-10	8923907	81381	Sensor, Pressure, N/O, Closes 5 psi (SE2)	1	
-11	NO NUMBER	COML	Screw, #6-32 x 0.63"	3	
-12	NO NUMB ER	COML	Lockwasher, #6	3	
-13	NO NUMBER	COML	Nut, #6-32	3	

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Chapter 6, Option 5

Jet Start Mode Timer

5.1 DESCRIPTION

5.1.1 This option adds a timer and two indicator lights (red) that illuminate when the unit has been operated in Jet Start Mode for over seven minutes. There is a keyed reset switch to reset the lights. There is also a light check function built into the keyed switch.

5.2 OPERATION

5.2.1 When the unit Mode Selector Switch in placed in the Jet Start position, a signal is sent to Time Delay TD4 thus energizing the coil on TD4. The time delay begins a seven minute cycle, and if the Mode Selector Switch is left in the Jet Start Mode, after seven minutes the time delay contacts 2-6 and 1-5 will close. Closure of contacts 1-5 will energize and illuminate red lights DS14 and DS15. Closure of contacts 2-6 will latch in the coil of the time delay TD4 keeping the lights illuminated until the keyed reset switch S27 is engaged to removed the power to the time delay thus reset the time delay to off and removing power to the red lights.

5.3 PARTS LIST

5.3.1 Refer to Table 5.1 for a complete list of component parts.

Table 5.1 Jet Start Timer Light Option

Fig & Ind #	Part Number	MFG Code	Description	Qty	Usable On Code
5.1			Jet Start Timer Light Option		
-1	37TB-4	81381	Terminal Board	1	
-2	LE000318	81381	Diode	1	
-3	LE000131	81381	Resister	1	
-4	70120F	81381	Time Delay	1	
-5	CDC00154	81381	Switch, Keyed	1	
-6	CDC00401	81381	Contact Block, N.C.	1	
-7	CDC00301	81381	Contact Block, N.O.	1	
-8	LE000062	81381	Lampholder	2	
-9	LE000062	81381	Lens, Red	2	
-10	LE000063	81381	Bulb	2	
-11	SD000504	81381	Enclosure & Backplate	1	
-12	SL000008	81381	Label	1	

Chapter 6, Option 6

Engine Warm-Up Circuit

6.1 DESCRIPTION

6.1.1 This option adds a thermostat into the engine water jacket that will not allow the unit to be operated in Jet Start Mode or Air Packs Mode until the engine has warmed up to 180 degrees F. A green indicator light is located on the unit exterior above the Control Box to inform the operator when the unit is ready for use in it's operating modes.

6.2 OPERATION

6.2.1 Thermostat (S28) closes when the engine water reaches a temperature of about 180 degrees F. The closure of S28 energizes the coil of relay K22 which closes its contacts 6-10 and 8-12. Closure of contacts 6 – 10 energizes green light DS16 and the closure of contacts 8-12 allows electrical signals to be sent to the engine ECM allowing the engine to operate in the RPM range required for unit operation.

6.3 PARTS LIST

6.3.1 Refer to Table 6.1 for a complete list of component parts.

Table 6.1 Engine Warm-Up Circuit

Fig & Ind #	Part Number	MFG Code	Description	Qty	Usable On Code
6.1			Engine Warm-Up Circuit		
-1	SE001000	81381	Switch, Temperature	1	
-2	RY4S-ULDC24V	81381	Relay	1	
-3	125-1192-403	81381	Lens, Lamp, Green	1	
-4	43J390	81381	Resister, 390 OHM, 3W	1	
-5	125-1310-11-103	81381	Holder, Lamp	1	
-6	67785	81381	Bulb, 28V,T-3-1/4	1	
-7	SY4S-05	81381	Socket, Relay	1	
-8	SY4S-51F1	81381	Spring, Relay Hold Down	1	
-9	SL000009	81381	Label, Jet Start Warning	1	
-10	SL000010	81381	Label, Jet Start Warning Light	1	

Chapter 6, Option 7

Counter and Label – Emergency Stop

7.1 DESCRIPTION

7.1.1 This option adds a label adjacent to the Emergency Stop Switch to warn against using the Emergency Stop Switch for normal shutdown. It also adds a counter in the Control Box to count the number of times the Emergency Stop Switch has been utilized. Each time the Emergency Stop Switch is engaged, the Counter increments up by one count.

7.2 OPERATION

7.2.1 Closure of the Emergency Stop Switch S9 energizes relay K9. Counter C1 is wired in parallel with the coil of K9, therefore each time the Emergency Stop Switch is utilized, the counter increments up by one count.

7.3 PARTS LIST

7.3.1 Refer to Table 7.1 for a complete list of component parts.

Table 7.1 Counter and Label Emergency Stop Option

Fig & Ind #	Part Number	MFG Code	Description	Qty	Usable On Code
7.1			Counter & Label Emergency. Stop Option		
-1	SL000007	81381	Label	1	
-2	SE000114	81381	Counter	1	