



**Models: 1010A / 1011A
Coolant Service Cart (CSC)
Electric/Diesel-Electric
For Boeing 787 Aircraft**

1010A S/N 113 and Up / 6714190501 and Up
1011A S/N 139 and Up / 3683190201 and Up



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This product can not be modified without the written approval of Tronair, Inc. Any modifications done without written approval voids all warranties and releases Tronair, Inc., its suppliers, distributors, employees, or financial institutions from any liability from consequences that may occur. Only Tronair OEM replacement parts shall be used.



WARNING!

By contractual agreement:

ONLY persons who fully understand ENGLISH are permitted to operate, service or maintain this equipment.



CAUTION!

Aircraft manufacturer's specifications and instructions must be followed. In the event of contradiction between aircraft manufacturer's specifications and Malabar's, aircraft manufacturer's will prevail.

NOTE: Malabar Model 1010a is electric cord powered. Model 1011a is electric cord powered and has a diesel engine driven generator set to enable self – powered operation. Functionally the units operate in an identical manner.

1.0 PRODUCT INFORMATION

1.1 LIMITS OF USE

The intended use of the model 1010A/1011A Coolant Service Cart (CSC) is to service the PECS, FCAC, ICS, and LRU coolant systems on a Boeing 787 aircraft as specified in the Aircraft Maintenance Manual by aircraft and equipment maintenance personnel. "Service" means flushing, cleaning, and filling the aircraft systems using the approved coolant, Boeing BMS 3-42 (see below for coolant information), or dry nitrogen. Aspects of use limits are listed below.

Modes of Operation:

- *Aircraft functions* (powered) circulate coolant and/or nitrogen through the equipment, external hoses and the aircraft or aircraft components;
- *Cart functions* (powered) circulate coolant and/or nitrogen within the machine or through the machine and external hoses;
- *Filling and draining* (powered or un-powered) include filling the clean reservoir manually or by using the machine's internal pump, or manually draining the waste reservoir;
- *Towing* (un-powered) requires a powered tow vehicle using the integral tow bar and lunette eye at a maximum speed of 5 mph (8 km/h) with power cord and hoses stowed;
- *Positioning* (powered or un-powered) involves minor re-positioning of the unit manually with the power cord and/or hoses either deployed or stowed.

Ergonomics: no accommodations are made for persons with handicaps. Operators and maintenance personnel are expected to possess average physical abilities (e.g. vision, hearing, size, strength).

Training: operators and maintenance personnel are required to have the requisite skills, to be trained on the proper use of the machine and to have read the owner's manual.

Safety of Unqualified Personnel in Vicinity: no special consideration is given to establishing a safe perimeter around the machine. The machine, stowed or operating under the control of a qualified operator presents no inherent danger to nearby disassociated personnel. The design of the machine protects against casual or inadvertent contact with hazards that may be associated with the machine.

1.1.1 Other Limits

Space Requirements: in order to use the cart as intended, it must be positioned in an open area, either in an aircraft hangar, equipment bay, or outdoors, usually adjacent to an aircraft being serviced. Sufficient clearance on all sides during operation of the machine is necessary for the operator or technician to gain free access to gauges, displays, hose and cord racks, service access panels and doors.

Calibration: periodic (generally annual) calibration of pressure safety and monitoring devices is required to maintain the inherent protection provided by these devices. Calibration is defined in this manual.

Preventative Maintenance & Repair: in order to use the cart as intended, repair and periodic preventative maintenance must be performed by qualified technicians as described in this manual and according to accepted standards and practices.

Language: the owner's manual, all documentation, machine placards and signage, instrument panel displays and labels are in English, to be consistent with the aircraft maintenance manual on the aircraft for which this machine was designed to service. Therefore, operators, service and maintenance personnel are required to have sufficient English language skills.

Environment: limits are defined in this manual. These include ambient temperature limits of -40°F to 130°F (-40°C to 54°C) and operation only in non-hazardous (no ignitable gasses, vapors or dust) areas, outdoors or indoors in well ventilated areas.

Surface conditions: the unit is expected to be towed and operated on even, relatively level, paved surfaces.

Service coolant: the unit is not approved for use with any coolants except the specified coolant, Boeing BMS 3-42 (60% propylene glycol, water, and <3% dipotassium hydrogen phosphate dye).

1.2 MODEL & SERIAL NUMBER

Reference nameplate on unit
1010A - S/N 113 and Up / 6714190501 and Up
1011A - S/N 139 and Up / 3683190201 and Up

1.3 MANUFACTURER

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2.0 SAFETY INFORMATION

2.1 USAGE AND SAFETY INFORMATION

To ensure safe operations please read the following statements and understand their meaning. Also refer to your equipment manufacturer's manual for other important safety information. This manual contains safety precautions which are explained below. Please read carefully.



WARNING!

Warning is used to indicate the presence of a hazard that can cause **severe personal injury, death, and/or substantial property damage** if the Warning Notice is ignored.



CAUTION!

Caution is used to indicate the presence of a hazard, which will or can cause **minor personal injury or property damage** if the Caution Notice is ignored.

2.2 GENERAL SAFETY INFORMATION

This manual describes equipment that may cause injury to personnel, or damage to equipment if correct operation and maintenance procedures are not followed. This safety summary includes general safety precautions and instructions that must be understood and applied during operation and maintenance to ensure personnel safety and protection of equipment.

Operators shall familiarize themselves with all operating procedures and safety precautions contained in this manual. If abnormal operating conditions are observed, the system should be shut down and the source of the problem investigated.

Do not use the CSC cart for purposes other than those described in this manual. See **Limits of Use**.

2.3 SHOCK HAZARD

The CSC cart has potentially fatal voltages applied during operation.

- Turn off the main power disconnect / transfer switch before beginning any service procedure and if equipped, ensure that the generator is off.
- Never touch enclosure heater terminals unless the main power disconnect / transfer switch is off and line cord disconnected. One heater terminal is connected directly to incoming line power and is live anytime the power is on, even if the heater is off.
- Before performing any work in the disconnect (lower) enclosure, verify that the Variable Frequency Drive (VFD) bus capacitors have discharged. Measure the DC bus voltage across the -DC and +DC terminals on the lower Power Terminal Block. The voltage must be zero. Darkened LED / LCD displays do not indicate that the capacitors have discharged to a safe voltage level.

2.4 HAZARDOUS MATERIALS INFORMATION – PROPYLENE GLYCOL (BMS3-42)

The CSC cart and the aircraft systems being serviced are filled with a BMS3-42 coolant mixture. Refer to the Boeing BMS3-42 MSDS for details of toxicity of the fluid.

2.5 COMPRESSED GAS WARNING

The CSC cart uses compressed nitrogen gas to purge aircraft systems. Use caution when connecting nitrogen lines to cart. Sudden release of compressed nitrogen can create an environment of airborne particles that may enter eyes or penetrate skin. Always use nitrogen in a well ventilated area, never in a pit.

2.6 STATIC GROUNDING

The CSC cart ground clamp (ground reel) must be connected to the aircraft grounding point prior to operation to prevent a buildup of static electricity and static discharge.

2.7 SAFETY GROUND

Never operate the cart if the ground connection from the power cord or generator set has been disconnected or compromised in any way.

2.8 ROTATING EQUIPMENT HAZARD

Before accessing the main pump-motor shaft coupling (pump adapter), turn off the main power disconnect / transfer switch to avoid sudden or unexpected starts while touching the shaft coupling.

2.9 PRESSURE HAZARD

Before loosening any tube, hose, or reservoir fittings, ensure that the internal system pressure is zero by turning off the main power disconnect / transfer switch. The internal vent valve (LV1) will bleed the return side pressure to the clean reservoir. If the supply pressure gauge shows trapped pressure, connect the supply to return hose in runaround configuration to relieve pressure.

2.10 SAFETY DEVICES AND GUARDING

2.10.1 General Information

Certain devices are installed on the cart for the purpose of safeguarding personnel and/or equipment. Their proper use is necessary for safe operation. Never operate the cart with any safety device removed or defeated.

2.10.2 Coupling Guard

The rotating shaft coupling between the main pump and motor can be accessed for service through an opening in the pump adapter (see Fig. 11). A plastic cover/guard is provided to cover the opening. The cover must be in place at all times except for service. A screw actuated band clamp facilitates securing the cover and requires a tool to remove it. Always re-install the band clamp after removal.

2.10.3 Fan Guard

The radiator cooling fan on the generator set (model 1011A only) is covered by a fan shroud to guard against hand/finger injury during operation. Do not remove this guard. Do not attempt to penetrate the openings in the guard with fingers or any tool.

2.10.4 Battery Cover

A 12V automotive type battery for starting the engine-generator (model 1011A only) is located in the opening at the tow-bar end of the cart. The battery is contained inside a closed battery case with a removable cover. The cover protects against falling objects coming in contact with the live battery posts and from inadvertent touching. Keep the battery case cover in place at all times, even when the cart is not in operation.

2.10.5 Electrical Disconnect - Lockable

The main power disconnect switch handle is interlocked with the electrical enclosure door to prevent enclosure access unless the power is off. The electrical enclosure door cannot be opened unless the disconnect switch is in the OFF position. The switch handle can be pad locked in the OFF position. DO NOT defeat this safety feature. Only qualified electrical technicians may enter the electrical enclosures: electrocution hazard. Lock-out / Tag-out procedures should be followed by anyone working on electrical or mechanical systems.

2.10.6 Instrument Panel Latch

The instrument/control panel is hinged and latched to the electrical enclosure behind it. The latch is a quarter-turn latch, requiring a tool (such as a screwdriver) to open it. To avoid electric shock and component damage, the instrument panel should remain closed and latched at all times except for service by a qualified technician.

2.10.7 Pressure Switch

A pressure switch (PSH/PS1) monitors the coolant pressure near the supply/outlet hose connection. This is the primary overpressure protection device and should never be altered, isolated or bypassed. The pressure setting is listed in the Specifications section of this manual. Periodic calibration is required and is described in the Calibration section of this manual.

2.10.8 Emergency Stop Pushbutton

The Red Mushroom pushbutton on the operator panel is used to immediately stop the CSC cart in the event of an emergency. Pressing this button at any time will bring the main pump motor and vacuum pump to a stop and de-energize all solenoid valves including the normally open return line vent valve which will relieve return side pressure to the reservoir.

2.10.9 Relief Valves

Several pressure relief valves are located throughout the piping system and serve to limit operating pressure at various points within the system. These relief valves can be adjusted externally, however, caution is advised: do not re-adjust any of these relief valves - system and/or aircraft damage could occur. Bench calibration under static conditions is the only reliable method to set the cracking pressure of these relief valves.

2.10.10 Removable Access Panels & Covers

It is not safe to operate the cart with any removable covers removed. These covers are attached to the cart body with screws and are for service access only.

2.11 WARNING LABELS - ALL MODELS

Observe the following warning labels where they appear on the cart:



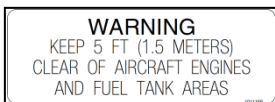
Electrical Hazard Warning: posted on any enclosure in which hazardous electrical potentials might exist. Exercise caution when opening or removing the cover.



High Voltage Warning: posted on electrical enclosures in which there is a risk of electrocution when energized. Access by qualified electricians only. Turn off or disconnect the electrical power source before accessing the enclosure.

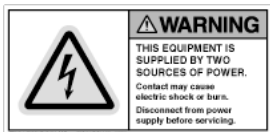


Arc Flash And Shock Hazard Warning: posted on electrical enclosures in which there is a risk of arc flash and/or electrical shock when working on or near energized equipment in the enclosure. Qualified technicians only: use appropriate protective clothing, shields and apparatus. Access by qualified electricians only.



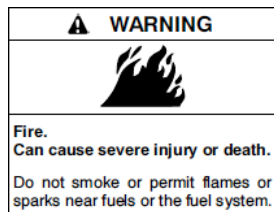
Explosion Hazard Warning: Do not operate this equipment under aircraft fuel tanks, engines, or where fuel vapors might exist within 5 ft. (1.5 meters) of the CSC.

2.12 WARNING LABELS - MODELS WITH GENERATOR SET

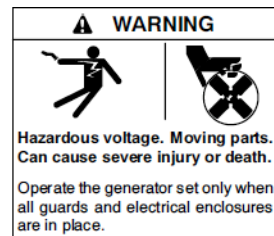


Two Sources Of Power Warning: posted on the main electrical enclosure of the model 1011A, equipped with an on-board generator set. The equipment can be powered by either the line cord or the generator. Before servicing, be sure both sources of power are OFF and/or disconnected.

Warning labels found on the generator set (model 1011A) are shown below. Refer to the generator set instruction manual for complete operation, maintenance, and safety information.



Engine Backfire/Flash Fire Warning: A flash fire can cause severe injury or death. Do not smoke or permit flames or sparks near the fuel injection system, fuel line, fuel filter, fuel pump, or other potential sources of spilled fuels or fuel vapors. Catch fuels in an approved container when removing the fuel line or fuel system.



Moving Parts Warning: Never operate the engine-generator set without all guards and covers in place.



Universal Warning: Do not operate or work on this equipment unless you have read and understand the instructions and warnings in the Operation and Maintenance Manuals. Failure to follow the instructions or heed the warnings could result in serious injury or death.

2.13 FIRE EXTINGUISHER

Model 1011A Only:

Generator set engine fuels and fuel vapors are flammable and explosive. Handle these materials carefully to minimize the risk of fire or explosion. Equip the CSC cart with a fully charged fire extinguisher. Select a fire extinguisher rated ABC or BC for electrical fires or as recommended by the local fire code or an authorized agency. Train all personnel on fire extinguisher operation and fire prevention procedures.

Recommended Fire Extinguisher Location on the CSC:

A fire extinguisher should be located in an area where it is highly visible and easily accessed. Do not locate the fire extinguisher in or immediately adjacent to the generator-set compartment. This is the area most likely to be engulfed in flames, making devices at that location potentially inaccessible.

The recommended location for a fire extinguisher on the CSC is at the rear (control panel end) of the cart. Suitable locations are:

1. On the (vertical) side body panel to the right of the control panel
2. On the (vertical) rear body panel below and to the right of the accessory folding shelf

NOTE: Throughout this manual, references to the "right" or "left" side of the cart are to be interpreted as the user standing at the control panel, at rear of cart.

3.0 INTRODUCTION

3.1 SCOPE

This manual provides operation, maintenance, and repair procedures for the Model 1010A and Model 1011A Coolant Service Carts (hereinafter referred to as CSC) manufactured by Malabar International for the Boeing 787 aircraft. The cart fluid systems are functionally identical. Both models are electrically driven. The Model 1011A has a diesel generator set for self-contained operation. The manual is intended for trained personnel responsible for maintaining the Power Electronics Cooling System (PECS), the Integrated Cooling System (ICS), and the Forward Cargo Air Conditioning System (FCAC). In addition to the information supplied by Malabar International, supplemental documentation for operation and maintenance of some subassemblies are provided in the Appendices.

NOTE: Throughout this manual, references to the "right" or "left" side of the cart are to be interpreted as the user standing at the control panel, at rear of cart.

3.2 SYSTEM DESCRIPTION

The following paragraphs provide a description of the CSC functions, major components, and specifications.

3.2.1 System Functions

The CSC is a mobile service cart designed to FILL (bleed), CLEAN (deaerate) and PURGE (drain) the Boeing 787 aircraft fluid circulation loops and LRU's. Internal RECIRCULATION, PREHEAT and RUNAROUND modes are provided to allow conditioning of cart fluid prior to aircraft servicing. The Model 1010A cart is electrically powered from facility supply while the Model 1011A cart has in addition, a diesel engine driven generator-set to allow user selectable self-powered operation. Normal operation of the cart is semi-automatic with pre-programmed modes established for each of the aircraft systems.

3.2.2 Major Components

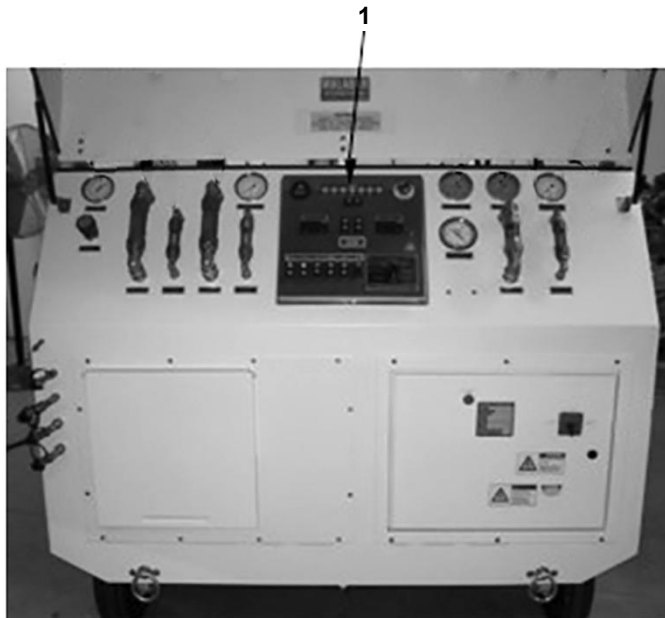
The following paragraphs describe the major components of the CSC. Refer to Figures.

1. Control Panel:

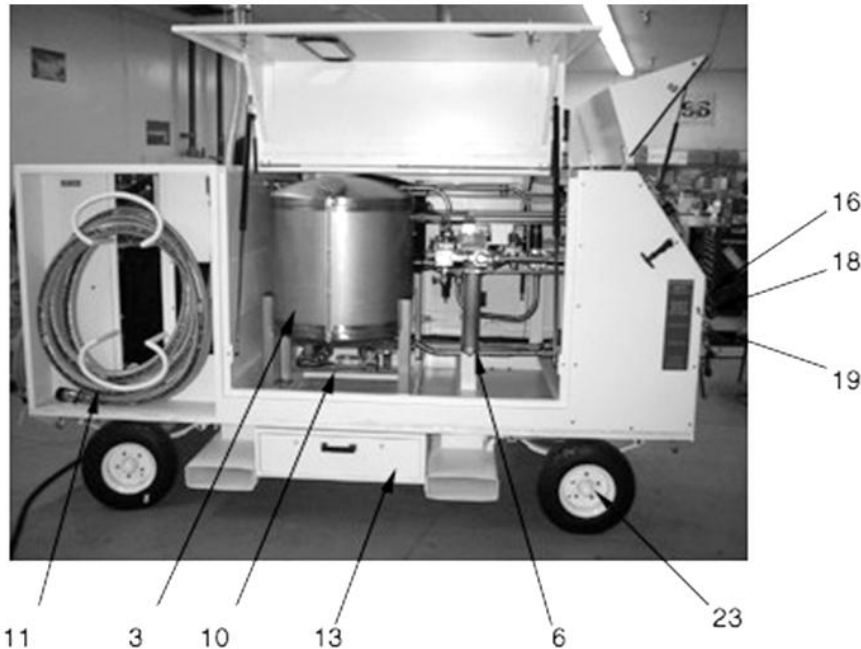
The control panel provides the primary operator interface for the cart. Located at the rear of the cart, it has all the electrical controls and displays mounted on the hinged door of the main control enclosure that houses a PLC, control relays, interconnection terminal blocks, and a low ambient temperature sensing and heating system for the electronics. This control enclosure is located in the center section of the panel. Located at either side of the control enclosure are the illuminated sight glasses for monitoring fluid aeration and purge (drain) status, nitrogen regulator, fluid fill and purge control valve and various vacuum, pressure, temperature and fluid meters.

2. Clean Reservoir:

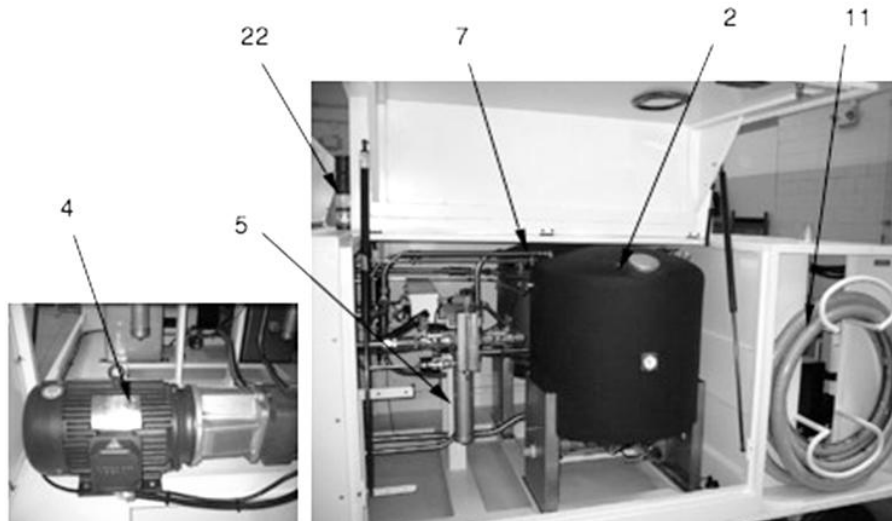
A 50 gallon useable capacity stainless steel cylindrical tank equipped with a level gauge, fill port/strainer/cap, drain valve, pump suction isolation valve, temperature sensor and vacuum and pressure relief valves is provided for storage of clean fluid.



3.2.2 Major Components (continued)



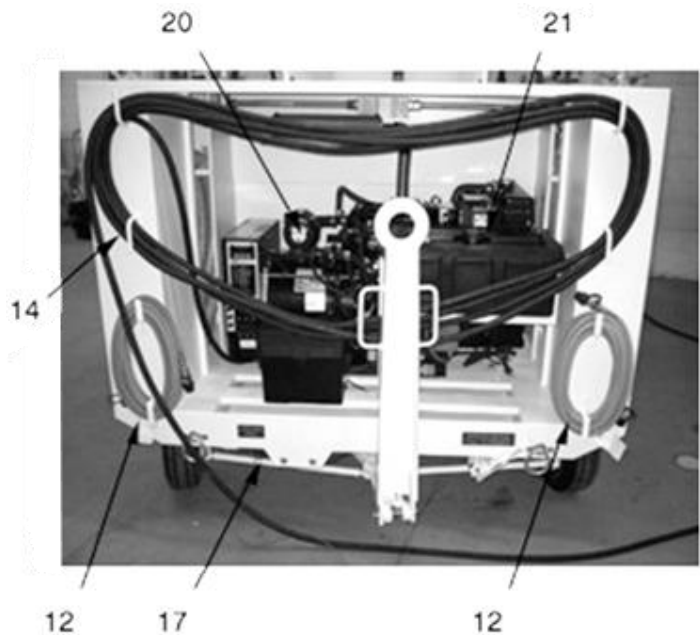
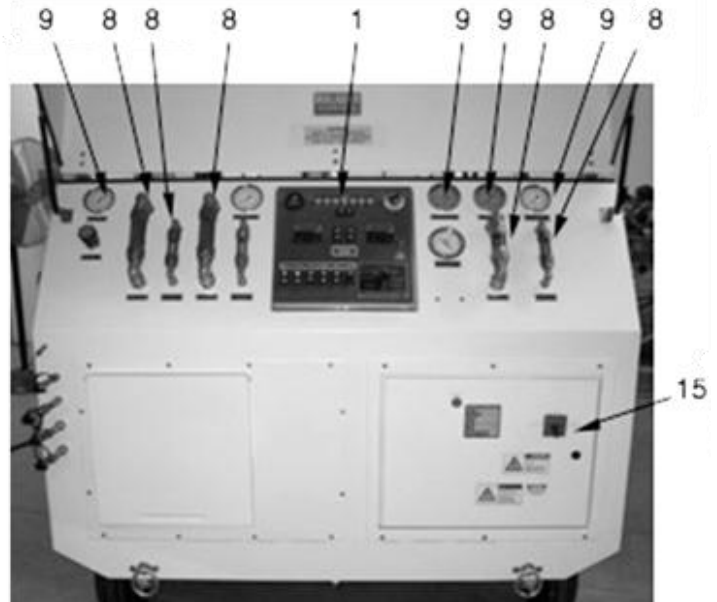
3. **Waste Reservoir:** A 50 gallon useable capacity stainless steel cylindrical tank equipped with a level gauge, fill port/strainer/cap, drain valve, and sintered breather is provided for collection of fluid purged from aircraft systems or LRU's.
4. **Motor / Pump Assembly:** A two-stage internal gear pump is close coupled to a 10 hp, 1760 rpm, 208-240 / 3 / 60 Vac, 'C' face, TEFC electric motor.
5. **Supply Filter and Valve Assemblies:** A manifolded system of filter and valves on the pressure side of the fluid circuit designed to minimize fluid connections and piping. There is a 3-micron absolute, non-bypass type filter with a differential pressure switch in the supply line downstream of the pump. All directional valves have stainless steel bodies, Viton seals and are 24 VDC solenoid operated.



6. **Return Filter and Valve Assemblies:** A manifolded system of filter and valves on the return side of the fluid circuit designed to minimize fluid connections and piping. There is a 10-micron absolute, non-bypass type filter with a differential pressure switch in the return line. All directional valves have stainless steel bodies, Viton seals and are 24 VDC solenoid operated.
7. **Turbine Flowmeter:** A precision turbine flowmeter provides flow rate information to a panel mounted digital readout. The flowmeter is located in the supply line.

3.2.2 Major Components (continued)

8. **Flow Sights:** Panel mounted, illuminated flow sights (6) are provided, one located upstream of the flowmeter in the supply line, one in the return flow line to clean reservoir, one in the drain flow line to waste reservoir, one in the clean bleed return line to the clean reservoir, one in the waste bleed return line to the waste reservoir and one in the topoff/LRU supply line.
9. **Pressure Gauges:** Panel mounted gauges monitor supply and return fluid pressures and reservoir vacuum.
10. **Vacuum Pump System:** A 24 VDC motor driven vacuum pump, trap, muffler and vacuum regulator are provided to apply a vacuum to the reservoir for deaerating the fluid. The regulator is preset for 3 inches Hg vacuum.
11. Parker flush face couplers/nipples installed at the ends. There is a supply and a return hose, and they are located at the front of the cart. The supply hose has the quick disconnect coupler at its end and the return hose has the quick disconnect nipple. This permits connection of a supply hose to a return hose to allow operation in a run-around mode to precondition the cart fluid or flush the cart system.
12. **Top Off/LRU Supply and Return Hose Assemblies:** 30-foot long synthetic rubber covered conductive hoses with Parker flush face couplers/nipples installed at the ends. There is a supply and a return hose, and they are located at the front of the cart.
13. **Accessory Storage Boxes:** Located above the fork lift pockets on each side of the unit, the storage boxes provide storage for all the necessary adapter fittings, bleed hose and accessories for interfacing the cart to the aircraft.
14. **Cable and Cable Storage Rack:** This rack is located at the front of the unit, and is designed to store the 100-foot power cable that mates with the facility power receptacle.
15. **Main Power Disconnect:** An electrical enclosure, located below the electrical controls at the rear of the cart, houses the main disconnect switch (1010A) / changeover switch (1011A), variable speed pump drive, a 24 VDC power supply for the control system, and a low ambient temperature sensing and heating system for the electronics.
16. **Supply and Return Hose Assemblies:** 30-foot long synthetic rubber covered conductive hoses with Parker flush face couplers/nipples installed at the ends.
17. **Nitrogen Purge (Drain) System:** The cart incorporates a panel mounted pressure regulator that can supply nitrogen at pressures up to 100 psig to assist in draining an aircraft system or LRU into the clean or waste reservoir. Nitrogen inlet connection is located on the rear of the cart below the pressure regulator.
18. **Static Grounding Reel:** Used to connect to the aircraft grounding system during servicing operations. The grounding reel is located at the front lower section of the cart.
19. **Bleed Returns:** Connections for bleed return hoses to clean reservoir or to waste reservoir for venting system or LRU during fill operations are located on the rear of the cart.
20. **LRU Out/In Cart Connections:** Connections for LRU service are located on the rear of the cart.
21. **Diesel Generator Set:** The 1011A unit has a 15 kVA diesel driven generator set for self-contained operation.



3.2.2 Major Components *(continued)*

22. **Diesel Fuel Tank and Gauge:** The 1011A unit generator set has a 8 gallon fuel tank located above the engine. A fuel gauge is located in the top of the tank.
23. **Status Beacon & Audible Alarm:** A green/yellow/red stack-light beacon is located above the control panel to indicate unit status: GREEN-power on, flashing YELLOW-(caution) operating, flashing RED-unacknowledged alarm / fault, steady RED-acknowledged alarm. An audible alarm, located at the top of the stack will sound when an alarm occurs (silenced from the operator panel).
24. **Enclosure and Running Gear:** The cart operating components are enclosed in a painted steel, weather resistant, sheet metal housing mounted on a four wheel, Ackerman steering trailer equipped with a towbar and lunette eye. Manually operated mechanical parking brakes on the rear wheels hold the cart while in operation or on a grade. The cart has a spring suspension and is equipped with foam filled or non-marking rubber tires. Fork lift pockets are provided on the frame for lifting along with tie-down rings for securing during transportation. Gull wing doors on each side permit access to internal components for maintenance and a hinged lift up cover at the rear, allows operator access to the controls.

3.3 THEORY OF OPERATION (FIGURE 2)

The Coolant Service Cart (CSC) is designed to service various cooling systems on the Boeing 787 aircraft. The system circulates BMS 3-42 coolant through the aircraft systems, filters it, deaerates it, and drains it. The cart can also be used to service individual aircraft systems LRU's.

The CSC unit uses a two-stage internal gear pump driven by a 10HP electric motor to circulate coolant through the cart and the aircraft cooling systems. The unit is powered by a line cord (1010A & 1011A) or a water-cooled diesel generator set (1011A only). The pump draws coolant from the 50 gallon clean reservoir and sends it through a 3-micron supply filter. From the filter, the coolant flow is directed by a selection of solenoid valves (based on aircraft sub-system being serviced and/or cart mode of operation) through: (1) a flowmeter, sight glass and main supply hose to the aircraft (or return hose in Runaround mode), (2) the LRU sightglass and LRU supply hose, (3) the recirculate solenoid valve to the return line, or (4) the pump relief valve in preheat mode (bypassing the filter). Coolant returning from the aircraft system re-enters the cart through the return hose. Solenoid valves direct the fluid to either the clean or waste reservoir. Sight glasses monitor fluid condition in each circuit. The flow path to the clean reservoir also includes a 10 micron return filter. A complete set of adapter fittings is provided for connecting the hoses to the appropriate points on the aircraft. The entire coolant loop is protected from overpressure by factory preset relief valves.

The clean reservoir on the cart is connected to a 24 VDC vacuum pump and vacuum regulator that will maintain a vacuum on the clean reservoir to deaerate the coolant. This regulator is factory set at 3 inches Hg vacuum. The vacuum pump is controlled by setting of the vacuum regulator located above the clean reservoir.

CSC operation is controlled by an Allen-Bradley programmable logic controller (PLC) in conjunction with a variable frequency drive (VFD), relays, selector switches, sensors, and other devices. By controlling the VFD (pump motor speed) and numerous solenoid valves the PLC controls the flow of coolant through the CSC and the aircraft. For each position of the "Mode" selector switch, the PLC system is pre-programmed with the required flow rate (motor speed) and valve configuration. The PLC system also monitors fluid levels in the two reservoirs, fluid temperature and filter differential pressures.

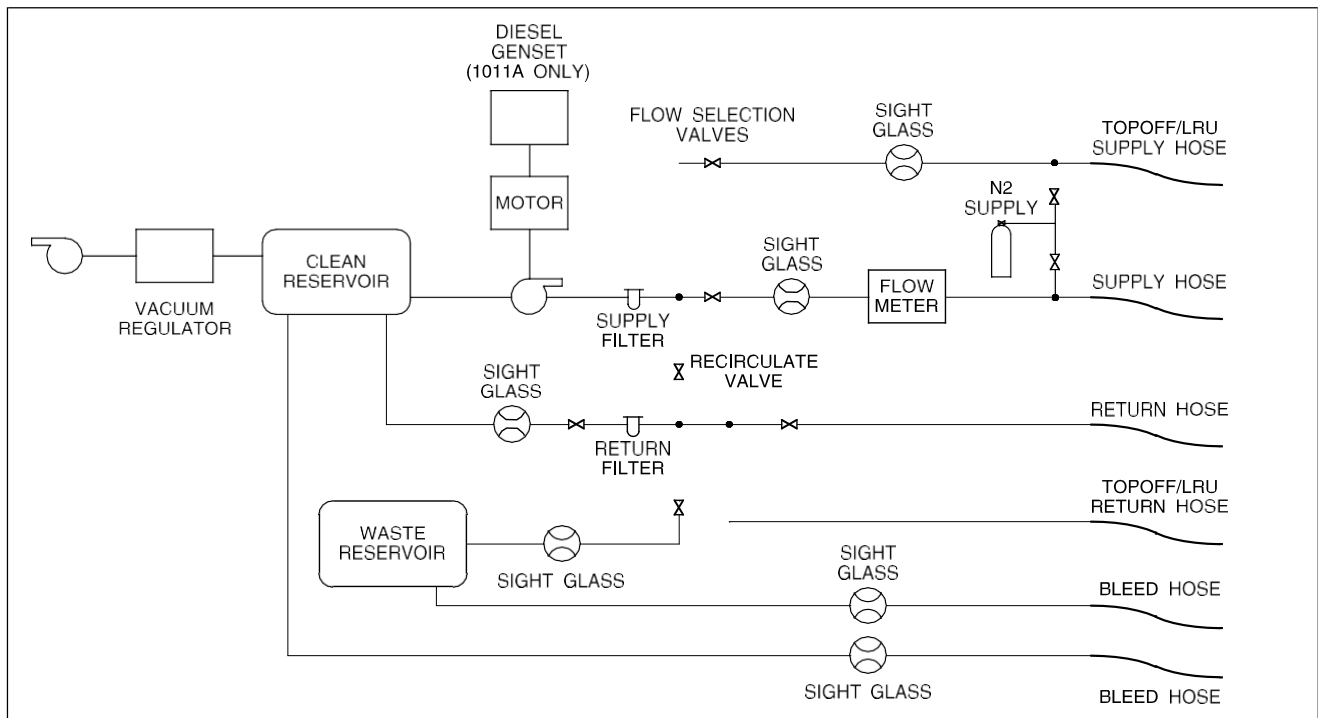


FIGURE 2. CSC Simplified Schematic

3.4 SPECIFICATIONS

Model Numbers.....	1010A (Electric); 1011A (Diesel/Electric)
Unit Weight (dry) 1010A/1011A.....	2900 lbs / 3980 lbs
Shipping Weight (mobile-dry) 1010A/1011A	2950 lbs / 4030 lbs
Fluid Weight, Operating (80 gal. onboard, typical)	700 lbs
Fluid	Boeing BMS 3-42 (60% Propylene Glycol/Water, dyed)
Rated Flow	3 to 32 gpm (variable)
Pump Relief Valve setting (cp).....	270 psig
Supply (outlet) Relief Valve setting(cp)	245 psig
Supply (outlet) Pressure Switch setting.....	230 psig
Return Relief Valve setting (cp).....	50 psig
Fill / Bleed Relief Valve setting (cp).....	70 psig
Clean Reservoir, Usable Capacity	50 gallons
Waste Reservoir, Usable Capacity.....	50 gallons
Supply Fluid Filter	3 micron absolute
Return Fluid Filter.....	10 micron absolute
Turbine Flowmeter	2 to 35 gpm
Aircraft Supply and Return Hoses	1-1/2 inch ID, 30 ft., synthetic rubber covered conductive
Vacuum Pump Capacity.....	0.39 cfm, 25 ins. Hg vacuum
Vacuum Regulator Setting	3.0 ins. Hg (912 mbar)
Nitrogen Inlet.....	7/16-20 (-4), 37° flared male port.
Nitrogen Pressure Regulator.....	3500 psig inlet max, 2-100 psig outlet
Nitrogen Assisted Drain System Capacity.....	10 scfm @ 50 psig
Ground Clearance.....	6.5 inches (16.5 cm)
Maximum Towing Speed.....	5 mph (8 km/h)
Brakes.....	Parking brakes on rear wheels
Tires	Solid non-marking 16.00x9 or Foam filled 16.00x9
Standard Finish	White (27880) Skydrol resistant paint
Power Cord	100 ft., 4-conductor hard-service cord (8 awg / 8.37 mm ² , plug by customer)
Electrical Power Requirement.....	(-1, -2): 380/480V, 3Ph, 50/60Hz, 15A (-3, -4): 200/240V, 3Ph, 50/60Hz, 30A
Diesel Fuel Tank Capacity (Model 1011A only)	8 gallons
Diesel Fuel (Model 1011A only)	DF-2, DF-1, Jet A, Jet A-1
Operating Ambient	40°F to 130°F (-40°C to 54°C)

3.5 LEVEL OF NOISE EMISSION

Equipment Description: Malabar model 1011A, Coolant Service Cart, Serial No. 110 Operating Voltage: 480/3/60
Operating Conditions: The equipment was placed in the middle of a paved delivery yard and operated at nominal production rate.

Level of noise emission in conformance with ISO 4871

Sound pressure level LpA (reference 20 µPa) measured at the operator's station (dB) Electric power provided by embedded diesel generator.	76
Uncertainty KpA (dB)	1
Sound pressure level LpA (reference 20 µPa) measured at the operator's station (dB) Electric power provided by connection to external power drop - Embedded diesel engine stopped.	73.7
Uncertainty KpA (dB)	1

Levels measured with reference to standards ISO 11201: 1995, ISO 3744:1994

NOTE: The sum of a level measured with the associated uncertainty is the upper limit of the range in which the level measured may be located.

4.0 TRAINING

4.1 TRAINING REQUIREMENTS

The employer of the operator is responsible for providing a training program sufficient for the safe operation of the unit.

4.2 TRAINING PROGRAM

The employer provided operator training program should cover safety procedures concerning use of the unit in and around the intended aircraft at the intended aircraft servicing location.

4.3 OPERATOR TRAINING

The operator training should provide the required training for safe operation of the unit.

NOTE: Maintenance and Trouble Shooting are to be performed by a skilled and trained technician.

5.0 SYSTEM SETUP

5.1 POSITIONING THE CSC CART

The CSC cart must be properly located before operation. The cart should be located so that the power cable can be readily connected to the facility power outlet ("Electric" Mode), and the supply and return hoses can be readily connected to the appropriate points on the aircraft.



CAUTION!

The CSC cart must never be located within 5 feet of the aircraft envelope.

5.2 POWER CONNECTION

The CSC is powered by standard 3-Phase facility power (1010A & 1011A) or by a water cooled diesel generator set (1011A). Connect the 100-foot power cord to a suitable power outlet in an appropriate location when operating in "Electric" mode.

5.3 HOSE CONNECTIONS

Before operating the CSC, the supply and return hoses must be removed from the cart, uncoiled, and connected to the appropriate connection points on the aircraft sub-system or LRU. The hoses are 30-foot long synthetic rubber covered conductive hoses with Parker flush face couplers/nipples installed at the ends. The supply hose has a quick-disconnect coupler on its end. The return hose has a quick-disconnect nipple on its end.

To facilitate connections to the various aircraft systems, a Liquid Cooling System Service Adapter Kit (p/n K21016-130) can be obtained from Malabar. There are fourteen adapters (K-tools) and various usage placards included in the kit. Refer to Boeing Aircraft Maintenance Manual for additional information on proper connections for different applications. These K-tools and usage placards can be stored in the tool boxes located on either side of the unit above the fork lift channels. The following table lists the K-tool part numbers and Usage placard part numbers and descriptions that are included in the K21016-130 Liquid Cooling System Service Adapter Kit.

5.4 K21016-130 – KIT, ADAPTER – LIQUID COOLING SYSTEM SERVICE

Aircraft..... Boeing 787

Mates With MALABAR International Coolant Service Cart (CSC - Model 1010A & 1011A, Includes storage compartments)

Shipping Size and Weight 28 IN x 20 IN x 25 IN H / 65 LBS

Part Number	Description	Qty
K21016-5	PECS, FCAC & ICS TOP OFF PORT ASSY	1
K21016-131	PECS, FCAC & ICS PUMP BLEED ASSY	1
K21016-7	PECS, FCAC & ICS PUMP FILL HOSE ASSY	1
K21016-8	PECS, FCAC & ICS BLEED HOSE ASSY	1
K21016-9	HVDC MC SERVICE ASSY	1
K21016-10	BLEED PLUG VALVE ASSY	1
K21016-12	SCU MC SUPPORT ASSY	1
K21016-14	SKID BAR CLAMP ASSY	1
K21016-111	PECS, FCAC, ICS & CRU MC LRU IN ASSY	1
K21016-112	PECS, FCAC, ICS & CRU MC LRU OUT ASSY	1
K21016-113	SCU COND, SCU EVAP, CRU COND & GCU IN ASSY	1
K21016-114	SCU COND, SCU EVAP, CRU COND & GCU OUT ASSY	1
K21016-121	USAGE PLACARD ASSY	1
K21016-123	SCU MC IN ASSY	1
K21016-124	PECS, FCAC & ICS SYSTEM IN/OUT ASSY	1

Malabar International is a Boeing-licensed K21016-130 tooling manufacturer. All parts are built to Boeing specifications.

K21016-110 Liquid Cooling System Service Adapter Kit K-tools and Usage Placards

5.5 VERIFYING HOSE AND ADAPTER CONNECTIONS

Before operating the CSC it is mandatory that the operator physically check all the connections of the supply and return hoses and adapters. For additional information on the appropriate connections of hoses, refer to Boeing AMM.

5.6 FILLING CLEAN RESERVOIR

NOTE: The CSC clean reservoir should ONLY be filled with BMS 3-42 (Propylene Glycol/Water) coolant. Use of any other coolant could result in damage to the system or the aircraft.

To fill the CSC cart clean reservoir, remove the fill cap from the reservoir and add coolant to the reservoir until it is full as indicated on level indicator. The capacity of the reservoir is 50 gallons useable. It takes approximately 55 gallons for the level indicator to indicate full. Replace fill cap when complete. Figure 3 shows location of fill cap and level indicator on reservoir.

NOTE: Cap must be tightly seated to maintain seal for proper vacuum pump operation.



FIGURE 3. Filling Clean Reservoir

6.0 OPERATION

6.1 GENERAL

This section provides operation instructions for the CSC cart.

6.2 PRIME MOVER

The Model 1011A CSC cart can be set to operate on the following prime movers.

ELECTRIC: 10 hp 3-phase induction motor operated from facility AC power.

DIESEL: A water-cooled diesel engine-generator, self-powered.

6.3 SYSTEM

The CSC cart allows the operator to adjust the coolant flow rate to suit the aircraft sub-system being serviced. Flow rate is continuously adjustable up to 32 GPM.

6.4 MODES OF OPERATION

The CSC cart operates in eight different modes. The following paragraphs describe each of the operating modes.

PREHEAT FLUID: Selection of this mode circulates fluid over the pump relief valve to warm the fluid in cold operating ambients. See recommended flow settings in Appendix III, Control System Operation

SYSTEM FILL: This mode is used to fill an aircraft system with coolant.

LRU FILL: This mode is similar to "System Fill" above except at lower pressures and flows and through a dedicated supply and return loop and hose set.

SYSTEM CLEAN: In this mode, the CSC is used to deaerate and filter contaminants from the coolant in the aircraft system. Generally, high flow rates are utilized for this mode.

N₂ PURGE SUPPLY: This mode uses compressed N₂ gas to purge (drain) the aircraft sub-system through the main supply connection and return through the main return connection to the selected clean or waste tank.

Alternately, the clean bleed or waste bleed connection can be used to provide a return path directly to either tank.

N₂ PURGE LRU: This mode uses compressed N₂ gas to purge (drain) the aircraft sub-system or LRU through the LRU supply connection and return through the LRU return connection to the selected clean or waste tank. Alternately, the clean bleed or waste bleed connection can be used to provide a return path directly to either tank.

DEAERATE/RECIRCULATE: In this mode, coolant is recirculated within the CSC cart. Typically this is done for maintenance purposes and for cart fluid monitoring.

RUNAROUND: This mode connects the supply hose coupler to the return hose nipple in order to condition cart and hose fluid prior to connection to aircraft.

6.5 CONTROLS AND INDICATORS (FIGURES 4 - 7)

The following paragraphs list all the controls, indicators, and manually operable components on the CSC cart.

6.5.1 Control Panel

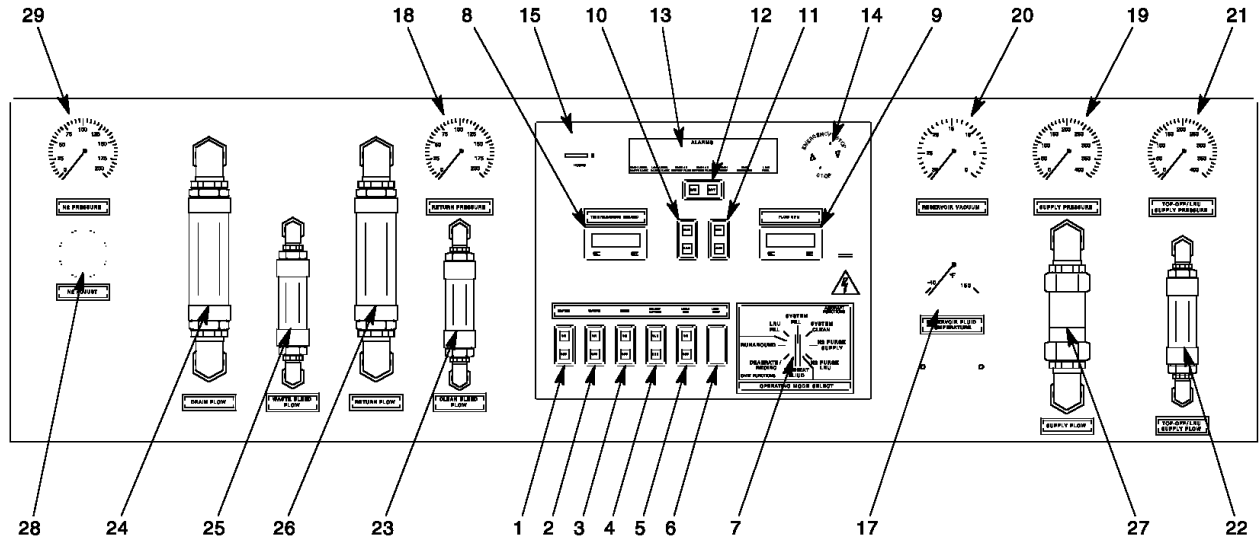


FIGURE 4 - Control Panel Controls and Indicators

Item	Name	Description
1	MASTER Switch	Turns on the CSC control system. Switch light indicates ON; blinks if E-Stop or alarm shutdown occurs. Turn this switch off to restart after an E-Stop
2	VACUUM Switch	Turns on the vacuum pump. Switch light indicates ON
3	TIMER Switch	Activates (enables) the CART TIMER. Switch light is ON when timer runs, blinks when timer is in standby
4	SELECT RETURN Pushbuttons	Press CLN or WST to select the coolant return path: Clean or Waste reservoir. Switch lights indicate selection Note: switch operation may be restricted by jumper configuration JMP1 disables return to clean reservoir in Purge Mode JMP2 disables return to waste reservoir in System Clean Mode
5	MODE RUN Pushbuttons	Press ON to run or OFF to stop the selected pump or purge operation. Red/Green lights indicate status. Green light will flash if the pump (VFD) fails to run
6	LAMP TEST Pushbutton	Press-to-Test instrument panel lamps and stacklights. Hold for 4 seconds for a short burst from the audible alarm
7	OPERATING MODE SELECT Switch	Eight position rotary switch. Select operating mode, i.e. RECIRC, RUNAROUND, LRU FILL etc
8	CART TIMER, MIN.SEC	Digital countdown timer, starts when MODE starts if TIMER Switch is ON. Controls auto shut-off (times are preset according to mode, operator adjustable, see TIME/FLOW pushbuttons)
9	FLOW, GPM Display	Displays actual coolant flowrate ("R") out the main CSC supply hose, or displays flow setpoint (preset according to mode, operator adjustable, see TIME/FLOW pushbuttons)
10	TIME / FLOW ^{1,2,3} Pushbuttons	Press & Hold TIME to change the timer setting. Press FLOW to toggle between actual and set flow. Press & Hold FLOW to change the flow setpoint using the INCR / DECR pushbuttons
11	INCR / DECR ^{1,2,3} Pushbuttons	Works while holding the TIME or FLOW switch. Press INCRement or DECRement to change the selected value by one (1). Press & hold to automatically change by greater values

6.5.1 Control Panel (continued)

Item	Name	Description
12	ACK / RST ^{1,2,3} Pushbuttons	Alarm Acknowledge & Reset buttons. ACK will silence the audible alarm & change the red lights from flashing to steady ON. RST will clear the alarm if the alarm condition has cleared
13	ALARMS Indicator Lights	Red lights indicate active alarms; lights flash until acknowledged
14	EMERGENCY STOP Pushbutton	Red Mushroom pushbutton. Push to immediately stop the CSC cart in the event of an emergency. To reset, turn the Master switch OFF, then twist/pull the button out
15	Hourmeter	Displays electric pump / motor operating hours
16	Genset Control Panel (front of unit, NS)	Generator set Start / Stop controls (See Generator set manual)
17	Temperature Gauge	Displays reservoir fluid temperature in °F
18	Pressure Gauge	Displays fluid Return pressure in psig
19	Pressure Gauge	Displays fluid Supply pressure in psig
20	Vacuum Gauge	Displays Reservoir vacuum/pressure in inches Hg/psig (compound gauge)
21	Pressure Gauge	Displays TOP-OFF/LRU fluid Supply pressure in psig
22	Sight Glass	A clear, backlit sight glass used to monitor TOP-OFF/LRU supply fluid flow
23	Sight Glass	A clear, backlit sight glass used to monitor clean bleed flow
24	Sight Glass	A clear, backlit sight glass used to monitor drain fluid flow
25	Sight Glass	A clear, backlit sight glass used to monitor waste bleed flow
26	Sight Glass	A clear, backlit sight glass used to monitor return fluid flow
27	Sight Glass	A clear, backlit sight glass used to monitor supply fluid flow
28	N2 Regulator	Rotary knob pressure regulator that adjusts Nitrogen (N ₂) pressure for purging
29	Pressure Gauge	Displays N ₂ purge pressure in psig

There are pre-set TIME and FLOW settings for each of the eight operating Modes (see items 7, 8, and 9 above). The default values may be changed if desired:

1. Adjust the TIME and FLOW values for the current mode using the TIME / FLOW and INCR / DECR pushbuttons (see items 10 and 11 above).
2. To lock in the new values, press and hold the TIME and RST or FLOW and RST (items 10 & 12 above) pushbuttons simultaneously for five (5) seconds.
3. Confirm the new values by changing modes, then return to the mode having the new values. Repeat if necessary. Be sure to hold the pushbuttons for five (5) seconds.

6.5.2 Main Power Disconnect Box

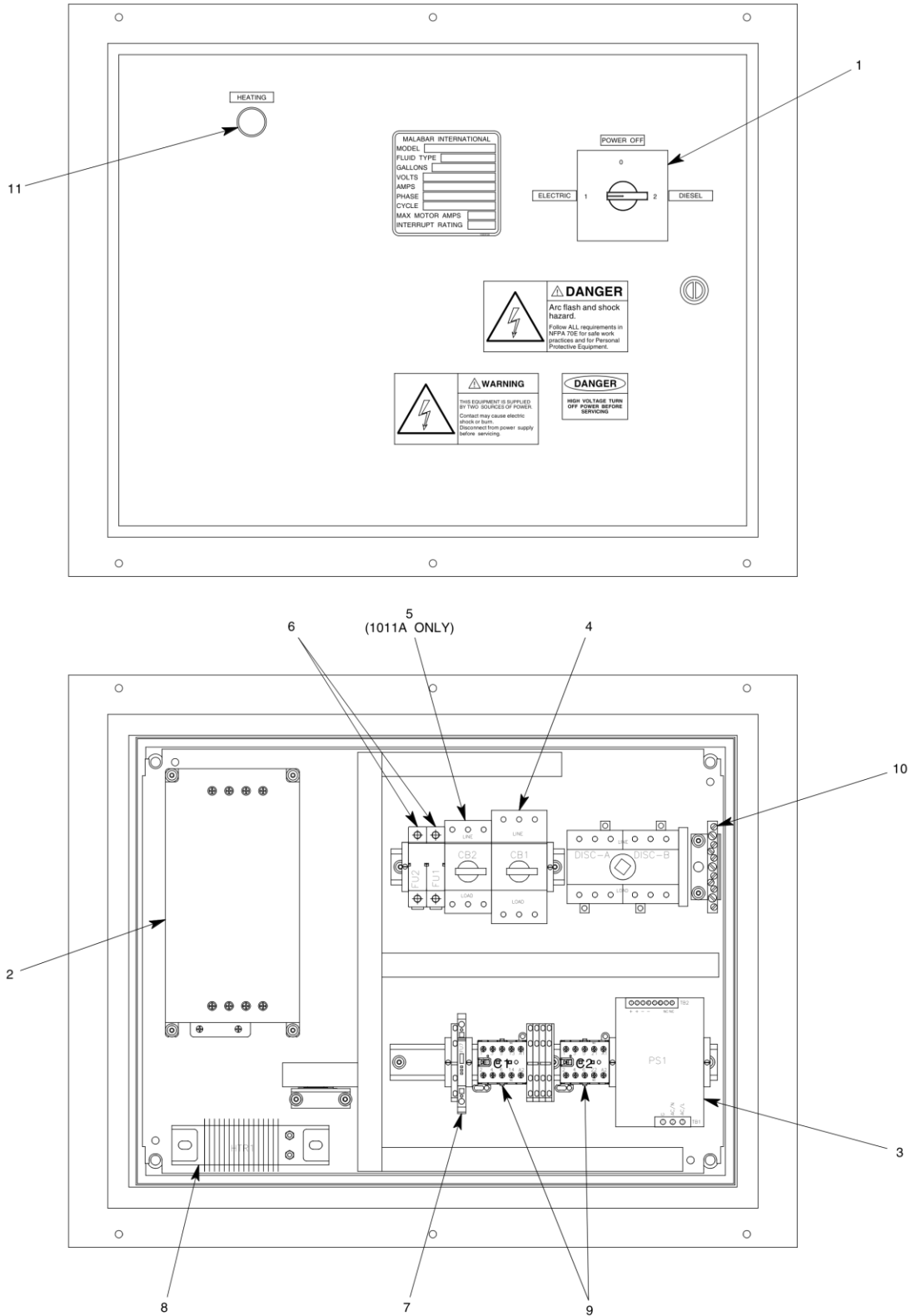


FIGURE 5 - Main Power Disconnect Box Controls, Fuses and Indicators

6.5.2 Main Power Disconnect Box *(continued)*

Item	Name	Description
1	Power Selector (1011A)	Transfer Switch, 3-Position, disconnects power from the cart (POWER OFF), selects ELECTRIC (power cord), or DIESEL (generator set power)
	Disconnect Switch (1010A)	Disconnect Switch, ON-OFF, disconnects line cord power from the cart
2	Variable Frequency Drive (VFD)	AC induction motor drive, controls motor/pump speed based on commands from the control system
3	DC Power Supply	Supplies 24VDC for the control circuit from incoming AC power
4	Circuit Breaker CB1	Main Circuit Breaker
5	Circuit Breaker CB2 (380-480 V units only)	Transformer Primary Circuit Breaker
6	Fuses FU1, FU2	Heater & Control Power Fuses, AC line voltage (see Maintenance Section for type)
7	Fuse FU3	Vacuum Pump Fuse, 24 VDC (see Maintenance Section for type)
8	Enclosure Heater & Thermostats	Raises the internal enclosure temperature to a safe level for the internal devices in cold ambient conditions
9	Contactors C1 & C2	Vacuum Pump contactor & Control Power contactor
10	Equipment Ground Buss	Common grounding point for all electrical grounds
11	Heating Light (on enclosure door)	Green light, ON while enclosure heating is on, thermostat controlled. Nothing else will turn on while enclosure heating is on

6.5.3 Drain And Sampling Valves



1



2



2

FIGURE 6 - Drain and Sampling Valve Locations

Item	Name	Description
1	Clean Reservoir Drain Valve	Manually operated ball valve located beneath the Clean Reservoir at the reservoir low point; used to drain coolant from the Clean Reservoir
2	Sampling Valves	Manually operated valves located on the exit manifolds of both the supply and return filters. These valves can be used to draw samples of the aircraft coolant for testing purposes

6.5.4 Miscellaneous Controls

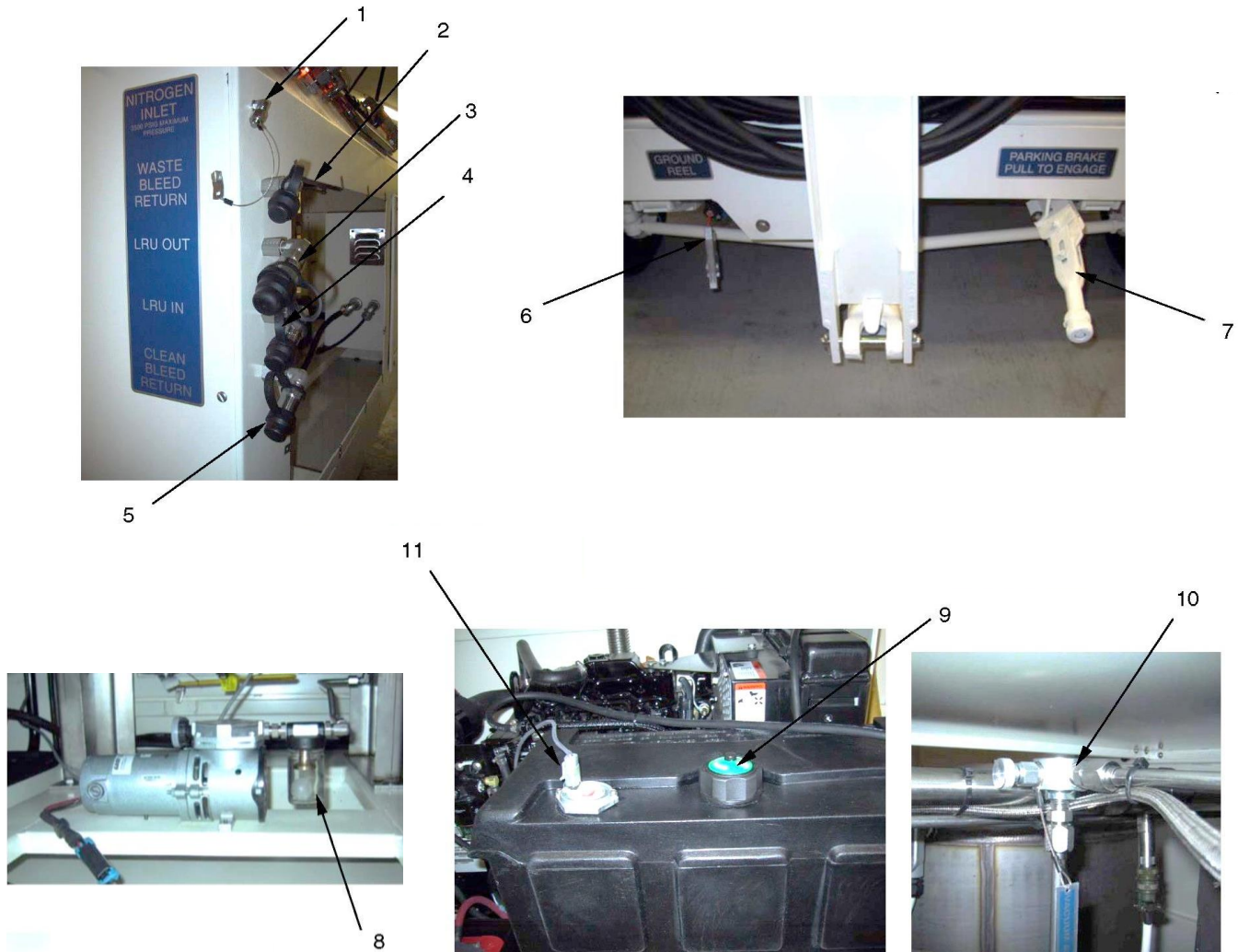


FIGURE 7 - Miscellaneous Controls Locations

Item	Name	Description
1	N2 Inlet	Standard nitrogen inlet port connected to the facility dry nitrogen supply
2	Waste Bleed Return	Coupler inlet used to bleed back to waste tank
3	LRU Out	Coupler outlet supply (cart out) used to service LRUs
4	LRU In	Coupler inlet return (cart in) used to service LRUs
5	Clean Bleed Return	Coupler inlet used to bleed back to clean tank
6	Ground Reel	Static grounding reel located at the front of the CSC. The grounding cable must be connected to the aircraft grounding system prior to any operation to prevent static discharge
7	Parking Brake	Hand operated parking brake that activates drum brakes on the rear axles to prevent the cart from rolling
8	Vacuum Pump Trap	A glass trap that collects any fluid carryover from the vacuum pump and requires periodic servicing. Refer to Servicing Vacuum Trap on page 33 for more information
9	Diesel fuel fill cap	Vented cap to fill diesel fuel (Model 1011A) using funnel or nozzle
10	Vacuum Regulator	Adjusts reservoir vacuum
11	Fuel Level Gage	Displays diesel fuel level in fuel tank (Model 1011A only)

6.6 PRE-OPERATION CHECKS

Perform the following checks prior to operating the CSC.

1. Check the frame structure for rigidity. Make sure all bolts are tightened.
2. Check system for any fluid or gas leaks. Fix or tighten as required.
3. Check parking brakes for proper operation by pulling on brake handle.
4. Check power cable for damage such as cut insulation or frayed wires.
5. Check supply and return hoses for cover damage, kinks or separation at end fitting.
6. Check fluid levels in main and waste reservoirs. Fill clean reservoir or drain waste reservoir as necessary.
7. Check fuel level in diesel tank (model 1011A). Top off as necessary.
8. Fully open the fuel valve under the diesel tank (model 1011A).
9. Be sure the DISCONNECT / POWER SELECTOR switch on the front of the unit is OFF prior to connecting the power cord (model 1010A & 1011A) or starting the diesel generator (model 1011A).

6.7 CONNECT CART FOR OPERATION

Perform the following procedures to connect the CSC system for operation.

1. Connect the static ground cable to the aircraft ground system.
2. Verify that the CSC power cord (model 1010A & 1011A) is connected to facility power when operating on electric power.
3. Ensure nitrogen bottle is connected to cart nitrogen inlet if DRAIN operations are to be performed.
4. Connect supply and return hoses in RUNAROUND mode or up to the aircraft using appropriate adapters.

6.8 OPERATING PROCEDURES

NOTE: The following procedures are provided only as a guide. Boeing Maintenance and/or Servicing Documentation shall take precedence over these procedures.

6.8.1 Operating Sequence - Diesel Generator Operation (1011A Only)



CAUTION!

Make sure the electrical disconnect/power selector switch on the front of the equipment is off before starting the diesel engine/generator. Always start the generator unloaded.

DIESEL ENGINE-GENERATOR START

(REFER TO DYNAGEN POWER CONTROLS OPERATION INSTRUCTIONS)

1. With the Genset off, set the CSC control panel switches as follows:
 - Master Switch: OFF
 - Vacuum Pump Switch: OFF
 - Emergency Stop Pushbutton: OUT
2. Open fuel shut-off valve on bottom of diesel fuel tank.
3. Press the generator set controller AUTO button and then press the RUN button. The engine should start and run at normal speed. NOTE: The controller must be in the auto mode to activate the run button.
4. Allow the engine to reach normal operating temperature (2-3 minutes).
5. Turn the DISCONNECT / POWER SELECTOR switch on the front of the unit to the DIESEL position. The green heating light located on the power disconnect box will come on if the temperature is below 35°F. The heaters will heat the enclosures to operating temperature, the green light will go out and the unit will be ready to operate. The flow and timer displays should come on.
6. Turn the Master Switch ON. The panel backlights, switch lights, and green stack-light should come on. Alarms, if any, will also activate. The system is now ready to start.
7. Refer to **CSC CART OPERATION** below for detailed information on running the cart.

DIESEL ENGINE-GENERATOR SHUTDOWN

It is recommended that the engine be unloaded before it is stopped. Do this by performing the following steps in the order listed:

1. Turn off all loads before shutting off the diesel engine:
 - Press MODE RUN switch OFF
 - Turn the VACUUM PUMP switch OFF
 - Turn the MASTER switch OFF
 - Turn the DISCONNECT / POWER SELECTOR switch to the POWER OFF position.
2. Run the generator set at no load for at least two minutes to ensure adequate engine cooldown.
3. Press the generator set controller OFF button. The engine stops.

NOTE: The Emergency Stop button has no effect on generator set operation.

6.8.2 Operating Sequence - Electric Operation (1010A & 1011A)

ELECTRIC OPERATION STARTUP

1. Before turning on the DISCONNECT / POWER SELECTOR switch on the front of the equipment, set the control panel switches as follows:
 - Master Switch: OFF
 - Vacuum Pump Switch: OFF
 - Emergency Stop Pushbutton: OUT
2. Turn the DISCONNECT/POWER SELECTOR switch to the ELECTRIC position. The green heating light located on the power disconnect box will come on if the temperature is below 35°F. The heaters will heat the enclosures to operating temperature, the green light will go out and the unit will be ready to operate. The flow and timer displays should come on.
3. Turn the Master Switch ON. The panel backlights, switch lights, and green stack-light should come on. Alarms, if any, will also activate. The system is now ready to start.
4. Refer to **CSC CART OPERATION** below for detailed information on running the cart.

6.8.3 CSC Cart Operation

START THE PUMP OR PURGE OPERATION

1. Select the desired MODE using the rotary selector switch.
2. Confirm or adjust the desired running time on the timer (by pressing the TIME switch and the INCR / DECR switch) and press the TIMER switch ON (if timed operation is not desired, leave the timer switch OFF and skip this step).
3. Confirm or adjust the flow setpoint by pressing the FLOW and INCR / DECR switches if desired.
4. Then press the MODE RUN switch ON. The proper valves will energize. Except for the two Purge Modes, the pump motor will accelerate to the set speed, indicated by an increase in flow rate (flowmeter display).

STOP THE PUMP

Automatic Timed Stop: When the timer reaches zero, the valves will de-energize and the pump motor will decelerate to a stop.

Manual Stop: The MODE RUN switch OFF may be pressed at any time to de-energize the valves, stop the timer, and cause the pump motor to decelerate to a stop.

Emergency Stop: Press the EMERGENCY STOP button at any time to stop the main pump motor, vacuum pump, and de-energize all solenoid valves. This will de-energize the Master Control Relay (MCR) and disable the Variable Frequency Drive. It will NOT stop the diesel engine (model 1011A).

NOTE: To reset after an Emergency Stop, turn the MASTER switch OFF and twist-pull the Emergency Stop button out. The system will not reset unless the Master switch is off.

Vacuum Pump Operation: The vacuum pump may be turned on any time the MASTER switch is on. It is recommended that it be turned on before pressing the MODE RUN switch ON to run the coolant pump motor

6.9 ALARMS

When the CSC system detects abnormal conditions, alarms are generated. The following table summarizes the alarm conditions. The alarm light(s), audible alarm, and red stack light will flash. Press ACK to turn off the audible alarm. The flashing red lights will go full red. Remedy cause of alarm and Press RST to reset and return to normal operation. All diesel engine related alarms / shutdowns (except Low Fuel) are displayed on the generator set (model 1011A).

Description	Transducer	Alarm Level	Alarm/Shutdown
High Level Waste Tank	LSH1	> 50 gallons	Alarm & Shutdown
Low Level Clean Tank	LSL1	< 5 gallons	Alarm & Shutdown
High dP Supply Filter	DP1	>25 psid	Alarm
High dP Return Filter	DP2	>25 psid	Alarm
High Temperature	TS1	>140°F	Alarm
High Pressure	PS1	>230 psig	Alarm & Shutdown
Low Fuel	LSL2	<1 gal (1/8 tk)	Alarm

6.10 CALIBRATION

There are four calibration verification procedures for the CSC: pressure gauges, temperature gauge, pressure switch and the flow meter.

NOTE: The vacuum gauge is for reference only and does not require calibration verification.

6.10.1 Pressure Gauge Calibration VERIFICATION (PG1, PG2, PG3, PG4)

The following procedure should be performed on the pressure gauges periodically, or whenever a gauge is replaced, or if erroneous readings are suspected. Proper calibration verification requires a hand pump with a calibrated pressure gauge (1% accuracy recommended) or a deadweight tester.

Inspect PG1 for $\pm 3\%$ and PG2 through PG4 for $\pm 5\%$ accuracy. Many times the gauges are simply "off zero" and a simple pointer adjustment is adequate. If the inspection shows that the gauge warrants recalibration to correct span and/or linearity errors, repair or replace the gauge.

6.10.2 Temperature Gauge Calibration Verification (TG1)

The following procedure should be performed on the temperature gauge periodically, or whenever a gauge is replaced, or if erroneous readings are suspected. Proper calibration verification requires the use of a digital reference thermometer (p/n 486-054) which can be purchased from Malabar.

Inspect TG1 for $\pm 5^\circ\text{F}$ accuracy.

6.10.3 Pressure Switch Calibration (PS1) (SEE FIGURE 8)

The following procedure should be performed on the pressure switch periodically, or whenever a switch is replaced, or if erroneous readings are suspected. Proper calibration verification requires a hand pump with a calibrated pressure gauge (1% accuracy recommended) or a deadweight tester. Perform the following steps to calibrate a pressure switch.

Inspect PS1 for $\pm 4\%$ accuracy.

To recalibrate your pressure switch:

1. Apply a known pressure utilizing the shutoff valve in the Malabar tool (p/n 1016200).
2. Remove pressure switch cover and loosen adjustment lock screw.
3. Adjust set point by turning 5/8 hex adjustment screw clockwise (left) to raise set point or counter-clockwise (right) to lower set point.
4. Tighten adjustment lock screw
5. Reinstall pressure switch cover.

6.10.4 Pressure Switch Re-Gapping (SEE FIGURE 8)

NOTE: Gapping is factory-set and critical to the function of the switch. This procedure should only be performed if the plunger has accidentally been adjusted.

1. Loosen adjustment lock screw.
2. Turn 5/8 hex adjustment screw clockwise (left), to approximately mid range. This puts load on the sensor and exposes the plunger flats.
3. Using a 1/4 wrench on the plunger and a 3/16 wrench on the plunger hex screw, turn the hex screw counter-clockwise (right) from plunger until switch actuates. If switch is already actuated, turn plunger hex screw clockwise (left) until switch deactuates. Turn hex screw clockwise (left) from this point (flats 1-1 1/2 and approximate gap .004-.006).
4. Check set point and reinstall pressure switch cover.

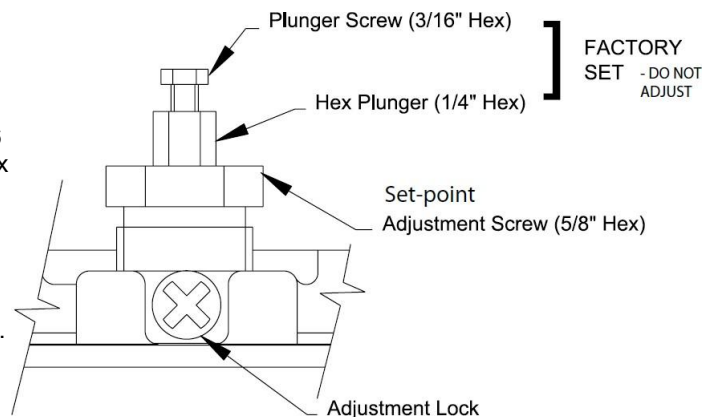


FIGURE 8 - Pressure Switch Adjustment

6.10.5 Flow Meter Calibration (FT1)

The turbine flowmeter in the supply line was initially calibrated by the manufacturer in conjunction with the digital readout. The flowmeter does not normally require recalibration. It should be periodically checked by installing a master flowmetering device in runaround mode. A flowmeter test tool (p/n 1016200) for flowmeter calibration can be purchased from Malabar. The cart meter is a 2% accuracy device and checking intervals should be based on frequency and severity of use. Complete flowmeter/readout calibration data is provided in the Supplemental Documentation section of this manual.

In the event of discrepancy between the master meter and the cart meter, remove the turbine meter from the cart and flush out the bearings with BMS3-42 or alcohol. Dirt in the bearings or wear are the usual cause for meter error. This meter has ceramic bearings that are unlikely to wear out. Recheck after flushing. If a discrepancy is still observed, adjust the Display Meter parameter (Rate Scaling Input Value - see "Control System Configuration Record") to display flow correctly.

If errors are still observed, return meter to factory for repair / recalibration.

7.0 REGULAR MAINTENANCE

7.1 MAINTAINING FLUID LEVELS

The level of coolant in both the clean reservoir and the waste reservoir should be checked prior to use. Add or drain coolant as needed (clean reservoir should be topped up and waste reservoir should be emptied).

7.2 CHANGING FILTER ELEMENTS

There are two filters in each system: one for the supply side and one for the return side. The pressure differential across the filters is continuously monitored and will generate an alarm to notify the operator when the differential exceeds the preset maximum.

NOTE: It is not necessary to immediately stop operation when a filter alarm is generated. Complete the operation in process and change the filter after the system is shut down.

When the system is shut down, close pump suction valve. Perform the following procedures to change a filter element.

1. Obtain a suitable container and position it below the filter bowl.
2. Open the drain plug and drain fluid into the container.
3. Dispose of fluid in accordance with Boeing procedures.

NOTE: It may be necessary to use a suitable wrench on the hexagon at the base of the filter to initially loosen the bowl.

4. Unscrew and remove filter bowl from head assembly.
5. Remove the filter element and the o-ring and discard in accordance with Boeing procedures.
6. Inspect the filter assembly for signs of damage. If damage is observed, refer to Section 9 and replace filter assembly.
7. Check the o-ring on the filter bowl for damage or signs of wear. Replace if necessary.



CAUTION!

Do not attempt to clean or reuse filter element.

8. Lubricate the replacement filter element o-ring with clean system fluid and push open end of the filter element straight onto the nipple in the filter head assembly.
9. Ensure threads on filter bowl and head assembly are clean and carefully screw filter bowl onto the filter head assembly.



CAUTION!

Do not use pipe wrench, hammer or any similar tool to tighten filter bowl.

10. Tighten filter bowl to 30 ft-lbs. (40 Nm).

Filter	Malabar Part No.	Manufacturers Part No.	Manufacturer
Supply	Filter: 481-114 O-ring Kit*: 481-134	Element: UE219AP13Z (5 Micron) O-ring: UR219SKZ	Pall
Return	Filter: 481-113 O-ring Kit*: 481-134	Element: UE219AS13Z (12 Micron) O-ring: UR219SKZ	Pall

*O-ring Kit p/n 481-134 includes the upper and lower filter housing seals.

7.3 SERVICING VACUUM TRAP

The vacuum trap should be inspected prior to each use. If the trap is more than about 3/4 full of fluid, it should be emptied. To empty the trap, unscrew the glass trap from the head assembly. Discard fluid in accordance with Boeing procedures, and re-install glass trap.

7.4 LUBRICATION

STEERING MECHANISM: There are six lubrication points on the steering mechanism of the running gear that should be lubricated periodically. Use standard automotive grease to lubricate the grease fittings on the steering knuckles and tie rod ends.

PARKING BRAKE MECHANISM: There are two lubrication points on the parking brake mechanism that should be lubricated periodically. Use standard automotive grease to lubricate the grease fittings on the supports for the rear cross shaft.

WHEEL BEARINGS: The wheel bearings should be repacked annually. Refer to Section 6 for procedures for servicing the wheel bearings.

7.5 FUSES



WARNING!

Shock hazard - always turn off power before attempting to change fuses. See additional cautions under electrical troubleshooting.



CAUTION!

A blown fuse is a symptom of a problem in an electrical circuit. Do not bypass a fuse or use a fuse other than the one specified. Using any other type fuse can damage components.

7.5.1 Fuses In The Main Electrical Disconnect Enclosure

Three (3) fuses are located in the main electrical disconnect enclosure. Access by turning the DISCONNECT / POWER SELECTOR switch to the OFF position, turning the quarter-turn latch on the right side of door and opening it. The fuses are mounted in blown fuse indicator type fuse holders. The following table lists the fuses located in the main electrical disconnect enclosure.

Reference Designator	Manufacturers Part Number	Manufacturer	Ampere Rating	Voltage Rating	Fuse Class	Load
FU1, 2*	CCMR008	Littelfuse	8	600 VAC	CC	DC Pwr sply/Heaters
FU3	218005	Littelfuse	5	250 VAC	5 x 20 mm SLO-BLO	Vac. Pump

*NOTE: replace power fuses in sets of two; do not replace only one.

7.5.2 Fuses In The Control Enclosure

Twelve (12) fuses are located in the control enclosure. Access by turning the quarter-turn latch on the right side of the instrument panel and opening it. The fuses are mounted in blown fuse indicator type fuse holders. A blown fuse is indicated by a red LED light in the terminal block. To replace a fuse, swing the fuse retainer latch up by pulling the handle. The fuses are removed and installed from the side of the retainer. The following table lists the fuses used in the control enclosure.

Reference Designator	Manufacturers Part Number	Manufacturer	Ampere Rating	Voltage Rating	Fuse Class	Load
FU4	218008	Littelfuse	8	250 VAC	5 x 20 mm SLO-BLO	MCR / Switched 24 VDC
FU5	218008	Littelfuse	8	250 VAC	5 x 20 mm SLO-BLO	Unswitched 24VDC
FU6-12	218.800XP	Littelfuse	0.8 (8/10)	250 VAC	5 x 20 mm SLO-BLO	Sol. Valves
FU13, 14	2183.15XP	Littelfuse	3	250 VAC	5 x 20 mm SLO-BLO	Sol. Valves
FU15	218.800XP	Littelfuse	0.8 (8/10)	250 VAC	5 x 20 mm SLO-BLO	Panel Lights

8.0 TROUBLESHOOTING

8.1 GENERAL

The following tables provide general guidance for diagnosing and correcting faults in the CSC cart. These procedures are not intended to be a comprehensive guide to addressing every possible problem encountered. Additional information on troubleshooting individual components may be found in the documentation for those components in Appendix I & II, system schematics and Diagrams. If additional assistance is required, contact Malabar.

8.2 ELECTRICAL TROUBLESHOOTING

Use the following table as a guide to troubleshoot the CSC electrical system in conjunction with Electrical Schematic in Appendix I.

CAUTION!



SHOCK HAZARD. Before performing any work in the disconnect enclosure, verify that the Variable Frequency Drive (VFD) bus capacitors have discharged. Measure the DC bus voltage across the -DC and +DC terminals on the lower Power Terminal Block. The voltage must be zero. Darkened LED / LCD displays do not indicate that the capacitors have discharged to a safe voltage level.

Symptom	Probable Cause	Remedial Action
CSC cart will not power up	No power	ELECTRIC operation (model 1010A): Verify that power cable is plugged in and that facility power is turned on DIESEL operation (model 1011A): Verify that power cable to the generator is connected and circuit breaker at the generator is on
	Main Power Disconnect OFF	Set DISCONNECT / POWER SELECTOR switch to ELECTRIC or DIESEL
	Main Fuses Blown	Check and/or replace FU1, 2 NOTE: replace in sets of two; do not replace only one.
	No 24VDC	Check for 24VDC at DC Power Supply PS1 terminals See "Main Fuses Blown" above
CSC cart powers up but nothing operates	No 24VDC to Master Switch	Check / Replace 24VDC fuse FU4
	E-Stop switch activated	Reset E-Stop switch (with Master OFF)
	PLC power off	Check / Replace 24VDC fuse FU5
CSC cart powers up but pump will not run	Mode Selector not properly set	Re-select Mode
	Timer set to "0" with "CART TIMER" switch on	Set timer dial above 0, - or- turn Cart Timer switch off
	VFD fault (Mode "ON" light blinks)	Check drive display for fault codes. Refer to VFD manual in Supplemental Documentation section
	HEATING GREEN light is on	Wait for temperature in enclosure to rise above 35o F (verify that internal heater is warm)
Vacuum pump will not operate	Blown fuse	Check fuse FU3 in main disconnect enclosure, replace if necessary
	Bad contactor	Check, replace C1
	Bad switch	Check, replace
	Failed vacuum pump	Check on bench, replace
System powers up but no valves will operate	Faulty wiring - open DC-connection	Check common DC- wiring for opens (wht/blu wire)
System powers up but individual valve(s) will not operate	Open / blown fuse	Refer to electrical schematic and check corresponding fuse. Replace if necessary
No reading on flowmeter Note: zero flowmeter reading is normal in Preheat, LRU Fill or Recirculate mode	Solenoid valve fault	Replace solenoid coil for corresponding valve.
	Wiring fault or blown fuse to a solenoid valve	Refer to electrical schematic and verify the wiring to the valve
	Flowmeter fault	Refer to electrical schematic and verify wiring from flow meter to display unit Refer to supplemental documentation in appendices for details

8.2 ELECTRICAL TROUBLESHOOTING (continued)

Symptom	Probable Cause	Remedial Action
Refer to supplemental documentation in appendices for details on the diesel generator set.		
Diesel engine will not crank (model 1011A)	12V Battery discharged	Charge or Replace
	Defective starter solenoid or wiring	Check connections and tighten or replace wiring or solenoid.
Diesel engine will not start (model 1011A)	No fuel or fuel valve shut	Fill tank and / or open valve under tank.
	Fuel filter/ hoses clogged	Clean out lines or replace filter element
	Low oil pressure	Fill oil to dipstick mark

8.3 FLUID SYSTEM TROUBLESHOOTING

Use the following table as a guide to troubleshoot the CSC fluid system in conjunction with the [Hydraulic System Schematic](#) and [Control System Operation](#) in Appendix II.

Symptom	Probable Cause	Remedial Action
Supply Pressure too high	Flow setpoint too high	Check AMM, adjust flow setpoint as required
	Aircraft valves not configured correctly	Check AMM, re-configure aircraft system as required
No Reading on Supply Pressure Gage PG1 (with main pump running)	Gage calibration valve shut	Open gage calibration / isolation valve (V1) CAUTION: <u>Never</u> operate the cart with this valve (V1) closed, overpressure hazard
	Solenoid valve LV2 did not open	RUNAROUND, SYST. FILL, SYST. CLEAN mode: Check/replace fuse FU6, Check for failed LV2
	Solenoid valve LV2 did not energize	PREHEAT, RECIRC., or LRU FILL mode: This is normal operation
	Loss of fluid in Supply Reservoir	Shut down immediately, check for stuck low level switch (LSL1) and look for leaks
No Reading on Return Pressure Gage PG2	Gage calibration valve shut	Open gage calibration / isolation valve (V2)
	No return flow	PREHEAT, RECIRCULATE, or LRU FILL mode: This is normal operation
Return Pressure too high	Solenoid valve LV3, LV4, or LV5 did not open	Check/replace fuse(s) FU13, FU7, FU14 Check for failed solenoid valves
Cannot select CLEAN Return	Either PURGE Mode: Jumper 1 installed	This is normal operation. See Control System Configuration Record in Appendix II for information on these user configurable options
Cannot select WASTE Return	SYST. CLEAN Mode: Jumper 2 installed	
Pump runs but Flow rate is too low	Flow set point too low	Adjust flow set point
	Relief Valve RV3 or RV4 may be bypassing flow	Adjust RV3, RV4. Repair or replace
	Recirc. Solenoid Valve LV8 may be stuck open	Tap valve body to un-stick Remove valve and bench check/test. Repair or replace
Purge Doesn't work	Loss of N2 Supply	Verify N2 supply is connected Valves LV6, 7 failed: check, repair or replace. Valves LV6, 7 didn't turn on: check fuses FU8, 9. Check valves CV3, 4 stuck: repair or replace

9.0 REPAIR

9.1 INTRODUCTION

Repair of the CSC consists of replacement of defective components.



WARNING!

THIS EQUIPMENT HAS POTENTIALLY FATAL VOLTAGES APPLIED DURING OPERATION. BEFORE BEGINNING ANY REPAIR PROCEDURE, ENSURE THAT THE MAIN POWER CABLE IS DISCONNECTED, THE CSC MAIN DISCONNECT SWITCH IS OFF, AND (MODEL 1011A) THE GENERATOR SET IS OFF.

9.2 MOTOR/PUMP ASSEMBLY REPLACEMENT (FIGURE 9)

Before replacing the motor/pump assembly, it is necessary to isolate the pump suction line from the clean reservoir. Close the pump suction ball valve at the bottom of the clean reservoir.

REMOVAL

1. Close pump suction ball valve located below clean reservoir.
2. Remove four screws and remove cover to electric motor connection box.
3. Tag and disconnect electrical leads from electric motor connection box.
4. Unscrew conduit nut securing electrical cable to electric motor connection box.
5. Unscrew hose end swivel from inlet elbow on pump suction.
6. Unscrew hose end swivel from outlet fitting on pump discharge.
7. Remove four capscrews, eight flat washers, and four lockwashers securing pump and motor assembly to cart frame.
8. Using a forklift or other suitable lifting device, carefully lift pump and motor assembly out of cart frame.

INSTALLATION

1. Using a forklift or other suitable lifting device, carefully install pump and motor assembly in cart frame and position over mounting holes.
2. Secure pump and motor assembly to cart frame using four capscrews, eight flat washers, and four lockwashers.
3. Install inlet hose on pump suction elbow.
4. Install outlet hose on pump discharge fitting.
5. Feed electrical leads into electrical connection box.
6. Secure electrical cable to connection box by tightening conduit nut.
7. Connect electrical leads to electric motor connection box.
8. Remove and discard tags.
9. Install cover on electric motor connection box and secure with four screws.
10. Open pump suction ball valve, check for leaks and tighten fittings if necessary.

Unscrew hose end
swivel from pump
port flange/fitting



Remove four screws,
remove cover,
disconnect wires.

Loosen conduit nut
and remove cable
from electrical box.

FIGURE 9 - Motor/Pump Assembly Replacement

9.3 MOTOR/PUMP ASSEMBLY REPAIR (FIGURE 10)

The following procedure describes a complete disassembly of the motor/pump assembly. Only disassemble the motor/pump assembly to the extent necessary to replace the defective component. The motor/pump assembly should be removed from the CSC cart prior to performing these repair procedures.

DISASSEMBLY

1. Remove orange plastic cover from opening in adapter.
2. Remove two capscrews, two lockwashers, and two flat washers securing pump assembly to adapter, and remove pump assembly.

NOTE: Note the orientation of adapter relative to motor and pump so that it can be reinstalled correctly.

3. Remove four capscrews, flat washers, and lock washers securing adapter to motor.

INSPECTION

Inspect the flexible coupling and rubber insert for signs of wear or damage. Replace insert or entire coupling assembly if necessary.

ASSEMBLY

1. Note orientation of adapter and install on motor.
2. Secure adapter to motor with four flat washers, lock washers, and capscrews.
3. Install pump assembly on adapter and secure with two flat washers, two lockwashers, and two capscrews. Rotate either pump or motor shaft as necessary to engage coupling insert into jaws.
4. Check coupling set screws to ensure they are tight.
5. Install orange plastic cover on adapter.
6. Install motor/pump assembly in CSC cart.

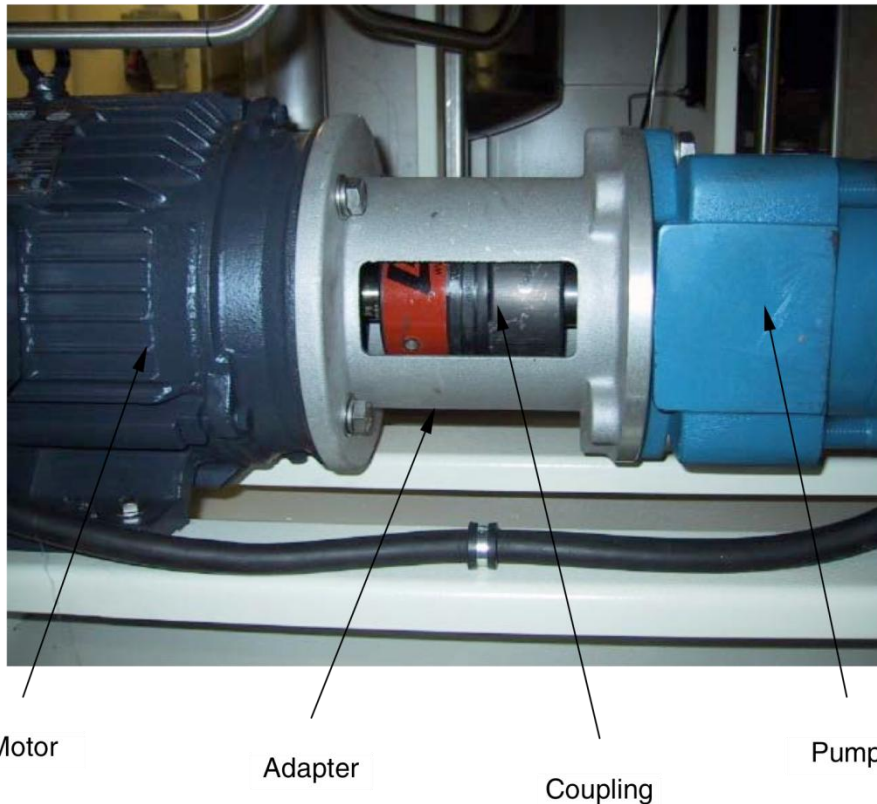


FIGURE 10 - Motor/Pump Assembly Repair

9.4 VACUUM PUMP ASSEMBLY REPLACEMENT

REMOVAL

1. Disconnect electrical leads from vacuum pump.
2. Disconnect inlet tube from vacuum pump glass trap.
3. From underneath vacuum pump mount bracket, remove three screws, three lockwashers, and three flat washers securing vacuum pump, and remove vacuum pump from cart.

INSTALLATION

1. Install vacuum pump on cart floor and secure with three flat washers, three lockwashers and three screws.
2. Connect inlet tube to vacuum pump glass trap.
3. Connect electrical leads to vacuum pump.

9.5 DIESEL GENERATOR SET REMOVAL (1011A) (FIG. 11)

The following procedure describes the removal and reassembly of the diesel generator set. Use caution when handling; the unit weighs approximately 400 lbs.

REMOVAL FROM CSC

1. Remove the towbar from the CSC.
2. Remove the CSC power cord from the cord support hooks.
3. Disconnect the power cord (inboard side) and fuel gauge connector from the fuel tank.
4. Disconnect battery cables, remove battery and battery box.
5. Drain fuel tank if necessary, close fuel suction valve on bottom of fuel tank and disconnect fuel lines from diesel engine. Cap engine fuel ports.
6. Remove fuel tank and fuel tank support bracket.
7. Disconnect exhaust piping from engine.
8. Remove two front and two rear bolts holding the generator set to the CSC base.
9. Raise the generator set with a forklift at locations shown in Fig. 11 and remove from the CSC.

INSPECTION / REPAIR

Refer to the GENERATOR SET OWNER'S MANUAL for information on service and repair.

ASSEMBLY

Reassemble in reverse order of removal.

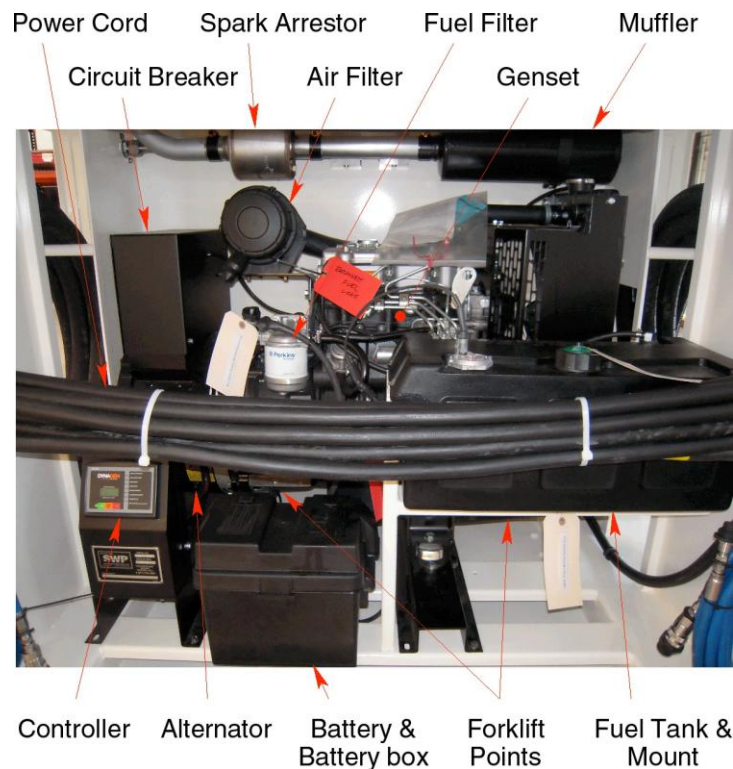


FIGURE 11. Diesel Generator Replacement

9.6 DIESEL GENERATOR SET REPAIR
Refer to OEM manual in supplemental documentation.

9.7 DRAIN VALVE REPLACEMENT
Before replacing the drain valve, it is necessary to drain the system. Connect a drain hose to the drain valve, and open it to release the coolant into a suitable container.

REMOVAL

To remove drain valve, unscrew it from the bottom of the reservoir.

INSTALLATION

To install drain valve, screw it into bottom of reservoir. Use Teflon tape to seal pipe threads.

9.8 SOLENOID REPLACEMENT (TYPICAL) (FIGURE 12)

The following procedure is typical for replacement of the solenoids on the system valves.

REMOVAL

1. Loosen screw and disconnect DIN connector from solenoid coil.
2. Remove nut and flat washer and lift solenoid coil off valve plunger.

INSTALLATION

1. Install solenoid coil on valve plunger and secure with nut.
2. Connect DIN connector to solenoid body and secure with screw and flat washer.

9.9 SOLENOID VALVE REPLACEMENT (TYPICAL)

The following procedure is typical for replacement of the solenoid valves in the system.

REMOVAL

1. Remove screw and disconnect DIN connector from solenoid coil.
2. Remove nut and flat washer and lift solenoid coil off valve plunger.
3. Unscrew the appropriate fittings, and unscrew seal nuts from valve body.
4. Remove o-rings and valve body. Retain o-rings for reuse.

INSTALLATION

NOTE: Some valves are supplied with buna o-rings. These should be discarded and replaced with viton o-rings.

1. Inspect o-rings for signs of damage or wear. Replace if necessary.
2. Install o-rings, seal nuts, and valve body.
3. Secure appropriate fittings, ensuring that all are tight.
4. Install solenoid coil on valve plunger and secure with nut.
5. Connect wiring cap to solenoid body and secure with screw and flat washer.

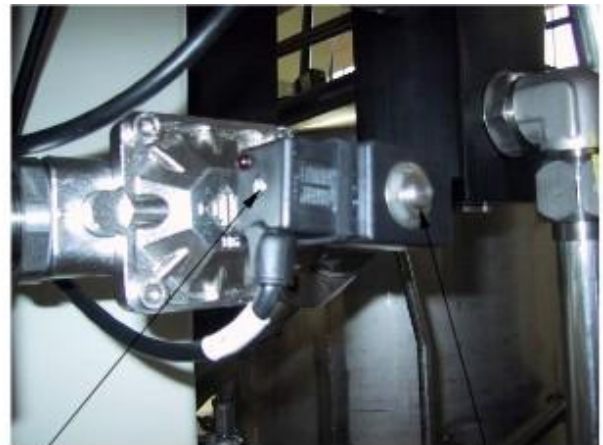
9.10 TEMPERATURE GAUGE REPLACEMENT (TYPICAL)
No calibration is required when replacing temperature gauges.

REMOVAL

Unscrew and remove sensor.

INSTALLATION

Install sensor.



Loosen screw
and disconnect
DIN connector

Remove nut, washer
and solenoid coil from
valve plunger

FIGURE 12 - Solenoid Replacement

9.11 PRESSURE GAUGE REPLACEMENT (TYPICAL)

If a pressure gauge is replaced, it must be bench calibrated prior to installation in cart (see 6.10.1 Pressure Gauge Calibration VERIFICATION for more information).

9.12 FLOWMETER REPLACEMENT (FIGURE 13)

REMOVAL

1. Disconnect flowmeter cable connector at flowmeter pick-off.
2. Loosen 'B' nuts on either side of flow meter and remove from cart. Note flow arrow and direction.

INSTALLATION

1. Install flowmeter observing proper flow direction and secure by tightening 'B' nuts on either side.
2. Connect cable at flowmeter pick-off connector.
3. Enter new pulse/gal. value (calibration data) in Flowrate Display, see Appendix III, **CSC_Config_Info**.

9.13 BEACON LAMP REPLACEMENT

The beacon light module snaps/twists into the base. To replace the lamp, perform the following procedures.

1. Twist the light module CCW and lift it straight up, removing it from the base.
2. Twist and pull the defective lamp from its socket.
3. Replace the lamp with 19mm P/N BA15d lamp (from Rockwell Automation) by inserting the lamp in the socket and twisting it until secure.
4. Using the arrow and alignment mark on the side of the units, align the light assembly with its base and turn until it clicks into place.

9.14 BEACON ASSEMBLY REPLACEMENT

REMOVAL

1. Twist the light module CCW and lift it straight up, removing it from the base.
2. Disconnect electrical leads from the base.
3. Remove two screws, two lockwashers, and four flat washers. Remove beacon base from top of cart.

INSTALLATION

1. Install beacon assembly on top of cart, feeding electrical leads through mounting hole.
2. Secure alarm beacon assembly in place with two screws, two lockwashers, and four flat washers.
3. Connect electrical leads to beacon assembly base.

9.15 GROUND CABLE REEL REPLACEMENT

REMOVAL

While supporting the ground cable reel, remove two capscrews, two locknuts, and four flat washers and remove ground reel cable from frame.

INSTALLATION

Position ground reel cable in place and secure with two locknuts, four flat washers, and two capscrews.

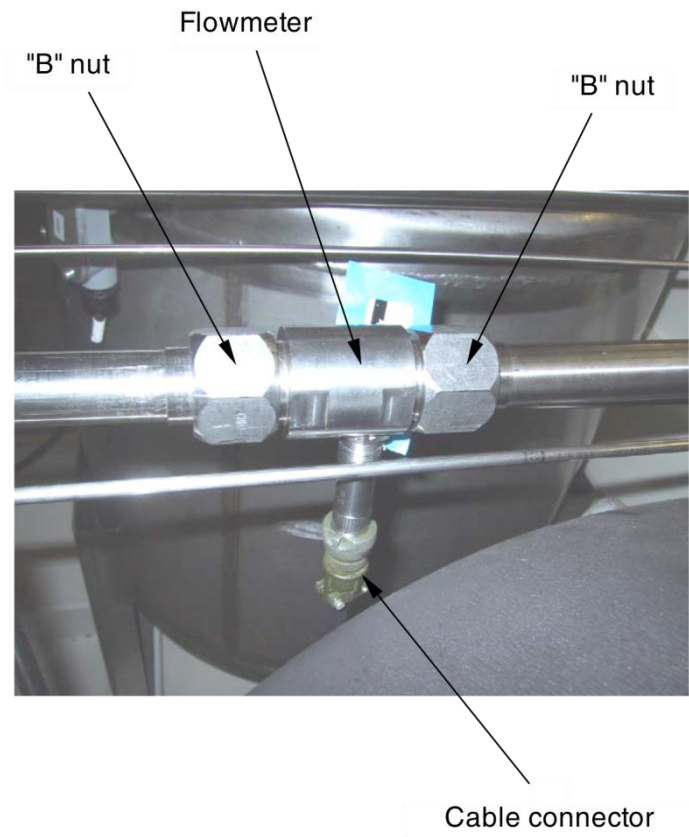


FIGURE 13 - Flowmeter Replacement

9.16 MAIN POWER DISCONNECT ENCLOSURE REPAIRS



CAUTION!

SHOCK HAZARD. Before performing any work in the disconnect enclosure, verify that the Variable Frequency Drive (VFD) bus capacitors have discharged. Measure the DC bus voltage across the -DC and +DC terminals on the lower Power Terminal Block. The voltage must be zero. Darkened LED / LCD displays do not indicate that the capacitors have discharged to a safe voltage level.

9.16.1 Variable Speed Drive (VFD) Replacement

REMOVAL

1. Snap cover and terminal guards off of the variable frequency drive (VFD).
2. Tag and disconnect all wiring from the VFD.
3. Remove four screws, lockwashers, and flat washers and remove the VFD.

INSTALLATION

1. Mount the VFD in the enclosure and secure with four flat washers, lock washers, and screws.
2. Connect all wiring to VFD (refer to electrical schematic).
3. Remove and discard any temporary tags.
4. Replace terminal guards and snap cover onto the VFD.
5. Set parameters listed in Appendix III, **CSC_ Config_Info**, when powered.

9.16.2 Main Disconnect / Power Selector Switch (DISC1) Replacement

REMOVAL

1. Tag and disconnect all electrical wires from the switch.
2. Remove four screws, lockwashers, and flat washers and remove from enclosure.

INSTALLATION

1. Secure to the mounting panel in enclosure with four flat washers, lockwashers, and screws.
2. Connect the wires to the main switches and auxiliary contact block (refer to electrical schematic).
3. Remove and discard any temporary tags.

9.16.3 24 VDC Power Supply (PS1) Replacement

REMOVAL

1. Tag and disconnect all electrical wires from power supply.
2. Snap power supply off DIN rail and remove from enclosure.

INSTALLATION

1. Snap power supply onto DIN rail. Be sure rail latches are latched.
2. Reconnect all electrical wiring.
3. Remove and discard any temporary tags.

9.17 CONTROL PANEL REPAIR

9.17.1 Flow Sight Gauge Replacement

The following procedure is identical for all sight gauges.

REMOVAL

1. Place a suitable container underneath work area to catch residual coolant.
2. Disconnect swivel elbows from bulkhead connectors and remove sight gauge assembly.
3. Remove two elbows and two seal nuts from sight gauge.

INSTALLATION

1. Install two seal nuts and two elbows on ends of sight gauge.
2. Install sight gauge assembly onto bulkhead connectors.
3. Check coolant level in main reservoir and add coolant as necessary.

9.17.2 Pressure Regulator Replacement

REMOVAL

1. At rear of pressure regulator, tag and disconnect four nitrogen lines.
2. Note position and orientation of elbows and tee in pressure regulator body for reinstallation.
3. Remove two elbows and one tee from pressure regulator body.
4. Pry center cap off knob of pressure regulator.
5. Remove nut and knob from stem of pressure regulator.
6. Remove ring nut and remove pressure regulator from panel.

INSTALLATION

1. Install pressure regulator in panel and secure with ring nut.
2. Install two elbows and tee in pressure regulator body, ensuring that position and orientation is same as noted in removal procedure.
3. Connect four nitrogen lines to elbows and tee.
4. Remove and discard tags.
5. Install knob on stem of pressure regulator and secure with nut.
6. Snap center cap into knob.

9.17.3 Emergency Stop Switch (Mpb1) Replacement

The E-stop switch consists of a contact block and a pushbutton operator.

REMOVAL

1. Using a flat blade screwdriver or coin, rotate the latch on the front of the control enclosure 90° CCW and open the door.
2. Tag and disconnect electrical wires from the switch.
3. From the rear of the control enclosure door, disengage the top and bottom contact block lugs and remove block from stem of pushbutton operator.
4. Loosen two screws and remove wires from the rear of switch block.
5. Remove ring nut from rear of stem, and remove switch pushbutton through front of panel.

INSTALLATION

1. Install switch pushbutton in through front of panel and secure in rear with ring nut.
2. Connect electrical wires to contact block and secure with two screws.
3. Snap contact block onto rear of pushbutton operator.

9.17.4 Toggle Switch (SW2-SW9) Replacement

REMOVAL

1. Use a flat blade screwdriver or coin to rotate the latch on the front of the control enclosure 90° CCW and open the door.
2. From behind the control enclosure door, tag and disconnect wires from the rear of the switch.
3. Press tongs together against switch body and pull switch through the front panel.

INSTALLATION

1. Push switch through hole in front panel until tongs firmly engage.
2. Connect the electrical wires to the rear of switch.
3. Remove and discard any temporary tags.

9.17.5 Hour Meter Replacement

REMOVAL

1. Using a flat blade screwdriver or coin, rotate the latch on the front of the control enclosure 90° CCW and open the door.
2. From the rear of the control enclosure door, tag and disconnect electrical wires from rear of meter.
3. From rear of meter, remove two nuts and mounting ring, then remove meter from front of panel.

INSTALLATION

1. Install meter in front panel and secure with mounting ring and two nuts.
2. Connect electrical leads to rear of meter.
3. Remove and discard any temporary tags.

9.17.6 PLC Module Replacement (FIGURE 14)

There are four (4) PLC modules. The PLC Base and Expansion I/O Modules are mounted side by side on the top DIN rail inside the control enclosure. Use the following procedure to remove/replace any of the units. The units are interconnected with Expansion Module Ribbon Cables.



CAUTION!

To avoid damage to the Expansion I/O Module ribbon cables between the units, the ribbon cables must be disconnected prior to removing the modules. Use the pull-loop on the connectors to disconnect the I/O module ribbon cable.



WARNING!

DO NOT disconnect or connect the I/O module ribbon cables or any wiring under power.

REMOVAL

1. Using a flat blade screwdriver or coin, rotate the latch on the front of the control enclosure 90° CCW and open the door. Locate the PLC modules at the top of the panel.
2. Disconnect the wires from the I/O module(s) or remove the removable terminal blocks from the PLC base unit to be removed.
3. Open the ribbon cable access door on the module(s) to the left of the module(s) to be removed and disconnect the ribbon cable(s).
4. Using both hands, grab I/O module(s) firmly (one at a time).
5. While pressing the module(s) (one at a time) down against the top of the DIN rail, pull the bottom away from the DIN rail, and then raise slightly to clear the top of the rail.
6. Remove the module(s) from the enclosure.

INSTALLATION

1. Open the control enclosure door (see no. 1 above).
2. Reassemble in reverse order of removal.

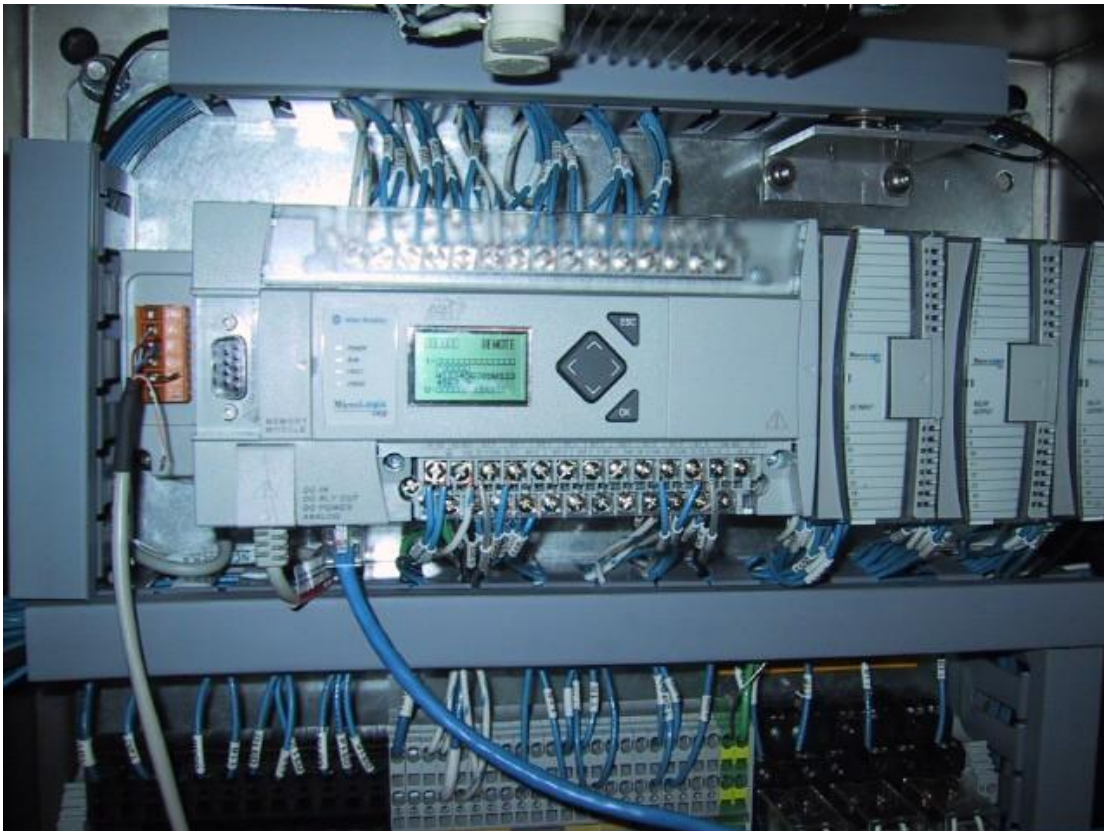


FIGURE 14 - PLC Module Replacement

9.17.7 PLC Software Replacement (FIGURE 15)

REMOVAL

1. Using a flat blade screwdriver or coin, rotate the latch on the front of the control enclosure 90° CCW and open the door. Locate the PLC module at the top of the panel.



WARNING!

DO NOT TOUCH MEMORY MODULE PC BOARD.

2. Unsnap Memory Module cover and remove as shown.

INSTALLATION

Insert new Memory Module into Memory Module socket connection and snap into place.



Memory Module

9.17.8 Cart Timer And Flow Display Replacement

REMOVAL

1. Using a flat blade screwdriver or coin, rotate the latch on the front of the control enclosure 90° CCW and open the door. Locate the Cart Timer and/or the Flow Display on the back (inside) of the enclosure door.
2. Disconnect the wires from the rear of the display to be removed.
3. Loosen the screws on the mounting ears, spread locking collar and pull display through the front of the panel.
4. Pull the timer out from the front of the panel.

FIGURE 15 - PLC Software Replacement

INSTALLATION

1. Open the control enclosure door (see Removal above).
2. Reassemble in reverse order of removal.

9.18 RUNNING GEAR REPAIR

9.18.1 Wheel Bearing Service (FIGURE 16)

Perform the following procedures to repack the wheel bearings.

NOTE: The front wheel bearings may be serviced with the brakes applied, however, the brakes must be released to service the rear wheel bearings. Make certain to chock the front wheels while servicing the rear wheel bearings.

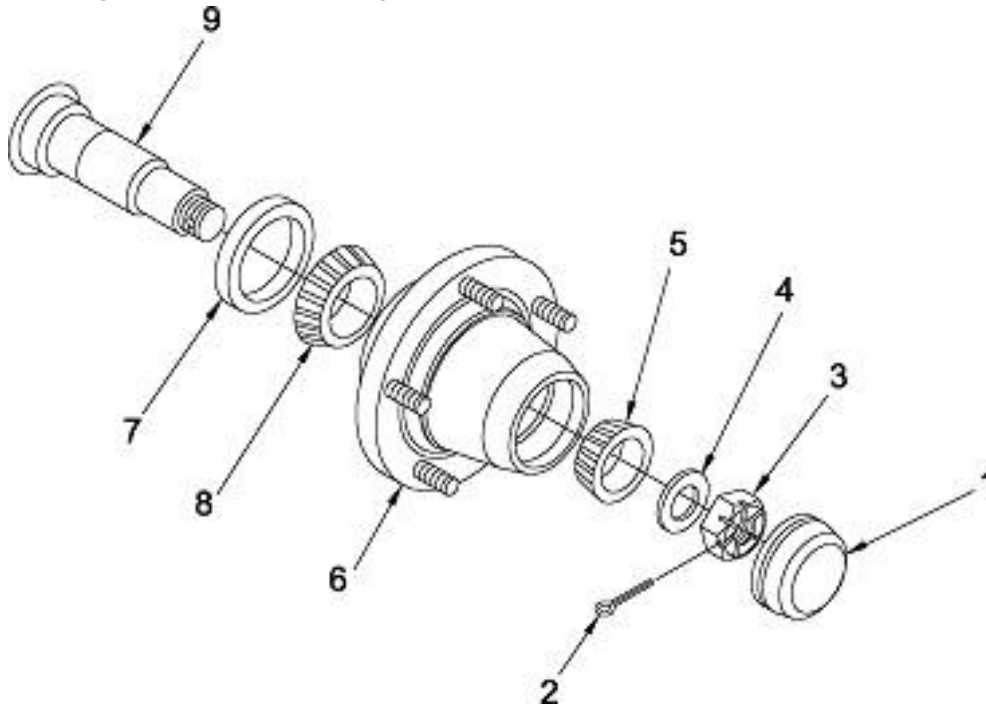


FIGURE 16 - Wheel Bearing Service

1. Park the test stand on level, hard ground, set the parking brakes and chock the wheels to prevent movement.
2. Loosen the wheel nuts.
3. Use a suitable jack to raise that wheel until the tire clears the ground, then remove the wheel nuts and the wheel.
4. Refer to Figure 17 and remove the hub cap (1), cotter pin (2), slotted nut (3) and washer (4).
5. Remove the outer bearing cone (5) and place it on a clean surface.
6. Pull the hub (6) off the spindle (9) while taking care not to damage the seal (7), then carefully pry the seal (7) out of the hub (6) and remove inner bearing cone (8).
7. Check the bearing races (still in the hub) for surface deterioration, pitting, cracks or discoloration. Light discoloration is acceptable. Severe discoloration indicates overheating.
8. Clean the bearing races by agitating them in a container of solvent. Do not spin the bearings. Doing so may cause damage to bearing or the bearing may fly apart.
9. Check the bearing cones for surface deterioration, cracks or other damage. Replace parts found unserviceable.
10. Pack the bearing cones with the specified bearing lubricant making certain to fill the gaps between the rollers with lubricant.
11. Install the inner bearing cone (8) in the hub (6), then install the seal (7) with the seal lip and spring inward.
12. Slide the hub assembly onto the spindle (9) taking care not to damage the seal (7).
13. Install the outer bearing cone (5) on the spindle (9) and push it into place with the washer (4).
14. Install slotted nut (3) and tighten it until heavy drag is felt while attempting to rotate the hub (6).
15. Back off slotted nut just enough that no drag is felt.
16. Rotate nut in tightening direction until slot in nut aligns with hole in spindle.
17. Install cotter pin (2). Bend ends of cotter pin to secure it.
18. Install hub cap (1), wheel and wheel nuts.
19. Lower wheel until tire makes firm contact with ground, then tighten wheel nuts.
20. Continue lowering test stand until tire supports test stand.
21. Repeat the above procedure with the remaining wheel bearings.

9.18.2 Wheel Alignment (FIGURE 17)

To prevent premature wear of the front tires as well as excessive swaying of the loaded trailer, the front wheels must be aligned properly with each other and with the towbar. Perform the following procedures to align the test stand wheels.

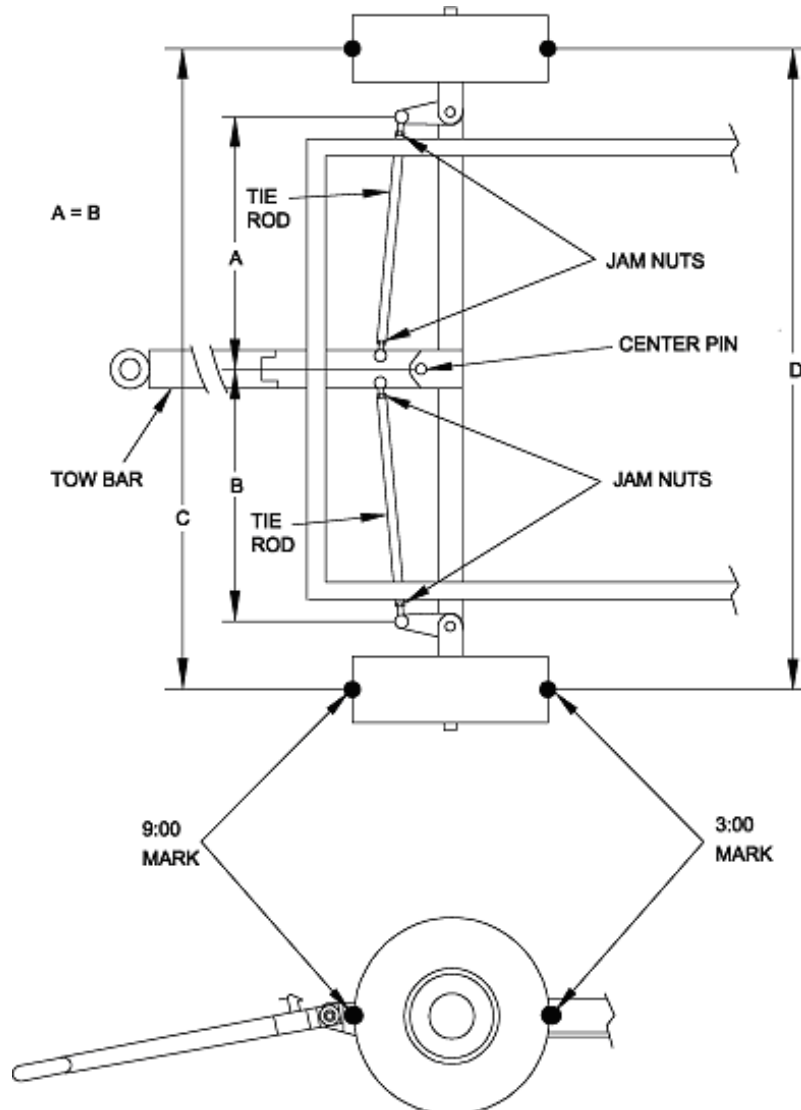


FIGURE 17 - Wheel Alignment

1. Choose a smooth, level surface to perform the alignment procedures.
2. Position the lift trailer with the towbar lowered and centered.
3. Refer to figure 18 and measure the length of each tie rod from the center pin to the removable pin at each wheel (A and B). The tie rods must be equal in length. If the tie rods are not equal in length, loosen the jam nuts and adjust the length to equalize the tie rods. If tie rods are equal in length, proceed to next step.
4. Place a mark in the middle of tread at the 9:00 o'clock position on the front side of each front tire.
5. Measure the distance "C" between the marks and record the measurement.
6. Move the trailer straight ahead until the marks on the front wheels are at the 3:00 o'clock position.
7. Measure the distance "D" between the marks.
8. Subtract the measurement "C" taken at the 9:00 position from the measurement "D" at the 3:00 position. The difference should be 1/8 inch. If the difference is greater than 1/8 inch, the tie rods must be lengthened. Be sure to lengthen both tie rods an equal amount to maintain the towbar in the centered position. If the difference is less than 1/8 inch, the tie rods must be shortened. Be sure to shorten both tie rods an equal amount to maintain the towbar in the centered position.
9. Loosen the jam nuts and adjust the length of the tie rods as necessary. Recheck the measurements when the adjustment is complete.

9.18.3 Brake Shoe Replacement (FIGURE 18)

1. Park the test stand on level, hard ground, set the parking brakes and chock the wheels to prevent movement.
2. Loosen the wheel nuts.
3. Use a suitable jack to raise that wheel until the tire clears the ground, then remove the wheel nuts and the wheel.
4. Refer to figure 17 and remove the hub cap (1), cotter pin (2), slotted nut (3) and washer (4).
5. Remove the outer bearing cone (5) and place it on a clean surface.
6. Pull the hub (6) off the spindle (9) while taking care not to damage the seal (7).
7. Refer to figure 19 and disengage the two lining retainer springs (2).
8. Spread the top of the brake shoes (3) apart to disengage the camshaft (5), then remove the shoes and retract spring (1).
9. Unhook the shoes (3) from retract spring (1).
10. Assemble replacement shoes (3) and retract spring (1).
11. Spread the top of the shoes (3) apart and position them on camshaft (5) against backing plate (6).
12. Secure the shoes (3) with retaining springs (2).
13. Perform wheel bearing service and hub installation as outlined on page 50.
14. Back off the brake linkage adjustment by rotating the knob at the end of the brake lever counter-clockwise.

Rotate the adjustment knob clockwise to increase the braking force. Adjust the brake mechanism so that the brakes will hold the test stand stationary on a 15° incline.

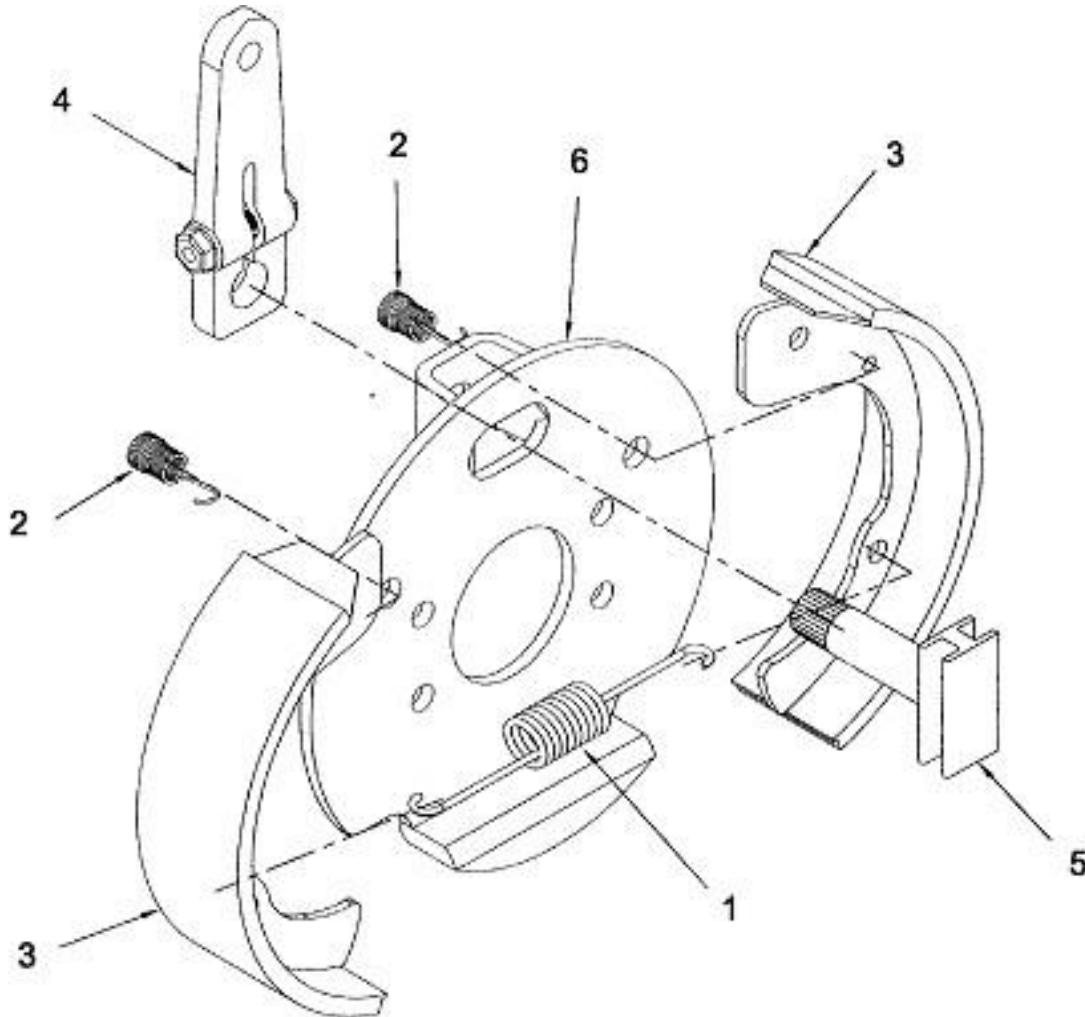


FIGURE 18 - Brake Shoe Replacement

9.18.4 Spring Replacement (FIGURE 19)

The following procedures outline replacement of a front or rear spring.

1. Park the test stand on level, hard ground, then apply the parking brake to prevent movement.
2. Disconnect test stand from tow vehicle.
3. Use a 2-ton minimum capacity jack to raise the corner of the test stand that requires the replacement spring. Raise the test stand until the tire clears the ground.
4. Place a jack stand under the frame (not the axle) to support the test stand in the raised position, then lower the test stand onto the jack stand. The tire should still just clear the ground.
5. Refer to figure 19 and remove the four lock nuts (1), flat washers (2), u-bolts (3) and plate (4). This will separate the axle (10) from the spring (9).

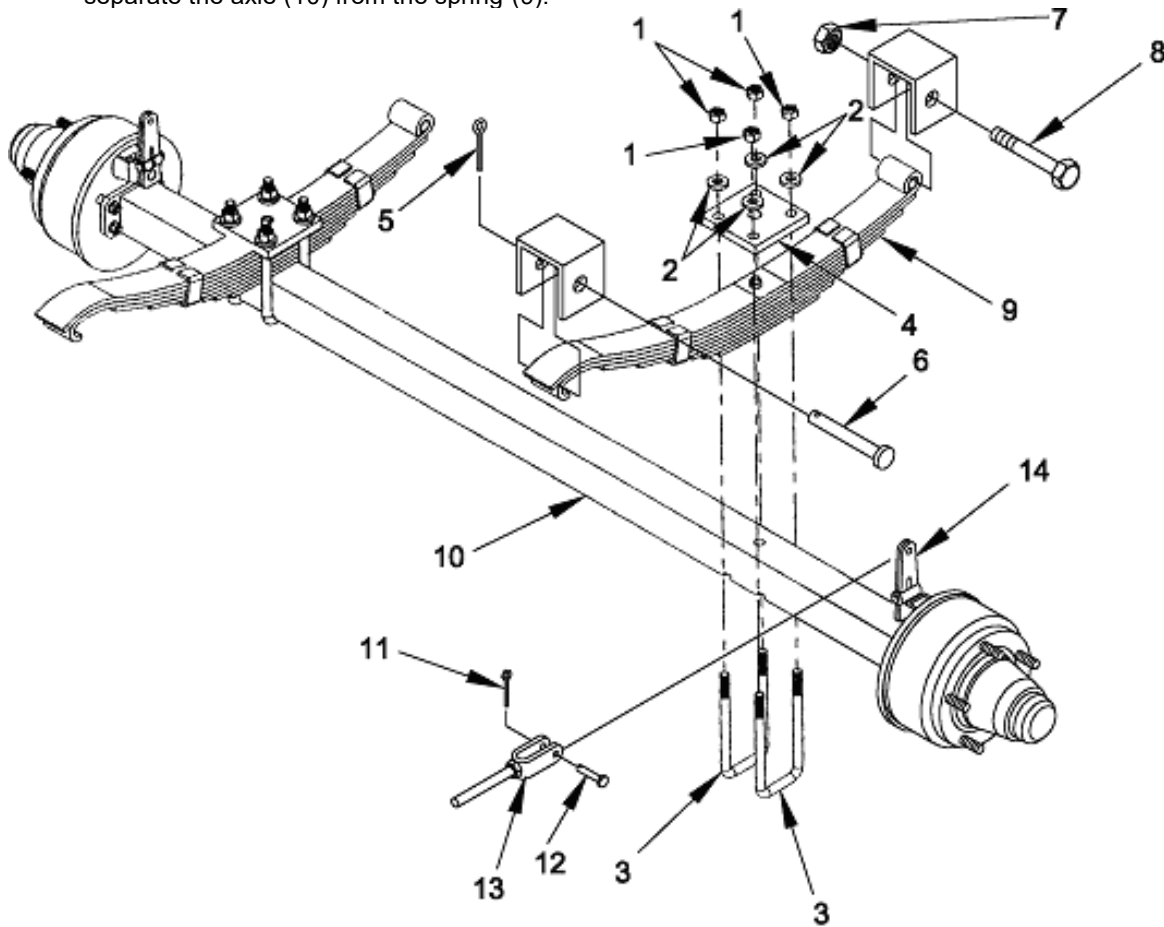


FIGURE 19 - Spring and Rear Axle Replacement

6. Remove cotter pin (5), clevis pin (6), lock nut (7) and capscrew (8) to release spring (9) from frame brackets.
7. Position replacement spring (9) between frame brackets and secure with capscrew (8), lock nut (7), clevis pin (6) and new cotter pin (5).
8. Assemble u-bolts (3) and plate (4) around axle (10) and spring (9). Secure with flat washers (2) and lock nuts (1).
9. Use jack to raise test stand off jack stand, remove jack stand and lower test stand to ground.
10. Repeat steps 3 through 9 for any remaining springs needing replacement.

9.18.5 Rear Axle Replacement (FIGURE 19)

1. Perform the following procedures to replace an entire rear axle assembly.
2. Park the test stand on level, hard ground, then block the front wheels to prevent movement.
3. Disconnect test stand from tow vehicle.
4. Use a 2-ton minimum capacity jack to raise the rear of the test stand. Raise the test stand until the tires clear the ground.
5. Place jack stands under both sides of the frame (not the axle) to support test stand in the raised position, then lower test stand onto jack stands. The tires should still just clear the ground.
6. Remove the rear tire/ wheel assemblies.
7. Refer to figure 20 and remove the cotter pins (11) and clevis pins (12) to disconnect the brake linkage (13) from brake assembly levers (14).
8. Remove the lock nuts (1), flat washers (2), u-bolts (3) and plates (4). This will separate the rear axle (10) from the springs (9).
9. Maneuver a replacement axle assembly (10) under the springs (9).
10. Assemble u-bolts (3) and plates (4) around axle (10) and springs (9). Secure with flat washers (2) and lock nuts (1).
11. Connect brake linkage (13) to brake assembly levers (14) with clevis pins (12) and new cotter pins (11).
12. Install the tire/ wheel assemblies, then raise the test stand and remove the jack stands. Lower the test stand to the ground.
13. Back off the brake linkage adjustment by rotating the knob at the end of the brake lever counter-clockwise.
14. Rotate the adjustment knob clockwise to increase the braking force. Adjust the brake mechanism so that the brakes will hold the test stand stationary on a 15° incline.

9.18.6 Steering Knuckle And King Pin Replacement (FIGURE 20)

1. Park the test stand on level, hard ground, then apply the parking brake to prevent movement.
2. Disconnect test stand from tow vehicle.
3. Loosen the wheel nuts.
4. Use a suitable jack to raise that wheel until the tire clears the ground, then remove the wheel nuts and the wheel.
5. Refer to figure 17 and remove the hub cap (1), cotter pin (2), slotted nut (3) and washer (4).
6. Remove the outer bearing cone (5) and place it on a clean surface.
7. Pull the hub (6) off the spindle (9) while taking care not to damage the seal (7)
8. Refer to figure 20 and remove cotter pin (1) and slotted nut (2) to allow tie rod end (3) to be disconnected from steering knuckle (4).
9. Place a jack stand under the frame (not the axle) to support the test stand in the raised position, then lower the test stand onto the jack stand. The tire should still just clear the ground.
10. Use suitable drift and hammer to drive out spring pin (5), then tap king pin (6) down out of steering knuckle (4) and axle (7).
11. Using standard automotive grease, lubricate holes in replacement knuckle where it will rotate on king pin.
12. Position replacement knuckle (4) over end of axle (7) and install replacement king pin (6). Secure king pin with spring pin (5).
13. Connect tie rod end (3) to knuckle (4) and secure with slotted nut (2) and cotter pin (1).
14. Perform wheel bearing service and hub installation.
15. Install tire/ wheel assembly, then raise test stand and remove jack stands. Lower test stand to ground.
16. Repeat steps 3 through 12 to replace steering knuckle and king pin.
17. Perform front wheel alignment procedures.

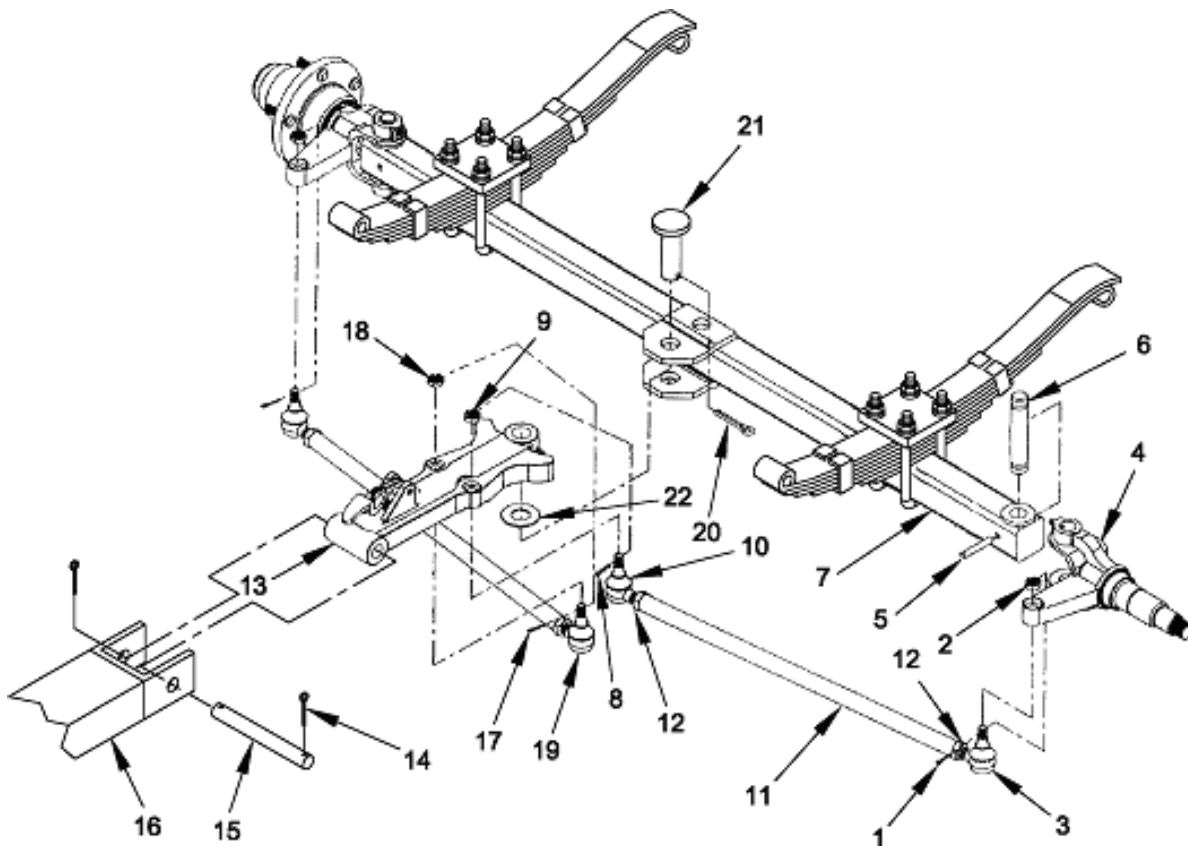


FIGURE 20 - Front Suspension and Steering Mechanism Service

9.18.7 Tie Rod End Replacement (FIGURE 20)

1. The following procedures apply to both tie rods.
2. Park the test stand on level, hard ground, then apply the parking brake to prevent movement.
3. Disconnect test stand from tow vehicle.
4. Refer to figure 21 and remove cotter pins (1 and 8) and slotted nuts (2 and 9).
5. Disconnect tie rod ends (3 and 10) from the steering lever (13) and knuckle (4).
6. Measure the length of the tie rod assembly (11) for reference during assembly.
7. Loosen the nuts (12), then remove the tie rod ends (3 and 10). Note which one of the tie rod ends has left hand threads for reference during assembly.
8. Thread replacement tie rod ends (3 and 10) through the nuts (1 and 12) and into the tie rod tube. Thread both tie rod ends an equal amount into the tie rod tube.
9. Adjust the length of the tie rod assembly to the measurement taken during disassembly. Leave the nuts (12) loose.
10. Attach the tie rod assembly (11) to the knuckle (4) and steering lever (13) with slotted nuts (2 and 9) and new cotter pins (1 and 8).
11. Repeat steps 1 through 7 for the remaining tie rod assembly.
12. Perform front wheel alignment procedures.

9.18.8 Steering Lever And Pin Replacement (FIGURE 20)

1. Park the test stand on level, hard ground and apply the parking brake to prevent movement.
2. Disconnect test stand from tow vehicle.
3. Refer to figure 20 and remove cotter pins (8 and 17) and slotted nuts (9 and 18).
4. Disconnect tie rod ends (10 and 19) from the steering lever (13).
5. Remove cotter pin (14) and tow bar hinge pin (15) to release tow bar (16).
6. Remove cotter pin (20) and steering pivot pin (21) to release steering lever (13) and thrust washer (22).
7. Check the condition of the thrust washer (22). If it is worn, obtain a replacement.
8. Check the condition of the pivot pin hole in the steering lever (13). If the hole has been substantially enlarged through wear, have the hole drilled to restore the hole to round and have a bushing installed. If the hole is not worn, the steering lever may be reused as is.
9. Check the condition of the pivot pin (21) for wear. Replace worn pivot pins.
10. Position thrust washer (22) and steering lever (13) between axle mounting brackets.
11. Lubricate the pivot pin (21) with grease and insert it through the axle brackets, steering lever (13) and thrust washer (22). Secure it with a new cotter pin (20).
12. Connect tie rod ends (10 and 19) to the steering lever (13) with slotted nuts (9 and 18) and new cotter pins (8 and 17).
13. Perform wheel alignment procedures.

10.0 PREVENTATIVE MAINTENANCE SCHEDULE

10.1 GENERAL

The following tables provide general guidance for routine CSC maintenance intervals. These recommendations are not intended to be all-inclusive. Use and operating environment may suggest additional specific maintenance activities as well as more (or less) frequent inspection and service or cleaning intervals. Only personnel experienced in electrical, piping, and mechanical systems should perform service and maintenance on this equipment. Additional information on individual components may be found in 6.0 OPERATION, 7.0 REGULAR MAINTENANCE and 9.0 REPAIR. If additional assistance is required, contact Malabar.

10.2 PREVENTATIVE MAINTENANCE TABLES

The tables below cover preventative maintenance recommendations for the models 1010A and 1011A Coolant Service Carts. They do not include information on the Generator set that is a part of the model 1011A. For Generator set preventative maintenance recommendations, see the Perkins Owners Manual, Maintenance Section, on the included thumb drive.

CAUTION! - SHOCK HAZARD

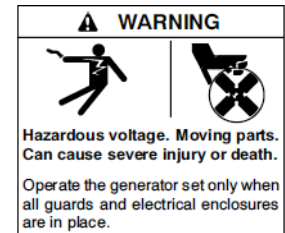
The CSC cart has potentially fatal voltages applied during operation.

- Turn off the main power disconnect / transfer switch before beginning any service procedure and if equipped, ensure that the generator is off.
- Never touch enclosure heater terminals unless the main power disconnect / transfer switch is off and line cord disconnected. One heater terminal is connected directly to incoming line power and is live anytime the power is on, even if the heater is off.
- Before performing any work in the disconnect (lower) enclosure, verify that the Variable Frequency Drive (VFD) bus capacitors have discharged. Measure the DC bus voltage across the -DC and +DC terminals on the lower Power Terminal Block. The voltage must be zero. Darkened LED / LCD displays do not indicate that the capacitors have discharged to a safe voltage level.



CAUTION! - ROTATING EQUIPMENT HAZARD

- Before accessing the main pump-motor shaft coupling (pump adapter), turn off the main power disconnect / transfer switch to avoid sudden or unexpected starts while touching the shaft coupling.



CAUTION! - PRESSURE HAZARD



- Before loosening any tube, hose, or reservoir fittings, ensure that the internal system pressure is zero by turning off the main power disconnect / transfer switch. The internal vent valve (LV1) will bleed the return side pressure to the clean reservoir. If the supply pressure gauge shows trapped pressure, connect the supply to return hose in runaround configuration to relieve pressure.

10.3 MAINTENANCE SCHEDULE

ITEM/SYSTEM	PROCEDURE/TASK	COMMENT/ACTION
DAILY		
Vacuum Trap	Visual Inspection: check level in bowl	<ul style="list-style-type: none"> • Drain if more than 1/2 full
Frame / Structure	Check for loose fasteners	<ul style="list-style-type: none"> • Tighten as required
Liquid System Components	Visual Inspection - check for evidence of damage or leaks on gauges, valves, hoses, fittings, etc.	<ul style="list-style-type: none"> • Tighten loose, leaking fittings (always use two wrenches) • Replace leaking gaskets • Repair or replace damaged components
Power Cord & Plug	Visual Inspection - look for signs of wear or damage	<ul style="list-style-type: none"> • Replace if damaged
Hoses	Visual Inspection - look for signs of wear or damage	<ul style="list-style-type: none"> • Replace if damaged
Parking Brake	Check that parking brake locks wheels	<ul style="list-style-type: none"> • Adjust or repair as required for proper operation
Instrument Lamps	Test: with power ON, press the LAMP TEST pushbutton, hold for 4+ seconds. Verify operation: <ul style="list-style-type: none"> • Alarm Lamps • Switch Lamps • Stack Light Lamps, Horn 	<ul style="list-style-type: none"> • Operation may continue w/ failed lamps. Replace as soon as possible (switch lamps cannot be replaced, replace entire switch)
QUARTERLY		
Emergency Stop Mushroom Button	Verify Operation. Run Cart (Runaround mode), press E-Stop mushroom button. Verify: <ul style="list-style-type: none"> • Main pump motor stops • All solenoid valves are off 	CAUTION: Discontinue cart use if Emergency Stop does not function properly. <ul style="list-style-type: none"> • Repair if malfunction occurs
Hardware	Check: <ul style="list-style-type: none"> • Hinges • Latches • Handles • Gas Struts 	If needed: <ul style="list-style-type: none"> • Lubricate hinges w/light oil • Adjust / Tighten latches • Tighten handle attachments • Replace defective struts
Pump-motor shaft coupling	Run Cart, System Clean mode at 7 GPM & again at 30 GPM with hoses connected in Runaround. Check for: <ul style="list-style-type: none"> • Excessive noise, vibration • Signs of Wear (insert) 	If symptoms exist: <ul style="list-style-type: none"> • Adjust Coupling • Tighten setscrews • Replace coupling insert (spider)
Supply Reservoir	<ul style="list-style-type: none"> • Visual Inspection - look for torn insulation or damaged level gauge 	<ul style="list-style-type: none"> • Patch or replace any torn insulation • Repair or replace damaged level indicator
ANNUALLY		
Wiring	<ul style="list-style-type: none"> • Visually inspect electrical enclosures for loose wire connections. • Check all power terminal screws for tightness. 	<ul style="list-style-type: none"> • Check / Tighten all screwed wire terminals
Electrical Enclosure Vents	Inspection: <ul style="list-style-type: none"> • Remove & inspect two vent filters from inside of the electrical enclosure side louvers. 	<ul style="list-style-type: none"> • Clean filters. Blow out dust w/compressed air or wash w/mild detergent if oily, dry. CAUTION: NEVER blow compressed air around any electrical devices or in any electrical enclosure.
Cabinet / Frame	Clean exterior surfaces. Use mild soap with a sponge or soft cloth.	<ul style="list-style-type: none"> • DO NOT use abrasive cleaners. • Remove all cleaning agent residue.
Cabinet Interior and Drip Pan	Remove debris from inside of the cart enclosure using a vacuum cleaner. Wipe the drip pan clean.	
Steering Mechanism	Lubricate	<ul style="list-style-type: none"> • See 7.0 Regular Maintenance
Parking Brake Mechanism	Lubricate	<ul style="list-style-type: none"> • See 7.0 Regular Maintenance
Wheel Bearings	Lubricate	<ul style="list-style-type: none"> • See 7.0 Regular Maintenance
Gauges	Calibrate	<ul style="list-style-type: none"> • See 6.0 Operation for Calibration procedures

11.0 PROVISION OF SPARES

11.1 SOURCE OF SPARE PARTS

Spare parts may be obtained from the manufacturer:

TRONAIR, Inc./ Malabar International

1 Air Cargo Pkwy East
Swanton, Ohio 43558 USA

Telephone: (419) 866-6301 or 800-426-6301

Fax: (419) 867-0634

E-mail: sales@tronair.com

Website: www.tronair.com



For Spare Parts, Operations & Service Manuals or Service Needs:

Scan the QR code or visit tronair.com/pages/tronair-information-center

11.2 RECOMMENDED SPARE PARTS LISTS

Reference the following page(s) for Replacement Parts and Kits available.

Recommended Spares:

481-113 Filter Element

481-114 Filter Element

481-134 O-Ring Filters

482-085 200 PSI Pressure Gauge

482-086 400 PSI Pressure Gauge

482-087 30"/0" HG VAC Gauge

12.0 IN SERVICE SUPPORT

Contact Malabar, Inc. for technical services and information. See Section 1.3 – Manufacturer.

13.0 GUARANTEES/LIMITATION OF LIABILITY

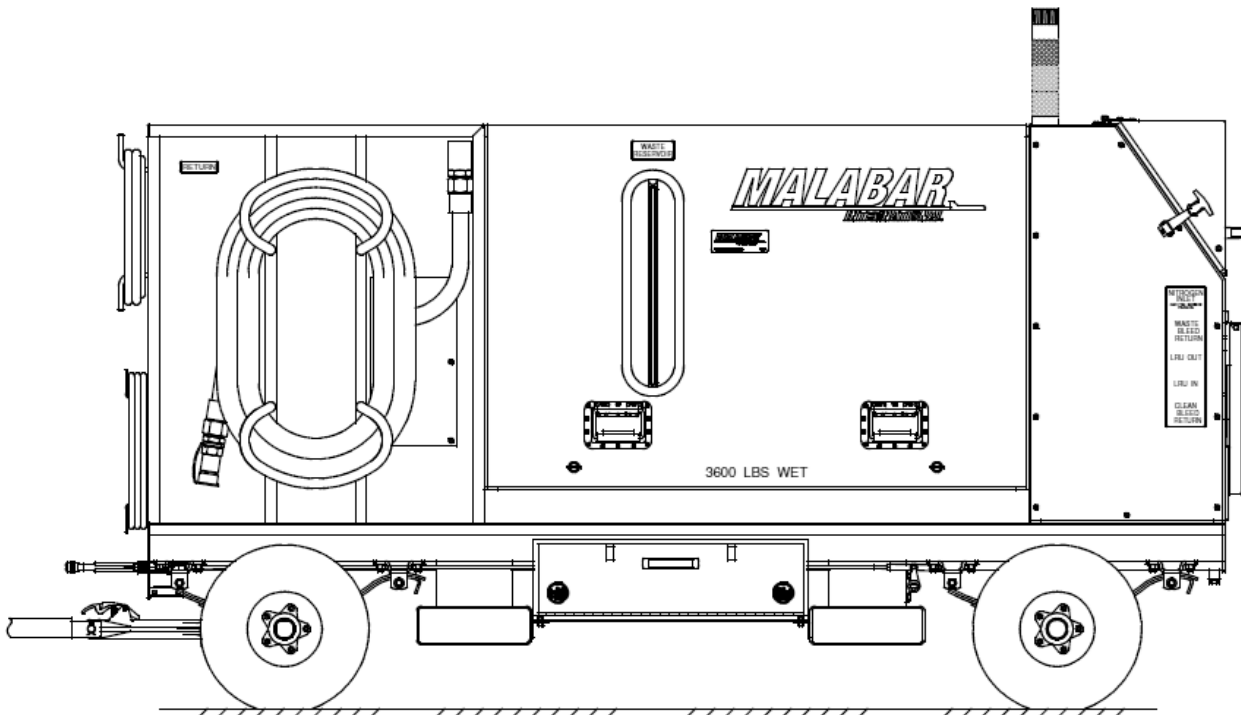
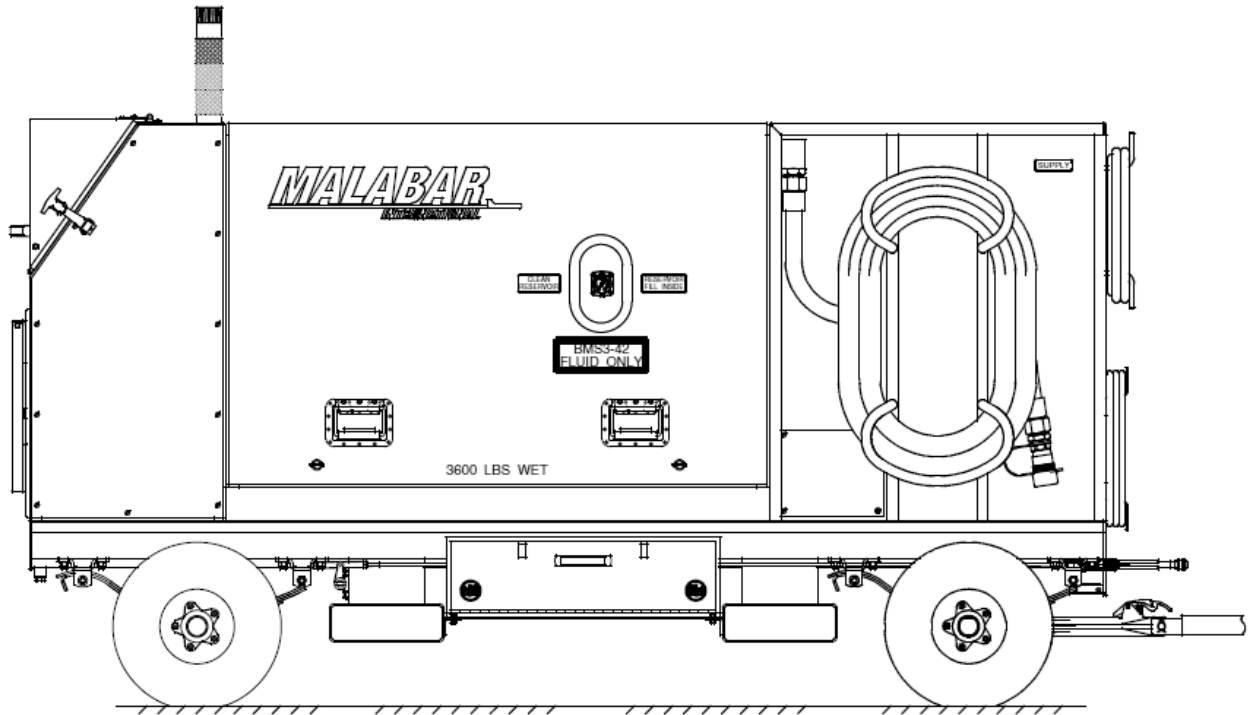
- I. Seller warrants each new product of its manufacture to be free from defects in material or workmanship, under proper, reasonable, and normal use and service.
- II. The warranty period shall be as follows:
 - A. For Malabar equipment, with the exception of Tripod Jacks, the warranty period is one (1) year after date of shipment.
 - B. For Malabar Tripod Jacks, the warranty period is three (3) years after date of shipment.
- III. Where Buyer claims an alleged defect in material or workmanship and so advises Seller in writing within ten (10) days after discovery thereof, then and in such event, Buyer shall return said equipment, transportation prepaid, to the Seller, provided such return is timely and within the above-mentioned warranty period. This warranty and liability of the Seller is expressly limited solely to replacement or repair of defective parts or goods, and return at Buyer's expense to Buyer after finding by Seller the product was defective prior to original shipment or, at the option of Seller, to providing refund to Buyer of the purchase price for said product.
- IV. It is further expressly understood and agreed that:
 - A. THERE IS NO WARRANTY, REPRESENTATION OF CONDITION OF ANY KIND, EXPRESS OR IMPLIED, (INCLUDING NO WARRANTY OF MERCHANTABILITY OR OF FITNESS) EXCEPT THAT THE MATERIAL SHALL BE OF THE QUALITY SPECIFIED IN APPLICABLE SPECIFICATIONS, AND NONE SHALL BE IMPLIED BY LAW. Except as otherwise provided herein, quality shall be in accordance with Seller's specifications. Final determination of the material for the use contemplated by Buyer is the sole responsibility of Buyer and Seller shall have no responsibility in connection with such suitability, and
 - B. Buyer's sole and exclusive remedy shall be repair or replacement of defective parts or goods by the Seller. Should the goods, in the judgment of Seller, preclude the remedying of the warranted defects by repair or replacement, the Buyer's sole and exclusive remedy shall be the refund of the purchase price, and
 - C. Seller shall not be liable for prospective profits or special, indirect or consequential damages, nor shall any recovery of any kind against Seller be greater in amount than the purchase price of the specific material sold and causing the alleged loss, damage or injury. Buyer assumes all risk and liability for loss, damage or injury to persons or property of Buyer or others arising out of use or possession of any product or part sold hereunder, and
 - D. Seller shall in no way be deemed or held to be obligated, liable or accountable upon or for any guarantees or warranties, express or implied, or created by statute or by operation of law or otherwise, in any manner of form beyond its express agreement above set forth, and
 - E. No warranty herein shall apply to any product which shall have been repaired or altered, unless such alteration or repair has been made by Seller or if, after return to and inspection by Seller, the product is found by Seller to have been subject to misuse, negligence or accident, and
 - F. No warranty of any nature is made by Seller as to any component forming a part of the product sold and Buyer shall receive only such warranties offered by such other manufacturer of such component, and
 - G. Seller does not assume nor does Seller authorize any other person to assume for it any other liability or make any warranty in connection with the sale of its products.

14.0 APPENDICIES

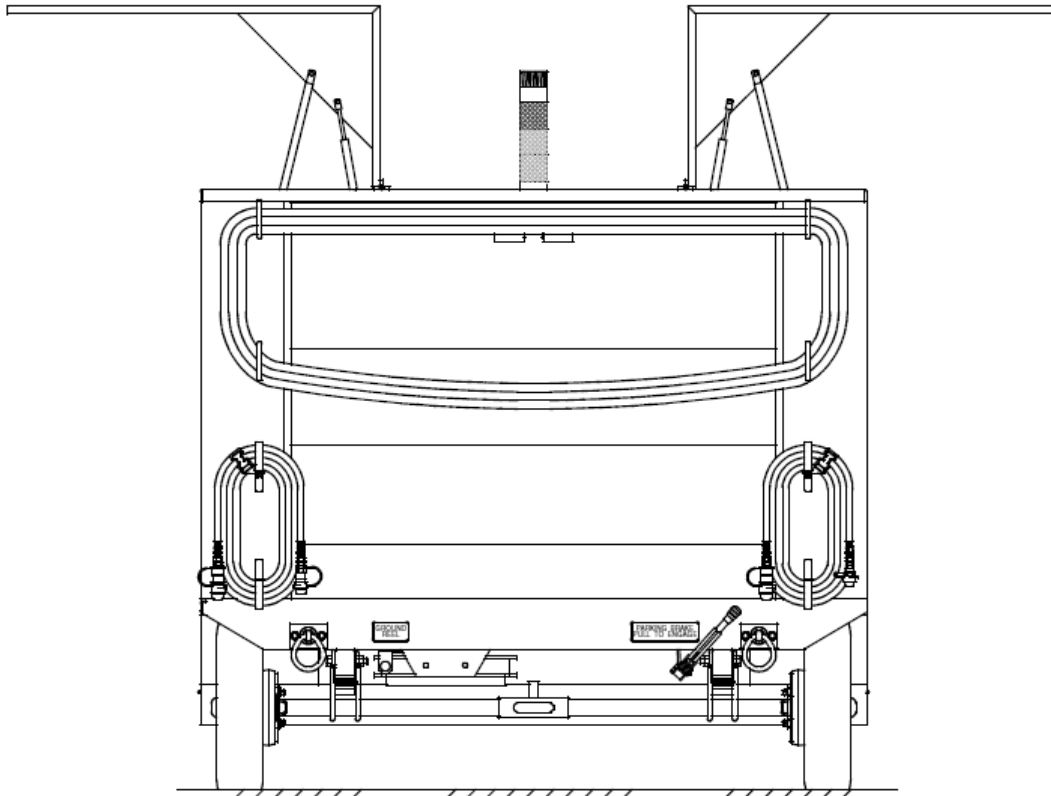
APPENDIX I	Electrical Schematic
APPENDIX II	Hydraulic Schematic
APPENDIX III	Control System Operation
APPENDIX IV	Allen Bradley MicroLogic 1400 Programmable Controllers
APPENDIX V	IMO Pump
APPENDIX VI	Perkins Engine Operation and Maintenance Manual
APPENDIX VII	Red Lion Model Cub5, Model Cub5T
APPENDIX VIII	United Electric 100 Series Pressure, Vacuum, Differential Pressure and Temperature Switches
APPENDIX IX	Mean Well SDR-480 Series
APPENDIX X	Flow Dynamics Turbine Flowmeter
APPENDIX XI	FenWall Thermoswitch Temperature Controller
APPENDIX XII	Tescom 44-5200 Series Regulators
APPENDIX XIII	Gransow Solenoid Valve
APPENDIX XIV	Omega SV100 and SV200 Series Solenoid Valves
APPENDIX XV	Gast Oil-Less Diaphragm Vacuum Pumps & Compressors
APPENDIX XVI	Lovejoy L, CJ, C & H Type Elastomeric Jaw Type Hubs
APPENDIX XVII	Coxreels Installation and Maintenance Manual
APPENDIX XVIII	Declaration of Conformity

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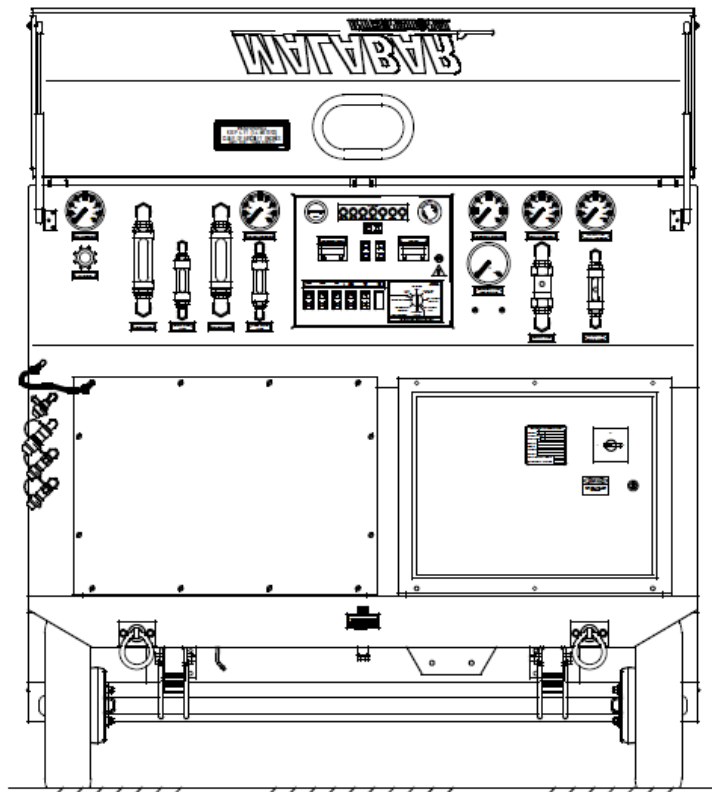
1010A - Electric CSC Cart – Side Views



1010A - Electric CSC Cart



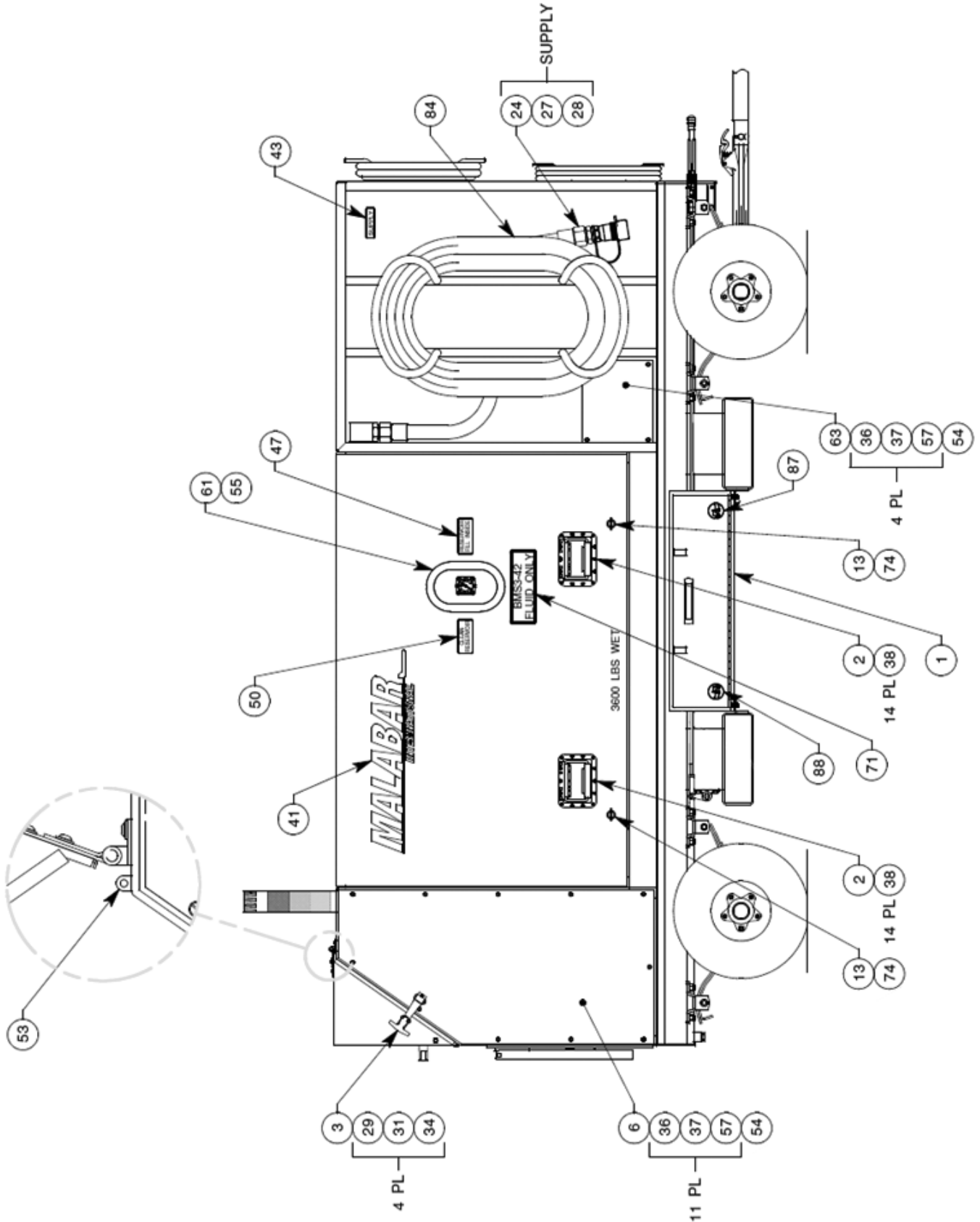
Front View



Rear View

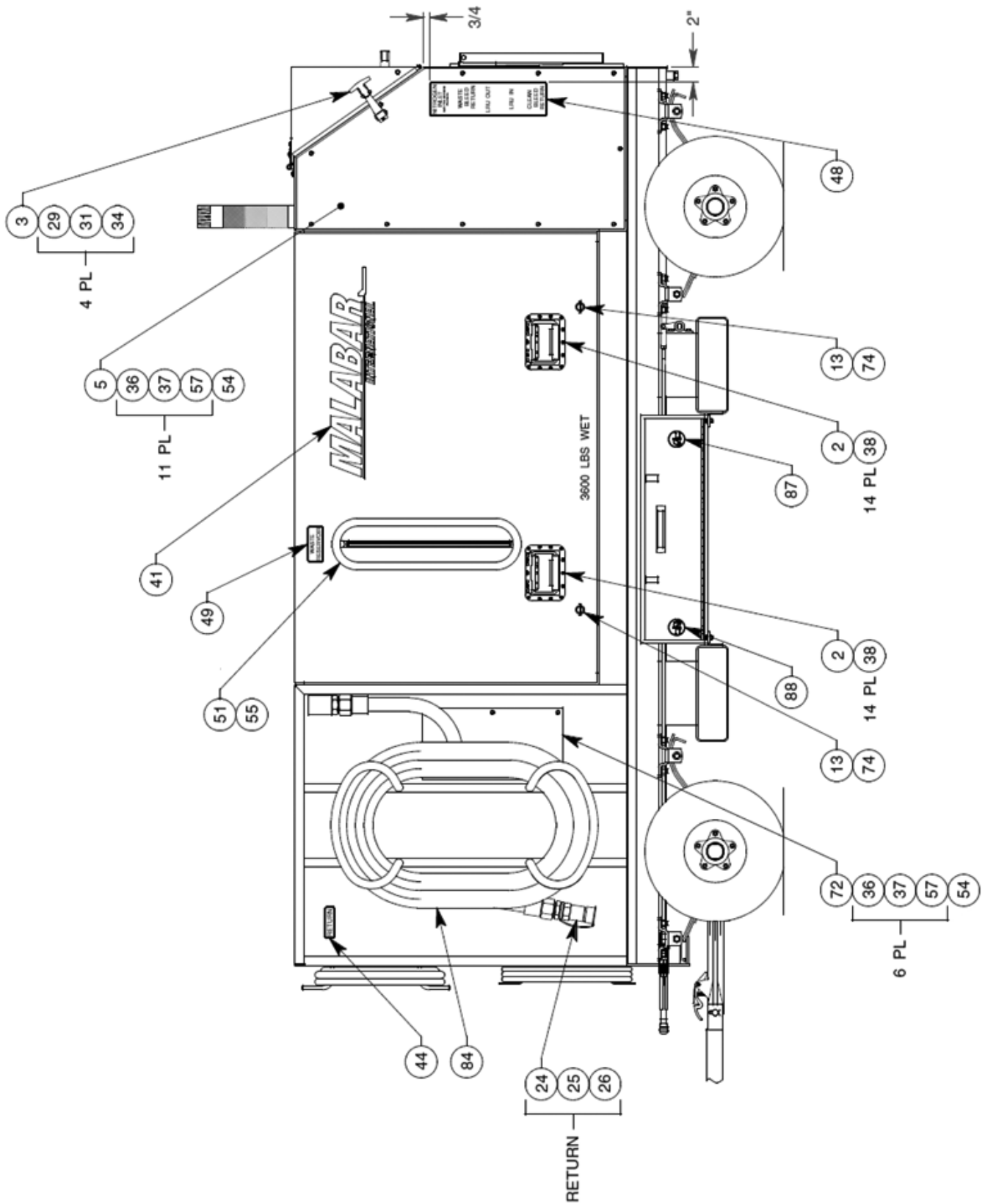
1010A - Electric CSC Cart

When ordering replacement parts/kits, please specify model, serial number and color of your unit.



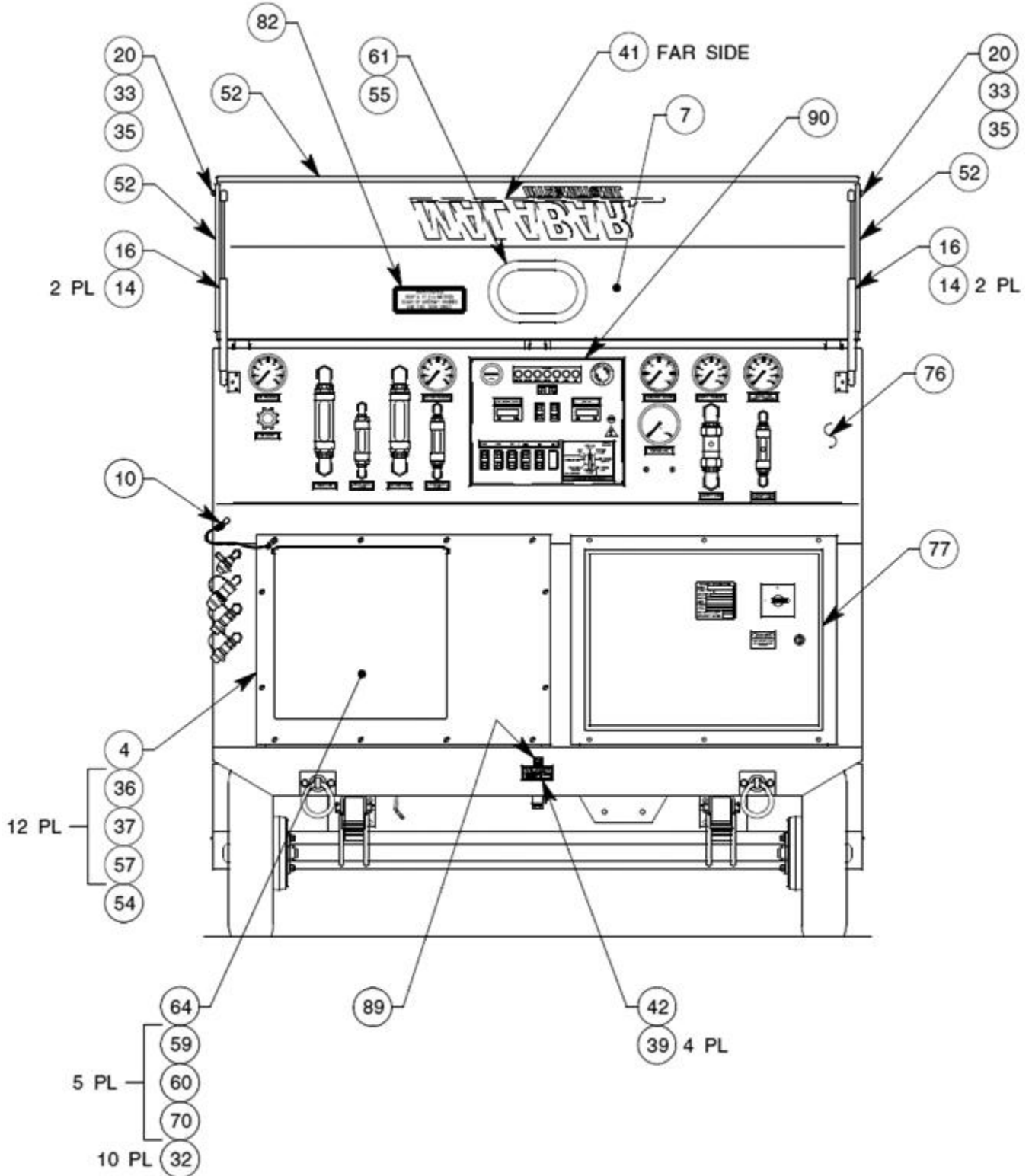
1010A - Electric CSC Cart

When ordering replacement parts/kits, please specify model, serial number and color of your unit.



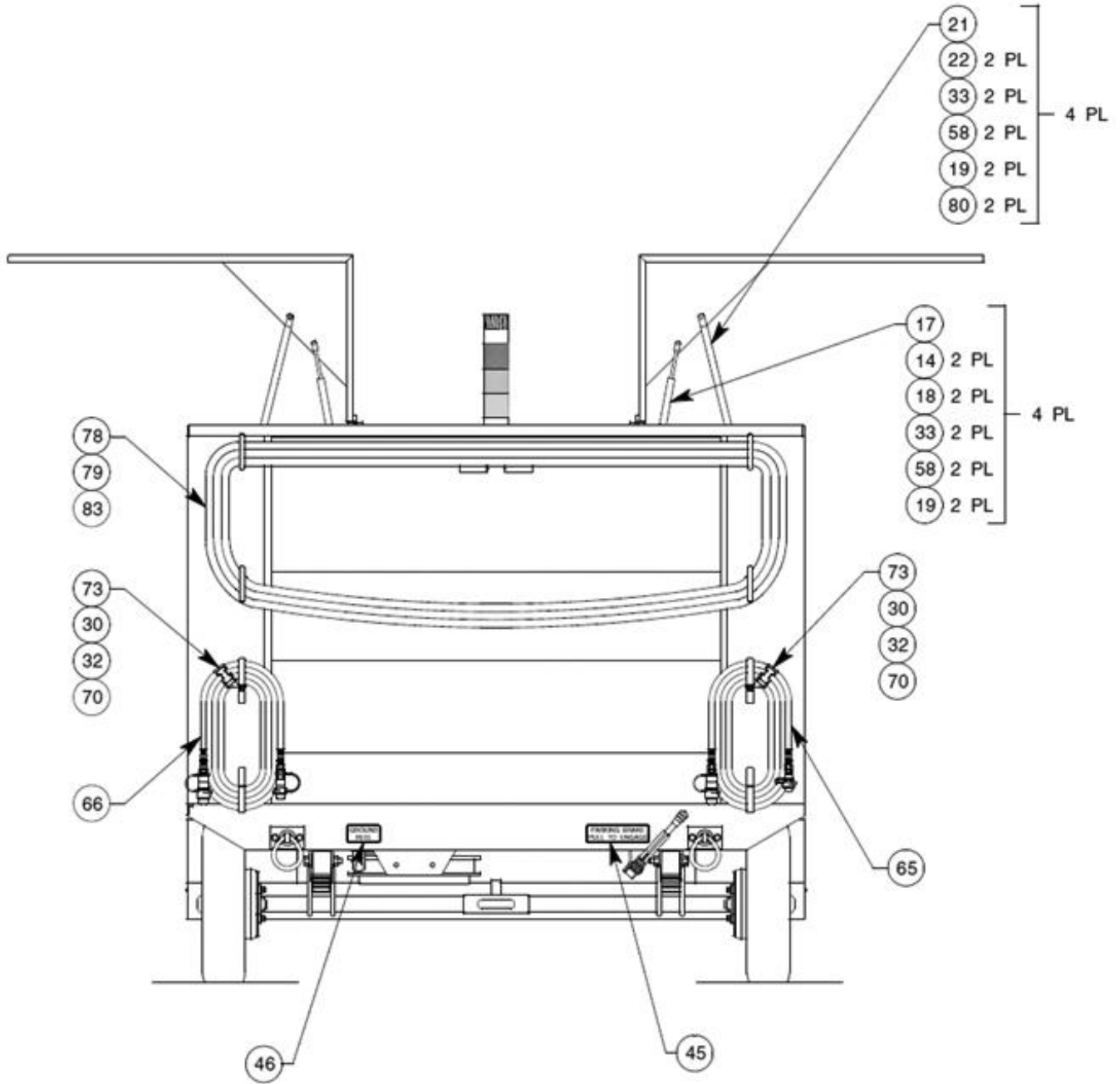
1010A - Electric CSC Cart

When ordering replacement parts/kits, please specify model, serial number and color of your unit.



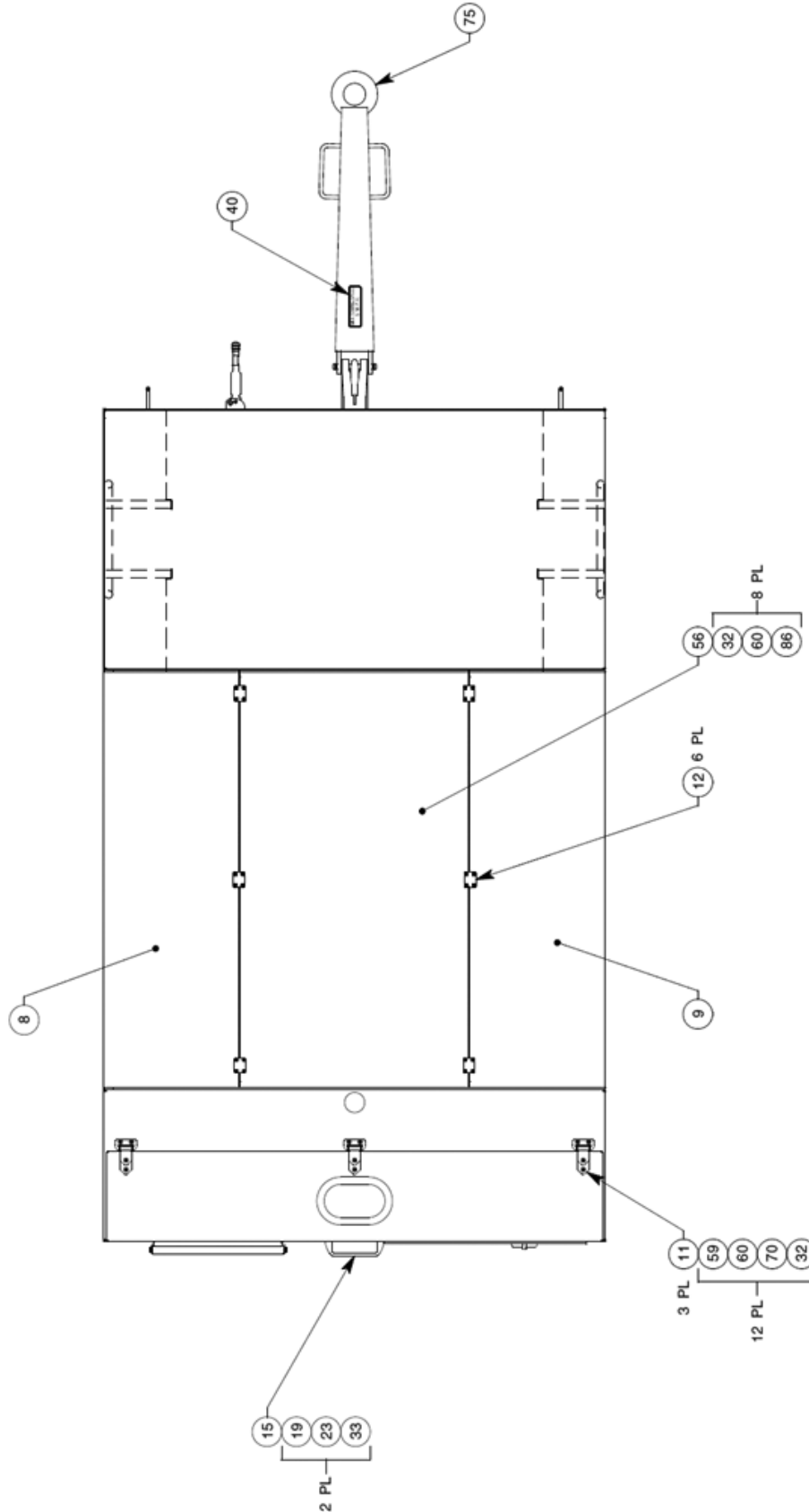
1010A - Electric CSC Cart

When ordering replacement parts/kits, please specify model, serial number and color of your unit.



1010A - Electric CSC Cart

When ordering replacement parts/kits, please specify model, serial number and color of your unit.



1010A - Electric CSC Cart Parts List

When ordering replacement parts/kits, please specify model, serial number and color of your unit.

Item	Part Number	Description	Qty
1	1010014	SUB COMPONENT ASSEMBLY	1
2	26425	WING HANDLE	4
3	491-088	RUBBER HOOD CATCH WITH BRACKET	3
4	1011080A	REAR PANEL	1
5	1011082	SIDE PANEL	1
6	1011081	SIDE PANEL	1
7	1011084A	CONTROL HOOD	1
8	1011090A	WING DOOR	1
9	1011091A	WING DOOR	1
10	1006197	DUST CAP LANYARD ASSEMBLY	1
11	390-104	HINGE	3
12	390-105	HINGE	6
13	494-034	COMPRESSION LATCH	4
14	394-068	BALL SOCKET, M6, 10MM	12
15	494-033	HANDLE	1
16	490-038	GAS STRUT, 40 LBS	2
17	490-048	GAS STRUT, 40 LBS	4
18	394-069	BALL STUD, 10MM	8
19	364-007	SPLIT LOCKWASHER, SST, 5/16	18
20	394-087	BALL STUD, 10MM, 1.19 LG	2
21	490-049	GAS STRUT, 356N, 80 LBS	4
22	394-088	BALL STUD, 13MM, 1.79 LG	8
23	343-020	PHMS, SST, 5/16-18 X 1/2 LG	2
24	721-175	CONNECTOR, SST, 1-1/2 37° X 1" MPT	2
25	735-068	QD NIPPLE, SST, 1" FPT	1
26	735-069	DUST CAP	1
27	736-133	QD COUPLER, SST, 1" FPT	1
28	736-134	DUST PLUG	1
29	326-032	BHCS, SST, 10-32 X 1/2 LG	8
30	326-033	BHCS, SELF LOCK, SST, 1/4-20 X 3/4 LG	2
31	362-055	FLATWASHER, SST, #10 SAE	8
32	362-038	FLAT WASHER, 1/4 SAE	32
33	362-048	FLAT WASHER, 5/16 SAE	20
34	359-012	HEX NUT, SST, 10-32	8
35	359-031	ACORN NUT, 5/16-18	2
36	390-103	SCREW, SLOTTED WITH WEAR WASHER	44
37	390-102	RECEPTACLE, SST, CLIP-ON	44
38	390-047	RIVET, BUTTON HD, 3/16 DIA X 1/4 GRIP	56
39	390-042	RIVET, DRIVE, 1/8 DIA X 1/4 LG	4
40	75940	STICKER, TOWING	1
41	55998-2	STICKER, MALABAR	3
42	55997-3	NAMEPLATE	1
43	1003137	STICKER, SUPPLY	1
44	1003138	STICKER, RETURN	1
45	1003139	STICKER, PARKING BRAKE	1
46	1003140	STICKER, GROUND REEL	1

Parts List – Electric CSC Cart

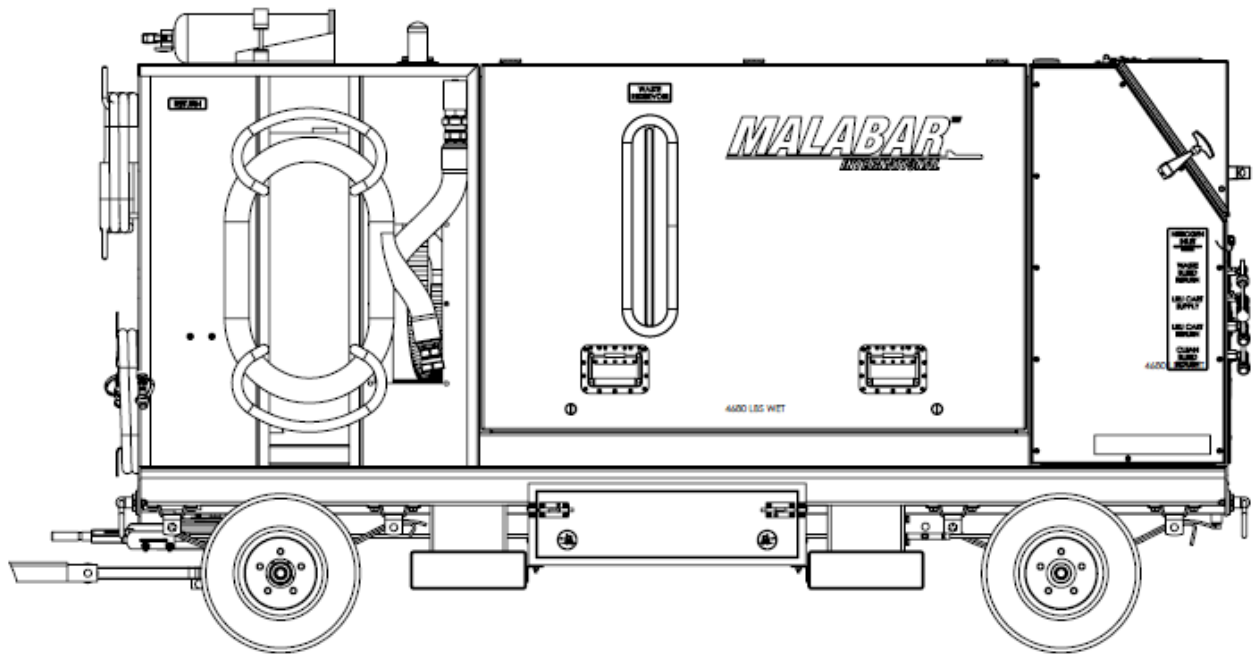
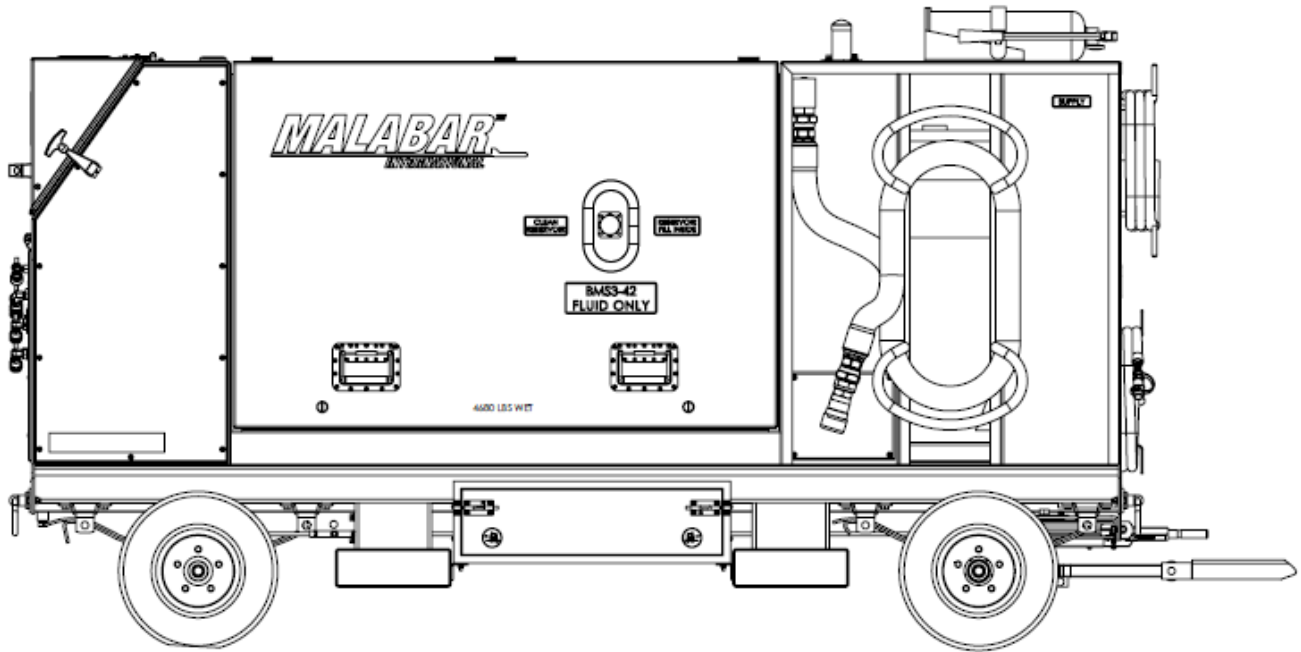
When ordering replacement parts/kits, please specify model, serial number and color of your unit.

Item	Part Number	Description	Qty
47	1003141	STICKER RESERVOIR FILL	1
48	1011174	STICKER, INTERFACE	1
49	1006198	STICKER, WASTE RESERVOIR	1
50	1006199	STICKER, CLEAN RESERVOIR	1
51	1011208	WINDOW	1
52	999-039	EDGE TRIM, 1/32-1/8 GRIP X 105" LG	AR
53	260-097	RUBBER SEAL, 68" LG	AR
54	999-047	NEOPRENE STRIP, 450" LG	AR
55	749-034	WEATHER STRIP, 110" LG	AR
56	1011089A	RIDGE BEAM WELDMENT	1
57	369-006	RETAINER	44
58	359-020	HEX NUT, SST, 5/16-18	16
59	324-019	BHCS, SST, 14/-20 X 3/4 LG	17
60	364-008	SPLIT LOCKWASHER, SST, 1/4	25
61	1011209	WINDOW	2
62	1011013A	PIPING ASSEMBLY	1
63	1011086	PANEL	1
64	499-132	FOLDING SHELF	1
65	1011198	HOSE LRU RETURN	1
66	1011199	HOSE LRU DELIVERY	1
69	1011154	K21016-13 STORAGE MOD (NOT SHOWN)	1
70	359-022	HEX NUT, SST, 1/4-20	19
71	PF56192	STICKER, BM53-42 FLUID ONLY	1
72	1011085	PANEL	1
73	837724	STRAP	2
74	1011155	PAWL	4
76	1011016A	CONTROL PANEL ASSEMBLY	1
77	1011012A-2	ELECTRICAL INTERCONNECT ASSEMBLY	1
78	450-771	ELECTRICAL CORD	1
80	394-101	BALL SOCKET, M8 THE, 13MM SOCKET	8
82	1011169	STICKER, WARNING	1
83	1011167	STICKER, ELECTRIC SHOCK	1
84	1006116	HOSE ASSEMBLY, SST BRAID	2
86	324-017	HHCS, SST, 14/-20 X 3/4 LG	8
87	499-149	STICKER, FORKLIFT POINT RIGHT	2
88	499-150	STICKER, FORKLIFT POINT LEFT	2
89	75938	STICKER, CE	1
90	1011153	LOADED MEMORY MODULE	1

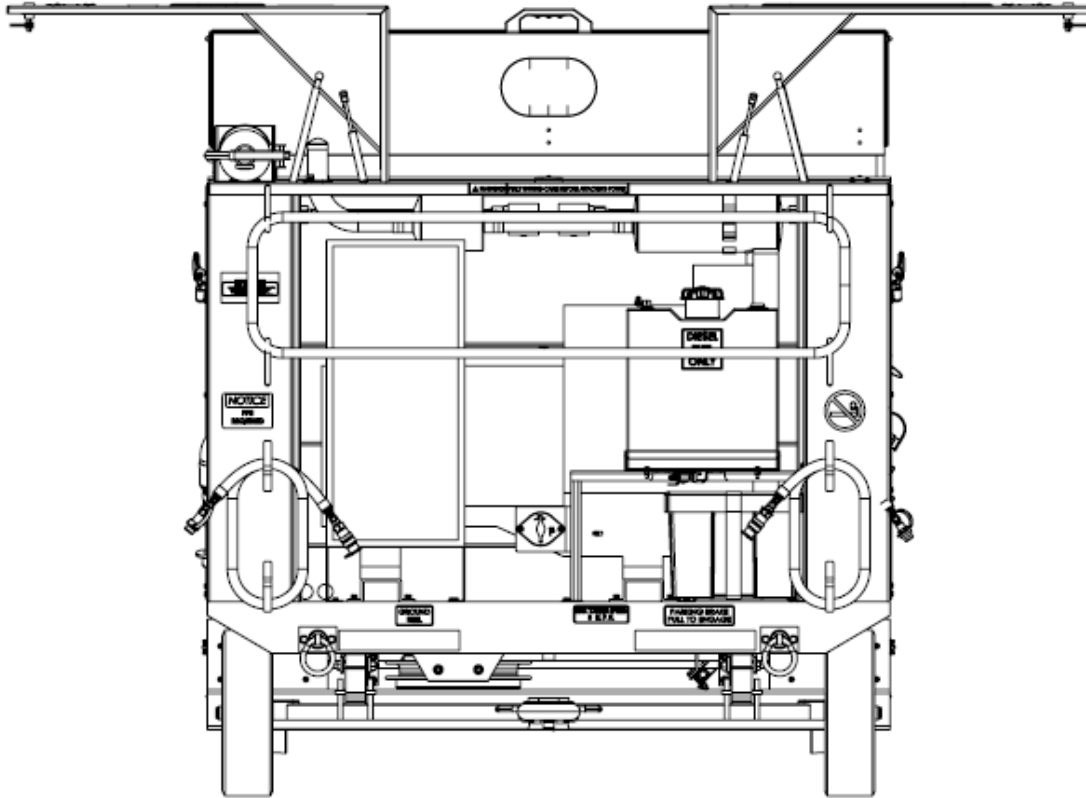
The Following Parts are Application Specific for 1010000A-1 and 1010000A-2

Item	Part Number	Description	-1	-2
			Qty	
67	1011040	TARP (NOT SHOWN)	1	----
68	491-073	TIE-DOWN (NOT SHOWN)	4	----
75	1010015	FRAME/RUNNING GEAR ASSY, NON-MARKING	1	----
79	450-465	PLUG, POWER CABLE, 30A	1	----
81	1011015A	FRAME/RUNNING GEAR ASSY, FOAM FILLED	----	1

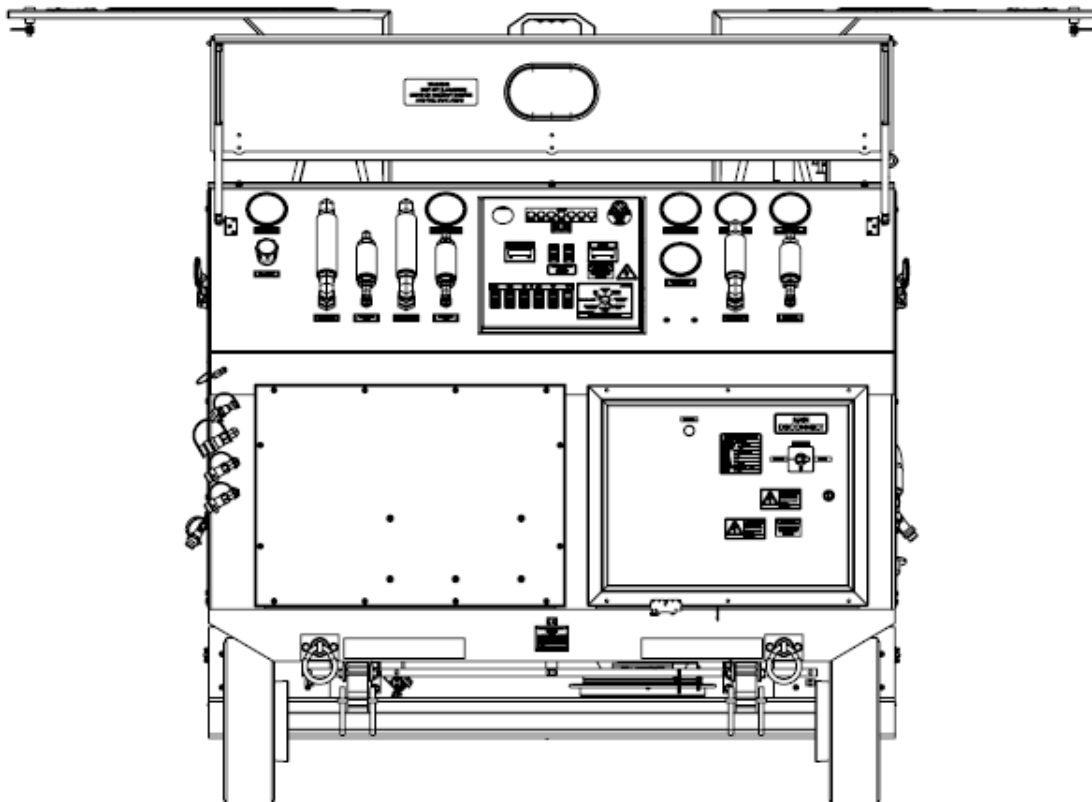
1011A - Diesel CSC Cart – Side Views



1011A - Diesel CSC Cart



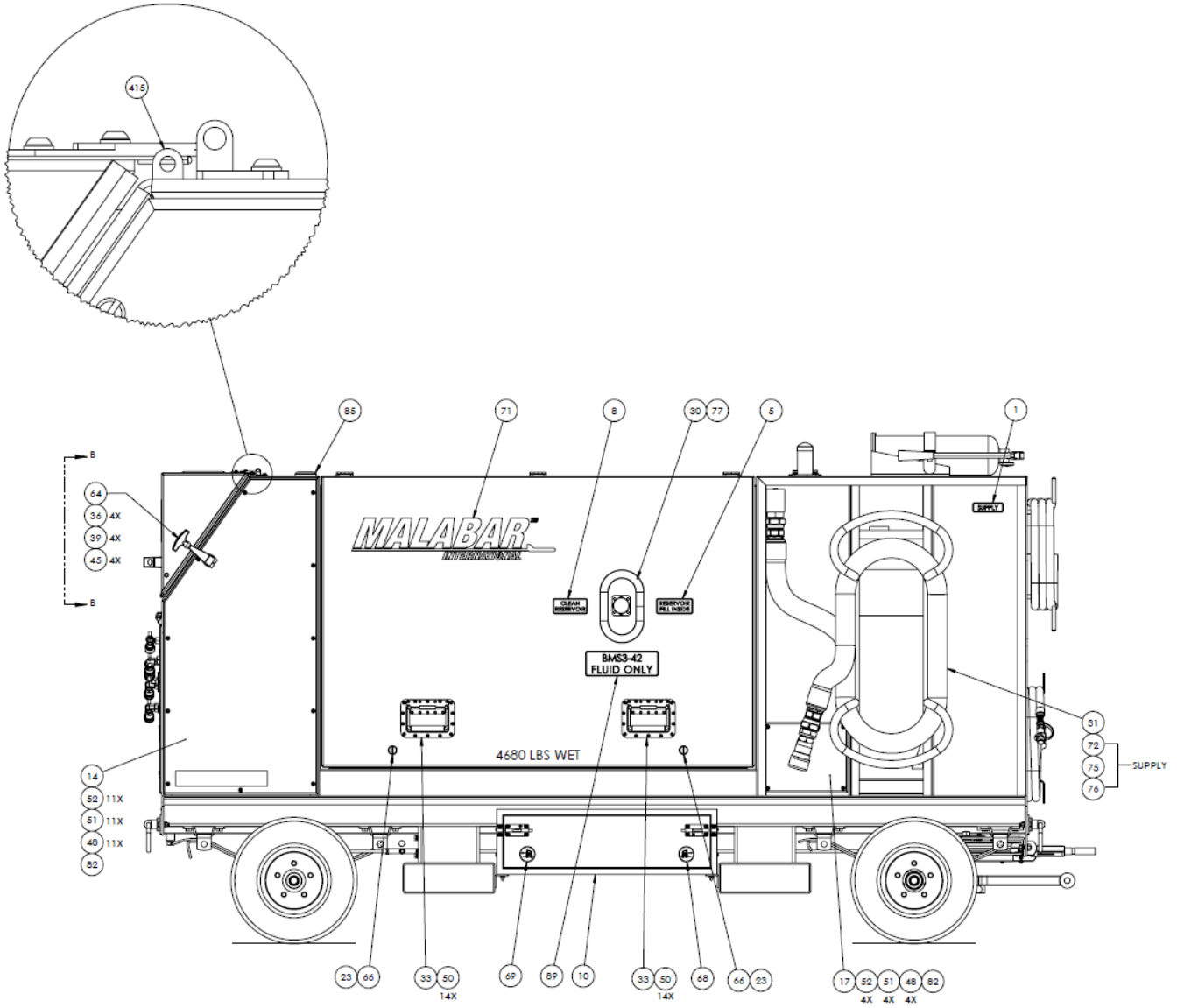
Front View



Rear View

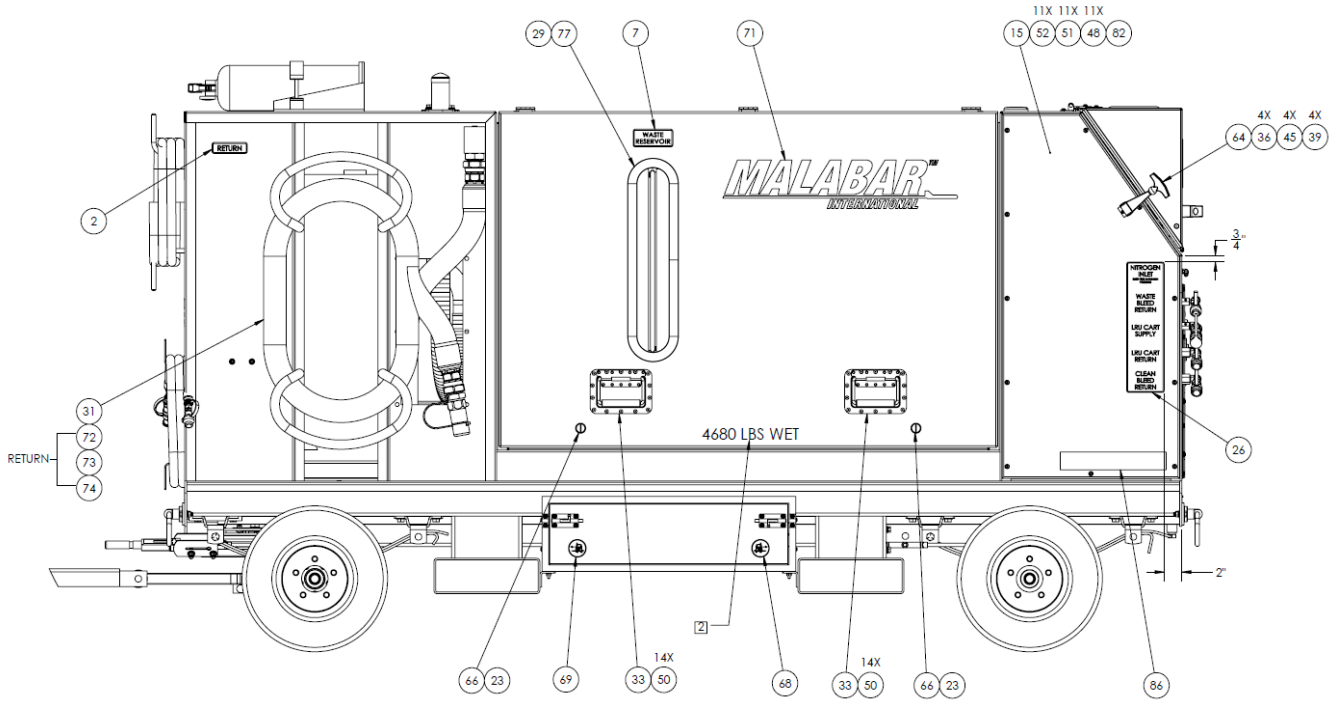
1011A - Diesel CSC Cart

When ordering replacement parts/kits, please specify model, serial number and color of your unit.



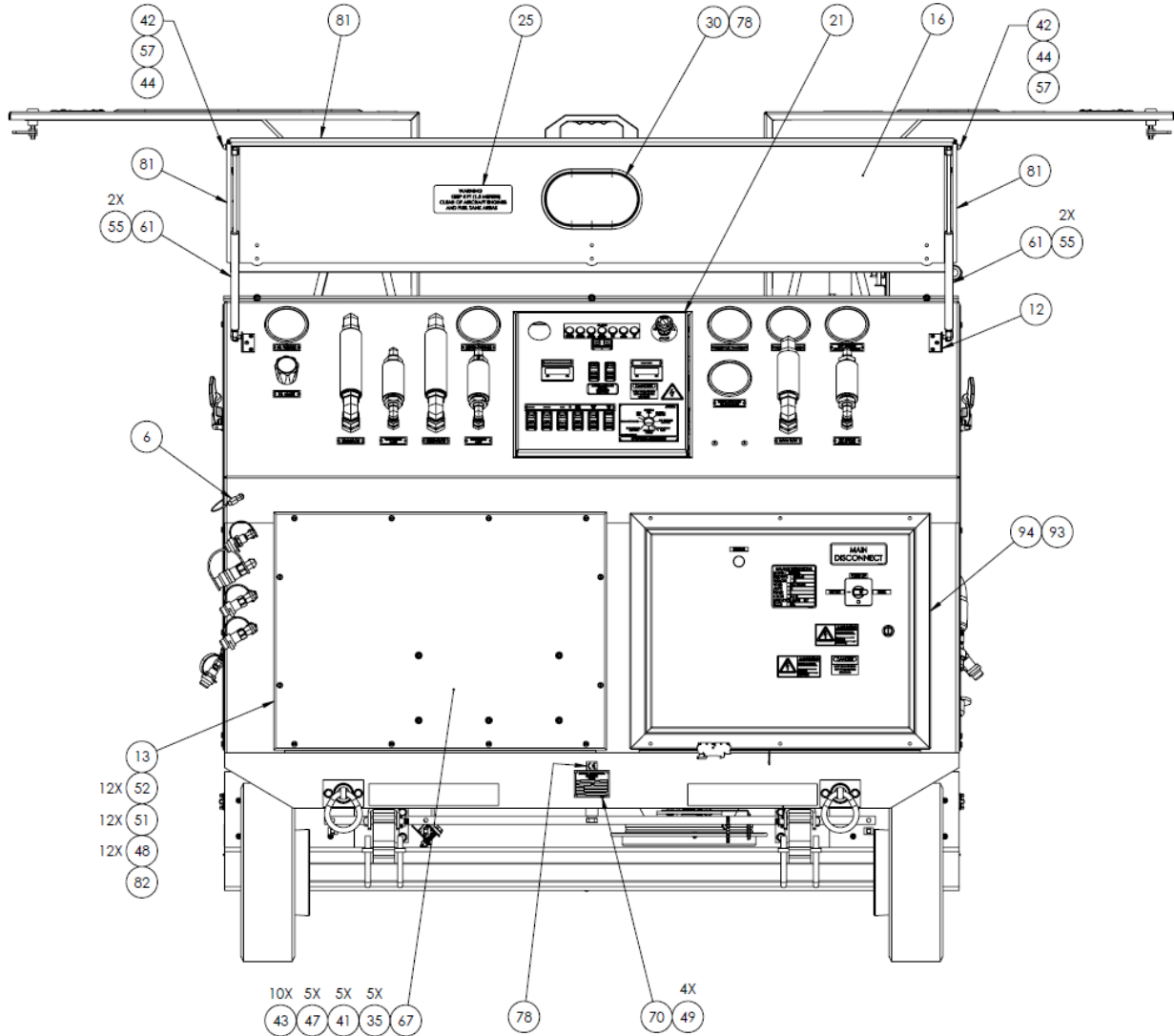
1011A - Diesel CSC Cart

When ordering replacement parts/kits, please specify model, serial number and color of your unit.



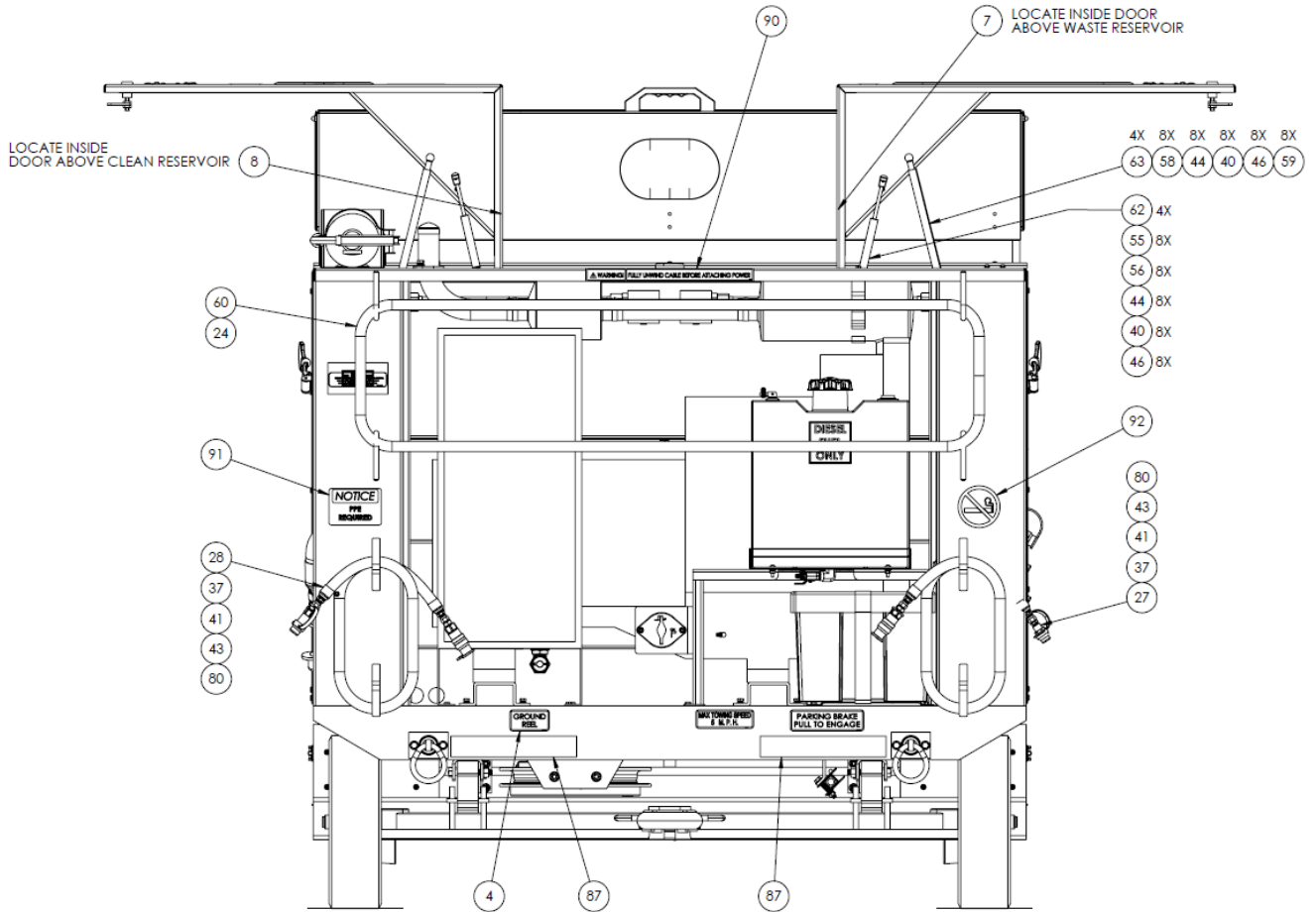
1011A - Diesel CSC Cart

When ordering replacement parts/kits, please specify model, serial number and color of your unit.



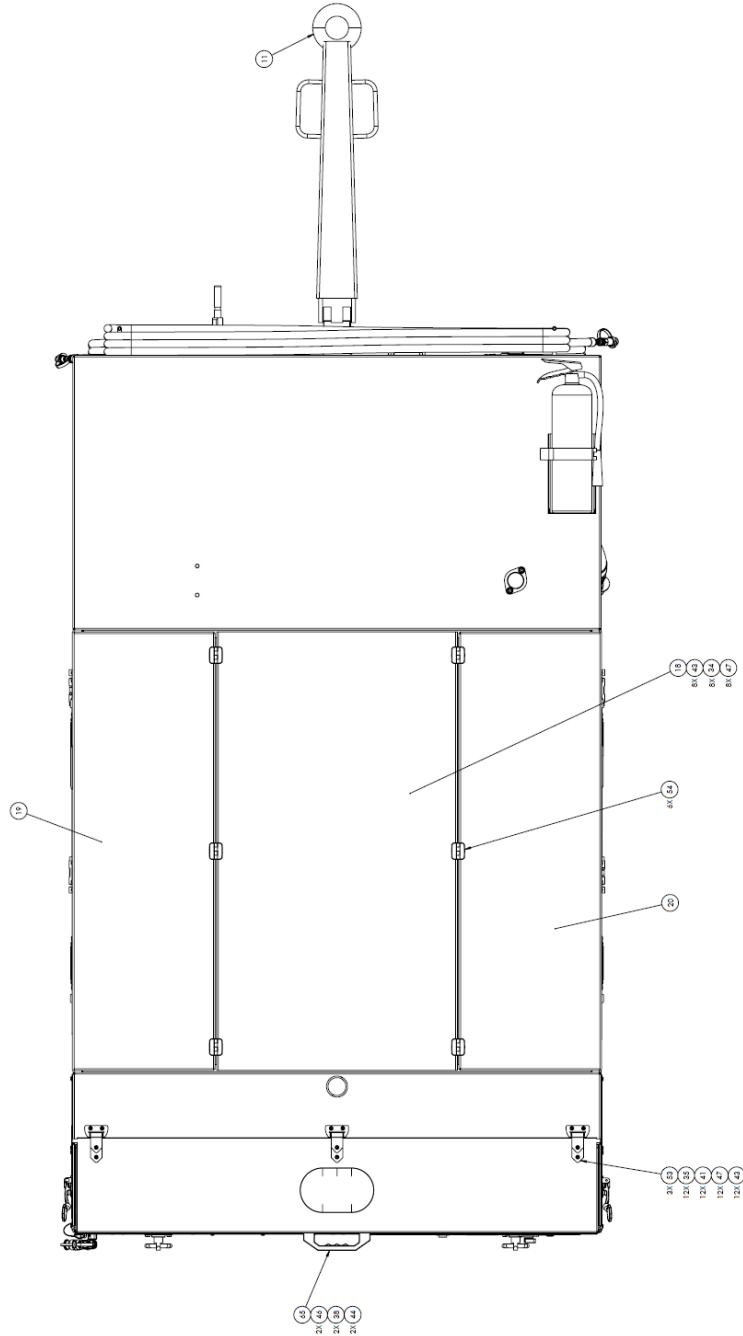
1011A - Diesel CSC Cart

When ordering replacement parts/kits, please specify model, serial number and color of your unit.



1011A - Diesel CSC Cart

When ordering replacement parts/kits, please specify model, serial number and color of your unit.



1011A - Diesel CSC Cart – Parts List

When ordering replacement parts/kits, please specify model, serial number and color of your unit.

Item	Part Number	Description	Qty
1	1003137	STICKER, SUPPLY	1
2	1003138	STICKER, RETURN	1
3	1003139	STICKER, PARKING BRAKE	1
4	1003140	STICKER, GROUND REEL	1
5	1003141	STICKER, RESERVOIR FILL	1
6	1006197	DUST CAP LANYARD ASSEMBLY	1
7	1006198	STICKER, WASTE RESERVOIR	2
8	1006199	STICKER, CLEAN RESERVOIR	2
9	1011013A	CSC PIPING ASSEMBLY	1
10	1011014A	SUB COMPONENT ASSEMBLY	1
11	1011015A	FRAME/RUNNING GEAR ASSEMBLY	1
12	1011016A	CONTROL PANEL ASSEMBLY	1
13	1011080A	REAR PANEL	1
14	1011081	SIDE PANEL	1
15	1011082	SIDE PANEL	1
16	1011084A	CONTROL HOOD WELDMENT (WP)	1
17	1011086	PANEL	1
18	1011089A	RIDGE BEAM WELDMENT	1
19	1011090A	WING DOOR	1
20	1011091A	WING DOOR	1
21	1011153	MEMORY MODULE, PROGRAMMED	1
22	1011154	K21016-13 STORAGE MOD (NOT SHOWN)	1
23	1011155	PAWL	4
24	1011167	STICKER, ELECTRIC SHOCK	1
25	1011169	STICKER, WARNING	1
26	1011174	INTERFACE STICKER	1
27	1011198	HOSE, LRU RETURN	1
28	1011199	HOSE, LRU DELIVERY	1
29	1011208	WINDOW	1
30	1011209	WINDOW	2
31	1006116	HOSE ASSEMBLY, SST BRAID	2
32	260-097	RUBBER SEAL, 68" LG	68
33	26425	WING HANDLE	4
34	324-017	HHCS, SS, 1/4-20 X 3/4" LG	8
35	324-019	SBHCS, SS, 1/4-20 x 3/4 LG	17
36	326-032	BHSCS, SST, 10-32 X 1/2, SLF LCKG	8
37	326-033	BHCS, SST, 1/4-20 x 3/4 LG	2
38	343-020	PHMS, SST, 5/16-18 x 1/2 LG	2
39	359-012	HEX NUT, SST, 10-32	8
40	359-020	HEX NUT, 5/16-18	16
41	359-022	HEX NUT, SST, 1/4-20	19
42	359-031	ACORN NUT, 5/16-18	2
43	362-038	FLAT WASHER, SS, 1/4 SAE	34
45	362-055	FLATWASHER, #10, SST	8
46	364-007	SPLIT LOCKWASHER, 5/16	18
47	364-008	SPLIT LOCKWASHER, 1/4	25
48	369-006	RETAINER	38
49	390-042	RIVET, DRIVE, 1/8 DIA X 1/4" LG	4
50	390-047	RIVET, POP, 3/16 X 1/4 GRIP	56
51	390-102	RECEPTACLE, SST, CLIP-ON	38

1011A - Diesel CSC Cart – Parts List

When ordering replacement parts/kits, please specify model, serial number and color of your unit.

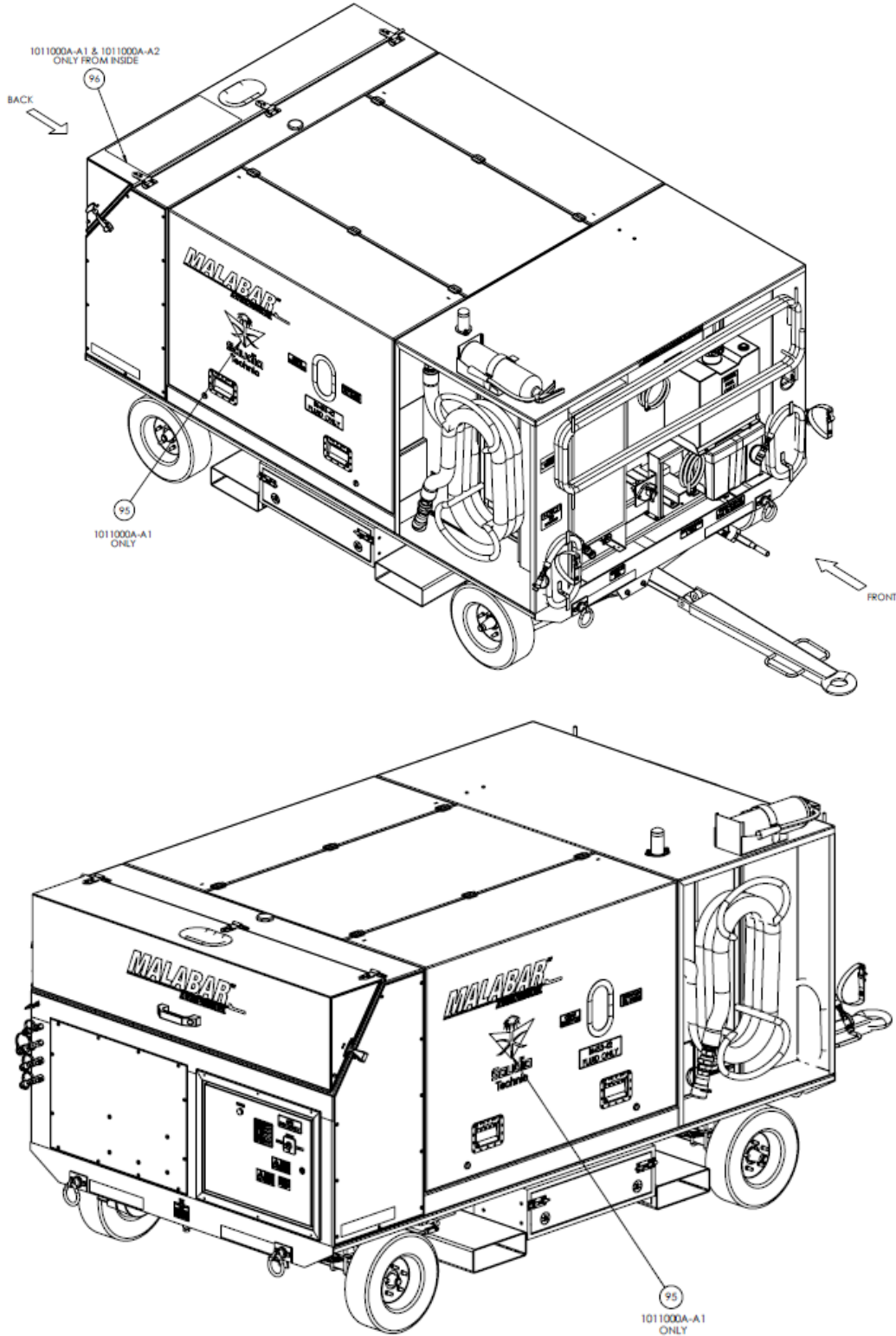
Item	Part Number	Description	Qty
52	390-103	SCREW, SLOTTED, WITH WEAR WASHER	38
53	390-104	HINGE	3
54	390-105	HINGE	6
55	394-068	BALL SOCKET FITTING, M6 X 10MM SOCKET	12
56	394-069	BALL STUD FOR GAS SPRING	8
57	394-087	BALL STUD, 10MM, 1.19 LG	2
58	394-088	BALL STUD, 13MM, 1.79 LG	8
59	394-101	BALL SOCKET, M8, 13MM	8
60	450-771	ELECTRICAL CORD, #8 / 4	1
61	490-038	GAS STRUT, 40 LB	2
62	490-048	GAS STRUT, 40LB	4
63	490-049	GAS STRUT, 356N (80 LB)	4
64	491-088	DRAW LATCH	2
65	494-033	HANDLE	1
66	494-034	COMPRESSION LATCH	4
67	499-132	FOLDING SHELF	1
68	499-149	STICKER, FORKLIFT POINT RIGHT	2
69	499-150	STICKER, FORKLIFT POINT LEFT	2
70	55997-5	NAME PLATE	1
71	55998-2	STICKER, MALABAR	3
72	721-175	CONNECTOR, SST, 1 1/2 37° x 1" MPT	2
73	735-068	NIPPLE	1
74	735-069	DUST CAP	1
75	736-133	QD COUPLER, SST, 1" FPT	1
76	736-134	DUST PLUG	1
77	749-034	WEATHER STRIP, 110" LG	3
78	75938	STICKER, CE	1
79	75940	STICKER, TOWING	1
80	837724	HOSE STRAP	2
81	999-039	EDGE TRIM x 105" LG	3
82	999-047	NEOPRENE STRIP, 395" LG	395
83	ATP-1010A-1011A-1012A	TEST PROCEDURE (NOT SHOWN)	1
84	C-1010A-1011A	OSM (NOT SHOWN)	1
85	EC-3252	CAP, CONTROL TOWER	1
86	H-2806-012.00	REFLECTOR, YELLOW	4
87	H-2807-012.00	REFLECTOR, RED	2
88	L-1031	DOWFROST 60 DYED FLUID (NOT SHOWN)	20
89	PF56192	STICKER, BMS3-42 FLUID ONLY	1
90	V-2791	LABEL, WARNING	1
91	V-3052	LABEL, PPE REQUIRED	1
92	V-3166	LABEL, NO SMOKING	1

The Following Parts are Application Specific

Item	Part Number	Description	-1	-2	-A1	-A2
			Qty			
44	362-048	FLAT WASHER, 5/16	19	19	20	20
93	1011012A-1	ELECTRICAL INTERCONNECT ASSEMBLY	-	1	1	1
94	1011012A-3	ELECTRICAL INTERCONNECT ASSEMBLY	1	-	-	-
95	V-3049	LABEL, SAUDIA TECHNIC LOGO	-	-	2	-
96	V-3050	LABEL, OPERATION INSTRUCTION	-	-	1	1

1011A-A1 & 1011A-A2 Only - Diesel CSC Cart – Parts List

When ordering replacement parts/kits, please specify model, serial number and color of your unit.

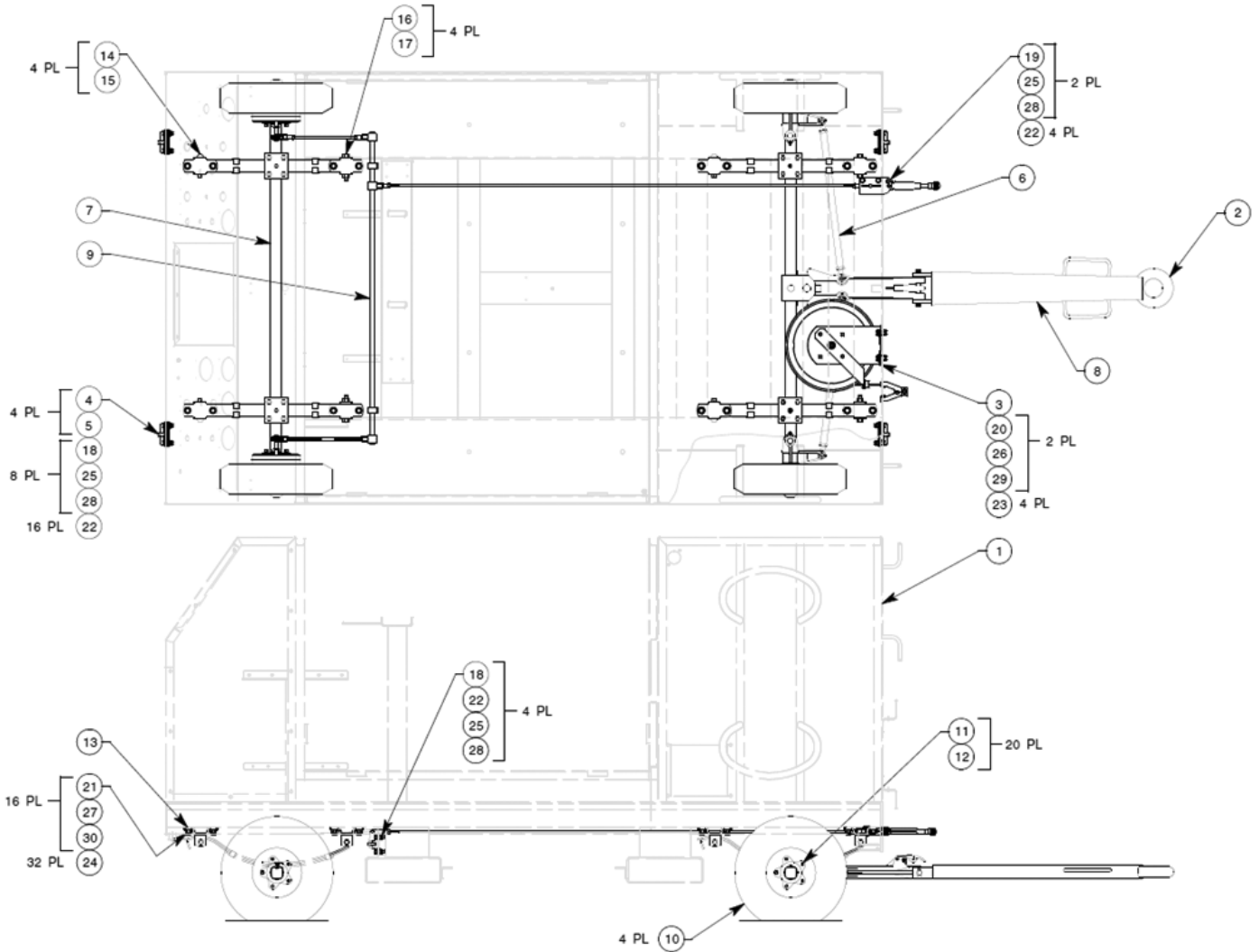


Item	Part Number	Description	Qty
95	V-3049	LABLE, SAUDIA TECHNIC LOGO	1
96	V-3050	LABEL, OPERATION INSTRUCTION	1

Parts List- Frame/Running Gear Assembly

When ordering replacement parts/kits, please specify model, serial number and color of your unit.

Model	Frame/Running Gear Assembly
1010000A-1.....	1010015
1010000A-2.....	1011015A
1011000A-1.....	1011015A
1011000A-2.....	1011015A



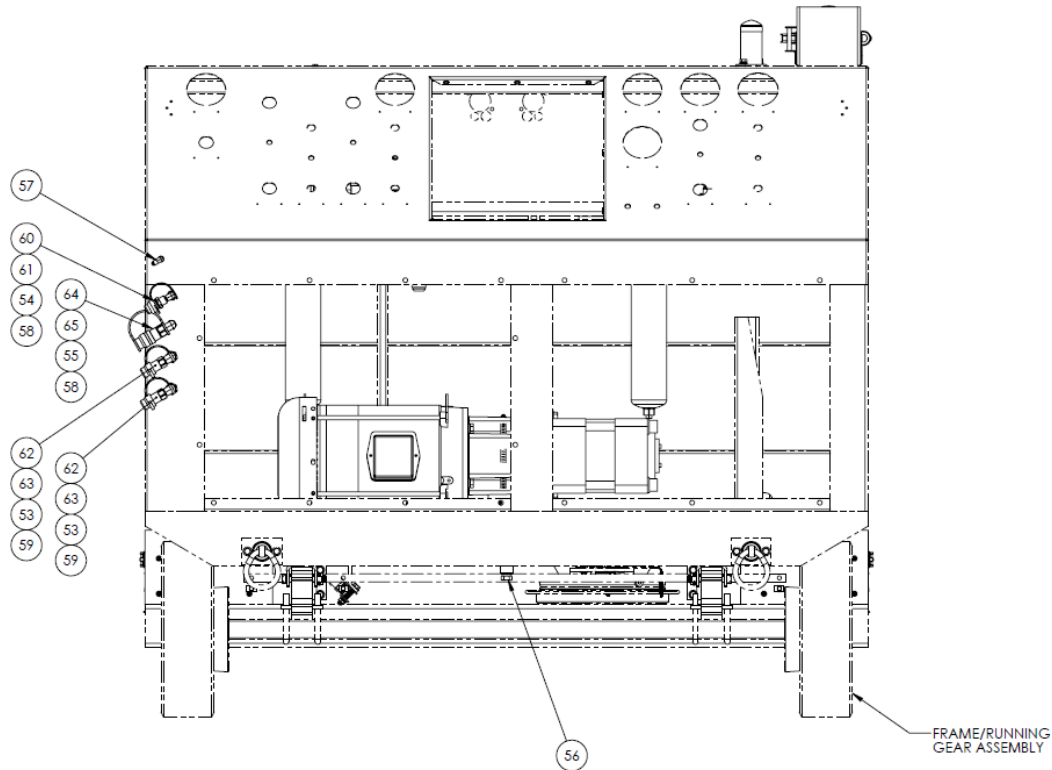
Parts List– Frame/Running Gear Assembly

When ordering replacement parts/kits, please specify model, serial number and color of your unit.

Item	Part Number	Description	Qty
	1010015/1011015A	FRAME/RUNNING GEAR ASSEMBLY ; consist of:	
1	1011035A	FRAME	1
2	1011025A-4	FOUR WHEEL RUNNING GEAR (1010015)	1
	1011025A-3	FOUR WHEEL RUNNING GEAR (1011015A)	1
3	26240	STATIC GROUND REEL	1
4	396-018	TIE DOWN NUT PLATE	4
5	396-017	TIE DOWN RING	4
6	14-1395	FRONT AXLE ASSEMBLY	1
7	17-1345	REAR AXLE ASSEMBLY	1
8	46-3502	DRAWBAR ASSEMBLY	1
9	91-5901	BRAKE CONTROL KIT	1
10	21-5901	NON-MARKING TIRE ASSEMBLY (1010015)	
	492-238	FOAM FILLED TIRE ASSEMBLY (1011015A)	4
11	4601-47	HEX NUT, 3/8-24	20
12	4700-4	SPLIT LOCKWASHER, 3/8	20
13	4251	SPRING BRACKET	8
14	5403-1	RIVET	4
15	4800-3	COTTER PIN, 1/8 X 1"	4
16	4901-19	HHCS, 9/16-12 X 1-1/4 LG, SST	4
17	4601-33	HEX NUT, 9/16-12	4
18	324-014	HHCS, 3/8-16 X 1-1/4 LG, SST	12
19	324-050	HHCS, 3/8-16 X 2-1/4 LG, SST	2
20	324-052	HHCS, 7/16-14 X 1-1/4 LG, SST	2
21	324-055	HHCS, 1/2-13 X 1-1/2 LG, SST	16
22	362-049	FLAT WASHER. 3/8 SAE, SST	32
23	362-059	FLAT WASHER. 7/16 SAE, SST	4
24	362-057	FLAT WASHER. 1/2 SAE, SST	32
25	359-023	HEX NUT, 3/8-16, SST	14
26	359-035	HEX NUT, 7/16-14, SST	2
27	351-036	HEX NUT, 1/2-13, SST	16
28	363-037	SPLIT LOCKWASHER, 3/8 SAE, SST	14
29	364-016	SPLIT LOCKWASHER, 7/16 SAE, SST	2
30	363-038	SPLIT LOCKWASHER, 1/2 SAE, SST	16

Parts List- Sub Component Assembly

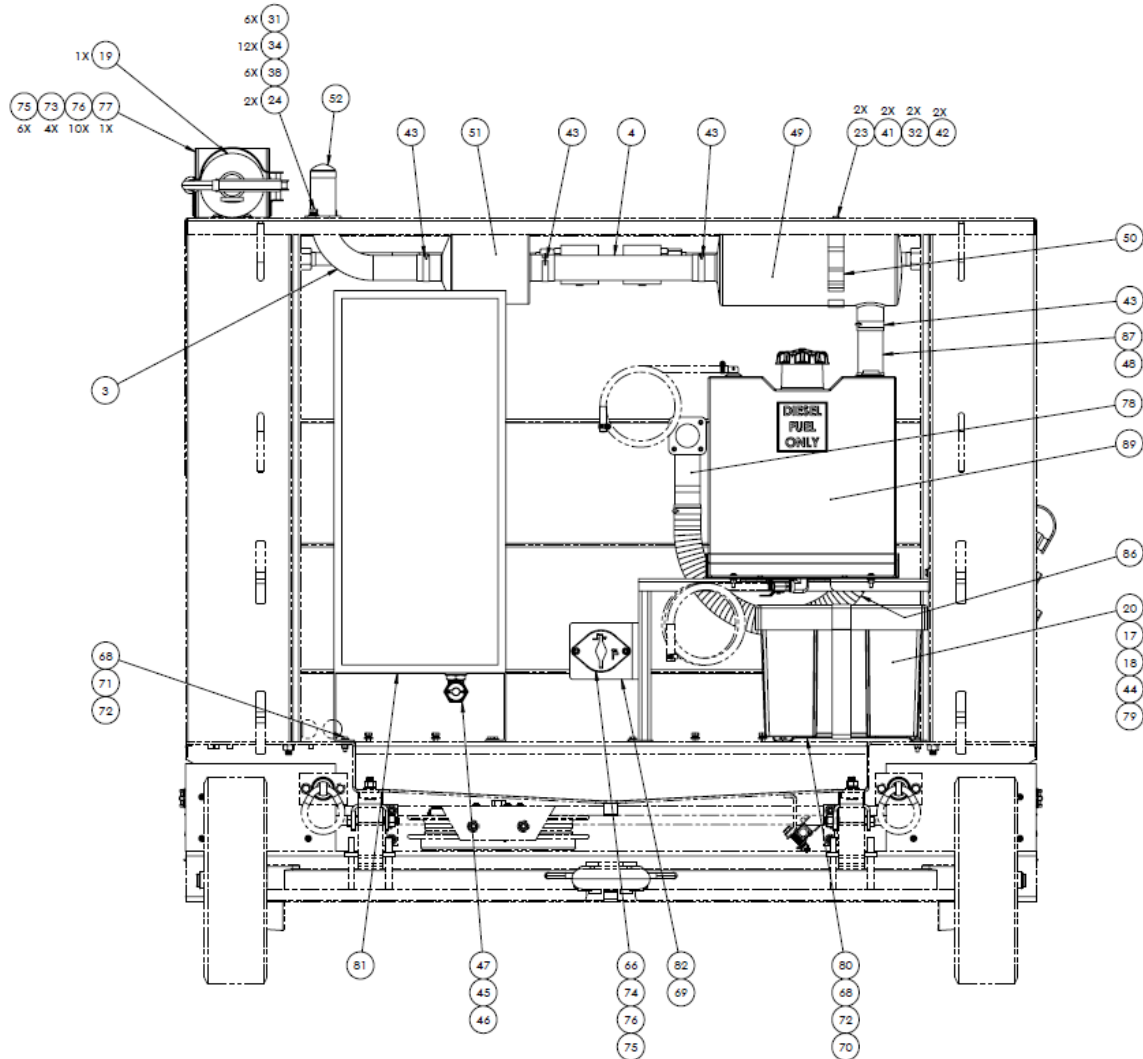
When ordering replacement parts/kits, please specify model, serial number and color of your unit.



Item	Part Number	Description	Qty
53	712-094	ELBOW, 3/8 MPT	2
54	712-096	ELBOW, 90°, 1/4 MPT, SS	1
55	712-111	ELBOW, 3/8 MPT x 1/4 MPT	1
56	717-077	PLUG, HEX HEAD, 1/2 MPT	1
57	721-198	ELBOW, BULKHEAD, 1/4 37°	1
58	721-204	CONN., BULKHEAD, 3/8 37° x 1/4 FPT	2
59	721-205	CONN., BULKHEAD, 1/2 37° x 3/8 FPT	2
60	735-070	QD NIPPLE, 1/4 FPT	1
61	735-071	DUST CAP	1
62	735-072	QD NIPPLE, 3/8 FPT	2
63	735-073	DUST CAP	2
64	736-136	QD COUPLER, 3/8 FPT	1
65	736-137	DUST PLUG	1

Parts List- Sub Component Assembly – 1011A Only

When ordering replacement parts/kits, please specify model, serial number and color of your unit.



Item	Part Number	Description	Qty
3	1011055	ELBOW WELDMENT	1
4	1011060	STRAIGHT PIPE, EXHAUST	1
17	1011213	BATTERY CABLE ASSEMBLY	1
18	1011214	BATTERY CABLE ASSEMBLY	1
19	15192	FIRE EXTINGUISHER	1
20	26176	HIGH POWER SEALED LEAD-ACID BATTERY	1
23	324-012	HHCS, SST, 1/4-20 x 1" LG	2
24	324-026	HHCS, SS, 3/8-16 X 1-1/4 LG	2
31	359-023	HEX NUT, SST, 3/8-16	6
32	362-038	FLAT WASHER, SS, 1/4 SAE	2
34	362-049	FLAT WASHER, 3/8 SAE, SS	12
38	363-037	SPLIT WASHER, SS, 3/8"	6
41	364-008	SPLIT LOCKWASHER, 1/4	18
42	390-057	INSERT, 1/4-20 THREAD	2
43	394-098	CLAMP, BENT BOLT	6

Parts List- Sub Component Assembly – 1011A Only

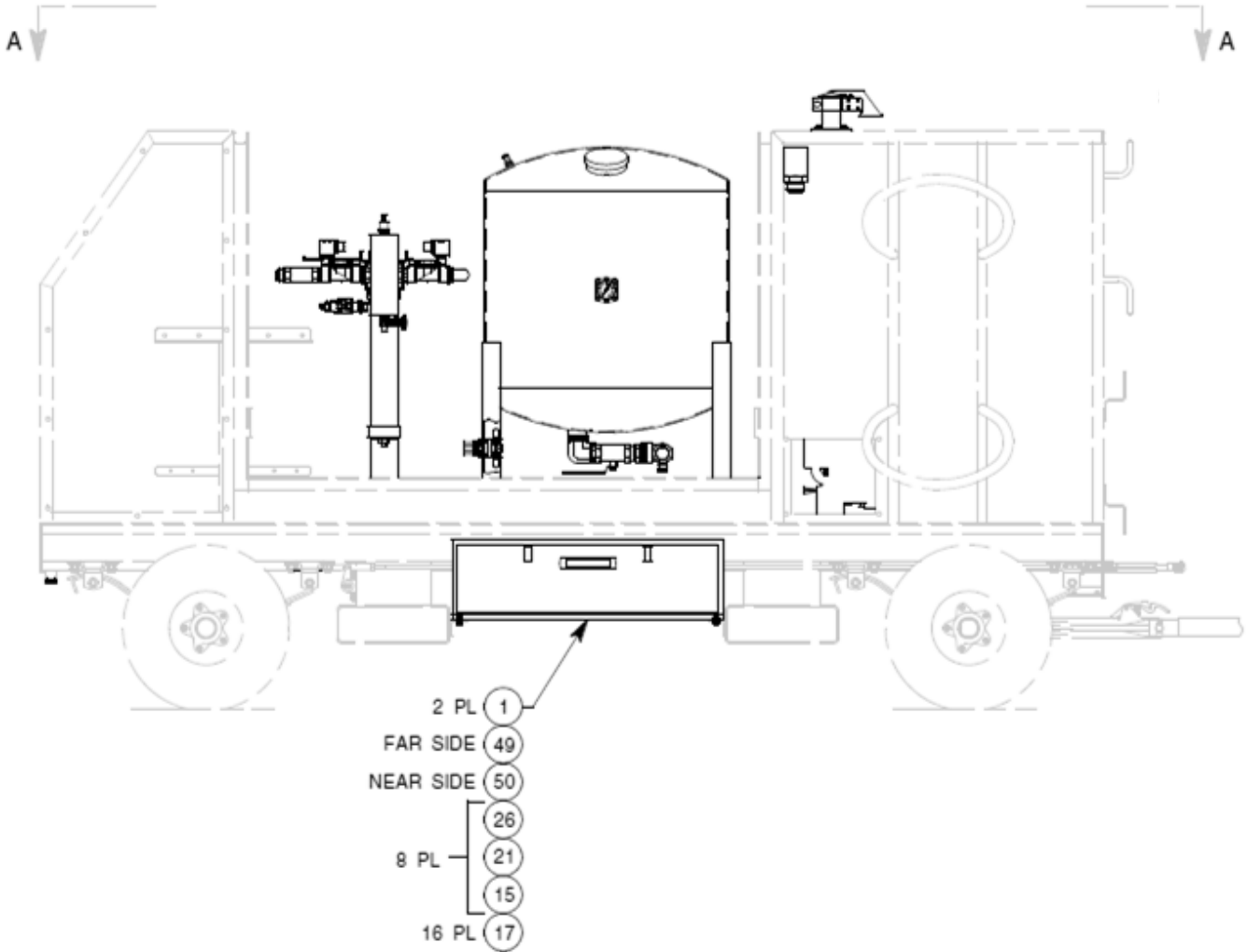
When ordering replacement parts/kits, please specify model, serial number and color of your unit.

Item	Part Number	Description	Qty
44	450-528	BATTERY TERMINAL ADAPTER, POSITIVE	1
45	450-641	RING AND RETAINER, 1"	1
46	450-678	1" NPT CONDUIT LOCKNUT	1
47	450-709	CORD GRIP, 1" NPT x .88 - 1.065 GRIP	1
48	499-146	EXHAUST WRAP, 2" WIDE x 180" LG	AR
49	499-161	MUFFLER	1
50	499-162	MUFFLER MOUNTING BRACKET	1
51	499-164	SPARK ARRESTOR	1
52	499-166	STACK CAP	1
66	EC-2700	SWITCH, BATTERY DISCONNECT	1
68	G-1100-105010	BOLT, 1/4-20 X 1.0" LG HEX HD GR 5	7
69	G-1159-105010	SCR, 1/4-20 RD HD CRS REC	2
70	G-1200-1050	NUT, 1/4-20 HEX	3
71	G-1202-1050	STOPNUT, 1/4-20 ELASTIC	4
72	G-1250-1050N	FLATWASHER, 1/4 NARROW	16
73	G-1476-106010	SCREW, 5/16-18 X 1.0" LG. SST SOC BUTT. HD CAP	4
74	G-1476-106012	SCREW, 5/16-18 X 1-1/4" LG. SST SOC BUTT. HD CAP	2
75	G-1501-1060	STOPNUT, 5/16-18 ELASTIC S.S.	6
76	G-1503-1060N	FLATWASHER, 5/16 NARROW S.S.	10
77	H-2914	BRACKET, FIRE EXTINGUISHER	1
78	H-5179	EXHAUST ELBOW	1
79	H-5393	BOX BATTERY / STRAP	1
80	J-9143	PLATE, BATTERY MOUNT	1
82	S-3072	PLATE, BATTERY SWITCH	1
86	TF-1282-36.0	EXHAUST, HOSE	1
87	TR1059-06.0	EXHAUST, SLEEVE	1
89	Z-13124	ASY, DIESEL FUEL TANK	1

Parts List- Sub Component Assembly

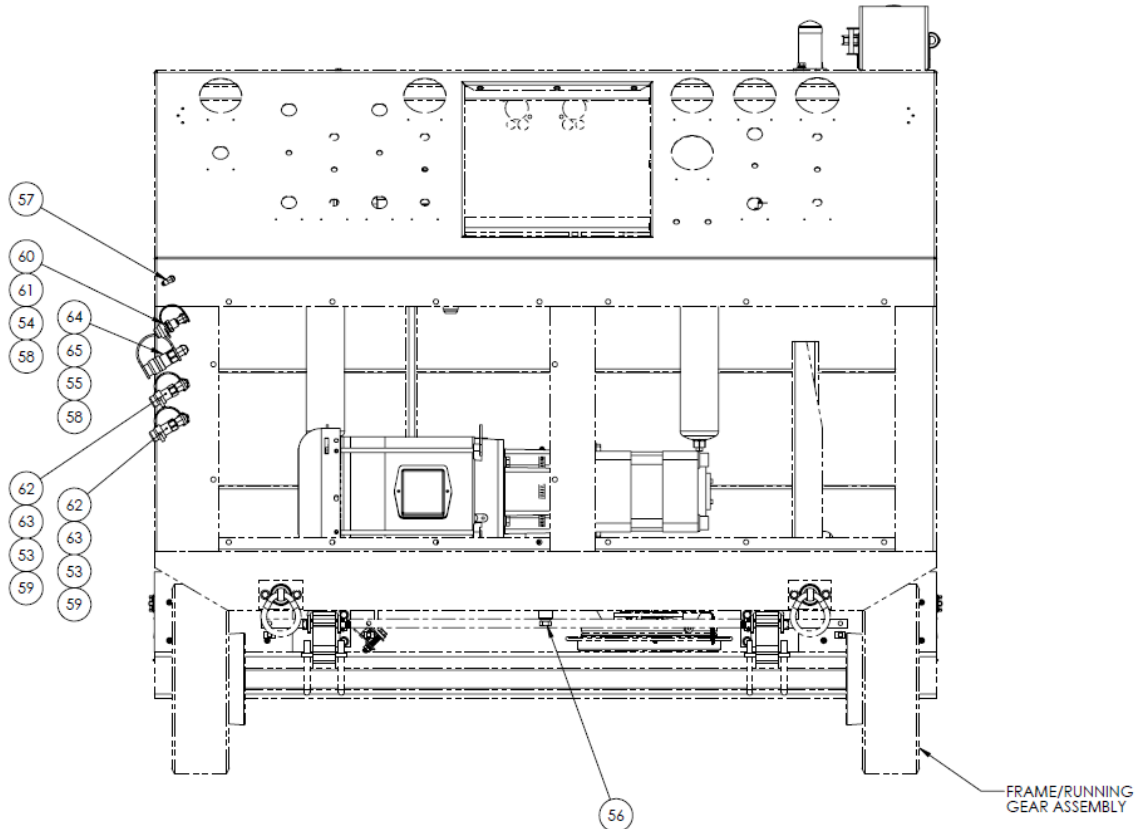
When ordering replacement parts/kits, please specify model, serial number and color of your unit.

Used on Models: 1011000A-1 & 1011000A-2



Parts List– Sub Component Assembly

When ordering replacement parts/kits, please specify model, serial number and color of your unit.

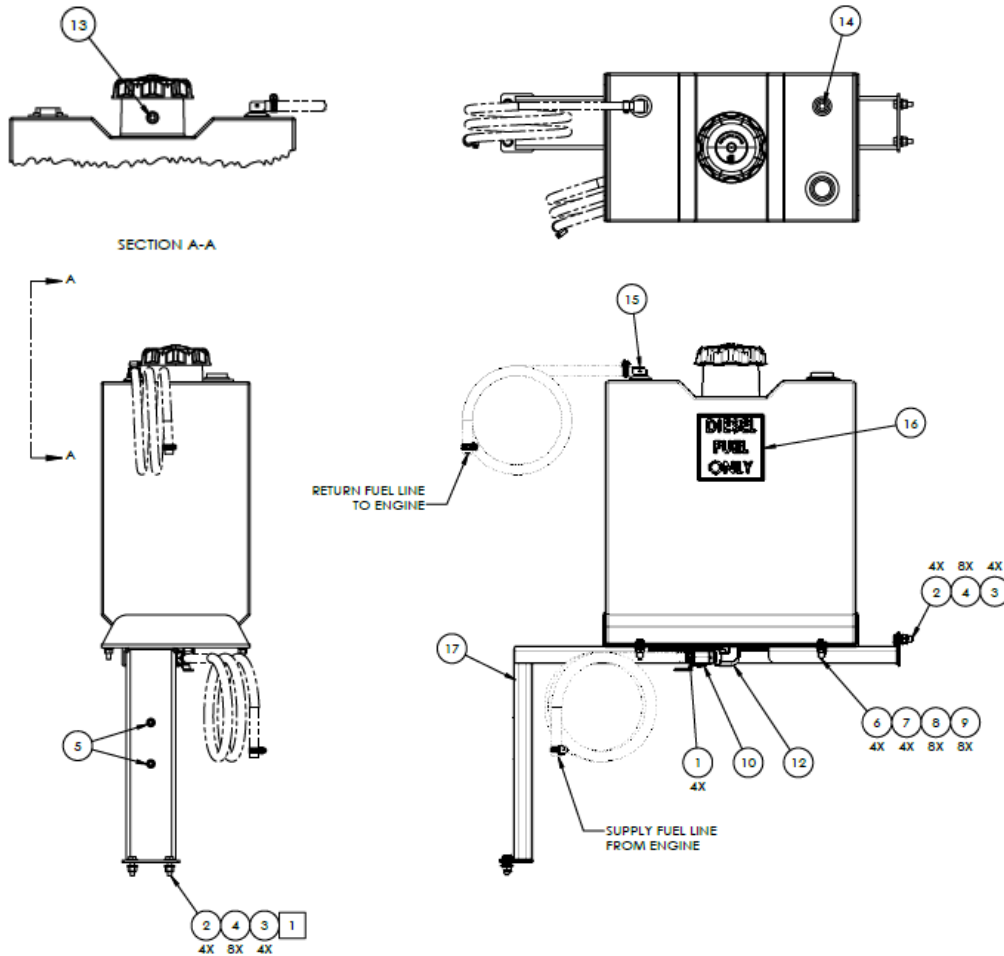


Item	Part Number	Description	Qty
1	1006147	VACUUM PUMP ASSEMBLY	1
2	1011050	GENSET	1
3	1011055	ELBOW WELDMENT	1
4	1011060	STRAIGHT PIPE, EXHAUST	1
5	1011099A-1	DELIVERY RESERVIOR ASSEMBLY	1
6	1011099A-2	RETURN RESERVIOR ASSEMBLY	1
7	1011117	TOOL BOX	2
8	1011121	MOTOR/PUMP ASSEMBLY	1
9	1011125A	SUPPLY FILTER ASSEMBLY	1
10	1011126A	RETURN FILTER ASSEMBLY	1
11	1011128	OUTLET MANIFOLD ASSEMBLY	2
12	1011129	RETURN MANIFOLD ASSEMBLY	1
13	1011130	SUPPLY MANIFOLD ASSEMBLY	1
14	1011160	TOOL BOX FOAM	1
15	1011161	TOOL BOX FOAM	1
16	1011170	CABLE ASSEMBLY	1
17	1011213	BATTERY CABLE ASSEMBLY	1
18	1011214	BATTERY CABLE ASSEMBLY	1
19	15192	FIRE EXTINGUISHER	1
20	26176	HIGH POWER SEALED LEAD-ACID BATTERY	1
21	324-009	HHCS, SST, 3/8-16 x 1-3/4 LG	4
22	324-010	HHCS, 5/16-18 X 1	18
23	324-012	HHCS, SST, 1/4-20 x 1" LG	10

24	324-026	HHCS, SS, 3/8-16 X 1-1/4 LG	2
25	324-027	HHCS, SS, 10-32 x 3/4 LG	3
26	324-055	HHCS, 1/2-13 X 1-1/2", 18-8SS	8
27	326-035	BHCS, SST, 1/4-20 x 5/8 LG	8
28	351-036	HEX NUT, 1/2-13, SST	8
29	359-020	HEX NUT, 5/16-18	12
30	359-022	HEX NUT, SST, 1/4-20	8
31	359-023	HEX NUT, SST, 3/8-16	6
32	362-038	FLAT WASHER, SS, 1/4 SAE	26
33	362-048	FLAT WASHER, 5/16	30
34	362-049	FLAT WASHER, 3/8 SAE, SS	12
35	362-055	FLATWASHER, #10, SST	3
36	362-057	FLAT WASHER, 1/2 SAE, SS	16
37	363-035	LOCKWASHER, SST, #10, SPLIT	3
38	363-037	SPLIT WASHER, SS, 3/8"	6
39	363-038	SPLIT LOCKWASHER, 1/2, SS	8
40	363-040	SPLIT LOCKWASHER, SST, M8	18
41	364-008	SPLIT LOCKWASHER, 1/4	18
42	390-057	INSERT, 1/4-20 THREAD	2
43	394-098	CLAMP, BENT BOLT	6
44	450-528	BATTERY TERMINAL ADAPTER, POSITIVE	1

Parts List- 1011ADiesel Fuel Tank Assembly

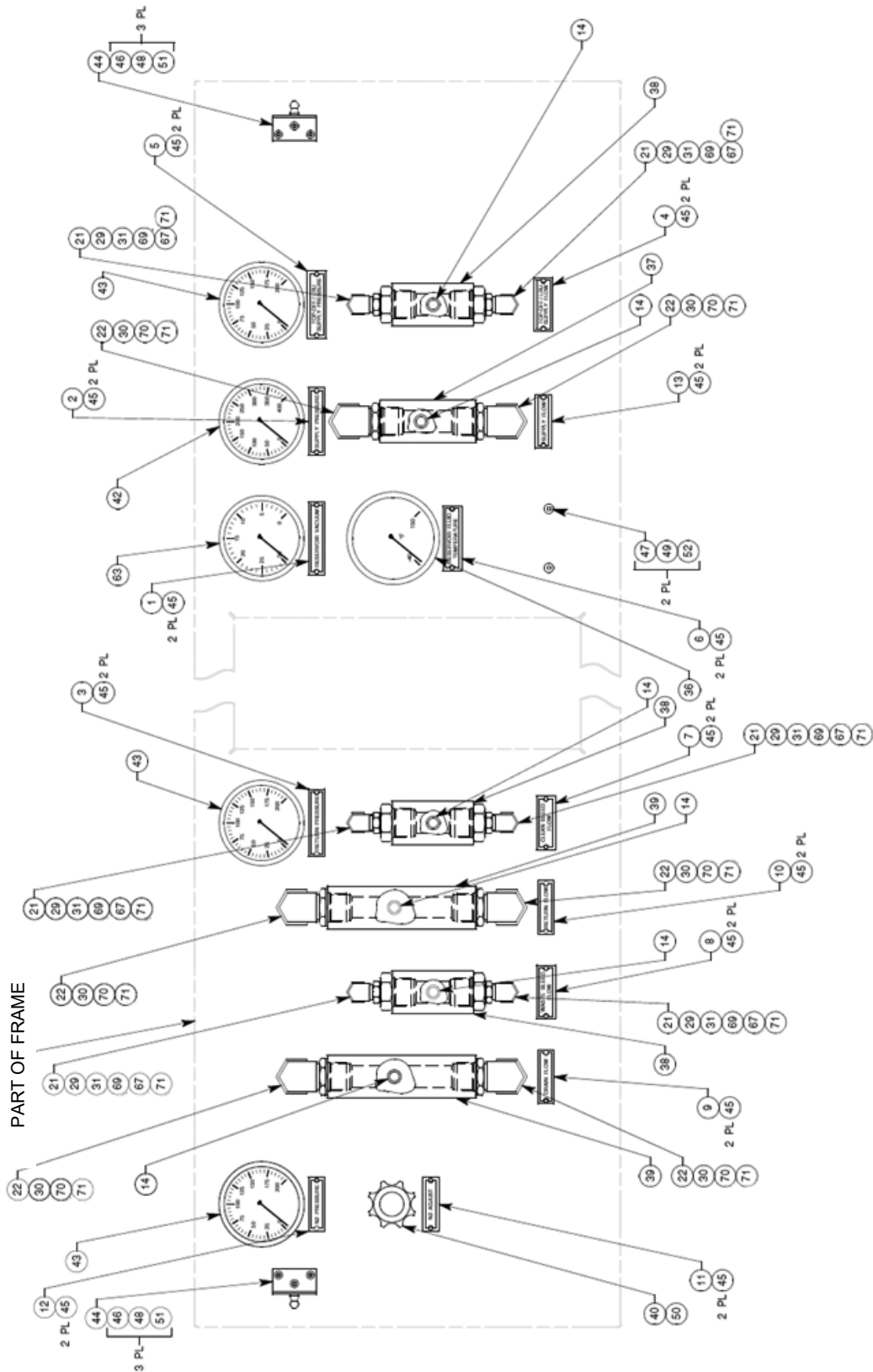
When ordering replacement parts/kits, please specify model, serial number and color of your unit.



Item	Part Number	Description	Qty
1	394-029	CLAMP WORM DRIVE 7/32 TO 5/8	4
2	G-1100-105010	BOLT, 1/4-20 X 1.0" LG HEX HD GR 5	4
3	G-1202-1050	STOPNUT, 1/4-20 ELASTIC	4
4	G-1250-1050N	FLATWASHER, 1/4 NARROW	8
5	G-1440-1050-S	NUTSERT, 1/4-20 OPEN END	2
6	G-1476-105010	SCREW, 1/4-20 X 1.0" LG. SST SOC BUTT. HD CAP	4
7	G-1500-1050	NUT, 1/4-20 HEX S.S.	4
8	G-1502-1050R	LOCKWASHER, 1/4 SST REGULAR	4
9	G-1503-1050N	FLATWASHER. 1/4 SST NARROW	8
10	H-5494	VALVE, ON/OFF	1
11	H-5495	TANK, 8 GAL ALUMINUM	1
12	N-2200-06	ELBOW, STREET 3/8 NPT	1
13	N-2205-03-S	HOLLOW HEX PLUG 1/4 MPT	1
14	N-2205-04-S	PLUG, HOLLOW HEX	1
15	N-2410-11	ELBOW, 90 DEG MALE	1
16	V-2227	LABEL, DIESEL FUEL	1
17	Z-13123-00	WELDMENT, TANK MOUNT	1

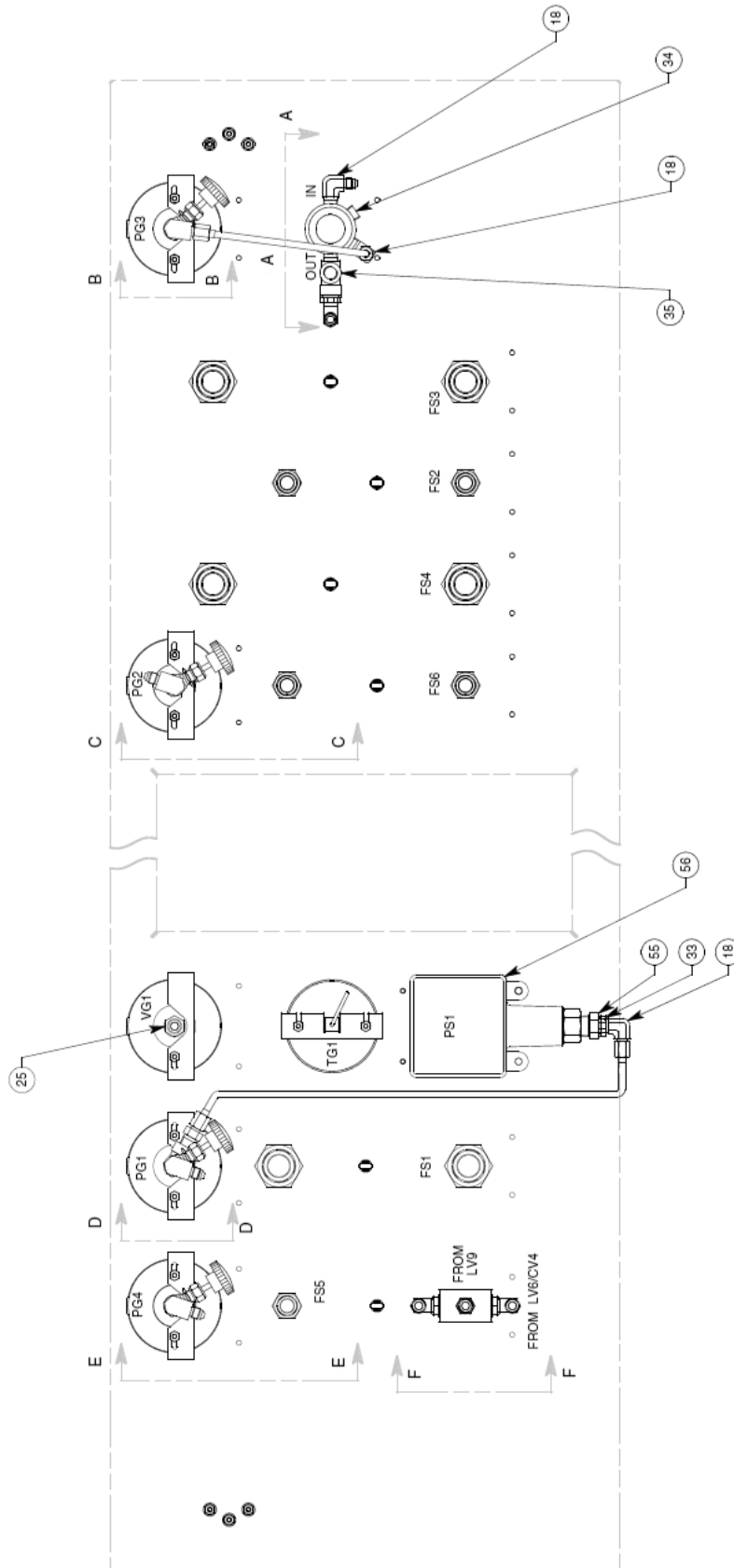
Parts List– Control Panel Assembly

When ordering replacement parts/kits, please specify model, serial number and color of your unit.



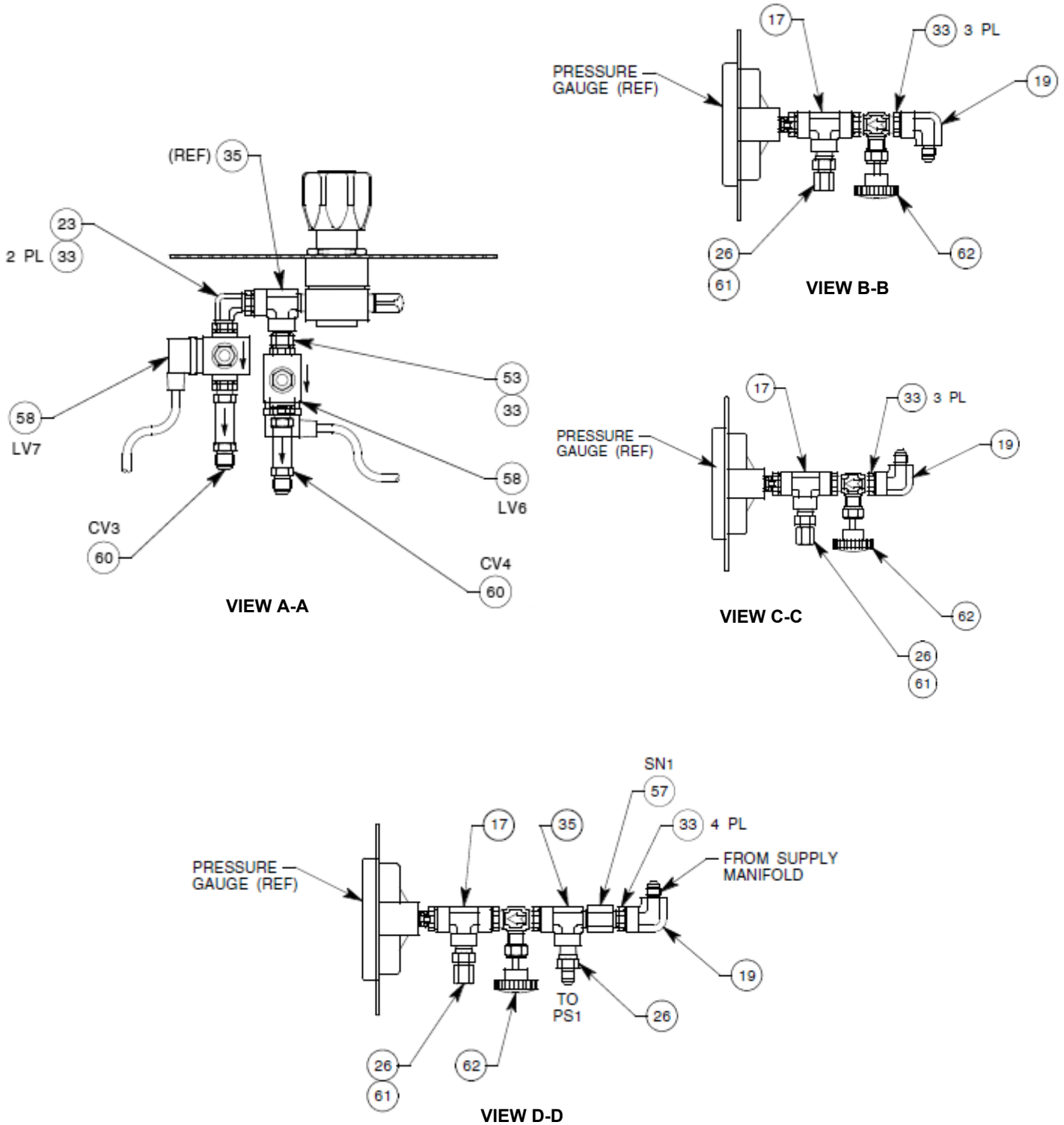
Parts List– Control Panel Assembly

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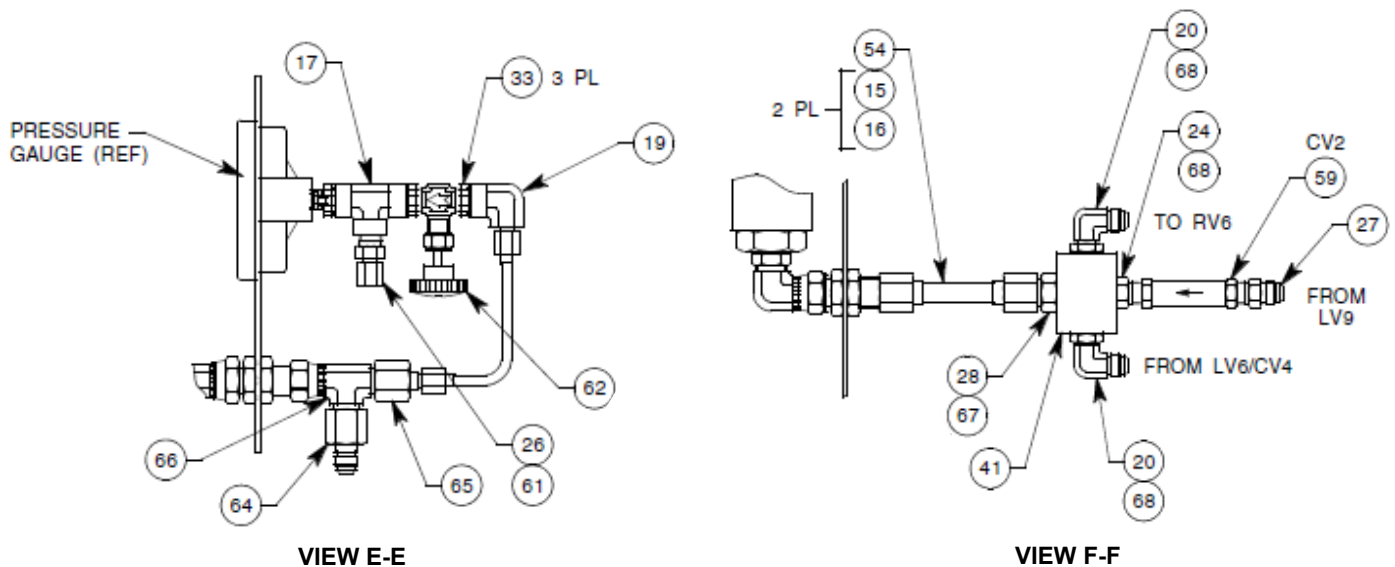
Parts List– Control Panel Assembly

When ordering replacement parts/kits, please specify model, serial number and color of your unit.



Parts List– Control Panel Assembly

When ordering replacement parts/kits, please specify model, serial number and color of your unit.



Item	Part Number	Description	Qty
	1011016A	CONTROL PANEL ASSEMBLY ; consist of:	
1	1006182	PLACARD, RESERVOIR VACUUM	1
2	1006181	PLACARD, SUPPLY PRESSURE	1
3	1006180	PLACARD, RETURN PRESSURE	1
4	101178	PLACARD, TOP-OFF / LRU SUPPLY FLOW	1
5	101177	PLACARD, TOP-OFF / LRU SUPPLY PRESSURE	1
6	1006177	PLACARD, RESERVOIR FLUID TEMP	1
7	1011176	PLACARD, CLEAN BLEED FLOW	1
8	1011175	PLACARD, WASTE BLEED FLOW	1
9	1006174	PLACARD, DRAIN FLOW	1
10	1006172	PLACARD, RETURN FLOW	1
11	1006171	PLACARD, N2 ADJUST	1
12	1006170	PLACARD, N2 PRESSURE	1
13	1006169	PLACARD, SUPPLU FLOW	1
14	26226	WARNING LIGHT	6
15	729-093	SLEEVE, 1/2 - 37°	2
16	729-094	NUT, 1/2 - 37°	2
17	713-006	TEE, 1/4 FPT	4
18	722-148	ELBOW, 1/4 MALE 37° X 1/4 FPT	3
19	722-111	ELBOW, 1/4 MALE 37° X 1/4 MPT	4
20	722-089	ELBOW, 3/8 MALE 37° X 3/8 SAE	2
21	722-184	ELBOW, 1/2 SWIVEL X 1/2 SAE	6
22	722-144	ELBOW, 1 SWIVEL X 1 SAE	6
23	712-096	ELBOW, 1/4 MPT	1
24	721-166	CONNECTOR, 1/4 MPT X 3/8 SAE	1
25	721-189	CONNECTOR, 1/4 MALE 37° X 1 FPT	1
26	721-138	CONNECTOR, 1/4 MALE 37° X 1/4 MPT	5

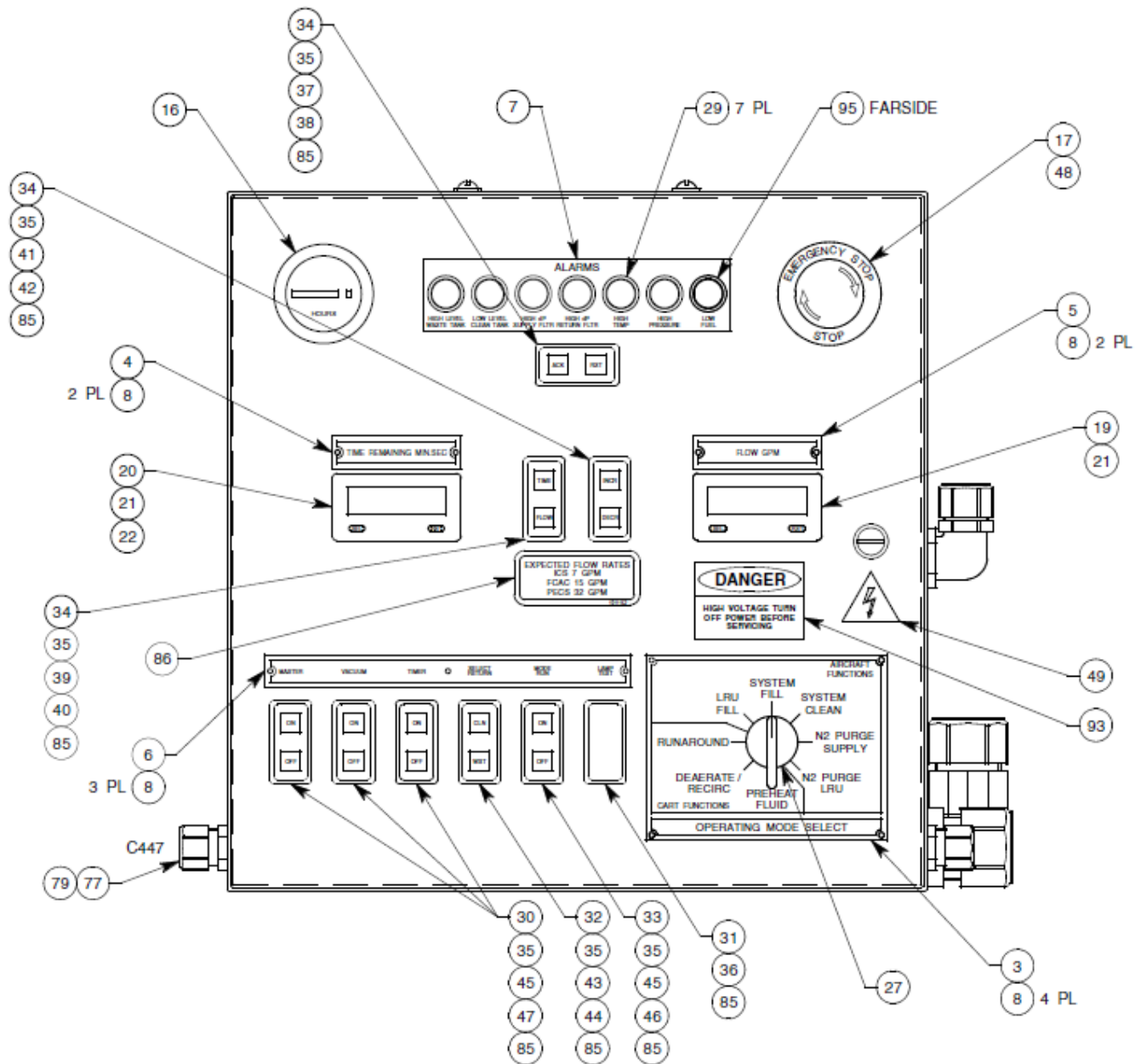
Parts List– Control Panel Assembly

When ordering replacement parts/kits, please specify model, serial number and color of your unit.

Item	Part Number	Description	Qty
27	721-124	CONNECTOR, 3/8 MALE 37° X 1/4 MPT	1
28	721-125	CONNECTOR, 1/2 MALE 37° X 1/2 SAE	1
29	721-170	CONNECTOR, BULKHEAD, 1/2 MALE 37°	6
30	721-171	CONNECTOR, BULKHEAD, 1 MALE 37°	6
31	729-141	REDUCER, 1 MALE SAE X 1/2 FEMALE SAE	6
33	719-055	SEAL NUT, 1/4 FPT	17
34	717-064	SOCKET PLUG, 1/4 MPT	1
35	713-026	TEE, 1/4 MPT X 1/4 FPT X 1/4 FPT	2
36	486-037	DIAL THEROMETER, 3-1/2 DIA X 1/2 MPT	1
37	1011189	FLOW SIGHT, 4.51 LG	1
38	1011188	FLOW SIGHT, 3.81 LG	3
39	1011187	FLOW SIGHT, 6.98 LG	2
40	473-096	REGULATOR, 2-100 PSIG, 1/4 FPT	1
41	101196	MANIFOLD	1
42	482-086	GAUGE, 3-1/2 DIA, 0-400 PSIG, 1/4 NPT	1
43	482-085	GAUGE, 3-1/2 DIA, 0-200 PSIG, 1/4 NPT	3
44	394-070	BALL BRACKET, 10MM	2
45	390-088	RIVET, BUTTON HEAD, 3/32 X 1/4 GRIP	26
46	326-031	BHCS, SST, 10-32 X 5/8 LG	6
47	325-028	FHSCS, 82°, SST, 1/4-20 x 1" LG	2
48	353-019	ELASTIC INSERT LOCKNUT, 10-32	6
49	353-020	ELASTIC INSERT LOCKNUT, 1/4-20	2
50	473-089	LOCKNUT	1
51	362-055	FLAT WASHER, #10 SAE	6
52	362-038	FLAT WASHER, 1/4 SAE	2
53	711-101	NIPPLE, 1/4 MPT	1
54	732-011	HYDRAULIC LINE TUBE, 1/2 OD x 3" LG	AR
55	714-028	REDUCER, 1/2 MPT x 1/4 FPT	1
56	450-675	PRESSURE SWITCH	1
57	486-008	SNUBBER, 1/4 NPT	1
58	424-064	SHUTOFF VALVE, 1/4 FPT	2
59	422-088	CHECK VALVE, 1/4 FPT	1
60	422-076	CHECK VALVE, 1/4 MPT x 3/8 MALE 37°	2
61	717-081	CAP, 1/4 37°	4
62	424-003	NEEDLE VALVE, 1/4 MPT	4
63	482-087	GAUGE, 3-1/2 DIA, 30"0 Hg, 1/4 NPT	1
64	729-132	REDUCER, 3/8 MALE 37° x 1/2 FEMALE 37°	1
65	729-133	REDUCER, 1/4 MALE 37° x 1/2 FEMALE 37°	1
66	723-056	TEE, 1/2 F SWIV 37° x 1/2 M 37° x 1/2 M 37°	1
67	55930-908	O-RING, 1/2	7
68	55930-906	O-RING, 3/8	3
69	362-061	FLAT WASHER, SST, 3/4 SAE	6
70	362-062	FLAT WASHER, SST, 1-1/4 SAE	6
71	55930-916	O-RING, 1	12

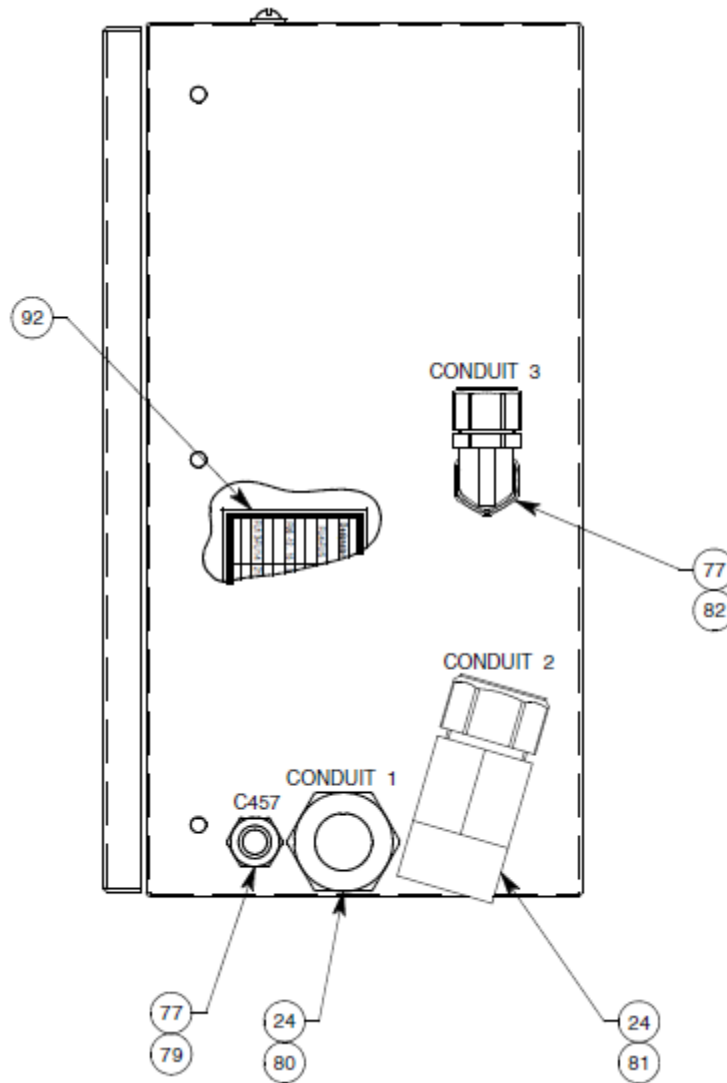
Parts List– Control Enclosure Assembly

When ordering replacement parts/kits, please specify model, serial number and color of your unit.



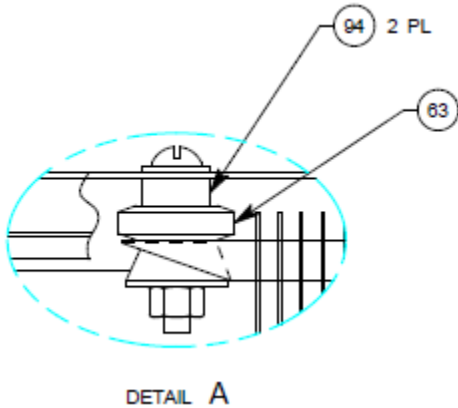
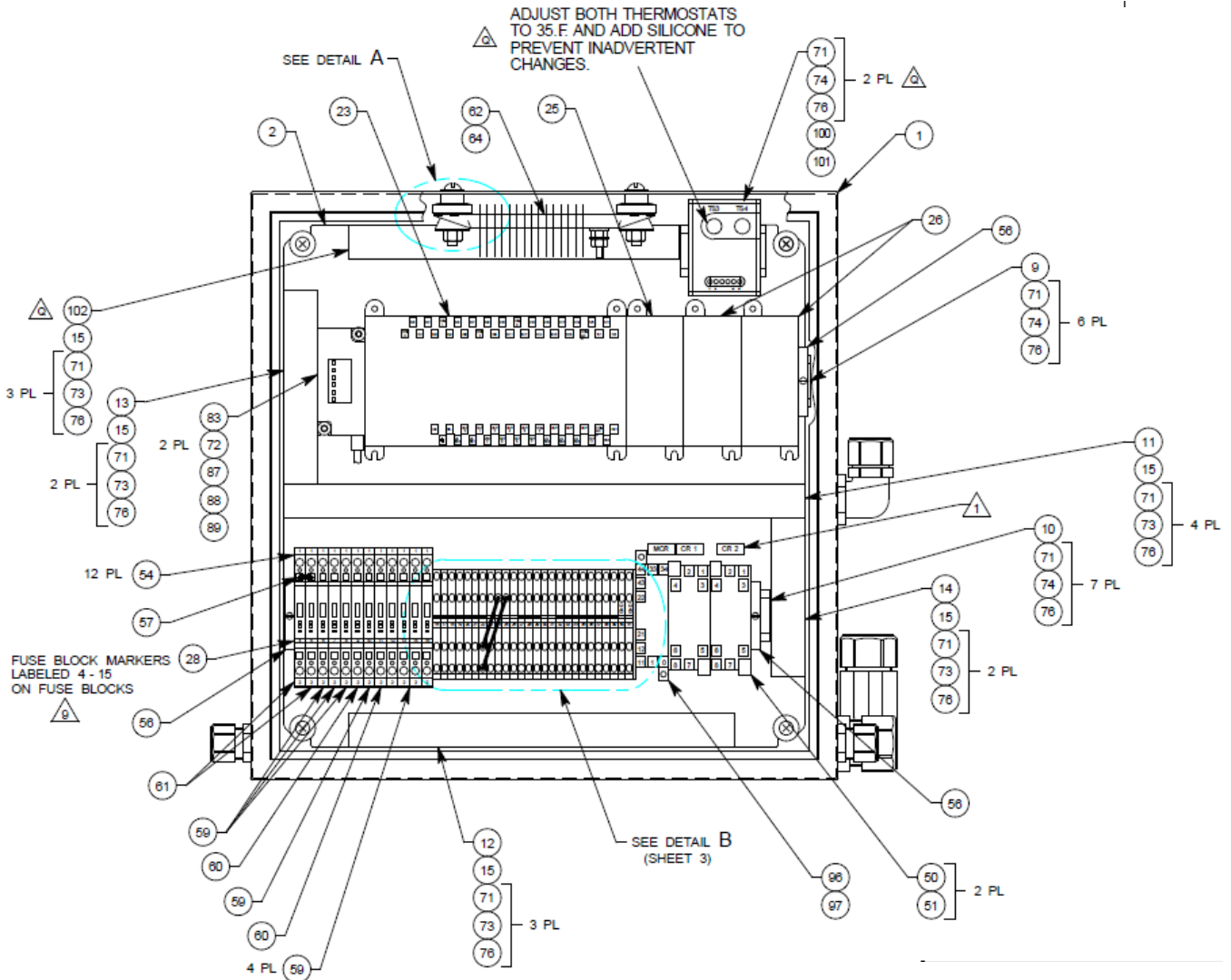
Parts List– Control Enclosure Assembly

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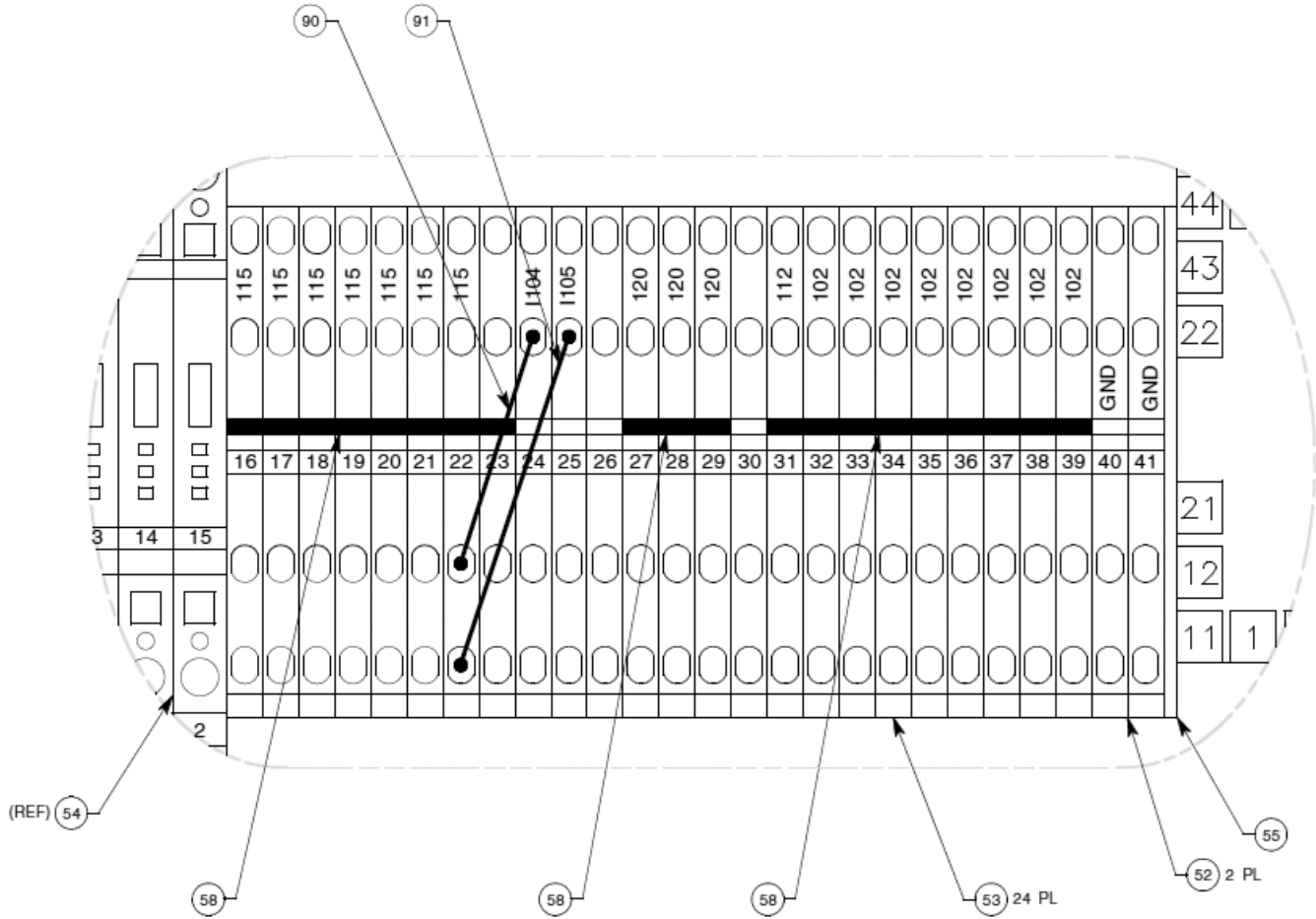
Parts List- Control Enclosure Assembly

When ordering replacement parts/kits, please specify model, serial number and color of your unit.



Parts List– Control Enclosure Assembly

When ordering replacement parts/kits, please specify model, serial number and color of your unit.



DETAIL C

Item	Part Number	Description	Qty
	1011017A	CONTROL ENCLOSURE ASSEMBLY ; consist of:	
1	1011019A	CONTROL ENCLOSURE	1
2	1011018A	SUB PANEL	1
3	1011179	PLACARD, OPERATING MODE SELECT	1
4	1011180	PLACARD, TIME REMAINING	1
5	1011181	PLACARD, FLOW	1
6	1011182	PLACARD, FUNCTIONS	1
7	1011183	PLACARD, ALARMS	1
8	390-088	RIVET, BUTTON HD, 3/32 DIA x 1/4 GRIP	11
9	1011146-2	DIN RAIL, 12 1/8 LG	1
10	1011146-1	DIN RAIL, 13 1/4 LG	1
11	1011145-6	WIRING DUCT, 14 1/4 LG	1
12	1011145-7	WIRING DUCT, 10 1/2 LG	1
13	1011145-8	WIRING DUCT, 5 1/4 LG	1
14	1011145-9	WIRING DUCT, 4 5/16 LG	1
15	450-348	WIRING DUCT COVER, x 76" LG	AR
16	26332	HOUR METER	1

Parts List– Control Enclosure Assembly

When ordering replacement parts/kits, please specify model, serial number and color of your unit.

Item	Part Number	Description	Qty
18	450-842	E-STOP SWITCH	1
19	486-039	FLOW METER DISPLAY	1
20	486-048	TIMER	1
21	486-050	SERIAL COMMUNICATIONS CARD	2
22	486-049	SINGLE RELAY OPTIONS CARD	1
23	452-052	PLC BASE UNIT	1
24	450-777	LOCKNUT, 1" NPT, NYLON	2
25	452-053	INPUT MODULE	1
26	452-054	OUTPUT MODULE	2
27	450-470	SELECTOR SWITCH, 8 POSITION	1
29	450-692	PANEL LIGHT, RED	7
30	450-694	ROCKER SWITCH, ON-NONE-ON, AMBER, NONE	3
31	450-695	ROCKER SWITCH, ON-NONE-(ON), NO LAMPS	1
32	450-696	ROCKER SWITCH, (ON)-OFF-(ON), AMBER, AMBER	1
33	450-697	ROCKER SWITCH, (ON)-OFF-(ON), GREEN, RED	1
34	450-698	ROCKER SWITCH, (ON)-OFF-(ON), NO LAMPS	3
35	450-699	ROCKER SWITCH ACTUATOR, TWO LENS OPG	8
36	450-700	ROCKER SWITCH ACTUATOR, NO LENS OPG	1
37	1011147-1	SWITCH LENS, WHT, ACK	1
38	1011147-2	SWITCH LENS, WHT, RST	1
39	1011147-3	SWITCH LENS, WHT, TIME	1
40	1011147-4	SWITCH LENS, WHT, FLOW	1
41	1011147-5	SWITCH LENS, WHT, INCR	1
42	1011147-6	SWITCH LENS, WHT, DECR	1
43	1011147-7	SWITCH LENS, CLR, CLN	1
44	1011147-8	SWITCH LENS, CLR, WST	1
45	1011147-9	SWITCH LENS, CLR, ON	4
46	1011147-10	SWITCH LENS, CLR, OFF	1
47	1011147-11	SWITCH LENS, WHT, OFF	3
48	499-097	STICKER, E-STOP, YELLOW	1
49	499-099	STICKER, ELECTRICAL SHOCK	1
50	450-479	RELAY SOCKET, 8 BLADE	2
51	450-478	RELAY, DPDT, 10A	2
52	450-400	TERMINAL BLOCK, LG3Q	2
53	450-391	TERMINAL BLOCK, L3Q	24
54	450-388	FUSE BLOCK	12
55	450-403	END COVER	1
56	450-401	END ANCHOR	3
57	450-404	JUMPER, FUSE BLOCK, 2 POLE	1
58	450-527	JUMPER, L3Q 10 POLE	3
59	450-484	FUSE, TYPE T, 5 x 20mm, 0.8A	8
60	450-562	FUSE, TYPE T, 5 x 20mm, 3A	2
61	450-495	FUSE, TYPE T, 5 x 20mm, 8A	2
62	450-679	STRIP HEATER	1

Parts List– Control Enclosure Assembly

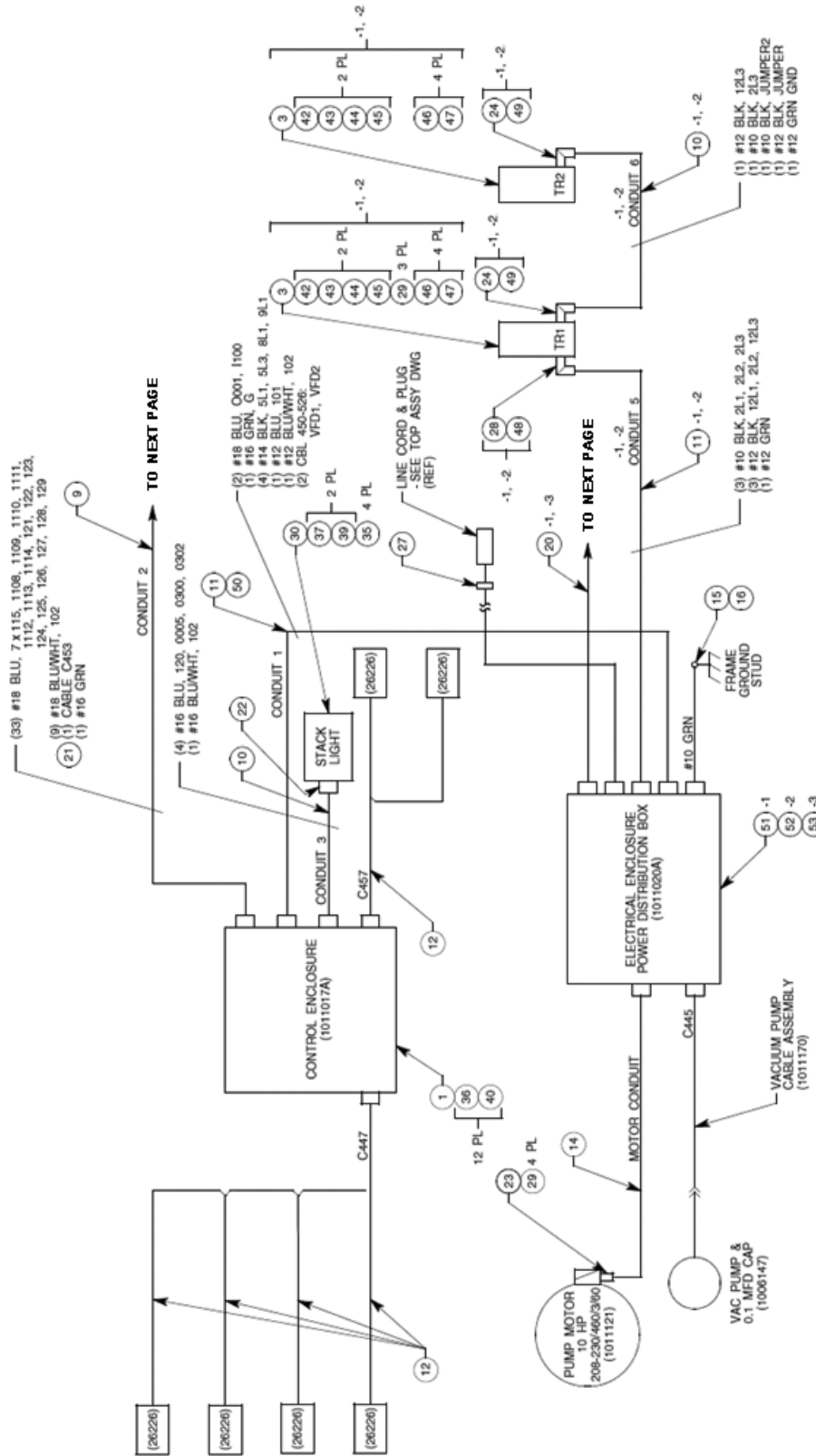
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Item	Part Number	Description	Qty
63	450-680	SECONDARY INSULATION BUSHING KIT	1
64	450-681	CERAMIC TERMINAL COVER	2
71	326-028	BHCS, 10-32 x 3/8 LG	29
72	326-032	BHCS, 10-32 x 1/2 LG	4
73	361-026	FLAT WASHER, #10, 3/4 OD	14
74	362-055	FLAT WASHER, #10 SAE	17
76	363-035	SPLIT LOCKWASHER, #10	29
77	450-581	LOCKNUT, 1/2 NPT, NYLON	3
79	450-669-	CORD CONNECTOR, 1/2 NPT, .17-.45 GRIP	2
80	450-778	CONDUIT FITTING, STRAIGHT, 29mm, x 1" NPT	1
81	450-775	CONDUIT FITTING, ELBOW, 29mm, x 1" NPT	1
82	450-542	CONDUIT FITTING, ELBOW, 17mm, x 1/2 NPT	1
83	452-056	COMMUNICATIONS CABLE	1
85	450-717	PANEL SEAL	9
86	1011152	STICKER, FLOW RATE	1
87	450-718	CABLE, SHIELDED, RJ11 PATCH CORD, 2 FT LG	1
88	450-719	CABLE, SHIELDED, RJ11 PATCH CORD, 1 FT LG	1
89	450-720	MODULAR TEE ADAPTER	1
90	1011162	PLACARD, JUMPER 1	1
91	1011163	PLACARD, JUMPER 2	1
92	1011164	STICKER, CONTROL ENCLOSURE FUSES	1
93	499-096	STICKER, HIGH VOLTAGE	1
94	390-113	SPACER	2
95	1011217	DOOR CABLE ASSEMBLY	1
96	450-768	RELAY, (2) NO + (2) NC, FORCE GUIDED	1
97	450-769	RELAY SOCKET, 10 BLADE	1
100	EC-3406	THERMOSTAT, ENCLOSURE	1
101	EC-1895-002.75	RAIL, DIN	1
102	450-5777	WIRING DUCT	9

Parts List– Electrical Interconnect Assembly

When ordering replacement parts/kits, please specify model, serial number and color of your unit.

Model	Electrical Interconnect Assembly
1010000A-1/101000A-2	1011012A-2
1011000A-1.....	1011012A-3
1011000A-2.....	1011012A-1

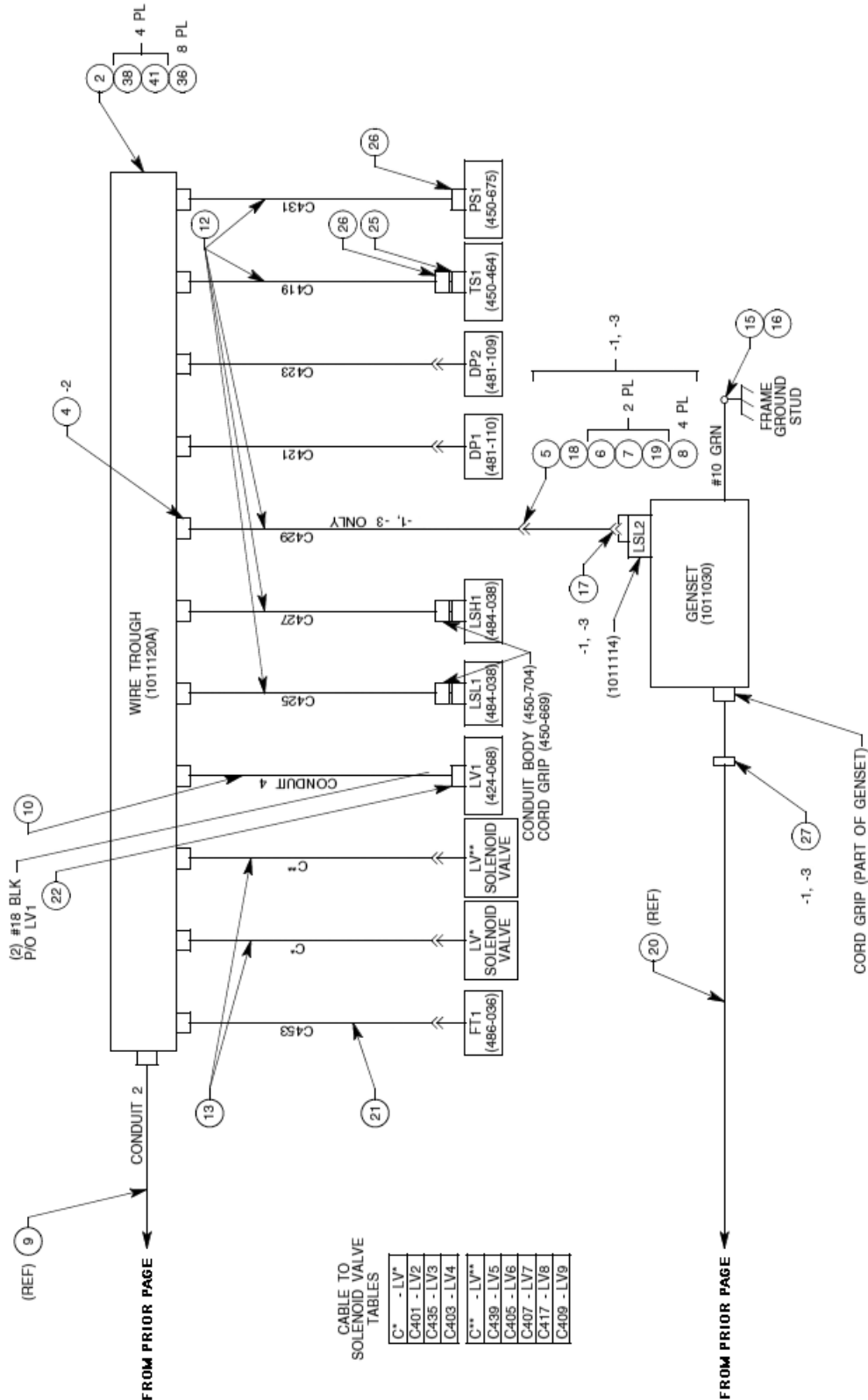


-1 380/480V W/ GENSET (1011A)
-2 380/480V W/O GENSET (1010A)
-3 200/240V W/ GENSET (1011A)

Parts List- Electrical Interconnect Assembly

When ordering replacement parts/kits, please specify model, serial number and color of your unit.

Model	Electrical Interconnect Assembly
1010000A-1/101000A-2	1011012A-2
1011000A-1	1011012A-3
1011000A-2	1011012A-1



Parts List– Electrical Interconnect Assembly

When ordering replacement parts/kits, please specify model, serial number and color of your unit.

The Following Parts are Application Specific

Item	Part Number	Description	-1	-2	-3
					Qty
1	1011017A	CONTROL ENCLOSURE	1	1	1
2	1011120A	WIRING TROUGH	1	1	1
3	450-676	TRANSFORMER	2	2	----
4	450-701	PLUG	----	1	----
5	450-296	FEMALE CONN., METRIPACK 150, 2 PIN	1	----	1
6	450-299	TPA, 2 POSITION	2	----	2
7	450-298	FEMALE TERMINAL, 16/18 AWG	2	----	2
8	450-301	CABLE SEAL, BLUE	4	----	4
9	450-776	CONDUIT, FLEX, 29mm, x 25" LG	AR	AR	AR
10	450-541	CONDUIT, FLEX, 17mm, x 80" LG	AR	AR	AR
11	450-665	CONDUIT, FLEX, 23mm, x 95" LG	AR	AR	AR
12	450-706	CABLE, 3 COND 18 AWG, x 630" LG	AR	AR	AR
13	450-721	CABLE & CONN. DIN 43650 FORM A, 3M	8	8	8
14	450-761	CONDUIT, FLEX SHIELDING, 1", 35" LG	AR	AR	AR
15	329-015	STUD, 3/8-16 x 1-1/4 LG, BRASS	2	2	2
16	351-035	HEX NUT, 3/8-16, BRASS	2	2	2
17	482-097	CONNECTOR & PIGTAIL	1	----	1
18	450-308	MALE CONN., METRIPACK 150, 2 PIN	1	----	1
19	450-328	MALE TERMINAL, 16/18 AWG	2	---	2
20	450-714	CABLE, TYPE W, 4 COND, 8 AWG x 180" LG	AR	----	AR
21	486-040	CABLE, 4 TWISTED PAIR x 120" LG	1	1	1
22	450-543	CONDUIT FITTING, 17mm x 1/2 MPT, STR	2	2	2
23	450-760	CONDUIT ELBOW, 1" NPT w/ LOCKNUT	1	1	1
24	450-542	CONDUIT FITTING, 90°, 17mm x 1/2 MPT	2	2	----
25	450-704	CONDUIT BODY, 1/2 SLB, ALUMINUM	1	1	1
26	450-669	CORD GRIP, 1/2 NPT x .17-.45 GRIP	2	2	2
27	390-087	GROMMET, 1-1/4 ID	2	1	2
28	450-670	CONDUIT FTG, 90°, 23mm x 3/4 MPT	1	1	----
29	450-838	WALL NUT	7	7	4
30	450-393	STACK LIGHT	1	1	1
31	999-051	NEOPRENE STRIP, 105" LG	AR	AR	AR
32	390-106	SLOTTED SCREW WITH WEAR WASHER	1	1	1
33	390-102	CLIP-ON RECEPTACLE	2	2	2
34	369-006	RETAINER	1	1	1
35	362-051	FLAT WASHER, SST, #8 SAE	4	4	4
36	362-038	FLAT WASHER, SST, 1/4 SAE	20	20	20
37	353-025	HEX LOCKNUT, SST, 8-32	2	2	2
38	353-020	HEX LOCKNUT, SST, 1/4-20	4	4	4
39	326-030	BHCS, SST, 8-32 x 1-3/4 LG	2	2	2
40	362-033	BHCS, SST, 1/4-20 x 3/4 LG	12	12	12

Parts List– Electrical Interconnect Assembly

When ordering replacement parts/kits, please specify model, serial number and color of your unit.

The Following Parts are Application Specific

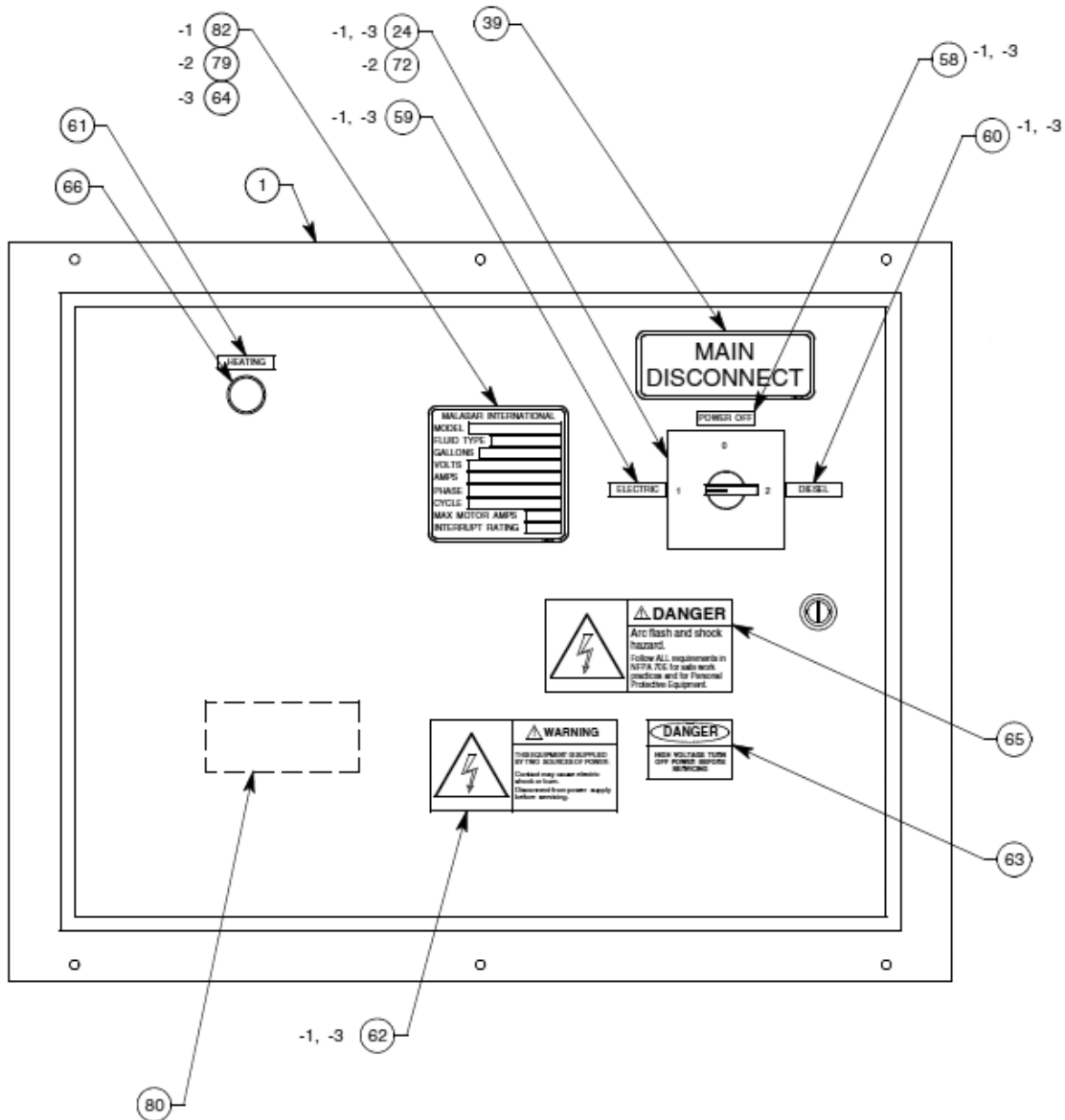
			-1	-2	-3
Item	Part Number	Description			Qty
41	324-012	HHCS, SST, 1/4-20 x 1" LG	4	4	4
42	324-010	HHCS, SST, 5/16-18 x 1" LG	4	4	----
43	353-021	HEX LOCKNUT, SST, 5/16-18	4	4	----
44	324-027	HHCS, SST, 10-32 x 3/4 LG	4	4	----
45	353-019	HEX LOCKNUT, SST, 10-32	4	4	----
46	362-048	FLAT WASHER, SST, 5/16 SAE	8	8	----
47	362-055	FLAT WASHER, SST, #10 SAE	8	8	----
48	450-580	LOCKNUT, 3/4 FPT, NYLON	1	1	----
49	450-581	LOCKNUT, 1/2 FPT, NYLON	2	2	----
50	450-526	CABLE, 2 COND., DRN., 18 AWG, 240" LG	AR	AR	AR
51	1011020A-1	ELECTRICAL ENCLOSURE	1	----	----
52	1011020A-2	ELECTRICAL ENCLOSURE	----	1	----
53	1011020A-3	ELECTRICAL ENCLOSURE	----	----	1

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Parts List– Electrical Enclosure Assembly

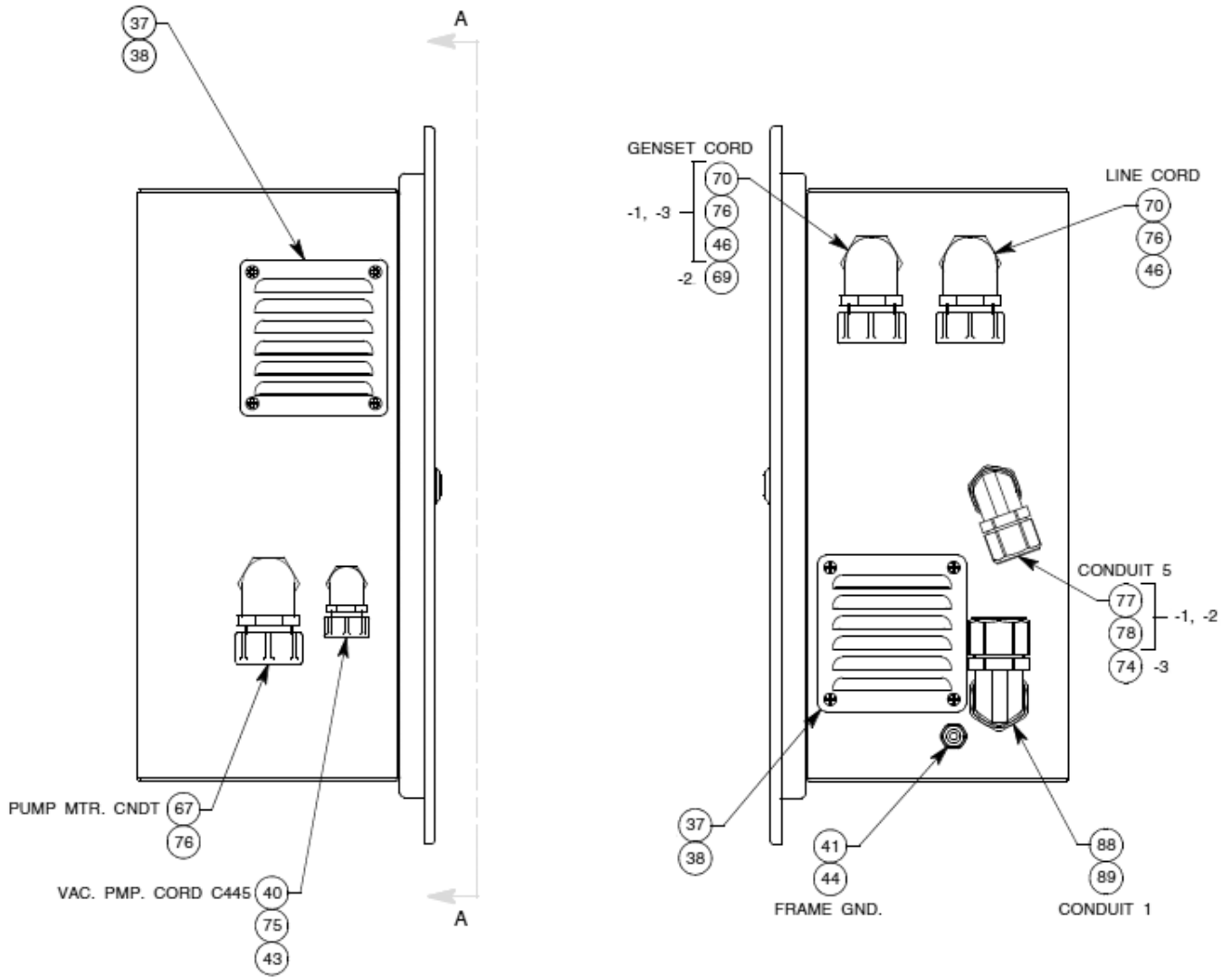
When ordering replacement parts/kits, please specify model, serial number and color of your unit.

MODEL	ELECTRICAL ENCLOSURE ASSEMBLY
1010000A-1, 1010000A-2.....	1011020A-2 (380/480V W/O GENSET)
1011000A-2.....	1011020A-1 (380/480V W/ GENSET)
1011000A-1.....	1011020A-3 (200/240V W/ GENSET)



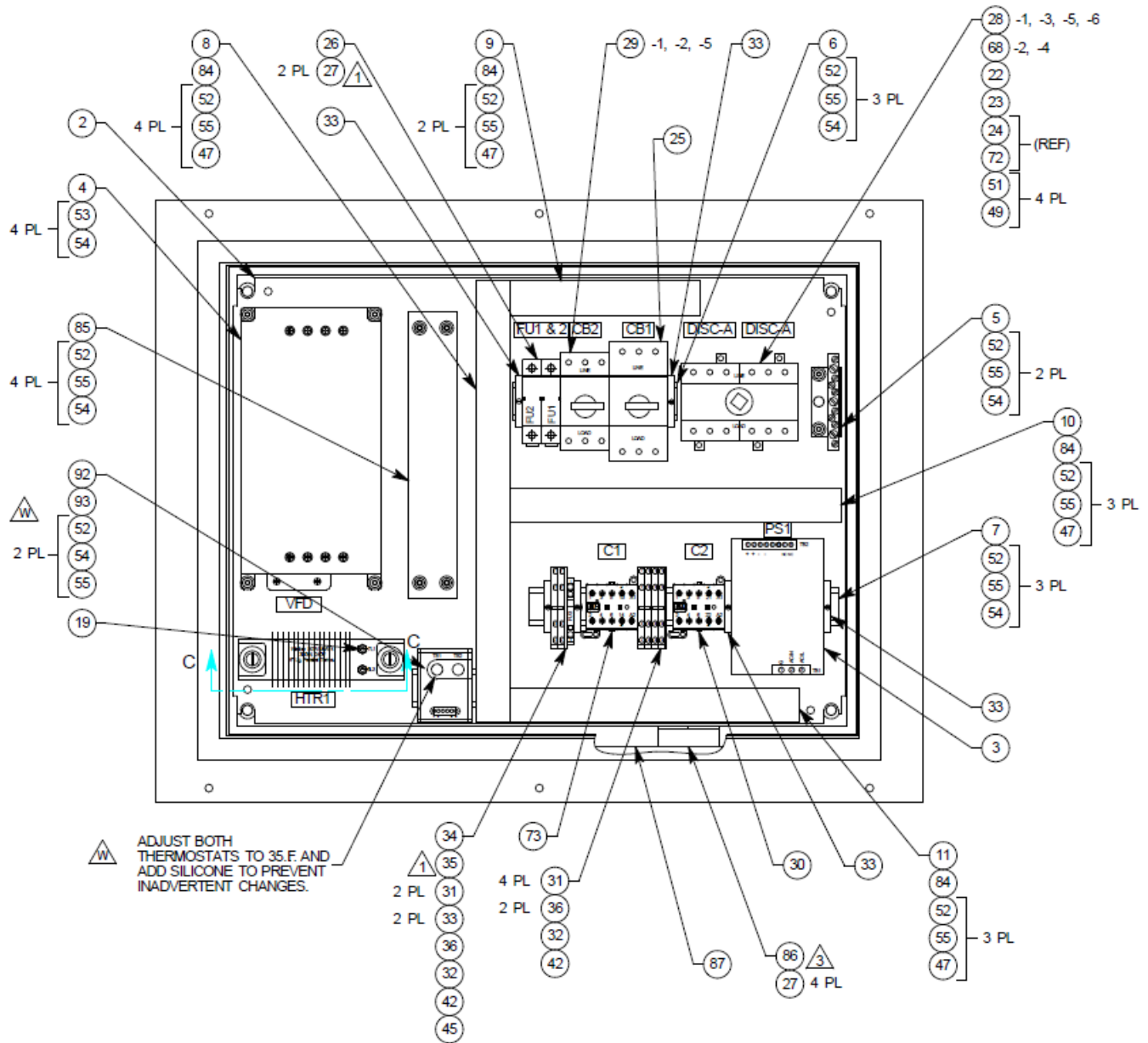
Parts List– Electrical Enclosure Assembly

When ordering replacement parts/kits, please specify model, serial number and color of your unit.



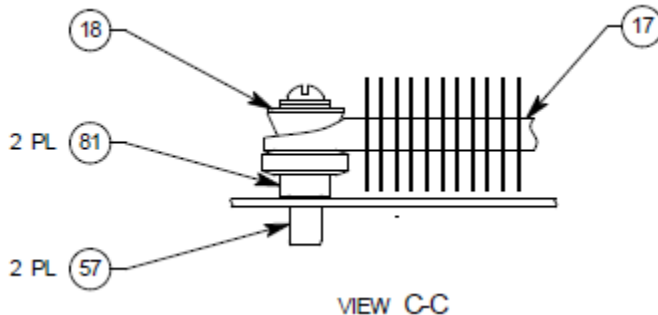
Parts List– Electrical Enclosure Assembly

When ordering replacement parts/kits, please specify model, serial number and color of your unit.



ADJUST BOTH THERMOSTATS TO 35.F. AND ADD SILICONE TO PREVENT INADVERTENT CHANGES.

VIEW A-A
ENCLOSURE DOOR
REMOVED FOR CLARITY



Parts List– Electrical Enclosure Assembly

When ordering replacement parts/kits, please specify model, serial number and color of your unit.

The Following Parts are Application Specific

Item	Part Number	Description	-1	-2	-3
					Qty
1	1011022A	ELECTRICAL ENCLOSURE	1	1	1
2	1011021A	ELECTRICAL ENCLOSURE SUB PANEL	1	1	1
3	452-050	POWER SUPPLY, 24VDC	1	1	1
4	452-051	POWERFLEX4M AC DRIVE	1	1	1
5	450-537	GROUND BAR KIT, 11 POSITION	1	1	1
6	1011146-5	DIN RAIL, 6 LG	1	1	1
7	1011146-3	DIN RAIL, 11 1/4 LG	1	1	1
8	1011146-1	WIRING DUCT, PVC	1	1	1
9	1011146-2	WIRING DUCT, PVC	1	1	1
10	1011146-10	WIRING DUCT, PVC	1	1	1
11	1011146-4	WIRING DUCT, PVC	1	1	1
13	450-348	WIRING DUCT COVER, 3/4 x 4" LG	AR	AR	AR
17	450-679	STRIP HEATER	1	1	1
18	450-680	SECONDARY INSULATION BUSHINGS (2)	1	1	1
19	450-681	CERAMIC TERMINAL COVER	2	2	2
22	450-601	METAL SHAFT EXTENSION	1	1	1
23	450-610	INSERT, EXTENSION	1	----	1
24	450-630	SWITCH OPERATOR (1 - 0 - 2)	1	----	1
25	450-686	CIRCUIT BREAKER, 45A	1	1	1
26	450-687	FUSE BLOCK, CLASS CC, 2 POLE	1	1	1
27	450-693	FUSE, CLASS CC, 8A	6	6	6
28	450-688	CHANGEOVER SWITCH, BASE MOUNT	1	----	1
29	450-689	CIRCUIT BREAKER, 20A	1	1	----
30	450-685	CONTACTOR, 3 POLE, 240 VAC COIL	1	1	1
31	450-391	TERMINAL BLOCK, L3Q	6	6	6
32	450-403	END COVER	2	2	2
33	450-401	END ANCHOR	6	6	6
34	450-388	FUSE BLOCK	1	1	1
35	450-493	FUSE, 5 x 20mm, 5A	1	1	1
36	450-385	JUMPER, L3Q, 2 POLE	3	3	3
37	499-085	LOUVER PLATE KIT	2	2	2
38	499-087	FILTER	2	2	2
39	1003190	STICKER, MAIN DISCONNECT	1	1	1
40	450-456	CORD GRIP, 3/4 NPT x 3/8 - 1/2	1	1	1
41	450-460	CORD GRIP, PG7	1	1	1
43	450-064	CONDUIT LOCKNUT, 3/4 NPT	1	1	1
44	450-462	LOCKNUT, PG7	1	1	1
46	450-678	1" NPT CONDUIT LOCKNUT	2	1	2
47	361-026	FLAT WASHER, #10, 3/4 OD	12	12	12
49	364-012	SPLIT LOCKWASHER, #8	4	4	4
51	326-019	BHCS, 8-32 x 1/2 LG	4	4	4
52	326-028	BHCS, 10-32 x 3/8 LG	26	26	26
53	326-032	BHCS, 10-32 x 1/2 LG	4	4	4

Parts List– Electrical Enclosure Assembly

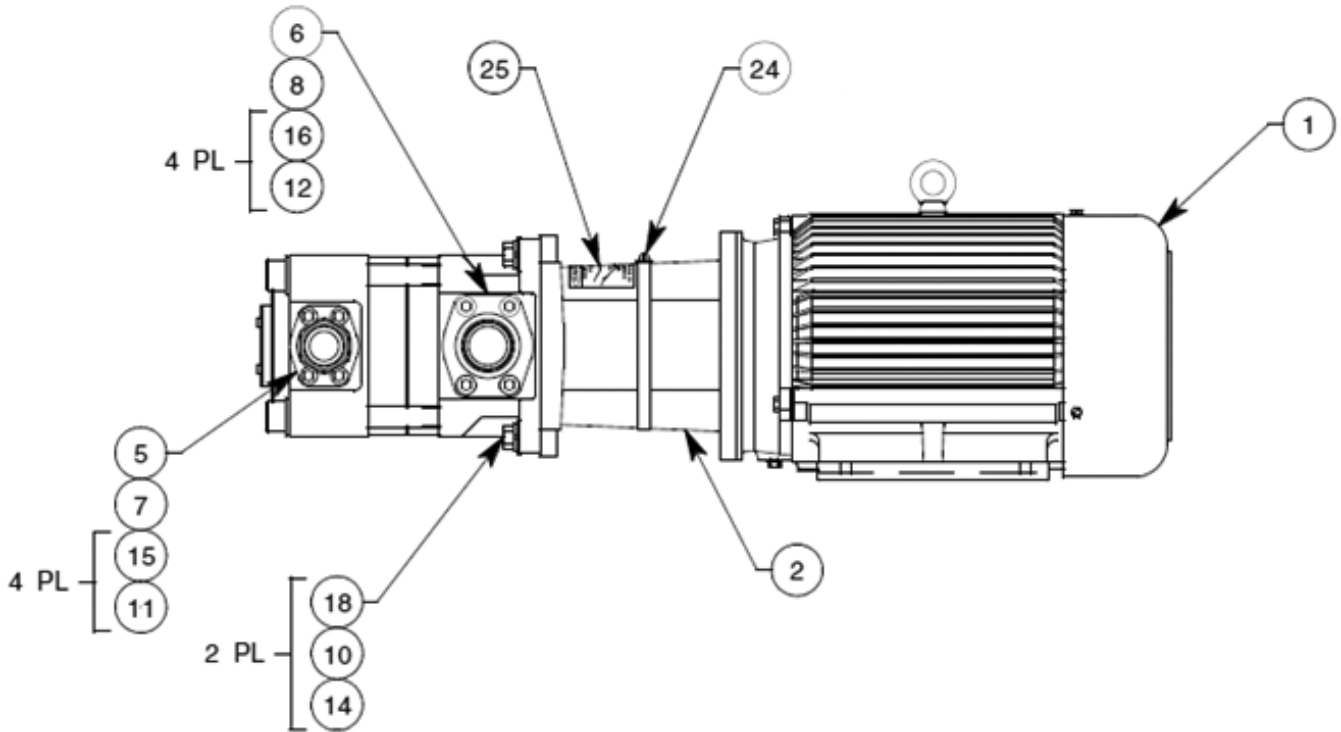
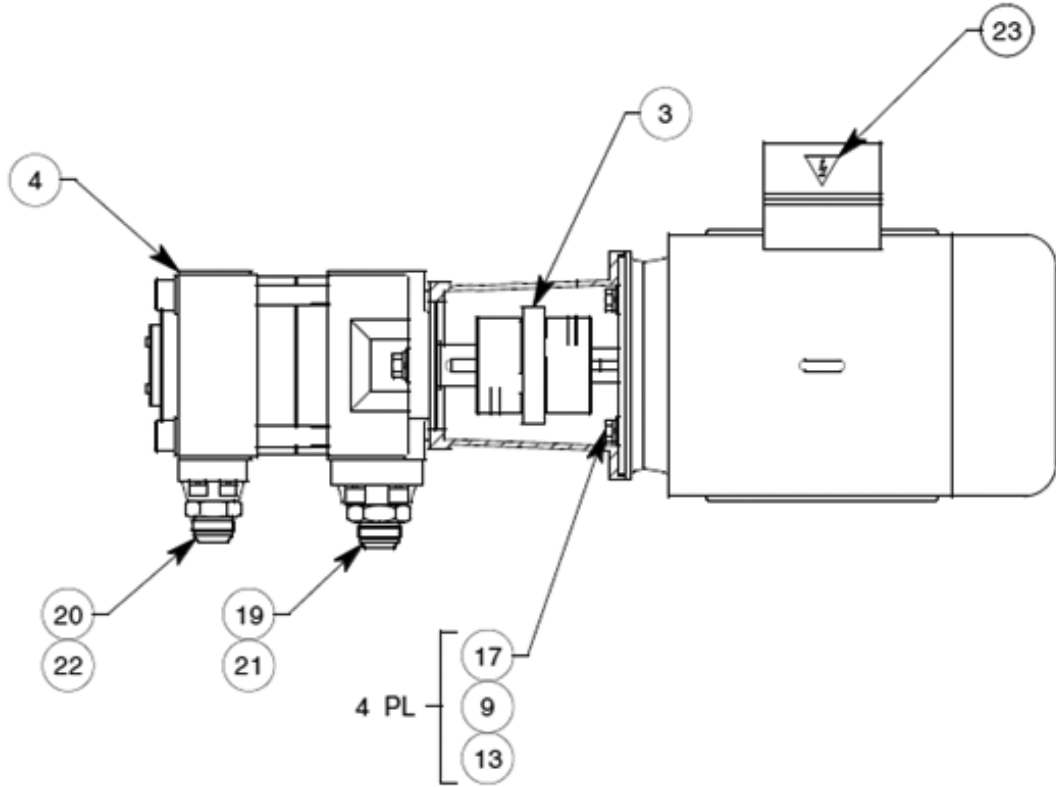
When ordering replacement parts/kits, please specify model, serial number and color of your unit.

The Following Parts are Application Specific

Item	Part Number	Description	-1	-2	-3
					Qty
54	362-055	FLAT WASHER, #10 SAE	20	20	20
55	636-035	SPLIT LOCKWASHER, #10	26	26	26
57	390-054	INSERT, OPEN END, 1/4-20	2	2	2
58	499-124	LEGEND PLATE, "POWER OFF"	1	----	1
59	499-125	LEGEND PLATE, "ELECTRIC"	1	----	1
60	499-126	LEGEND PLATE, "DIESEL"	1	----	1
61	499-135	LEGEND PLATE, "HEATING"	1	1	1
62	499-129	STICKER, WARNING / TWO SRC OF POWER	1	----	1
63	499-096	STICKER, HIGH VOLTAGE	1	1	1
64	1011156	STICKER, SYSTEM DATA (1011A, LV)	----	----	1
65	499-100	STICKER, ARC FLASH	1	1	1
66	450-684	PANEL LIGHT	1	1	1
67	450-760	CONDUIT ELBOW, 1" NPT w/ LOCKNUT	1	1	1
68	450-707	DISCONNECT SWITCH, ON - OFF	----	1	----
69	499-136	HOLE PLUG	----	1	----
70	450-709	CORD GRIP, 1" NPT x .88 - 1.065 GRIP	2	1	2
72	450-710	SWITCH OPERATOR (OFF - ON)	----	1	----
73	450-663	CONTACTOR, 3 POLE, 24 VDC COIL	1	1	1
74	499-142	HOLE PLUG, 1-1/8	----	----	1
75	450-640	RING AND RETAINER, 3/4	1	1	1
76	450-641	RING AND RETAINER, 1	3	2	3
77	450-670	ELBOW, 23mm CONDUIT FTG, 3/4 NPT	1	1	----
78	450-580	LOCKNUT, 3/4 NPT, NYLON	1	1	----
79	1010156	STICKER, SYSTEM DATA (1010A, HV)	----	1	----
80	1011165	STICKER, MAIN CB ENCLOSURE FUSES	1	1	1
81	390-113	SPACER	2	2	2
82	1011172	STICKER, SYSTEM DATA (1011A, HV)	1	----	----
84	450-578	WIRING DUCT COVER, 1" x 50" LG	AR	AR	AR
85	452-066	EMC/EMI INPUT RFI FILTER	1	1	1
86	450-770	PLASTIC BOX	1	1	1
87	1011220	STICKER, SPARE FUSES	1	1	1
88	450-775	CONDUIT FTG, ELBOW, 29mm, x 1" NPT	1	1	1
89	450-777	LOCKNUT, 1" NPT, NYLON	1	1	1
92	EC-3406	THERMOSTAT, ENCLOSURE	1	1	1
93	EC-1895-002.75	RAIL, DIN	1	1	1

Parts List- Motor/Pump Assembly

When ordering replacement parts/kits, please specify model, serial number and color of your unit.



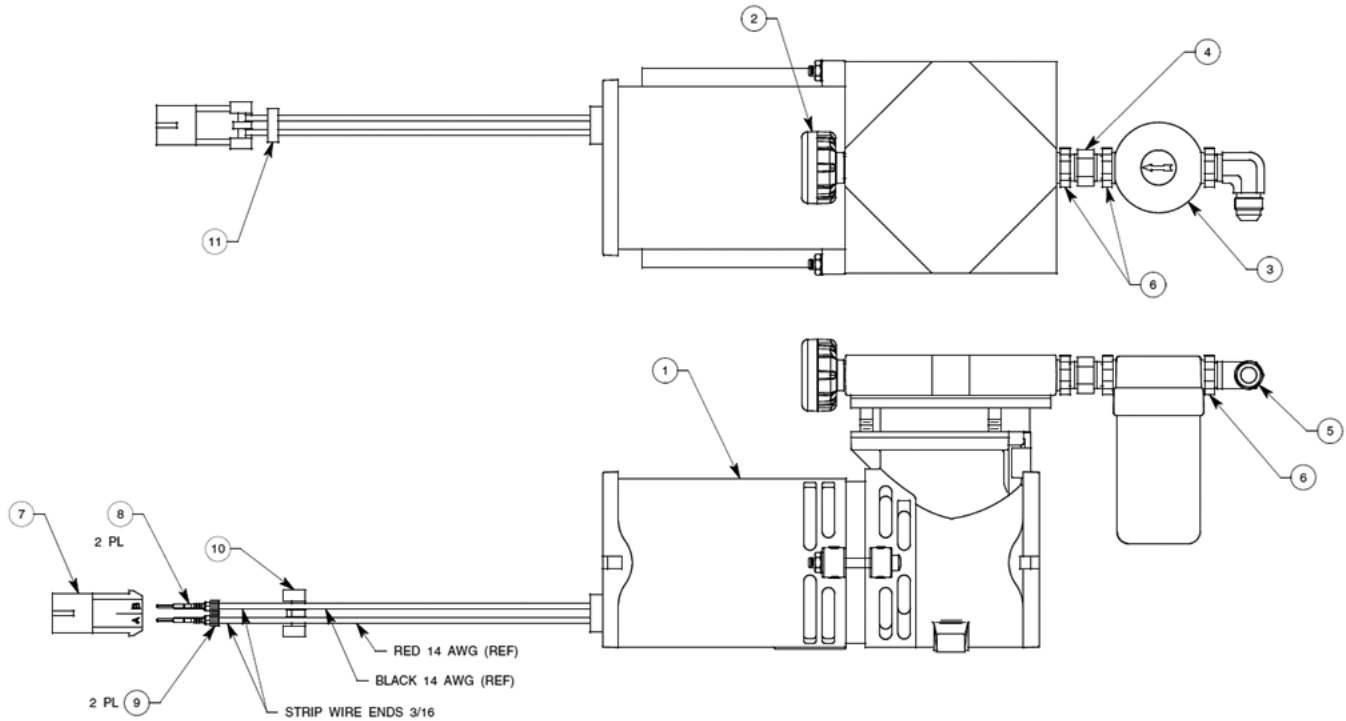
Parts List– Motor/Pump Assembly

When ordering replacement parts/kits, please specify model, serial number and color of your unit.

Item	Part Number	Description	Qty
	1011121	MOTOR/PUMP ASSEMBLY ; consist of:	
1	431-018	MOTOR, 10 HP	1
2	438-009	PUMP/MOTOR ADAPTER	1
3	432-023	FLEXIBLE COUPLING	1
4	442-062	PUMP, CRESCENT GEAR, 35 GPM	1
5	1003118	FLANGE, 1 1/4 CODE 61	1
6	1003119	FLANGE, 2" CODE 61	1
7	55933-222	O-RING, VITON	1
8	55933-228	O-RING, VITON	1
9	363-038	LOCKWASHER, 1/2, SST	4
10	363-039	LOCKWASHER, 5/8, SST	2
11	363-033	LOCKWASHER, 5/8, SST	4
12	363-034	LOCKWASHER, HI-COLLAR, 1/2, SST	4
13	362-057	FLAT WASHER, 1/2 SAE, SST	4
14	362-058	FLAT WASHER, 5/8 SAE, SST	2
15	324-045	SHCS, 7/16-14 x 1 1/2 LG, SST	4
16	324-046	SHCS, 1/2-13 x 1 3/4 LG, SST	4
17	324-054	HHCS, 1/2-13 x 1 1/4 LG, SST	4
18	324-056	HHCS, 5/8-11 x 1 3/4 LG, SST	2
19	721-179	CONN., 1-1/4 37° MALE x 1-1/2 SAE, SST	1
20	721-197	CONN., 1" 37° MALE x 1-1/4 SAE, SST	1
21	55933-924	O-RING, VITON	1
22	55933-920	O-RING, VITON	1
23	499-099	STICKER, ELECTRICAL SHOCK	1
24	394-051	BAND CLAMP, 4-1/8 THRU 7" DIA	1
25	499-080	STICKER, KEEP HANDS CLEAR	1

Parts List- Vacuum Pump Assembly

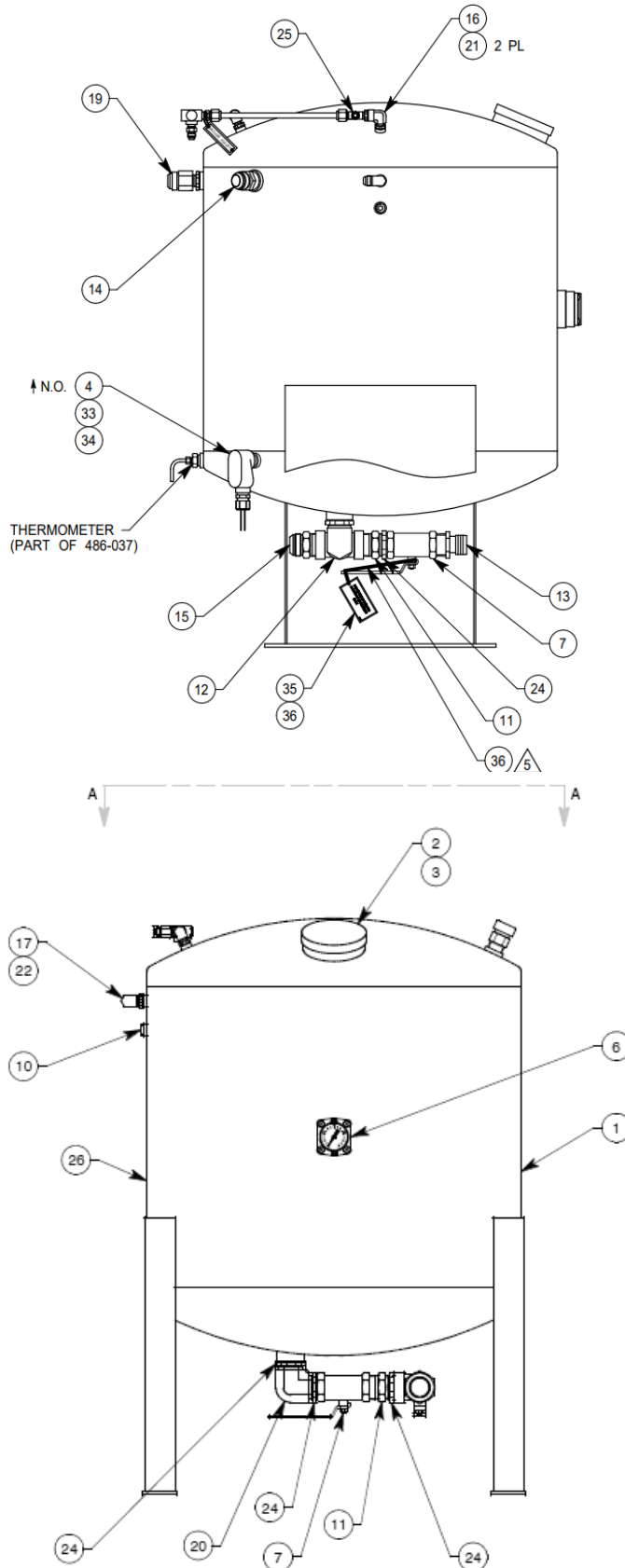
When ordering replacement parts/kits, please specify model, serial number and color of your unit.



Item	Part Number	Description	Qty
	1006147	VACUUM PUMP ASSEMBLY ; consist of:	
1	442-063	VACUUM PUMP	1
2	472-007	MUFFLER, 1/4 MPT	1
3	486-034	TRAP, 1/4 FPT	1
4	711-101	NIPPLE, 1/4 MPT x 1/4 MPT	1
5	722-069	ELBOW, 3/8 MALE 37° x 1/4 MPT	1
6	719-055	SEAL NUT, 1/4 FPT	3
7	450-308	MALE CONNECTOR, METRI-PACK 150	1
8	450-328	MALE TERMINAL, 16/18 AWG	2
9	450-327	CABLE SEAL, RED	2
10	450-299	TPA, 2 POSITION	1
11	450-530	CAPACITOR, 0.47 MICROFARAD	1

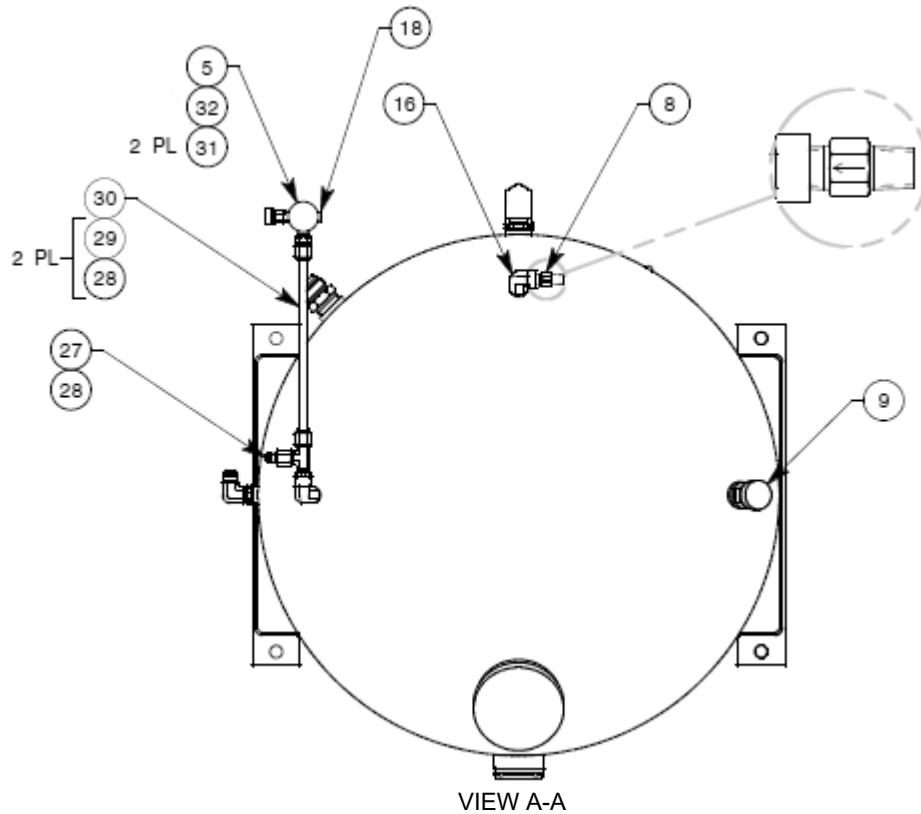
Parts List- Delivery Reservoir Assembly

When ordering replacement parts/kits, please specify model, serial number and color of your unit.



Parts List- Delivery Reservoir Assembly

When ordering replacement parts/kits, please specify model, serial number and color of your unit.



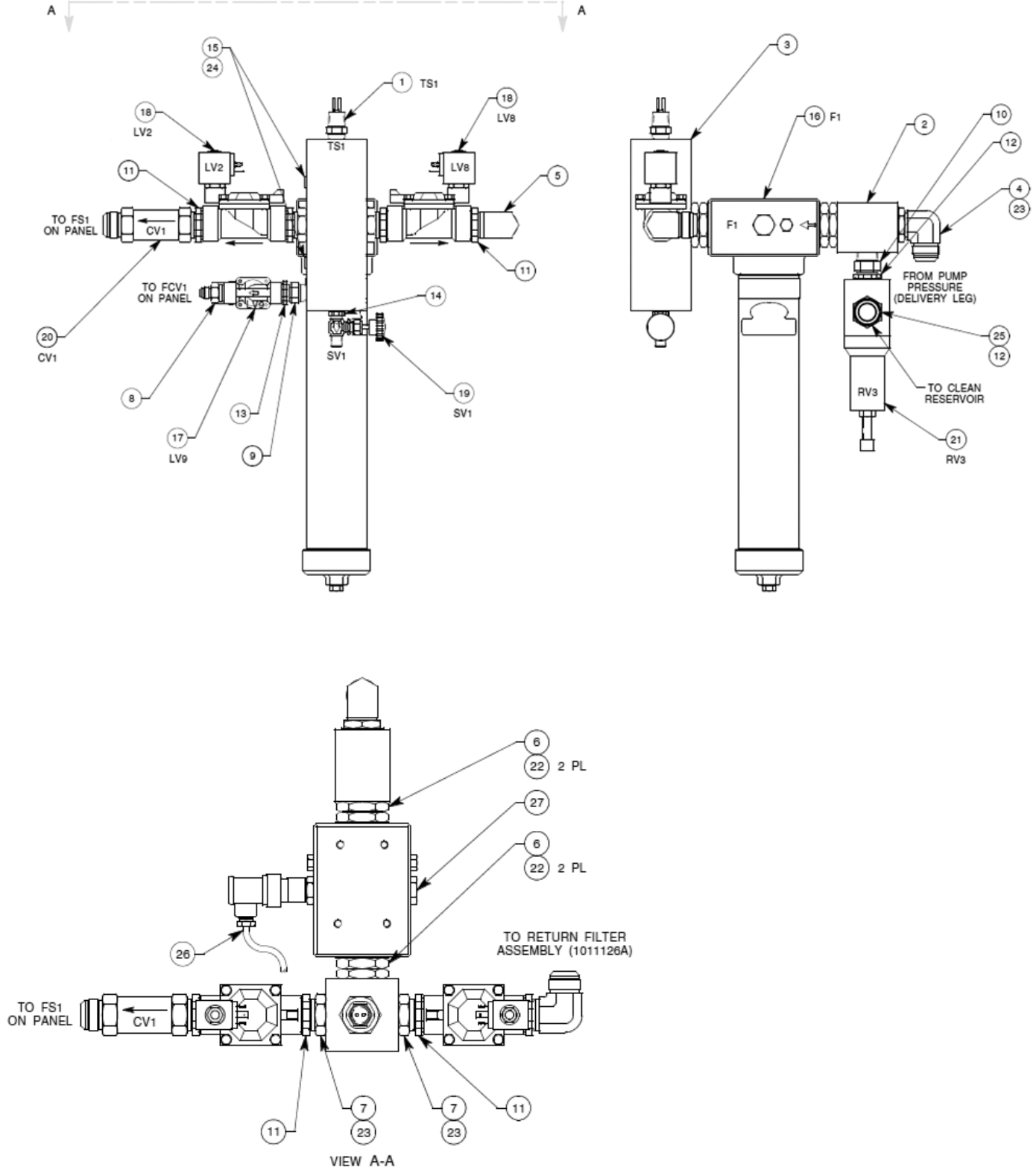
Parts List– Delivery Reservoir Assembly

When ordering replacement parts/kits, please specify model, serial number and color of your unit.

Item	Part Number	Description	Qty
	1011099A-1	DELIVERY RESERVOIR ASSEMBLY ; consist of:	
1	1011158A	RESERVOIR WELDMENT	1
2	483-029	FILL CAP	1
3	483-030	STRAINER	1
4	484-038	OIL LEVEL SWITCH ASSEMBLY	1
5	473-100	VACUUM REGULATOR	1
6	482-099	LIQUID LEVEL GAUGE	1
7	424-065	BALL VALVE, 1-1/4 FPT	2
8	422-079	CHECK VALVE, 1/4 MPT	1
9	423-075	RELIEF VALVE, 3/4 MPT	1
10	717-083	HOLLOW HEX PLUG, 3/8 MPT	1
11	711-113	NIPPLE, 1-1/4 MPT x 1-1/4 MPT	2
12	713-057	TEE, 1-1/4 FPT x 1-1/4 FPT x 1-1/4 FPT	1
13	719-063	CONN., 1-1/4 MPT x 1-1/4 HOSE BARB	1
14	721-163	CONNECTOR, 1" MALE 37° x 1" MPT	1
15	721-195	CONNECTOR, 1-1/4 MALE 37° x 1-1/4 MPT	1
16	712-077	ELBOW, 1/4 MPT x 1/4 FPT	2
17	722-14	ELBOW, 1/2 MALE 37° x 3/8 MPT	1
18	717-006	PLUG, 1/4 MPT	1
19	721-162	CONNECTOR, 1" MALE 37° x 3/4 MALE PIPE	1
20	712-110	ELBOW, 1-1/4 MPT x 1-1/4 MPT	1
21	719-055	SEAL NUT, 1/4 FPT	2
22	719-056	SEAL NUT, 3/8 FPT	1
24	719-060	SEAL NUT, 1-1/4 FPT	4
25	723-059	TEE, 3/8 37° x 3/8 37° x 1/4 MPT	1
26	499-101	ARMAFLEX INSULATION	3
27	714-048	REDUCER, 3/8 37° x 1/4 37°	1
28	729-092	NUT, 3/8 37°	3
29	729-091	SLEEVE, 3/8 37°	2
30	732-024	TUBE, 3/8 x .035 WALL x 10" LG	AR
31	721-124	CONNECTOR, 3/8 MALE 37° x 1/4 MPT	2
32	1006175	PLACARD, VACUUM ADJUST	1
33	450-704	CONDUIT BODY, 1/2 SLB, ALUMINUM	1
34	450-669	CORD GRIP, 1/2 NPT x .17-.45 GRIP	1

Parts List- Supply Filter Assembly

When ordering replacement parts/kits, please specify model, serial number and color of your unit.



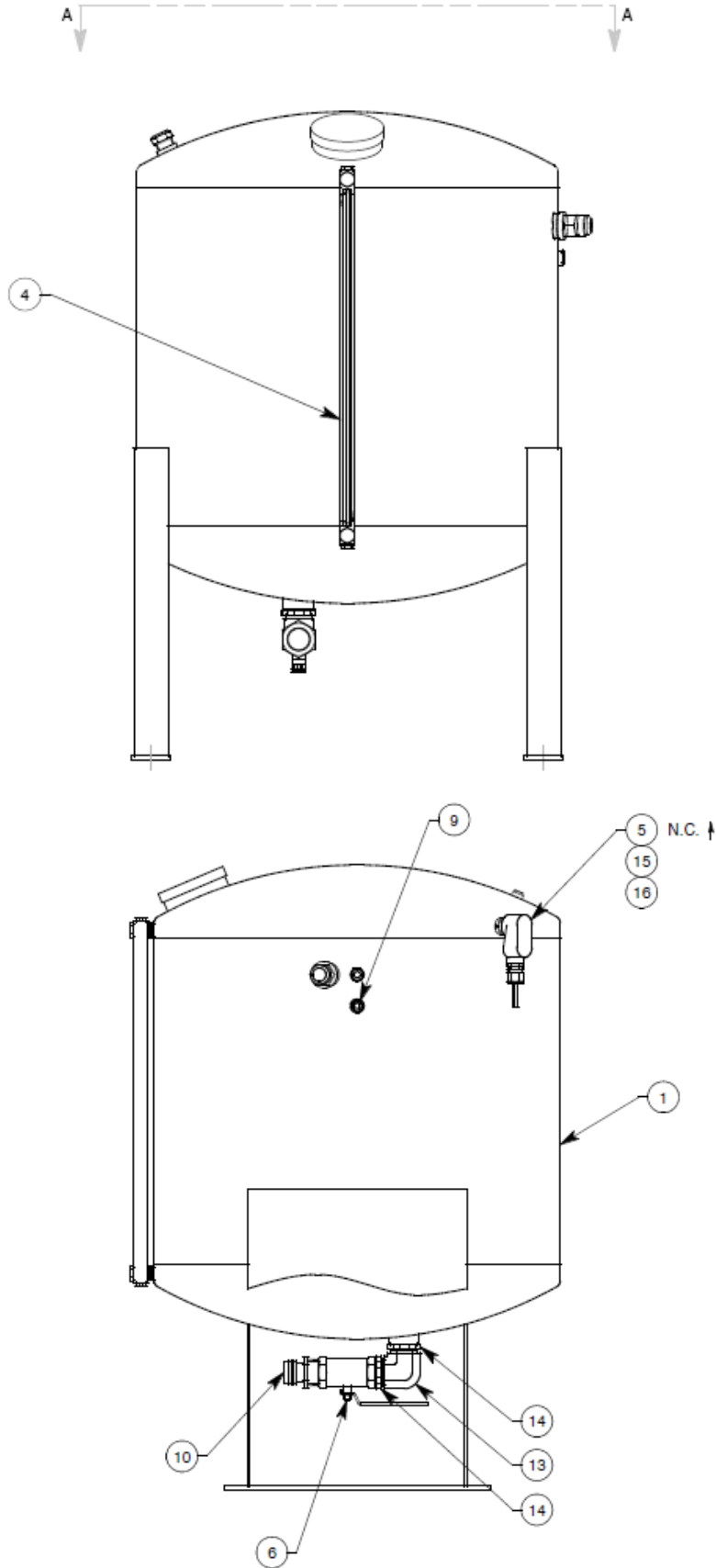
Parts List– Supply Filter Assembly

When ordering replacement parts/kits, please specify model, serial number and color of your unit.

Item	Part Number	Description	Qty
	1011125A	SUPPLY FILTER ASSEMBLY ; consist of:	
1	450-464	TEMPERATURE SWITCH ASSEMBLY	1
2	1011135A	SUPPLY FILTER INLET MANIFOLD	1
3	1011136A	SUPPLY FILTER OUTLET MANIFOLD	1
4	722-153	ELBOW, 1" MALE 37° x 1" MALE SAE	1
5	722-139	ELBOW, 1" MALE 37° x 1" MPT	1
6	721-180	CONNECTOR, 1-1/4 MALE SAE	2
7	721-167	CONNECTOR, 1" MPT x 1" MALE SAE	2
8	721-186	CONNECTOR, 3/8 MALE 37° x 1/2 MPT	1
9	711-119	NIPPLE, 1/2 MPT	1
10	711-091	NIPPLE, 3/4 MPT	1
11	719-059	SEAL NUT, 1" FPT	4
12	719-058	SEAL NUT, 3/4 FPT	2
13	719-057	SEAL NUT, 1/2 FPT	1
14	719-055	SEAL NUT, 1/4 FPT	1
15	717-090	PLUG, SOCKET HEAD, 1/4 SAE	2
16	481-110	FILTER ASSEMBLY, 3 MICRON	1
17	424-063	SHUTOFF VALVE, 1/2 FPT	1
18	424-061	SHUTOFF VALVE, 1 FPT	2
19	424-003	NEEDLE VALVE, 1/4 MPT	1
20	422-087	CHECK VALVE, 1" MPT x 1" 37° FLARE	1
21	423-076	PRESSURE REGULATOR, 3/4 FPT	1
22	55933-920	O-RING, 1-1/4	4
23	55933-916	O-RING, 1	3
24	55933-904	O-RING, 1/4	2
25	721-162	CONNECTOR, 1" MALE 37° x 3/4 MPT	1
26	450-706	CABLE, #18-3, SJOOW x 42" LG	AR
27	481-145	FILTER BLANKING PLUG	1

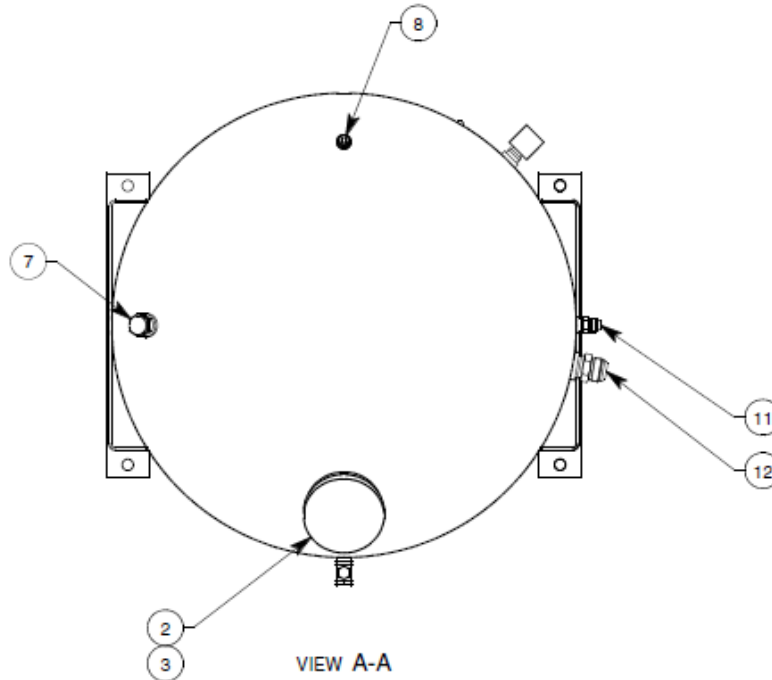
Parts List- Return Reservoir Assembly

When ordering replacement parts/kits, please specify model, serial number and color of your unit.



Parts List- Return Reservoir Assembly

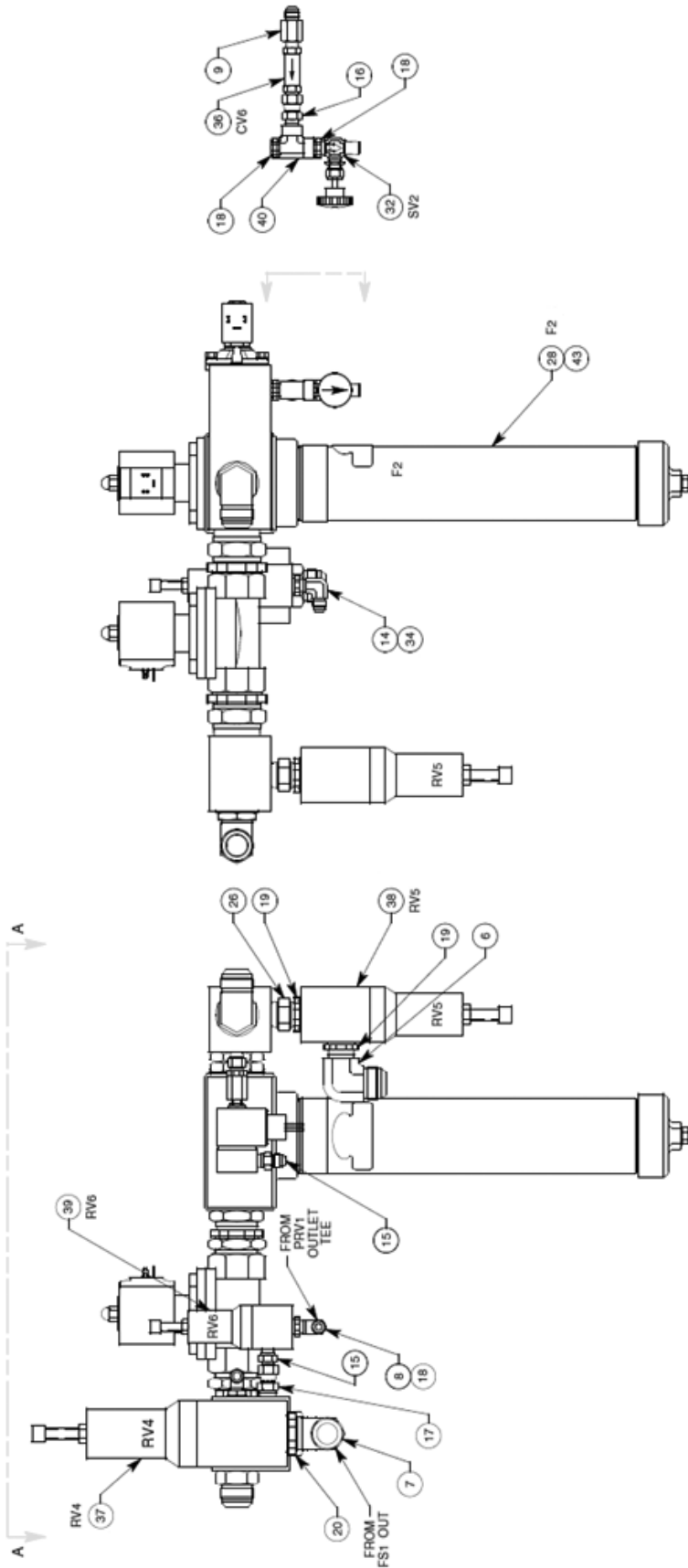
When ordering replacement parts/kits, please specify model, serial number and color of your unit.



Item	Part Number	Description	Qty
	1011099A-2	RETURN RESERVOIR ASSEMBLY ; consist of:	
1	1011157	RESERVOIR WELDMENT	1
2	483-029	FILL CAP	1
3	483-030	STRAINER	1
4	484-037	FLUID SIGHT GAUGE	
5	484-038	OIL LEVEL SWITCH ASSEMBLY	1
6	424-065	BALL VALVE, 1-1/4 FPT	2
7	483-031	BREATHER, 3/4 MPT	
8	717-064	HOLLOW HEX PLUG, 1/4 MPT	
9	717-083	HOLLOW HEX PLUG, 3/8 MPT	1
10	719-063	CONN., 1-1/4 MPT x 1-1/4 HOSE BARB	1
11	721-141	CONNECTOR, 1/2 MALE 37° x 3/8 MPT	
12	721-163	CONNECTOR, 1" MALE 37° x 1" MPT	1
13	712-110	ELBOW, 1-1/4 MPT x 1-1/4 MPT	1
14	719-060	SEAL NUT, 1-1/4 FPT	14
15	450-704	CONDUIT BODY, 1/2 SLB, ALUMINUM	1
16	450-669	CORD GRIP, 1/2 NPT x .17-.45 GRIP	1

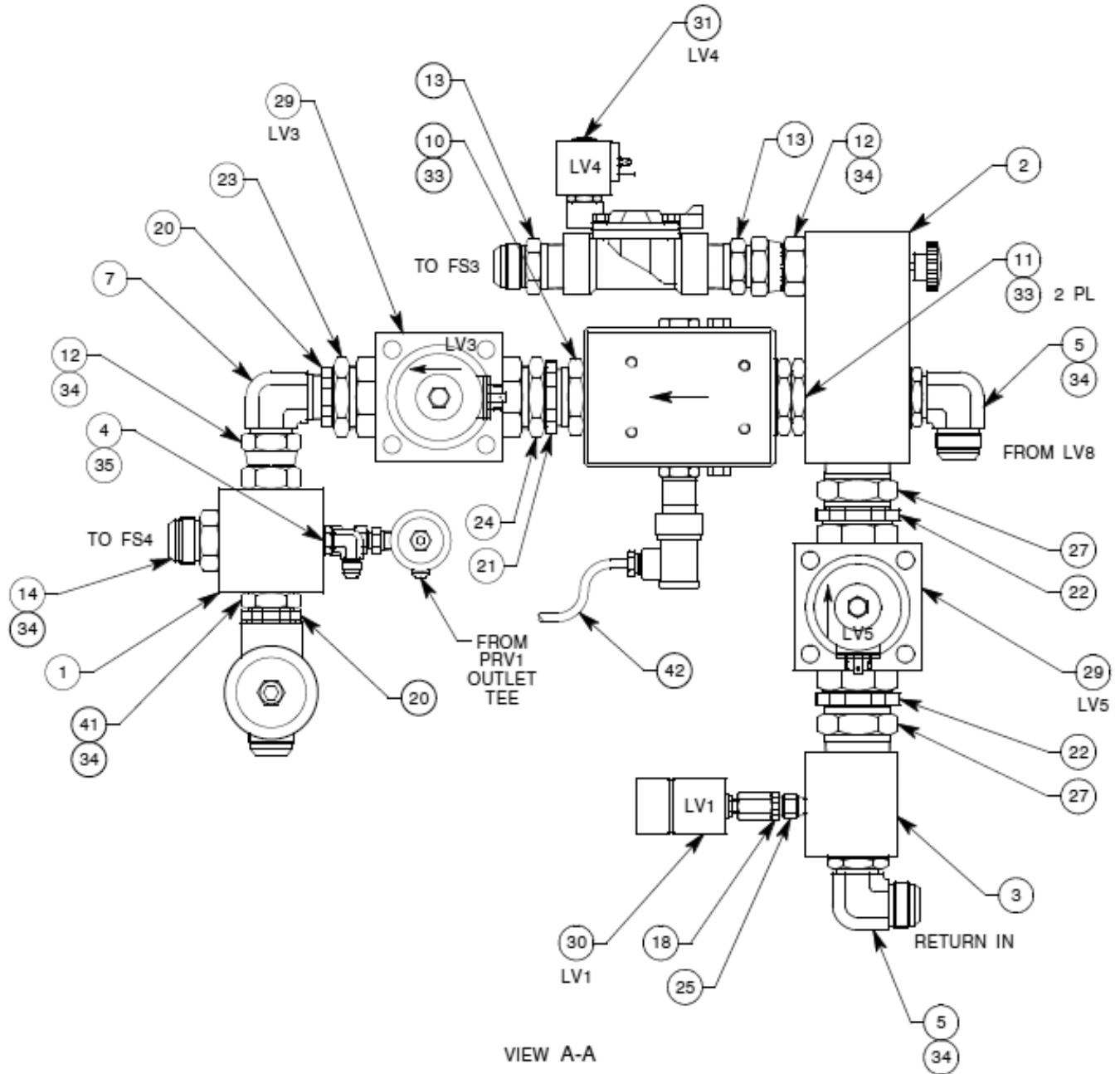
Parts List- Return Filter Assembly

When ordering replacement parts/kits, please specify model, serial number and color of your unit.



Parts List- Return Filter Assembly

When ordering replacement parts/kits, please specify model, serial number and color of your unit.



Parts List– Return Filter Assembly

When ordering replacement parts/kits, please specify model, serial number and color of your unit.

Item	Part Number	Description	
	1011126A	RETURN FILTER ASSEMBLY ; consist of:	
1	1011137	RETURN FILTER OUTLET MANIFOLD	1
2	1011138A	RETURN FILTER INLET MANIFOLD	1
3	1011139A	VALVE INLET MANIFOLD	1
4	722-089	ELBOW, 3/8 MALE 37° X 3/8 SAE	1
5	722-153	ELBOW, 1" MALE 37° x 1" MALE SAE	2
6	722-151	ELBOW, 1" MALE 37° x 3/4 MPT	1
7	722-139	ELBOW, 1" MALE 37° x 1" MPT	2
8	722-069	ELBOW, 3/8 MALE 37° x 1/4 MPT	1
9	721-121	CONNECTOR, 3/8 MALE 37° x 1/4 FPT	1
10	721-196	CONNECTOR, 1-1/4 MPT x 1-1/4 SAE	1
11	721-180	CONNECTOR, 1-1/4 MALE SAE	1
12	721-165	CONNECTOR, 1" SWIVEL x 1" SAE	2
13	721-163	CONNECTOR, 1" MALE 37° x 1" MPT	2
14	721-159	CONNECTOR, 1" MALE 37° x 1" SAE	2
15	721-124	CONNECTOR, 3/8 MALE 37° x 1/4 MPT	2
16	721-173	ADAPTER, 3/8 37° SWIVEL x 1/4 MPT	1
17	721-200	ADAPTER, 3/8 37° SWIVEL x 3/8 MPT	1
18	719-055	SEAL NUT, 1/4 FPT	4
19	719-058	SEAL NUT, 3/4 FPT	2
20	719-059	SEAL NUT, 1" FPT	3
21	719-60	SEAL NUT, 1-1/4 FPT	1
22	719-69	SEAL NUT, 1-1/2 FPT	2
23	714-064	REDUCER, 1-1/2 MPT x 1" FPT	1
24	174-065	REDUCER, 1-1/2 MPT x 1-1/4 FPT	1
25	711-101	NIPPLE, 1/4 MPT x 1/4 MPT	1
26	711-091	NIPPLE, 3/4 MPT	1
27	711-122	NIPPLE, 1-1/2 MPT x 1-1/2 MPT	2
28	481-110	FILTER ASSEMBLY, 3 MICRON	1
29	424-072	SHUTOFF VALVE, 120 PSI, 1-1/2 FPT	2
30	424-068	SHUTOFF VALVE, 250 PSI, 1/4 FPT	1
31	424-061	SHUTOFF VALVE, 230 PSI, 1" FPT	1
32	424-003	NEEDLE VALVE, 1/4 MPT	1
33	55933-920	O-RING, 1-1/4	3
34	55933-916	O-RING, 1	7
35	55933-906	O-RING, 3/8	1
36	422-076	CHECK VALVE, 1/4 MPT x 3/8 male 37°	1
37	432-077	RELIEF VALVE, 1" FPT	1
38	423-078	RELIEF VALVE, 3/4 FPT	1
39	423-079	RELIEF VALVE, 1/4 FPT	1
40	713-026	TEE, 1/4 MPT x 1/4 FPT x 1/4 FPT	1
41	721-167	CONNECTOR, 1" MPT x 1 SAE	1
42	450-706	CABLE, #18-3, SJOOW x 42" LG	AR
43	481-113	FILTER ELEMENT, 12 MICRON	1



APPENDIX I

Electrical Schematic

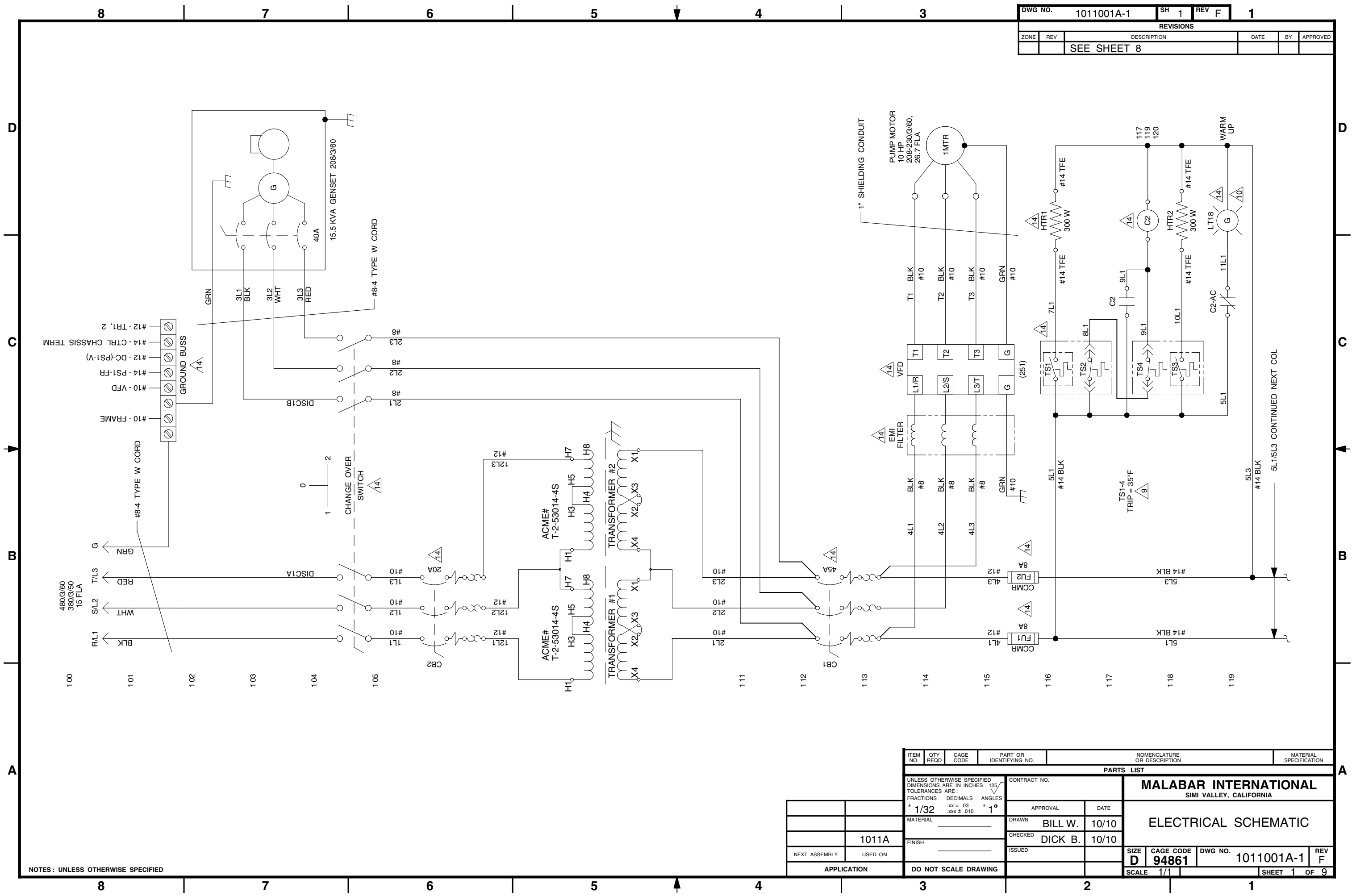
1011001A-1

1011001A-2

1011001A-3

1011001A-4

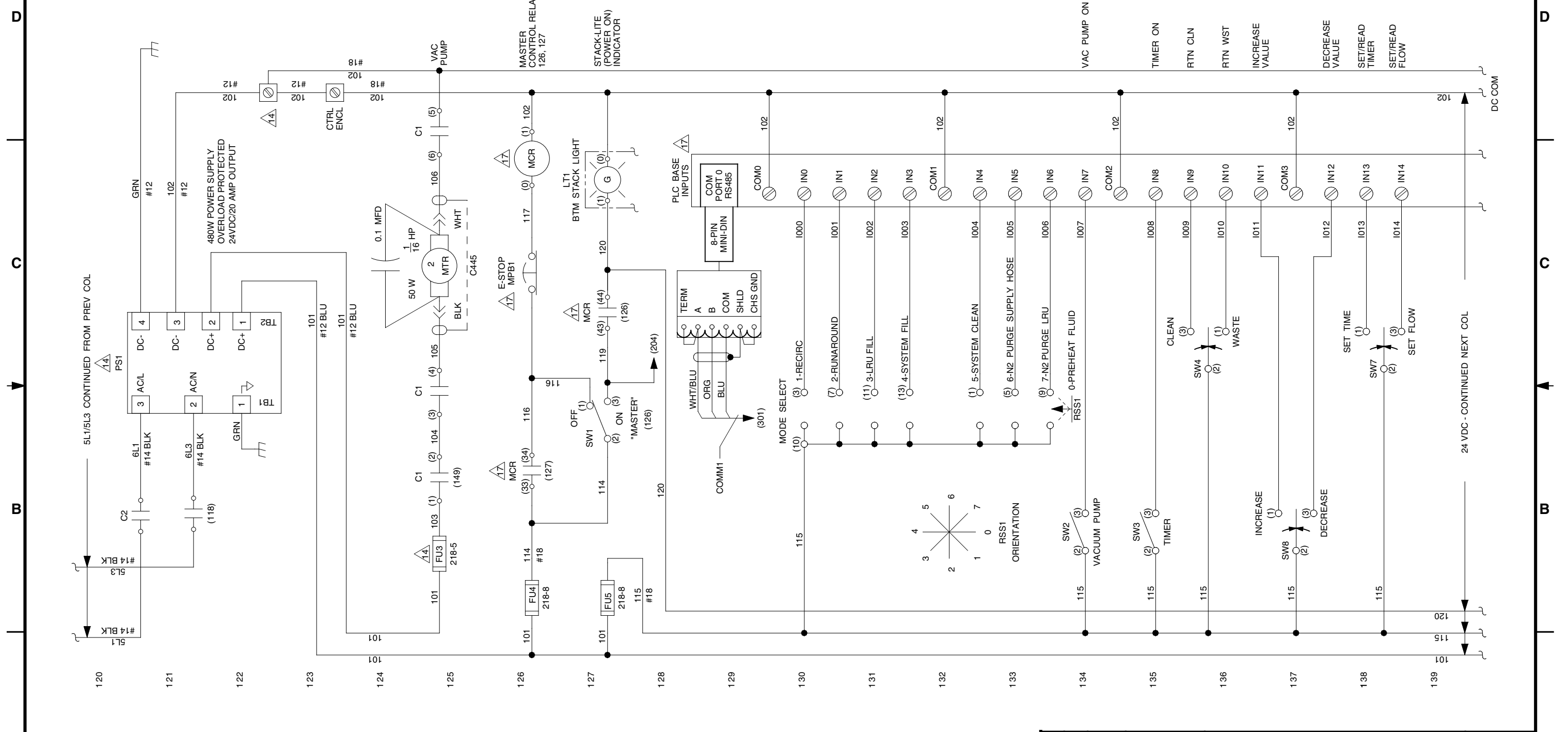
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REVISIONS						
ZONE	REV	DESCRIPTION	DATE	BY	APPROVED	
		SEE SHEET 8				



NOTES : UNLESS OTHERWISE SPECIFIED

ITEM NO.	QTY	CAGE CODE	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MATERIAL SPECIFICATION
PARTS LIST					
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES 125 TOLERANCES ARE :				CONTRACT NO.	
FRACTIONS	DECIMALS	ANGLES		MALABAR INTERNATIONAL SIMI VALLEY, CALIFORNIA	
± 1/32	.xx ± .03	± 1°			
MATERIAL				APPROVAL	DATE
FINISH				DRAWN	10/10
NEXT ASSEMBLY USED ON				CHECKED	10/10
APPLICATION				ISSUED	
DO NOT SCALE DRAWING				SIZE	D
				CAGE CODE	94861
				DWG NO.	1011001A-1
				SCALE	1/1
				REV	F
				SHEET	1 OF 9

DWG NO.	1011001A-1	SH	2	REV	F	1
REVISIONS						
ZONE	REV	DESCRIPTION	DATE	BY	APPROVED	
		SEE SHEET 8				



NOTES: UNLESS OTHERWISE SPECIFIED

ITEM NO.	QTY REQD	CAGE CODE	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MATERIAL SPECIFICATION
PARTS LIST					
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES 125 TOLERANCES ARE: FRACTIONS DECIMALS ANGLES ± 1/32 ± .03 ± 1°				CONTRACT NO.	
MATERIAL				APPROVAL	DATE
FINISH				DRAWN	10/10
NEXT ASSEMBLY				CHECKED	10/10
ISSUED					
APPLICATION		DO NOT SCALE DRAWING		SIZE	DWG NO.
				D	1011001A-1
				SCALE	REV
				1/1	F
				SHEET 2 OF 9	

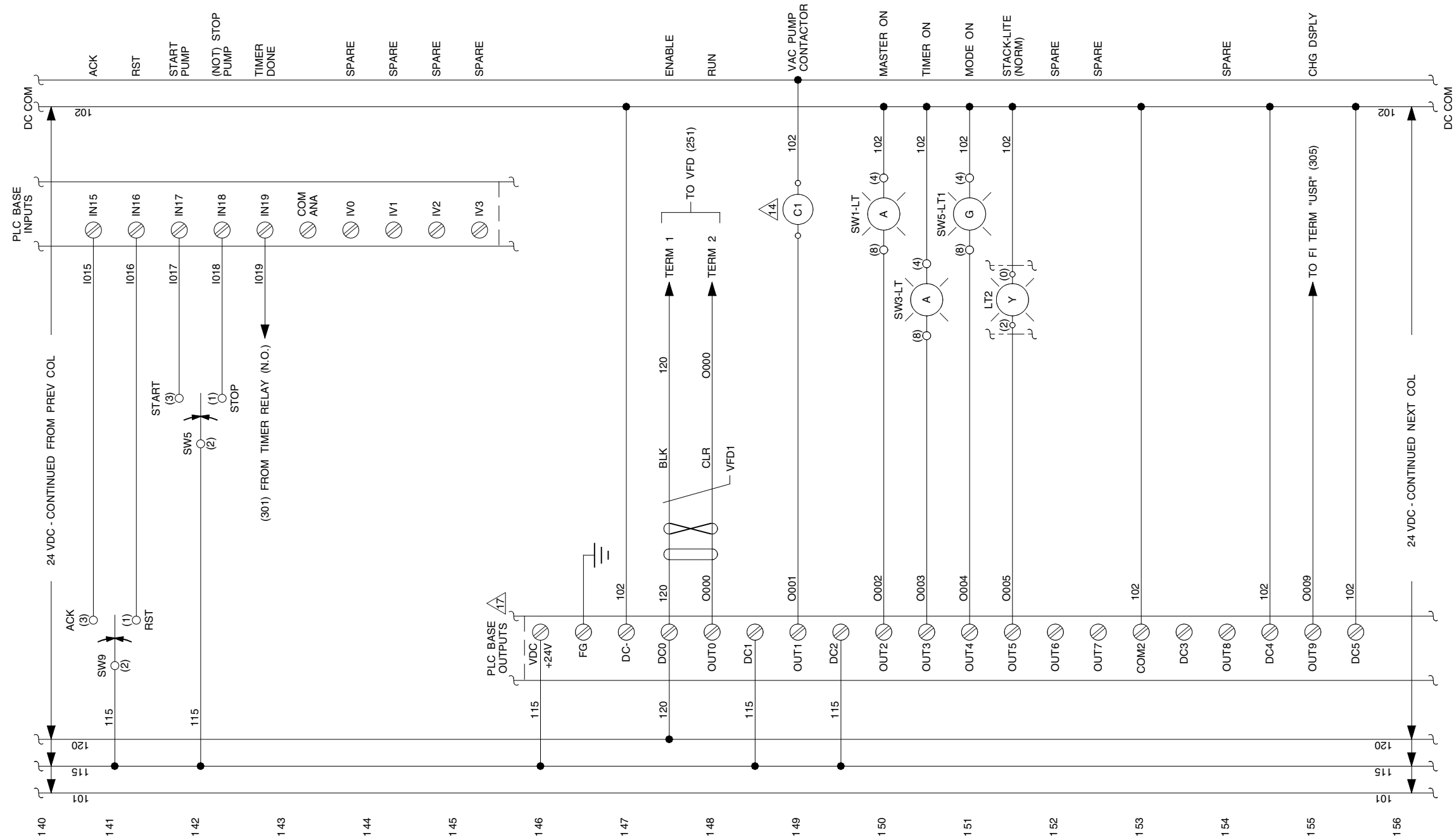
MALABAR INTERNATIONAL
SIMI VALLEY, CALIFORNIA

ELECTRICAL SCHEMATIC

1011A
USED ON

SCALE 1/1 SHEET 2 OF 9

DWG NO. 1011001A-1		SH 3	REV F	1
REVISIONS				
ZONE	REV	DESCRIPTION	DATE	APPROVED
		SEE SHEET 8		



NOTES : UNLESS OTHERWISE SPECIFIED

ITEM NO.	QTY REQD	CAGE CODE	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MATERIAL SPECIFICATION
PARTS LIST					
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES 125 TOLERANCES ARE:				MALABAR INTERNATIONAL SIMI VALLEY, CALIFORNIA	
FRACTIONS DECIMALS ANGLES					
± 1/32 .xx ± .03 ± 1°				CONTRACT NO.	
MATERIAL				APPROVAL	
FINISH				DATE	
NEXT ASSEMBLY USED ON				DRAWN BILL W. 10/10	
APPLICATION				CHECKED DICK B. 10/10	
DO NOT SCALE DRAWING				ISSUED	
SIZE D		CAGE CODE 94861		DWG NO. 1011001A-1	
SCALE 1/1		SHEET 3		REV F	

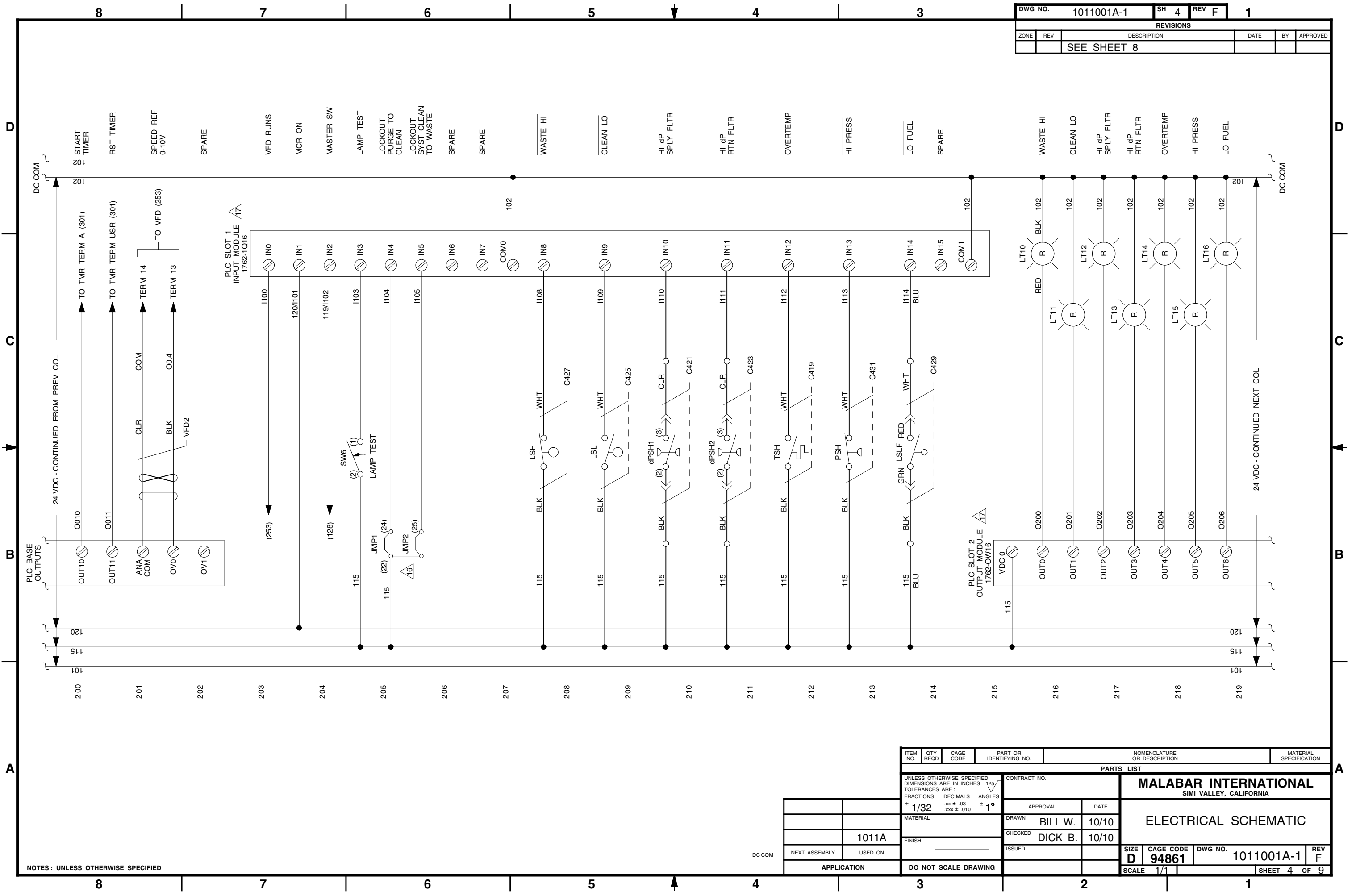
8 7 6 5 4 3

8 7 6 5 4 3 2 1

D
C
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A

D
C
B
A

DWG NO.	1011001A-1	SH	4	REV	F	1
REVISIONS						
ZONE	REV	DESCRIPTION	DATE	BY	APPROVED	
		SEE SHEET 8				

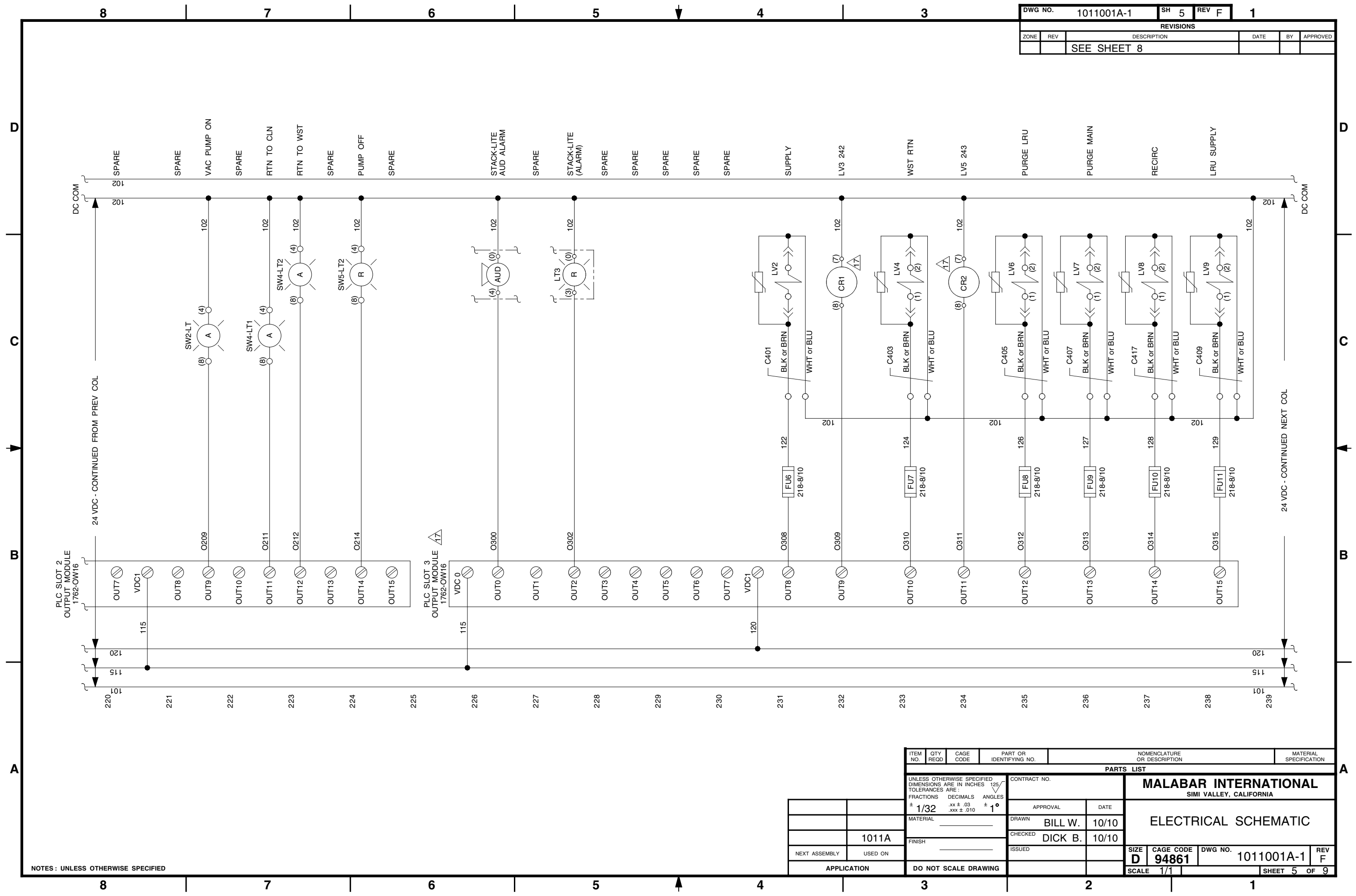


NOTES : UNLESS OTHERWISE SPECIFIED

ITEM NO.	QTY REQD	CAGE CODE	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MATERIAL SPECIFICATION																	
PARTS LIST																						
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE:				<table border="1"> <tr> <td colspan="2">CONTRACT NO.</td> <td colspan="2" rowspan="2"> MALABAR INTERNATIONAL SIMI VALLEY, CALIFORNIA </td> </tr> <tr> <td>APPROVAL</td> <td>DATE</td> </tr> <tr> <td>DRAWN</td> <td>BILL W.</td> <td>10/10</td> <td colspan="2" rowspan="3"> ELECTRICAL SCHEMATIC </td> </tr> <tr> <td>CHECKED</td> <td>DICK B.</td> <td>10/10</td> </tr> <tr> <td>ISSUED</td> <td></td> <td></td> </tr> </table>		CONTRACT NO.		MALABAR INTERNATIONAL SIMI VALLEY, CALIFORNIA		APPROVAL	DATE	DRAWN	BILL W.	10/10	ELECTRICAL SCHEMATIC		CHECKED	DICK B.	10/10	ISSUED		
CONTRACT NO.		MALABAR INTERNATIONAL SIMI VALLEY, CALIFORNIA																				
APPROVAL	DATE																					
DRAWN	BILL W.	10/10	ELECTRICAL SCHEMATIC																			
CHECKED	DICK B.	10/10																				
ISSUED																						
MATERIAL _____ FINISH _____				<table border="1"> <tr> <td>SIZE</td> <td>CAGE CODE</td> <td>DWG NO.</td> <td>REV</td> </tr> <tr> <td>D</td> <td>94861</td> <td>1011001A-1</td> <td>F</td> </tr> <tr> <td>SCALE</td> <td>1/1</td> <td colspan="2">SHEET 4 OF 9</td> </tr> </table>		SIZE	CAGE CODE	DWG NO.	REV	D	94861	1011001A-1	F	SCALE	1/1	SHEET 4 OF 9						
SIZE	CAGE CODE	DWG NO.	REV																			
D	94861	1011001A-1	F																			
SCALE	1/1	SHEET 4 OF 9																				
NEXT ASSEMBLY		USED ON		APPLICATION																		
				DO NOT SCALE DRAWING																		

DC COM

DWG NO.	1011001A-1	SH	5	REV	F	1	
REVISIONS							
ZONE	REV	DESCRIPTION			DATE	BY	APPROVED
SEE SHEET 8							



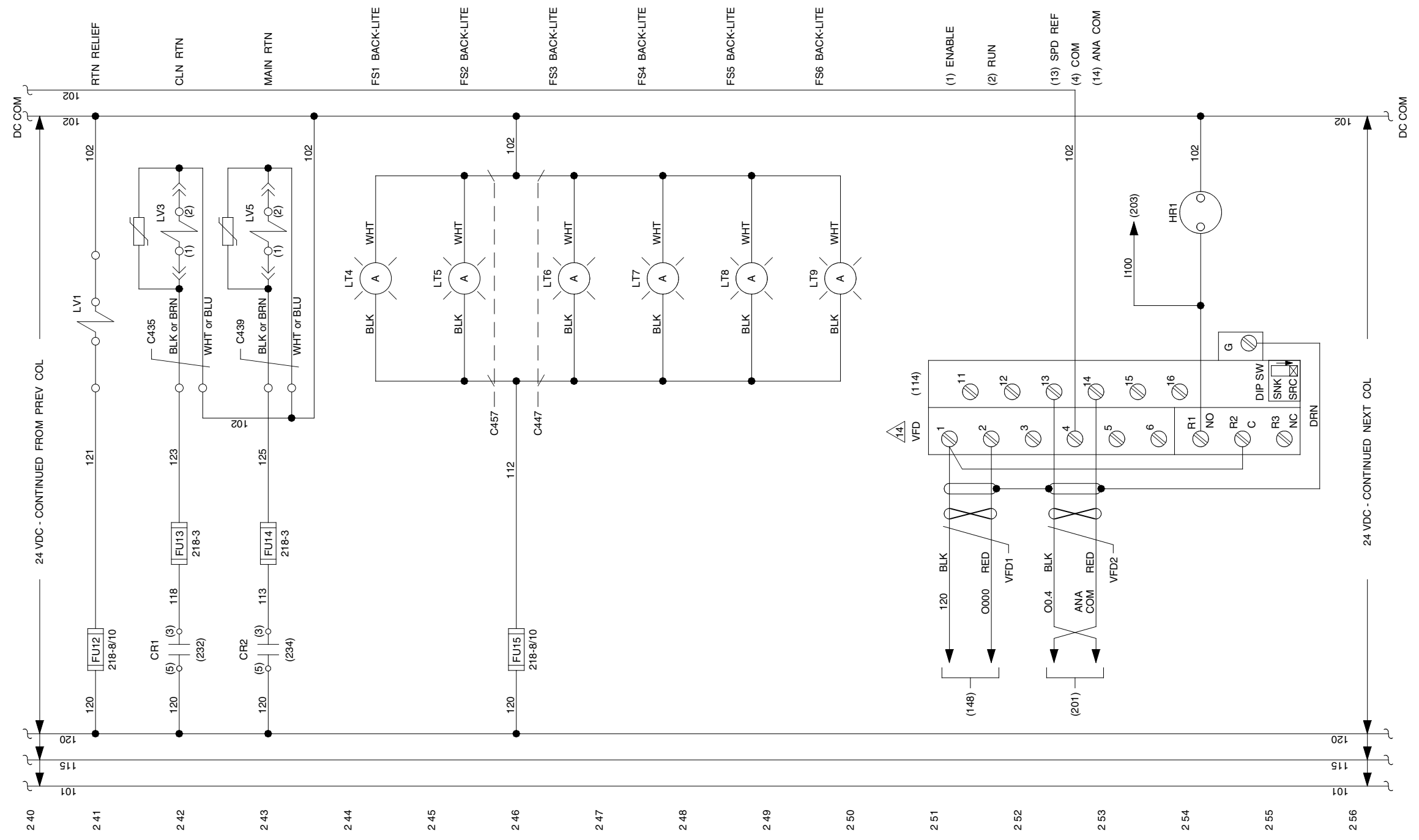
NOTES: UNLESS OTHERWISE SPECIFIED

ITEM NO.	QTY REQD	CAGE CODE	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MATERIAL SPECIFICATION
PARTS LIST					
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES 1/32 TOLERANCES ARE:				CONTRACT NO.	
FRACTIONS ± 1/32		DECIMALS .xx ± .03 .xxx ± .010		APPROVAL DATE	
ANGLES ± 1°		FINISH		DRAWN BILL W. 10/10	
NEXT ASSEMBLY USED ON		APPLICATION DO NOT SCALE DRAWING		CHECKED DICK B. 10/10	
				ISSUED	
				SIZE D CAGE CODE 94861 DWG NO. 1011001A-1 REV F	
				SCALE 1/1 SHEET 5 OF 9	

MALABAR INTERNATIONAL
SIMI VALLEY, CALIFORNIA

ELECTRICAL SCHEMATIC

DWG NO.	1011001A-1	SH	6	REV	F	1
REVISIONS						
ZONE	REV	DESCRIPTION	DATE	BY	APPROVED	
		SEE SHEET 8				



ITEM NO.	QTY REQD	CAGE CODE	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MATERIAL SPECIFICATION								
PARTS LIST													
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE:				<table border="1"> <tr> <td>APPROVAL</td> <td>DATE</td> </tr> <tr> <td>DRAWN</td> <td>10/10</td> </tr> <tr> <td>CHECKED</td> <td>10/10</td> </tr> <tr> <td>ISSUED</td> <td></td> </tr> </table>		APPROVAL	DATE	DRAWN	10/10	CHECKED	10/10	ISSUED	
APPROVAL	DATE												
DRAWN	10/10												
CHECKED	10/10												
ISSUED													
FRACTIONS	DECIMALS	ANGLES	<table border="1"> <tr> <td colspan="2" style="text-align: center;">MALABAR INTERNATIONAL</td> </tr> <tr> <td colspan="2" style="text-align: center;">SIMI VALLEY, CALIFORNIA</td> </tr> <tr> <td colspan="2" style="text-align: center;">ELECTRICAL SCHEMATIC</td> </tr> </table>			MALABAR INTERNATIONAL		SIMI VALLEY, CALIFORNIA		ELECTRICAL SCHEMATIC			
MALABAR INTERNATIONAL													
SIMI VALLEY, CALIFORNIA													
ELECTRICAL SCHEMATIC													
± 1/32	.xx ± .03	± 1°	<table border="1"> <tr> <td>SIZE</td> <td>CAGE CODE</td> <td>DWG NO.</td> <td>REV</td> </tr> <tr> <td>D</td> <td>94861</td> <td>1011001A-1</td> <td>F</td> </tr> </table>			SIZE	CAGE CODE	DWG NO.	REV	D	94861	1011001A-1	F
SIZE	CAGE CODE	DWG NO.	REV										
D	94861	1011001A-1	F										
MATERIAL			CONTRACT NO.										
FINISH			SCALE 1/1										
NEXT ASSEMBLY USED ON			SHEET 6 OF 9										
APPLICATION			DO NOT SCALE DRAWING										

NOTES: UNLESS OTHERWISE SPECIFIED

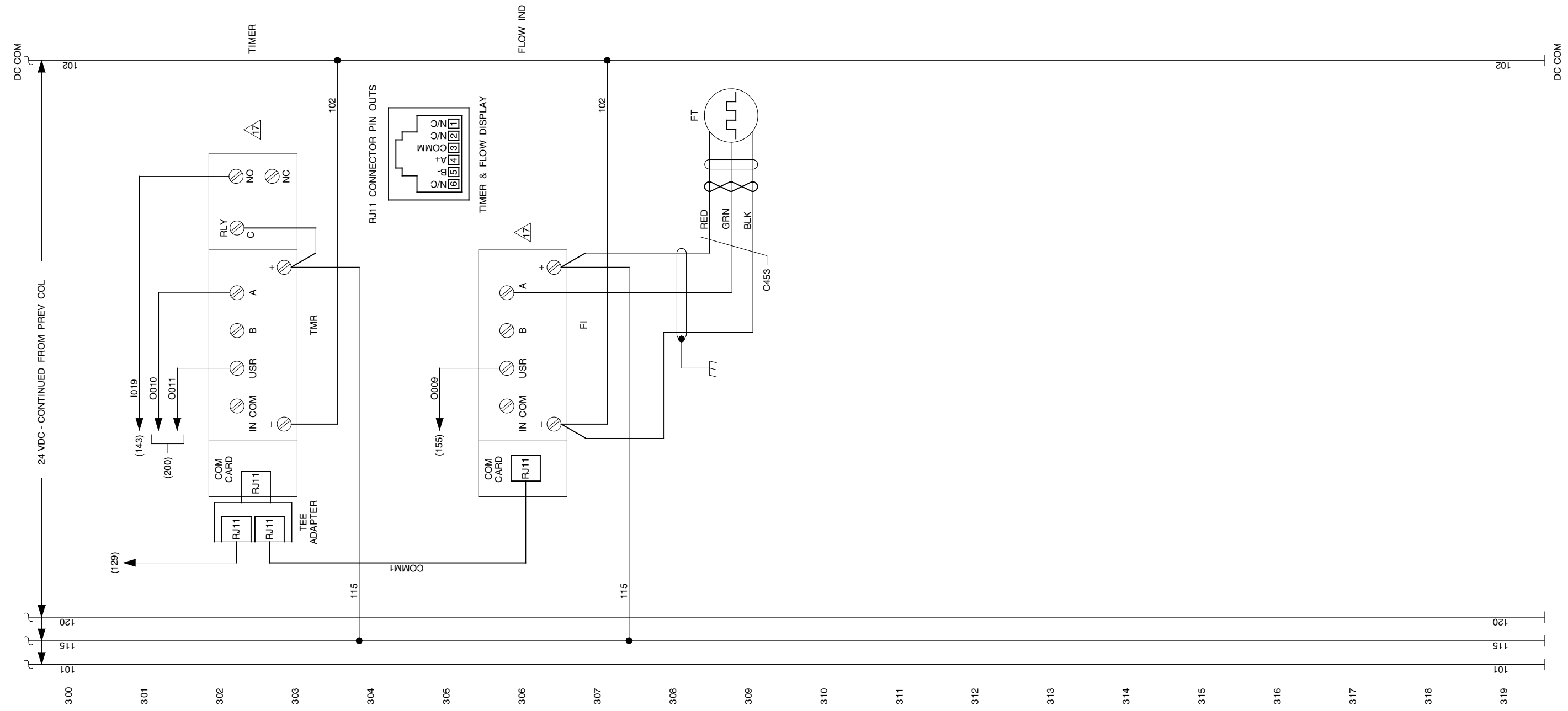
8 7 6 5 4 3

8 7 6 5 4 3 2 1

D
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A

D
C
B
A

DWG NO.	1011001A-1	SH 7	REV F	1
REVISIONS				
ZONE	REV	DESCRIPTION	DATE	BY
		SEE SHEET 8		



NOTES: UNLESS OTHERWISE SPECIFIED

ITEM NO.	QTY REQD	CAGE CODE	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MATERIAL SPECIFICATION
PARTS LIST					
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE:				CONTRACT NO.	
FRACTIONS	DECIMALS	ANGLES		APPROVAL	DATE
± 1/32	.xx ± .03	± 1°		DRAWN	BILL W. 10/10
	.xxx ± .010			CHECKED	DICK B. 10/10
MATERIAL				ISSUED	
FINISH					
NEXT ASSEMBLY	USED ON				
APPLICATION	DO NOT SCALE DRAWING				
			SIZE	CAGE CODE	DWG NO.
			D	94861	1011001A-1
			SCALE	1/1	REV F
			SHEET 7 OF 9		

MALABAR INTERNATIONAL
SIMI VALLEY, CALIFORNIA

ELECTRICAL SCHEMATIC

SCALE 1/1 SHEET 7 OF 9

DWG NO.	1011001A-1	SH 8	REV F	1	
REVISIONS					
ZONE	REV	DESCRIPTION	DATE	BY	APPROVED
	A	SEE ECN 5645	10/19/11	JW	BW
	B	SEE ECN 5684	1/16/12	TT	BW
	C	SEE ECN 5697	2/28/12	JW	BW
	D	SEE ECN 5757	6/15/12	BW	BW
	E	SEE ECN 5766	7/20/12	TT	BW
	F	SEE ECN 6031	9/12/14	BW	BW

Construction Notes:

- All wire & cord is stranded copper conductor. Solid conductor shall not be used.
 - Individual hook up wire, unspecified:
 - 18 awg & smaller - type MTW (600V) / H05V-K (300/500V)
 - 16 awg & larger - type MTW (600V) / H07V-K (450/750V)
 - Individual hook up wire, specified:
 - TFE - teflon hook up wire, NEMA HP-3 Type E (Mil-W-16878/4), 600V nom., 2 kV dielectric withstand voltage, NPC, -65 to 200°C
- Multi-Conductor Power Cords over 50 V, specified:
 - Utility Power Cord - type W (UL), 2000V, 90°C
 - Generator Power Cord - type W (UL), 2000V, 90°C
- Multi-Conductor Control & Actuator Cordage, less than 50V, unspecified:
 - Type SJOOOW or H05VVVF or SOOW
- Shielded instrument cable within enclosures (except flowmeter cable) is UL type TC, Belden 9341 or equal, (1) pair, 18 awg, 600V, 90°C
- Minimum wire size, unless otherwise noted, shall be:
 - 18 AWG for individual conductors
 - 22 AWG for multiconductor jacketed cable
- Wire sizes indicated are minimum. Larger sizes may be substituted.
- Wire color for individual wires shall be:
 - (Colored shrink-tube at wire termination may be used to designate wire color)
 - BLACK - Ungrounded conductors at line voltage (greater than 150 volts).
 - BLUE - Ungrounded DC control conductors. (DC+)
 - WHITE w/ BLUE Stripe - Grounded DC control conductors (DC-)
 - GREEN w/ YELLOW Stripe - Equipment ground conductor.
- Each wire shall be clearly marked at each termination with commercial wire markers, with the wire number or cable number shown on this schematic diagram.
- Grounding: All metal enclosures and panels exposed to electrical wiring shall be grounded. Use internal toothed star washer under ground lug on painted surfaces.
- Grounding conductors shall be copper. Conduit and enclosures shall not be used as a grounding conductor. Grounding conductors shall be sized per NFPA-70(NEC), Art. 250-95.
- Circuit shown de-energized and empty, 70°F ambient temperature.
- Wrap exposed terminals w/ glass tape: LT18.

General Notes:

- To restart after an EMERGENCY STOP, reset (twist-pull) E-Stop mushroom button and turn MASTER switch off and back on. Then restart.
- LAST WIRE NO. USED: 129, NOT USED: 107-111
- LAST CABLE NO. USED: C457
- $\triangle 14$ = Located in Electrical Enclosure Assembly power panel. See dwg 1011012A for Cord/Cable specifications.
- JMP 1 (Jumper 1): Remove jumper to enable Purge Return to Clean Reservoir. JMP 2 (Jumper 2): Remove jumper to enable System Clean Reservoir to Waste Reservoir.
- All 18 awg stranded wire may be terminated using non-insulated crimp-on ferrules for strand containment, unless otherwise specified. Panduit F77-7-M or equal (0.28 in. lg).

NOTES: UNLESS OTHERWISE SPECIFIED

ITEM NO.	QTY REQD	CAGE CODE	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MATERIAL SPECIFICATION
PARTS LIST					
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE:				CONTRACT NO. MALABAR INTERNATIONAL SIMI VALLEY, CALIFORNIA	
FRACTIONS	DECIMALS	ANGLES			
$\pm 1/32$.xx ± .03 .xxx ± .010	$\pm 1^\circ$		APPROVAL DATE DRAWN BILL W. 10/10 CHECKED DICK B. 10/10 ISSUED	
MATERIAL		FINISH		SIZE D CAGE CODE 94861 DWG NO. 1011001A-1 REV F	
NEXT ASSEMBLY		USED ON		SCALE 1/1 SHEET 8 OF 9	
APPLICATION			DO NOT SCALE DRAWING		

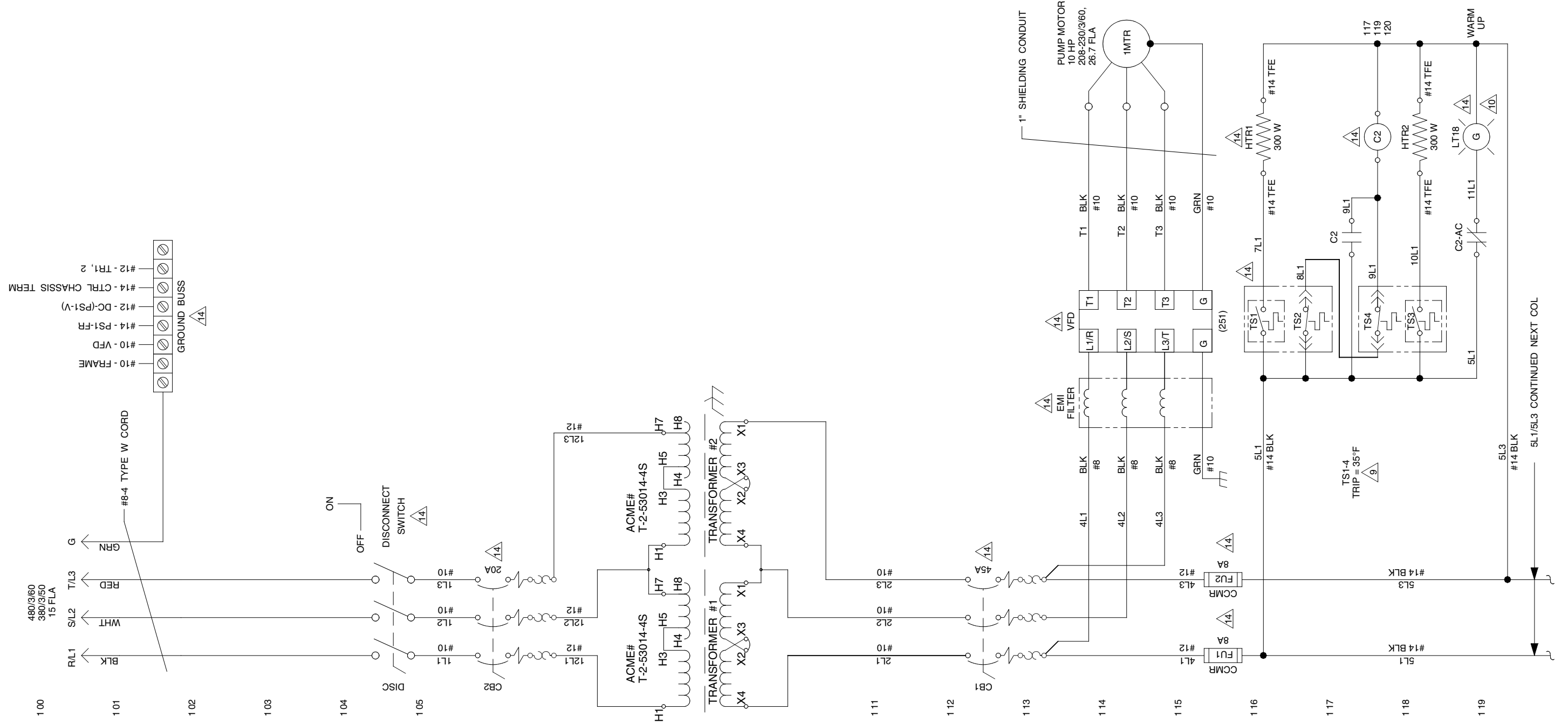
IEC CROSS REFERENCE LEGEND

IEC 617 SYMBOL	MALABAR SYMBOL	DEVICE DESCRIPTION
		RELAY OR CONTACTOR, NORMALLY OPEN CONTACT
		RELAY OR CONTACTOR, NORMALLY CLOSED CONTACT
		MANUAL SWITCH, SPDT, MAINTAINED
		RELAY OR CONTACTOR COIL
		CIRCUIT BREAKER THERMAL & MAGNETIC TRIP
		DISCONNECT SWITCH
		CHANGEOVER SWITCH
		MOTOR, 3-PHASE INDUCTION
		GENERATOR, 3-PHASE
		MOTOR, DC PERMANENT MAGNET
		LINE FILTER / REACTOR / TRANSFORMER
		MUSHROOM PUSHBUTTON, TWIST-LATCH
		FUSE
		MANUAL SWITCH, SPST, MAINTAINED
		MANUAL SWITCH, SPNO, MOMENTARY
		MANUAL SWITCH, SPDT, CENTER-OFF
		INDICATOR LAMP, SWITCH LAMP, PANEL LAMP, STACK LIGHT (LETTER INDICATES COLOR)
		CABLE MARKERS

IEC 617 SYMBOL	MALABAR SYMBOL	DEVICE DESCRIPTION
		SELECTOR SWITCH, ROTARY, 8-POSITION
		EQUIPOTENTIAL BOND (FRAME GROUND)
		SOLENOID VALVE
		PRESSURE SWITCH, OPEN ON RISE
		DIFFERENTIAL PRESSURE SWITCH, CLOSE ON RISE
		LEVEL SWITCH, CLOSE ON RISE
		LEVEL SWITCH, OPEN ON RISE
		THERMOSTAT, CLOSE ON RISE
		THERMOSTAT, OPEN ON RISE
		RESISTANCE HEATER ELEMENT
		BUZZER, AUDIBLE ALARM
		HOUR METER
		SPEED PICK-UP, PULSE OUTPUT
		VARISTOR
		PLUG / JACK
		TERMINALS
		SHIELD + DRAIN WIRE
		TWISTED WIRES, PAIRS OR TRIADS

NOTES: UNLESS OTHERWISE SPECIFIED

DWG NO.	1011001A-2	SH	1	REV	F	1
REVISIONS						
ZONE	REV	DESCRIPTION	DATE	BY	APPROVED	
		SEE SHEET 8				



480/3/60
380/350
15 FLA

#8-4 TYPE W CORD

#10 - FRAME
#10 - VFD
#14 - PS1-FR
#12 - DC-(PS1-V)
#14 - CTRL CHASSIS TERM
#12 - TR1, 2

GROUND BUSS

ON
OFF
DISCONNECT SWITCH

DISC
CB2

ACME# T-2-53014-4S
H1 H2 H3 H4 H5 H6 H7 H8
X1 X2 X3 X4

TRANSFORMER #1
X1 X2 X3 X4

TRANSFORMER #2
X1 X2 X3 X4

EMI FILTER
VFD

4L1 4L2 4L3
BLK #8 BLK #8 BLK #8
GRN #10

45A

1MTR
PUMP MOTOR
10 HP
208-230/3/60,
26.7 FLA

1" SHIELDING CONDUIT

HTR1
HTR2
300 W

TS1
TS2
TS3
TS4

9L1
9L2
9L3

10L1
10L2
10L3

11L1
11L2
11L3

12L1
12L2
12L3

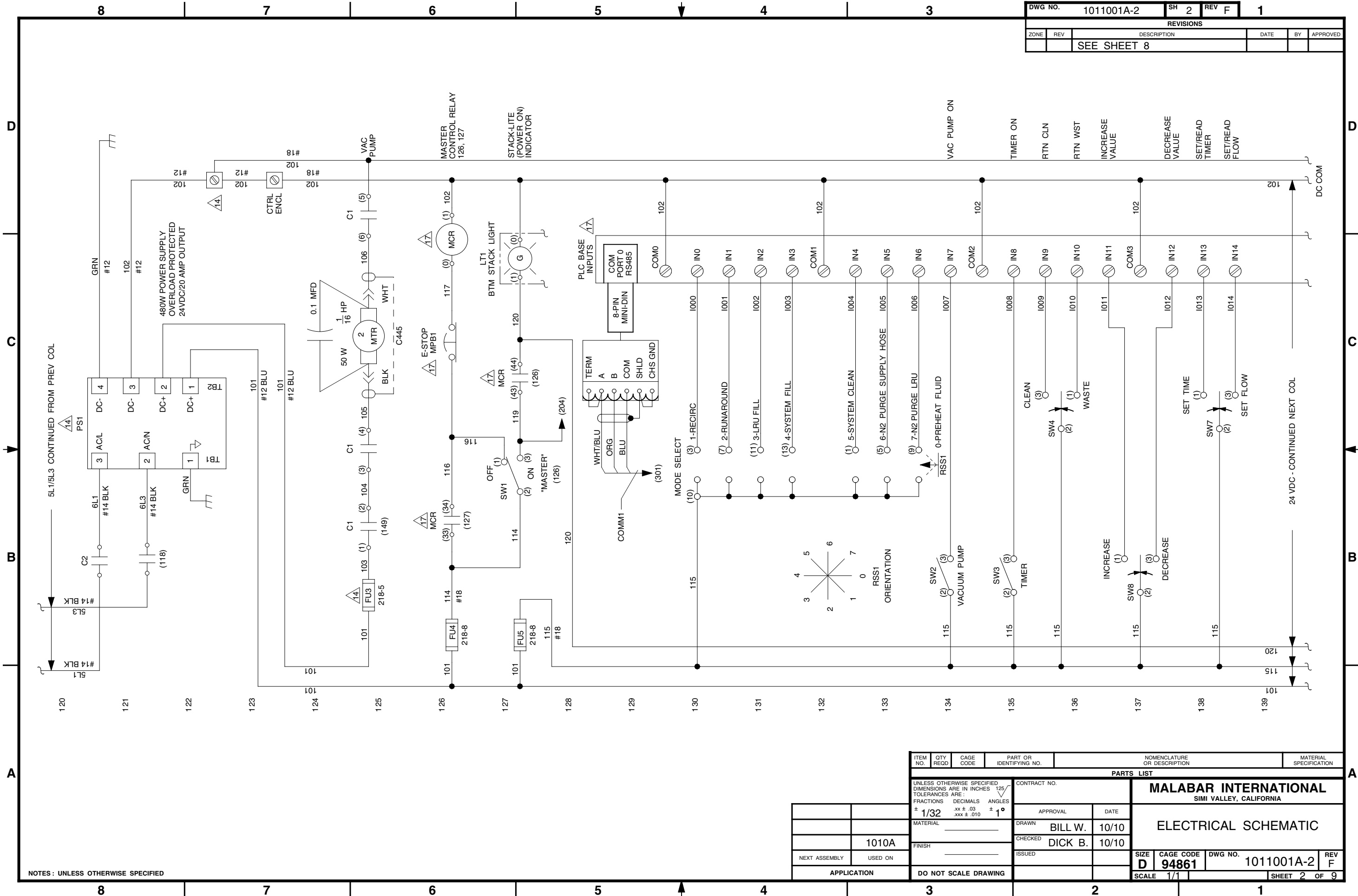
5L1
5L2
5L3

5L1/5L3 CONTINUED NEXT COL

ITEM NO.	QTY	CAGE	PART OR	NOMENCLATURE	MATERIAL
NO.	REQD	CODE	IDENTIFYING NO.	OR DESCRIPTION	SPECIFICATION
PARTS LIST					
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES 1/25 TOLERANCES ARE:			CONTRACT NO.		
FRACTIONS	DECIMALS	ANGLES	MALABAR INTERNATIONAL SIMI VALLEY, CALIFORNIA		
± 1/32	.xx ± .03	± 1°			
MATERIAL			APPROVAL	DATE	ELECTRICAL SCHEMATIC
FINISH			DRAWN	10/10	
NEXT ASSEMBLY USED ON			CHECKED	10/10	
APPLICATION			ISSUED		SIZE D CAGE CODE 94861 DWG NO. 1011001A-2 REV F SCALE 1/1 SHEET 1 OF 9

NOTES : UNLESS OTHERWISE SPECIFIED

DWG NO.	1011001A-2	SH	2	REV	F	1
REVISIONS						
ZONE	REV	DESCRIPTION	DATE	BY	APPROVED	
		SEE SHEET 8				



NOTES: UNLESS OTHERWISE SPECIFIED

ITEM NO.	QTY REQD	CAGE CODE	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MATERIAL SPECIFICATION
PARTS LIST					
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE: FRACTIONS DECIMALS ANGLES ± 1/32 .xx ± .03 ± 1° .xxx ± .010 ± 0°			CONTRACT NO.		MALABAR INTERNATIONAL SIMI VALLEY, CALIFORNIA
MATERIAL		APPROVAL	DATE	ELECTRICAL SCHEMATIC	
FINISH		CHECKED	ISSUED		
NEXT ASSEMBLY		USED ON		SIZE D CAGE CODE 94861 DWG NO. 1011001A-2 REV F	
APPLICATION		DO NOT SCALE DRAWING		SCALE 1/1	SHEET 2 OF 9

8

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DWG NO.	1011001A-2	SH 3	REV F	1
REVISIONS				
ZONE	REV	DESCRIPTION	DATE	BY
		SEE SHEET 8		

D

D

C

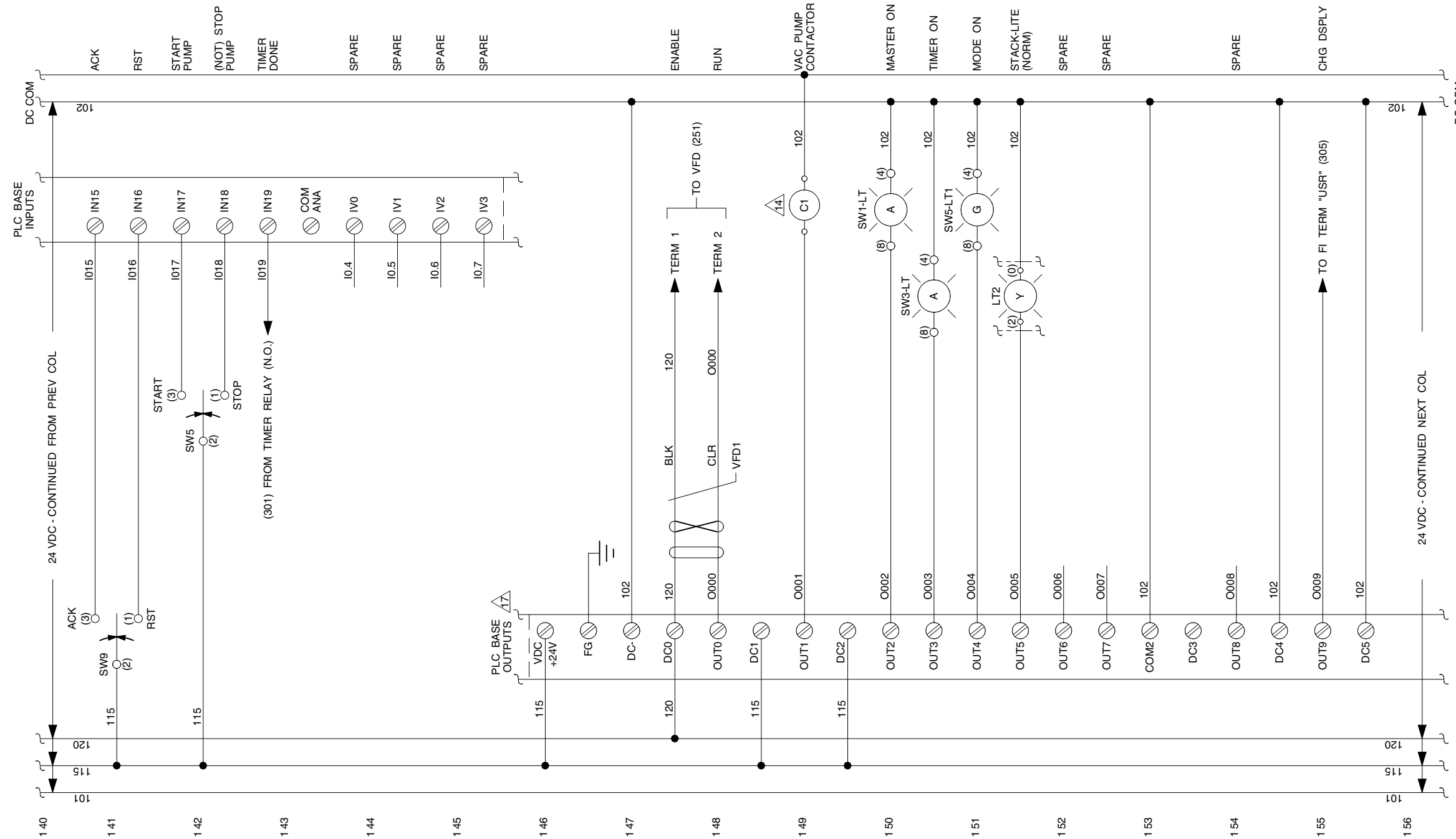
C

B

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NOTES: UNLESS OTHERWISE SPECIFIED

8

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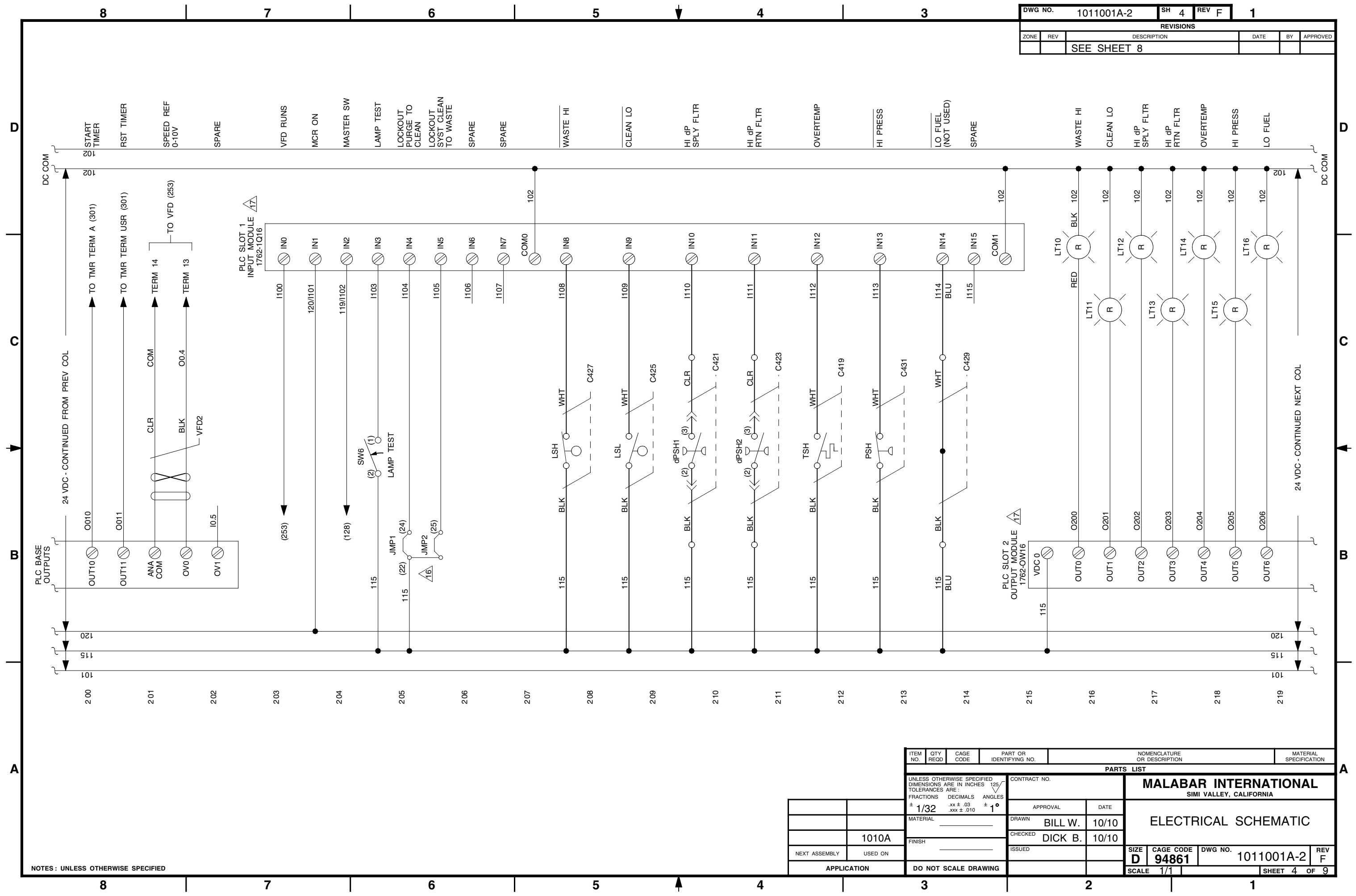
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ITEM NO.	QTY REQD	CAGE CODE	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MATERIAL SPECIFICATION
PARTS LIST					
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FRACTIONS DECIMALS ANGLES			APPROVAL DATE		
± 1/32 .xx ± .03 ± 1°			DRAWN BILL W. 10/10		
MATERIAL			CHECKED DICK B. 10/10		
FINISH			ISSUED		
NEXT ASSEMBLY USED ON			SCALE 1/1		
APPLICATION			DO NOT SCALE DRAWING		
		SIZE D		CAGE CODE 94861	
		DWG NO. 1011001A-2		REV F	
		SHEET 3		OF 9	

MALABAR INTERNATIONAL
SIMI VALLEY, CALIFORNIA

ELECTRICAL SCHEMATIC

DWG NO.	1011001A-2	SH 4	REV F	1	
REVISIONS					
ZONE	REV	DESCRIPTION	DATE	BY	APPROVED
SEE SHEET 8					



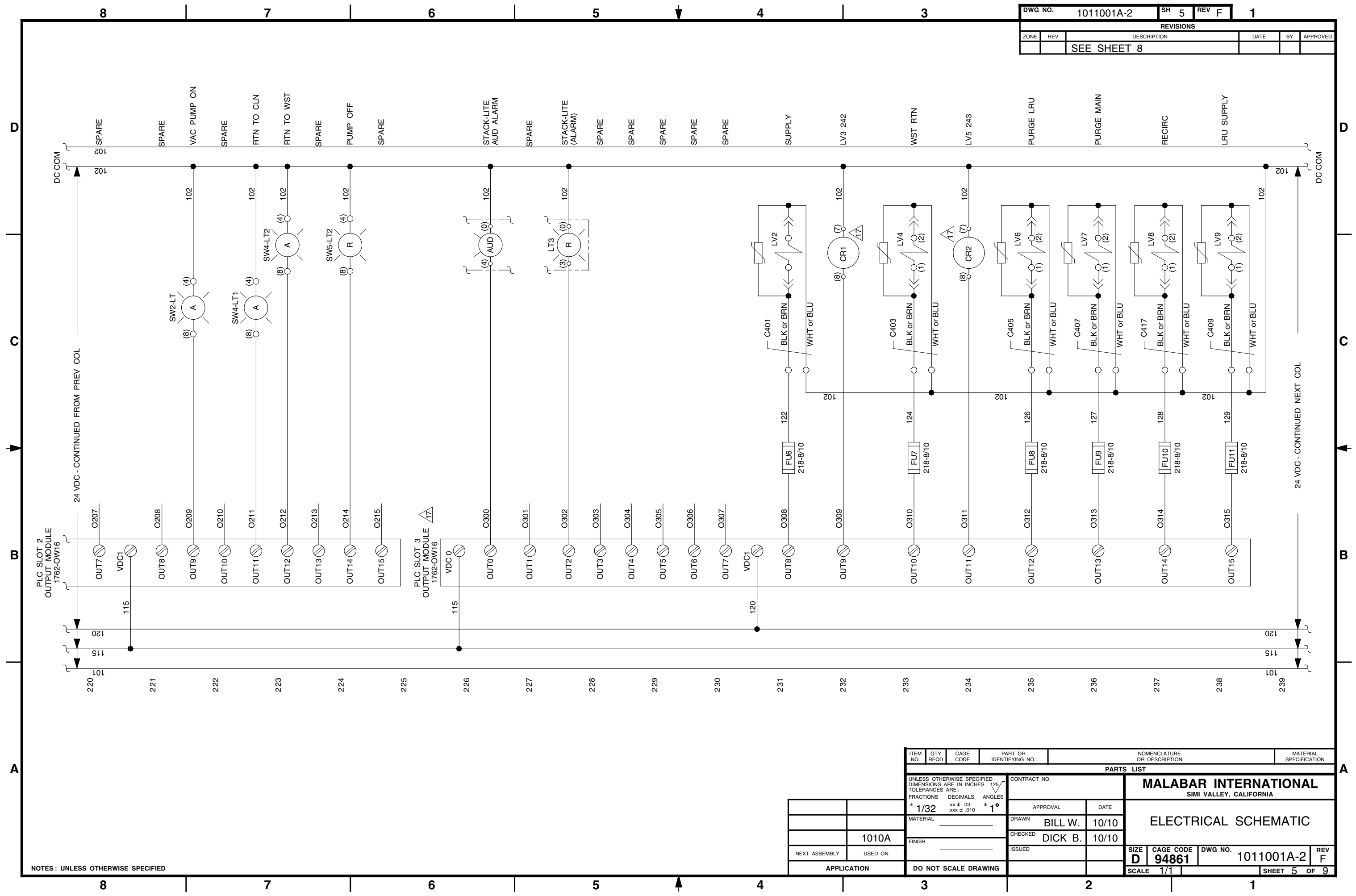
NOTES: UNLESS OTHERWISE SPECIFIED

ITEM NO.	QTY REQD	CAGE CODE	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MATERIAL SPECIFICATION
PARTS LIST					
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES			CONTRACT NO.		
TOLERANCES ARE:			APPROVAL		
FRACTIONS	DECIMALS	ANGLES	DATE		
± 1/32	.xx ± .03	± 1°	DRAWN BILL W. 10/10		
MATERIAL			CHECKED DICK B. 10/10		
FINISH			ISSUED		
NEXT ASSEMBLY USED ON			SCALE 1/1		
APPLICATION			DO NOT SCALE DRAWING		
SIZE D		CAGE CODE 94861	DWG NO. 1011001A-2	REV F	
SCALE 1/1		SHEET 4 OF 9			

MALABAR INTERNATIONAL
SIMI VALLEY, CALIFORNIA

ELECTRICAL SCHEMATIC

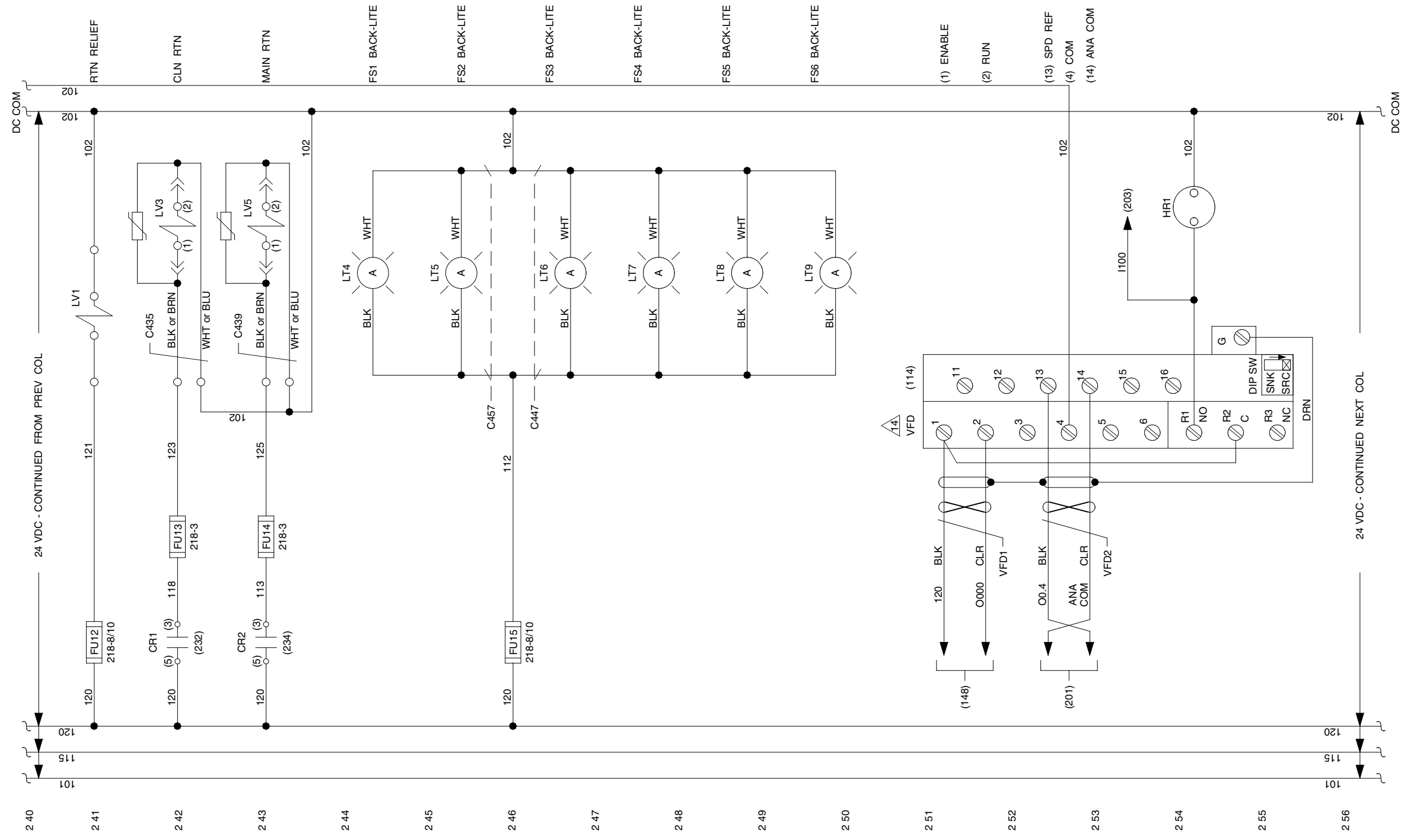
DWG NO.	1011001A-2	SH	5	REV	F	1
REVISIONS						
ZONE	REV	DESCRIPTION	DATE	BY	APPROVED	
		SEE SHEET 8				



NOTES: UNLESS OTHERWISE SPECIFIED

ITEM NO.	QTY REQD	CAGE CODE	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MATERIAL SPECIFICATION
PARTS LIST					
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES 1/25 TOLERANCES ARE:			CONTRACT NO.		
FRACTIONS	DECIMALS	ANGLES	MALABAR INTERNATIONAL SIMI VALLEY, CALIFORNIA ELECTRICAL SCHEMATIC		
± 1/32	.xx ± .03 .xxx ± .010	± 1°			
MATERIAL	FINISH		APPROVAL	DATE	
1010A			DRAWN	BILL W.	10/10
NEXT ASSEMBLY	USED ON		CHECKED	DICK B.	10/10
APPLICATION	DO NOT SCALE DRAWING		ISSUED		
SCALE 1/1			SIZE	D	CAGE CODE
			DWG NO.	1011001A-2	REV
			SCALE	1/1	SHEET 5 OF 9

DWG NO.	1011001A-2	SH	6	REV	F	1
REVISIONS						
ZONE	REV	DESCRIPTION	DATE	BY	APPROVED	
		SEE SHEET 8				



NOTES: UNLESS OTHERWISE SPECIFIED

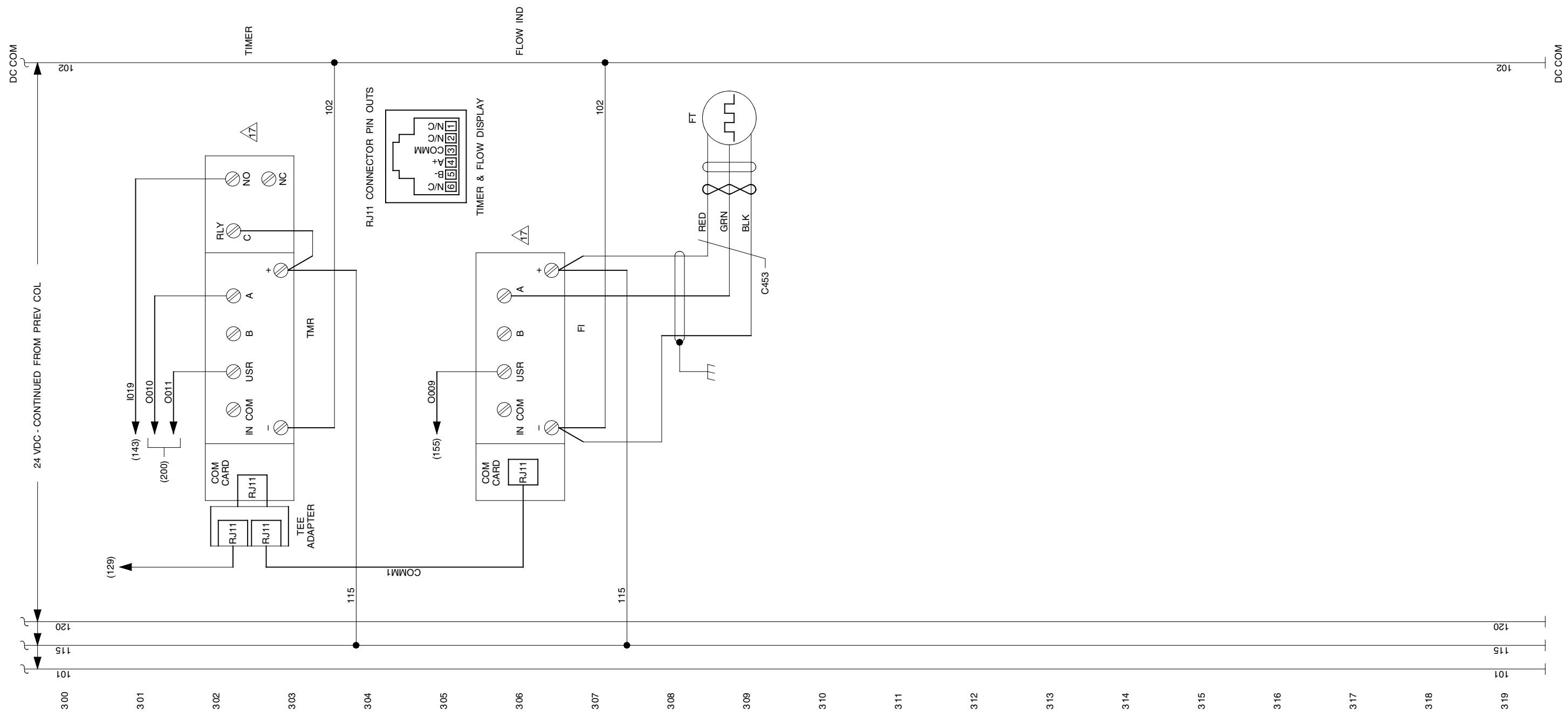
ITEM NO.	QTY REQD	CAGE CODE	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MATERIAL SPECIFICATION												
PARTS LIST																	
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE:			CONTRACT NO.														
FRACTIONS	DECIMALS	ANGLES	<table border="1"> <tr> <td>APPROVAL</td> <td>DATE</td> </tr> <tr> <td>DRAWN BILL W.</td> <td>10/10</td> </tr> <tr> <td>CHECKED DICK B.</td> <td>10/10</td> </tr> <tr> <td>ISSUED</td> <td></td> </tr> </table>			APPROVAL	DATE	DRAWN BILL W.	10/10	CHECKED DICK B.	10/10	ISSUED					
APPROVAL	DATE																
DRAWN BILL W.	10/10																
CHECKED DICK B.	10/10																
ISSUED																	
$\pm 1/32$.xx \pm .03 .xxx \pm .010	$\pm 1^\circ$	<table border="1"> <tr> <td>SIZE</td> <td>CAGE CODE</td> <td>DWG NO.</td> <td>REV</td> </tr> <tr> <td>D</td> <td>94861</td> <td>1011001A-2</td> <td>F</td> </tr> <tr> <td>SCALE</td> <td>1/1</td> <td colspan="2">SHEET 6 OF 9</td> </tr> </table>			SIZE	CAGE CODE	DWG NO.	REV	D	94861	1011001A-2	F	SCALE	1/1	SHEET 6 OF 9	
SIZE	CAGE CODE	DWG NO.				REV											
D	94861	1011001A-2	F														
SCALE	1/1	SHEET 6 OF 9															
MATERIAL	FINISH																
1010A																	
NEXT ASSEMBLY	USED ON																
APPLICATION	DO NOT SCALE DRAWING																

MALABAR INTERNATIONAL
SIMI VALLEY, CALIFORNIA

ELECTRICAL SCHEMATIC

SIZE D CAGE CODE 94861 DWG NO. 1011001A-2 REV F
SCALE 1/1 SHEET 6 OF 9

DWG NO.	1011001A-2	SH 7	REV F	1
REVISIONS				
ZONE	REV	DESCRIPTION	DATE	BY
		SEE SHEET 8		



NOTES: UNLESS OTHERWISE SPECIFIED

ITEM NO.	QTY REQD	CAGE CODE	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MATERIAL SPECIFICATION
PARTS LIST					
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE:				CONTRACT NO. MALABAR INTERNATIONAL SIMI VALLEY, CALIFORNIA	
FRACTIONS	DECIMALS	ANGLES	APPROVAL		
± 1/32	.xx ± .03 .xxx ± .010	± 1°	DRAWN	BILL W.	10/10
MATERIAL			CHECKED	DICK B.	10/10
FINISH			ISSUED		
NEXT ASSEMBLY	USED ON				
APPLICATION	DO NOT SCALE DRAWING				
SIZE	CAGE CODE	DWG NO.	REV		
D	94861	1011001A-2	F		
SCALE	1/1	SHEET 7 OF 9			

DWG NO.	1011001A-2	SH	8	REV	F	1
REVISIONS						
ZONE	REV	DESCRIPTION	DATE	BY	APPROVED	
	A	SEE ECN 5645	10/19/11	JW	BW	
	B	SEE ECN 5684	1/16/12	TT	BW	
	C	SEE ECN 5697	2/28/12	JW	BW	
	D	SEE ECN 5757	6/15/12	BW	BW	
	E	SEE ECN 5766	7/20/12	TT	BW	
	F	SEE ECN 6031	9/12/14	BW	BW	

Construction Notes:

- All wire & cord is stranded copper conductor. Solid conductor shall not be used.
 - Individual hook up wire, unspecified:
18 awg & smaller - type MTW (600V) / H05V-K (300/500V)
16 awg & larger - type MTW (600V) / H07V-K (450/750V)
 - Individual hook up wire, specified:
TFE - teflon hook up wire, NEMA HP-3 Type E (Mil-W-16878/4), 600V nom.,
2 kV dielectric withstand voltage, NPC, -65 to 200°C
 - Multi-Conductor Power Cords over 50 V, specified:
Utility Power Cord - type W (UL), 2000V, 90°C
Generator Power Cord - type W (UL), 2000V, 90°C
 - Multi-Conductor Control & Actuator Cordage, less than 50V, unspecified:
Type SJOOW or H05VVVF or SOOW
- Shielded instrument cable within enclosures (except flowmeter cable) is UL type TC, Belden 9341 or equal, (1) pair, 18 awg, 600V, 90°C
- Minimum wire size, unless otherwise noted, shall be:
18 AWG for individual conductors
22 AWG for multiconductor jacketed cable
- Wire sizes indicated are minimum. Larger sizes may be substituted.
- Wire color for individual wires shall be:
(Colored shrink-tube at wire termination may be used to designate wire color)
BLACK - Ungrounded conductors at line voltage (greater than 150 volts).
BLUE - Ungrounded DC control conductors. (DC+)
WHITE w/ BLUE Stripe - Grounded DC control conductors (DC-)
GREEN w/ YELLOW Stripe - Equipment ground conductor.
- Each wire shall be clearly marked at each termination with commercial wire markers, with the wire number or cable number shown on this schematic diagram.
- Grounding: All metal enclosures and panels exposed to electrical wiring shall be grounded. Use internal toothed star washer under ground lug on painted surfaces.
- Grounding conductors shall be copper. Conduit and enclosures shall not be used as a grounding conductor. Grounding conductors shall be sized per NFPA-70(NEC), Art. 250-95.
- Circuit shown de-energized and empty, 70°F ambient temperature.
Wrap exposed terminals w/ glass tape: LT18.

General Notes:

- To restart after an EMERGENCY STOP, reset (twist-pull) E-Stop mushroom button and turn MASTER switch off and back on. Then restart.
- LAST WIRE NO. USED: 129, NOT USED: 107-111
- LAST CABLE NO. USED: C457
- $\triangle 14$ = Located in Electrical Enclosure Assembly power panel.
See dwg 1011012A for Cord/Cable specifications.
- $\triangle 16$ JMP 1 (Jumper 1): Remove jumper to enable Purge Return to Clean Reservoir.
JMP 2 (Jumper 2): Remove jumper to enable System Clean Reservoir to Waste Reservoir.
- All 18 awg stranded wire may be terminated using non-insulated crimp-on ferrules for strand containment, unless otherwise specified. Panduit F77-7-M or equal (0.28 in. lg).

ITEM NO.	QTY REQD	CAGE CODE	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MATERIAL SPECIFICATION
PARTS LIST					
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE: FRACTIONS DECIMALS ANGLES $\pm 1/32$.xx $\pm .03$ $\pm 1^\circ$ xxx $\pm .010$				CONTRACT NO.	
				MALABAR INTERNATIONAL SIMI VALLEY, CALIFORNIA	
MATERIAL		DRAWN		APPROVAL	DATE
1010A		BILL W.			10/10
FINISH		CHECKED			
		DICK B.			10/10
NEXT ASSEMBLY USED ON		ISSUED			
APPLICATION		DO NOT SCALE DRAWING		SIZE	CAGE CODE
				D	94861
				DWG NO.	REV
				1011001A-2	F
				SCALE	SHEET
				1/1	8 OF 9

NOTES: UNLESS OTHERWISE SPECIFIED

8

7

6

5

4

3

REVISIONS					
ZONE	REV	DESCRIPTION	DATE	BY	APPROVED
		SEE SHEET 8			

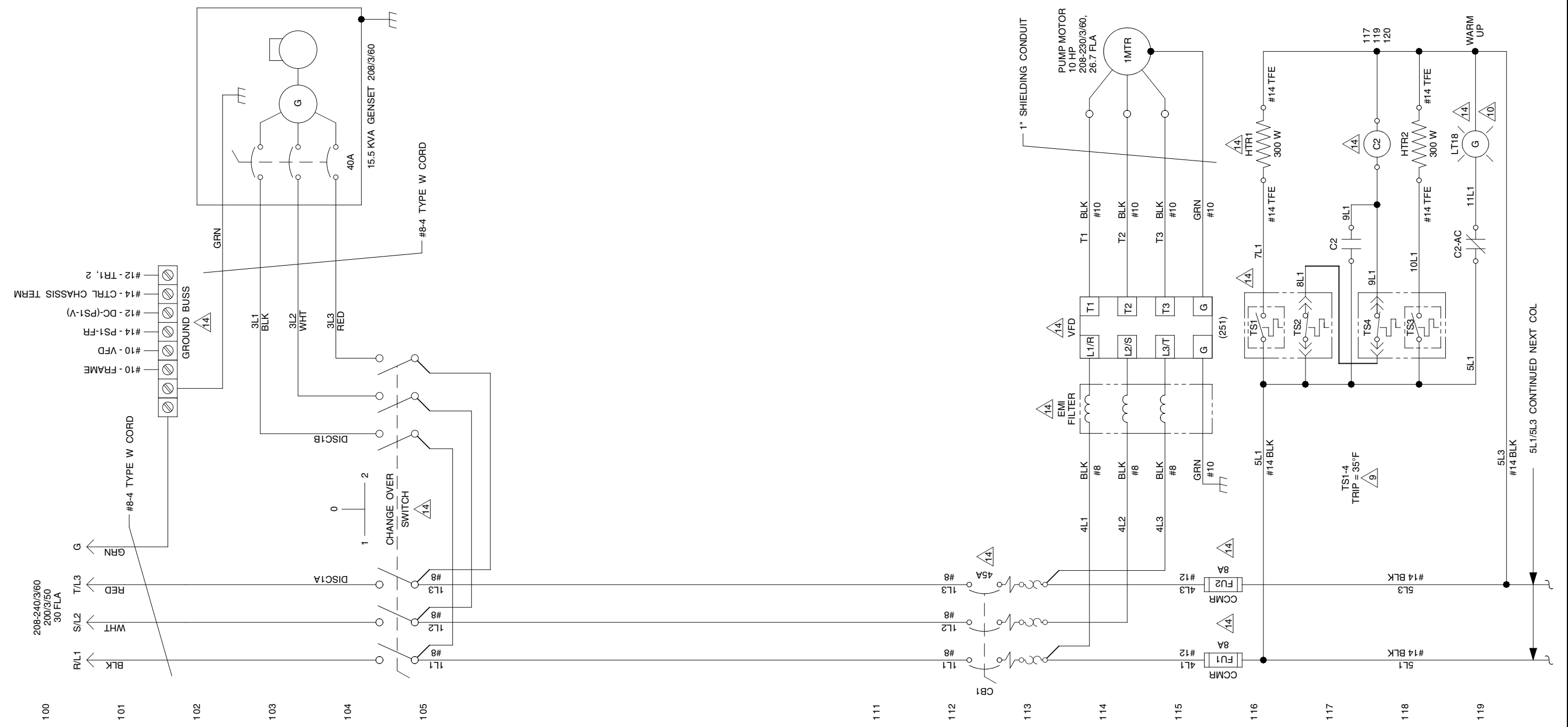
IEC CROSS REFERENCE LEGEND

IEC 617 SYMBOL	MALABAR SYMBOL	DEVICE DESCRIPTION
		RELAY OR CONTACTOR, NORMALLY OPEN CONTACT
		RELAY OR CONTACTOR, NORMALLY CLOSED CONTACT
		MANUAL SWITCH, SPDT, MAINTAINED
		RELAY OR CONTACTOR COIL
		CIRCUIT BREAKER THERMAL & MAGNETIC TRIP
		DISCONNECT SWITCH
		CHANGEOVER SWITCH
		MOTOR, 3-PHASE INDUCTION
		GENERATOR, 3-PHASE
		MOTOR, DC PERMANENT MAGNET
		LINE FILTER / REACTOR / TRANSFORMER
		MUSHROOM PUSHBUTTON, TWIST-LATCH
		FUSE
		MANUAL SWITCH, SPST, MAINTAINED
		MANUAL SWITCH, SPNO, MOMENTARY
		MANUAL SWITCH, SPDT, CENTER-OFF
		INDICATOR LAMP, SWITCH LAMP, PANEL LAMP, STACK LIGHT (LETTER INDICATES COLOR)
		CABLE MARKERS

IEC 617 SYMBOL	MALABAR SYMBOL	DEVICE DESCRIPTION
		SELECTOR SWITCH, ROTARY, 8-POSITION
		EQUIPOTENTIAL BOND (FRAME GROUND)
		SOLENOID VALVE
		PRESSURE SWITCH, OPEN ON RISE
		DIFFERENTIAL PRESSURE SWITCH, CLOSE ON RISE
		LEVEL SWITCH, CLOSE ON RISE
		LEVEL SWITCH, OPEN ON RISE
		THERMOSTAT, CLOSE ON RISE
		THERMOSTAT, OPEN ON RISE
		RESISTANCE HEATER ELEMENT
		BUZZER, AUDIBLE ALARM
		HOUR METER
		SPEED PICK-UP, PULSE OUTPUT
		VARISTOR
		PLUG / JACK
		TERMINALS
		SHIELD + DRAIN WIRE
		TWISTED WIRES, PAIRS OR TRIADS

NOTES : UNLESS OTHERWISE SPECIFIED

DWG NO.	1011001A-3	SH	1	REV	E	1
REVISIONS						
ZONE	REV	DESCRIPTION	DATE	BY	APPROVED	
		SEE SHEET 8				

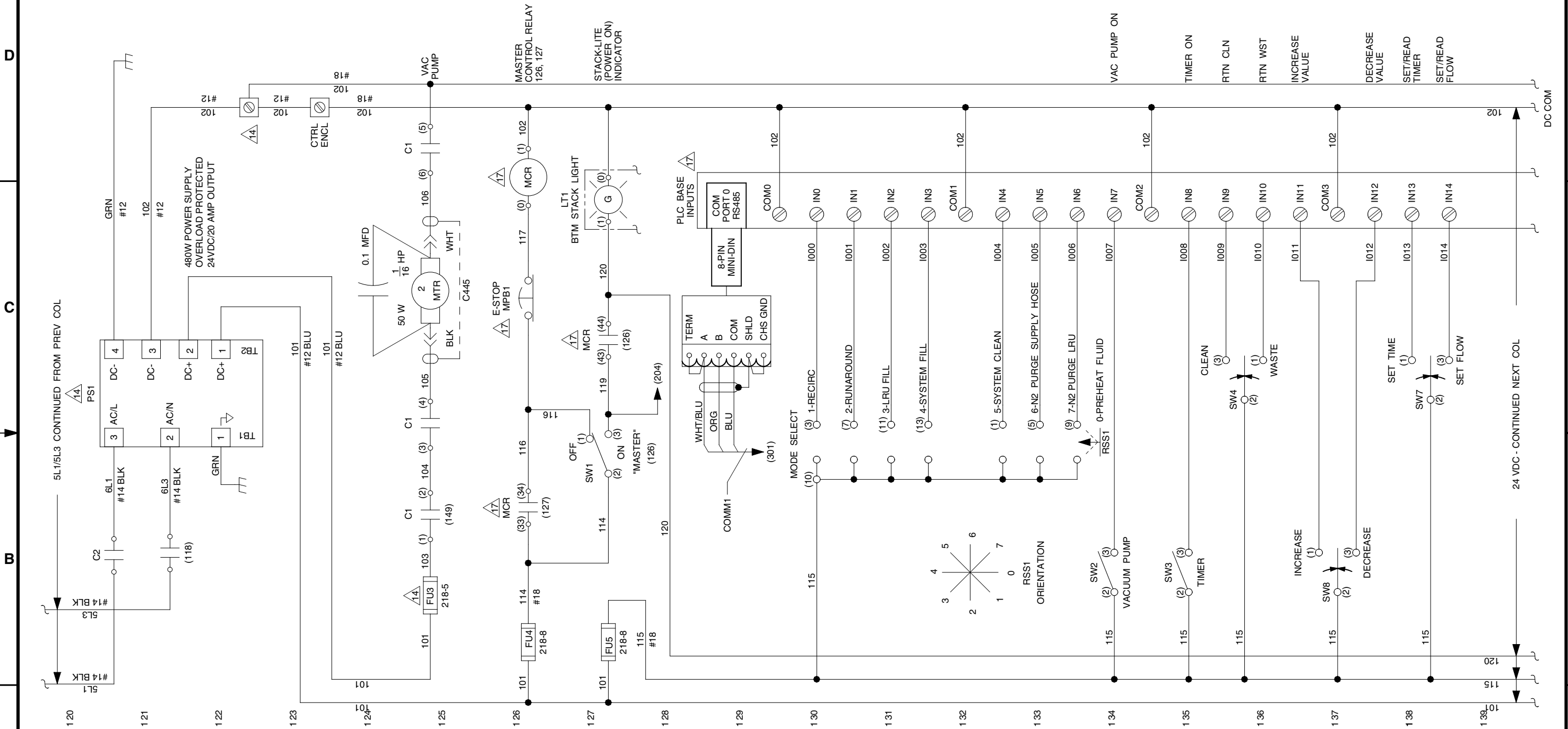


208-240/360
200/350
30 FLA

NOTES : UNLESS OTHERWISE SPECIFIED

ITEM NO.	QTY	CAGE CODE	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MATERIAL SPECIFICATION
				PARTS LIST	
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES 125 TOLERANCES ARE:				CONTRACT NO.	
FRACTIONS	DECIMALS	ANGLES		MALABAR INTERNATIONAL SIMI VALLEY, CALIFORNIA	
± 1/32	.xx ± .03	± 1°		APPROVAL	DATE
MATERIAL				DRAWN	BILL W. 10/10
FINISH				CHECKED	DICK B. 10/10
NEXT ASSEMBLY	USED ON			ISSUED	
APPLICATION	DO NOT SCALE DRAWING			SIZE	D
				CAGE CODE	94861
				DWG NO.	1011001A-3
				SCALE	1/1
				REV	E
				SHEET	1 OF 9

DWG NO.	1011001A-3	SH	2	REV	E	1	
REVISIONS							
ZONE	REV	DESCRIPTION			DATE	BY	APPROVED
		SEE SHEET 8					



SL1/SL3 CONTINUED FROM PREV COL

24 VDC - CONTINUED NEXT COL

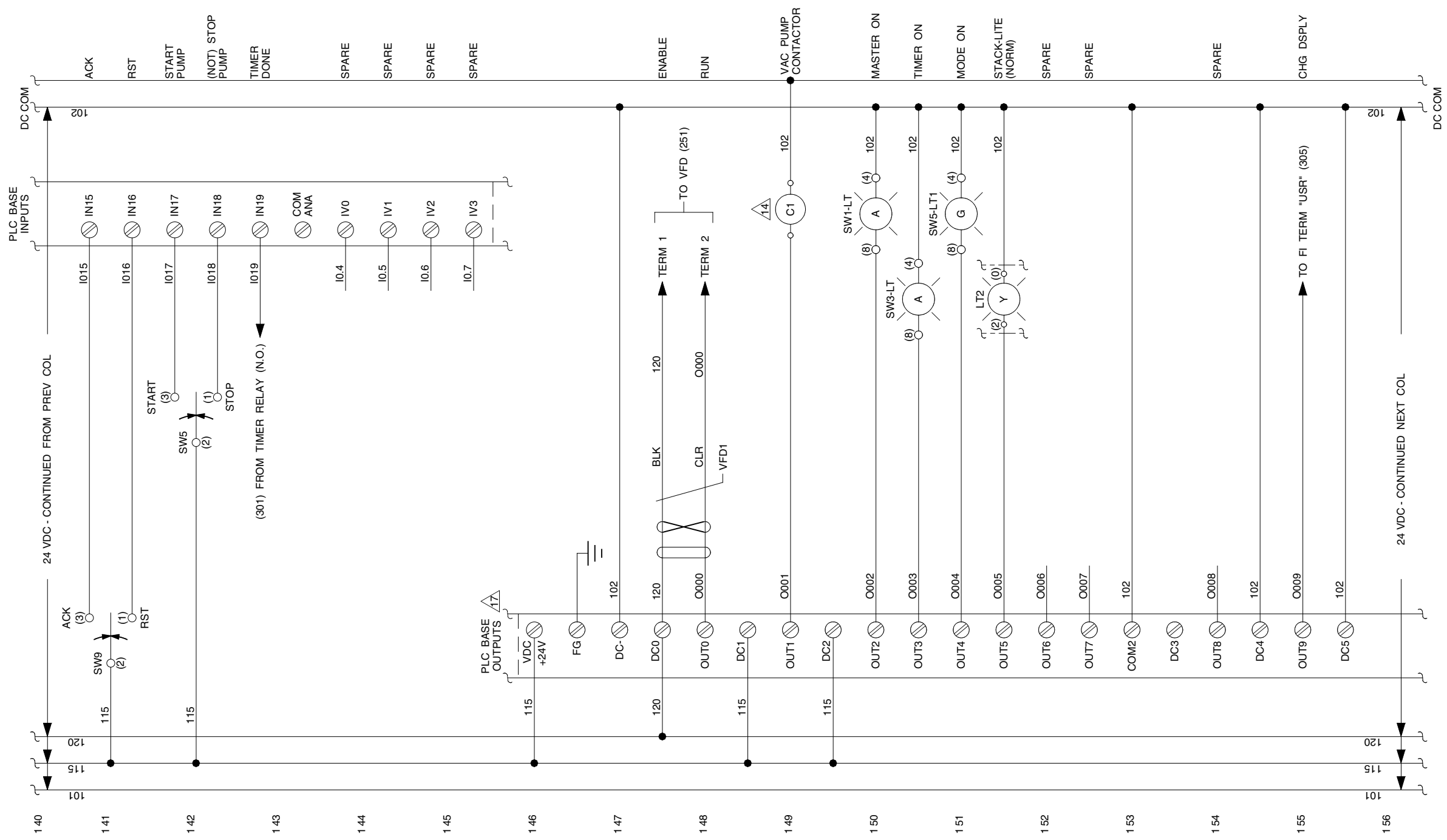
NOTES: UNLESS OTHERWISE SPECIFIED

ITEM NO.	QTY	CAGE CODE	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MATERIAL SPECIFICATION
PARTS LIST					
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES 125/ TOLERANCES ARE: FRACTIONS DECIMALS ANGLES ± 1/32 .xx ± .03 ± 1° .xxx ± .010				CONTRACT NO.	
MATERIAL				APPROVAL	DATE
FINISH				DRAWN	10/10
NEXT ASSEMBLY USED ON				CHECKED	10/10
APPLICATION				ISSUED	
SIZE		CAGE CODE	DWG NO.	REV	
D		94861	1011001A-3	E	
SCALE		1/1		SHEET 2 OF 9	

MALABAR INTERNATIONAL
SIMI VALLEY, CALIFORNIA

ELECTRICAL SCHEMATIC

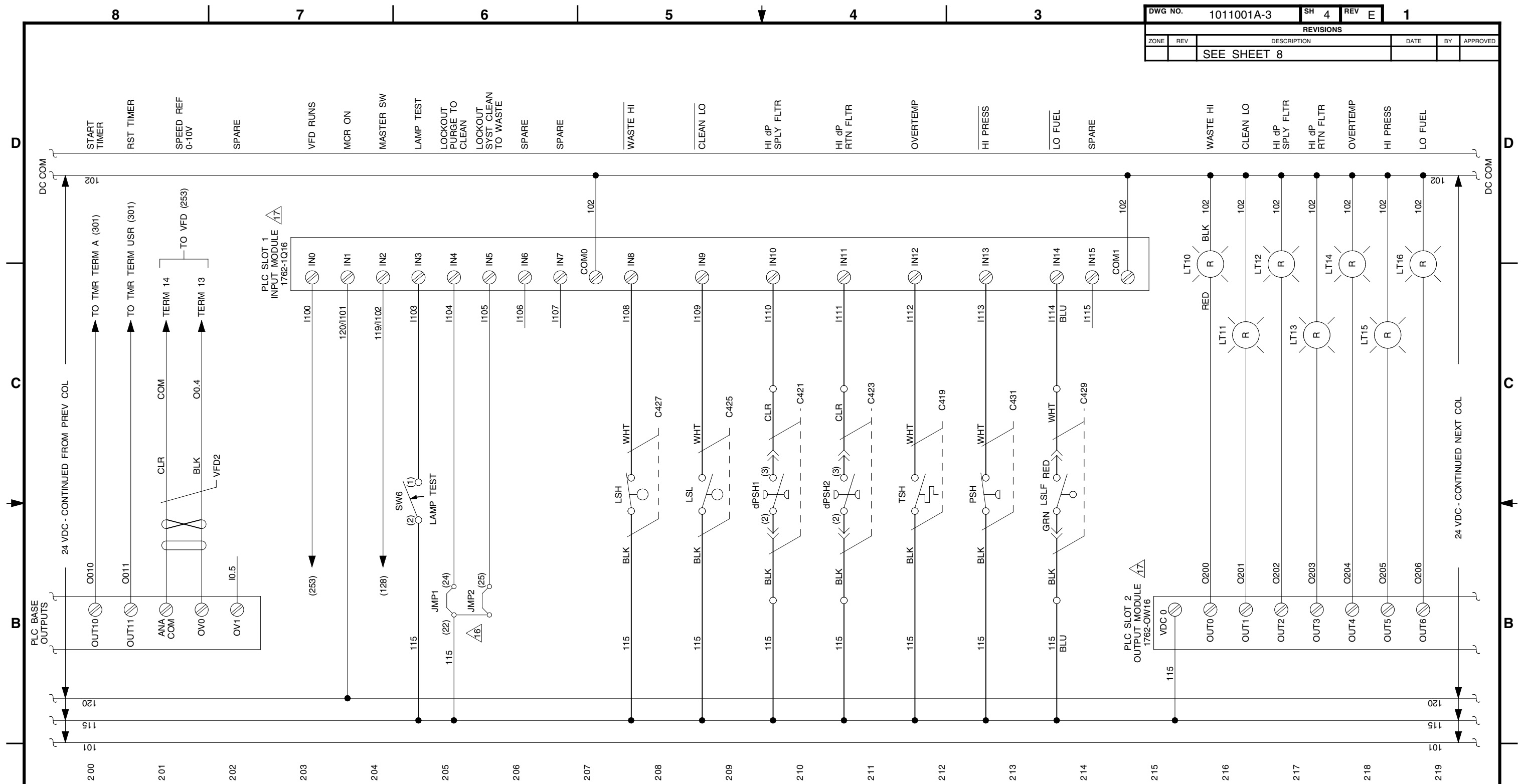
DWG NO.	1011001A-3	SH	3	REV	E	1
REVISIONS						
ZONE	REV	DESCRIPTION	DATE	BY	APPROVED	
		SEE SHEET 8				



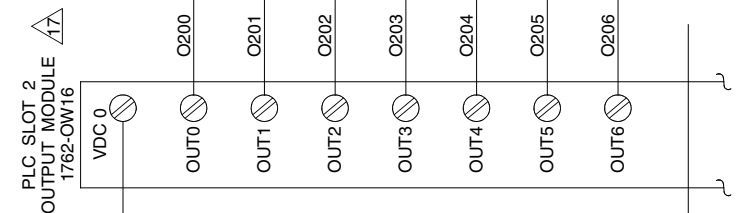
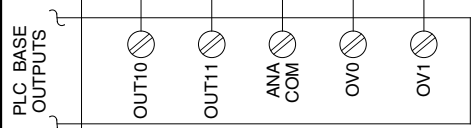
NOTES : UNLESS OTHERWISE SPECIFIED

ITEM NO.	QTY REQD.	CAGE CODE	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MATERIAL SPECIFICATION
PARTS LIST					
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES 125/				CONTRACT NO.	
TOLERANCES ARE :				MALABAR INTERNATIONAL	
FRACTIONS DECIMALS ANGLES				SIMI VALLEY, CALIFORNIA	
± 1/32 .xx ± .03 ± 1°				ELECTRICAL SCHEMATIC	
MATERIAL				APPROVAL	DATE
FINISH				DRAWN	BILL W. 10/10
NEXT ASSEMBLY USED ON				CHECKED	DICK B. 10/10
APPLICATION				ISSUED	
DO NOT SCALE DRAWING				SIZE	DWG NO.
				D	1011001A-3
				SCALE	REV
				1/1	E
				SHEET 3 OF 9	

DWG NO.	1011001A-3	SH	4	REV	E	1
REVISIONS						
ZONE	REV	DESCRIPTION	DATE	BY	APPROVED	
SEE SHEET 8						



START TIMER, RST TIMER, SPEED REF 0-10V, SPARE, VFD RUNS, MCR ON, MASTER SW, LAMP TEST, LOCKOUT PURGE TO CLEAN, LOCKOUT SYST CLEAN TO WASTE, SPARE, SPARE, WASTE HI, CLEAN LO, HI dP SPLY FLTR, HI dP RTN FLTR, OVERTEMP, HI PRESS, LO FUEL, SPARE, WASTE HI, CLEAN LO, HI dP SPLY FLTR, HI dP RTN FLTR, OVERTEMP, HI PRESS, LO FUEL

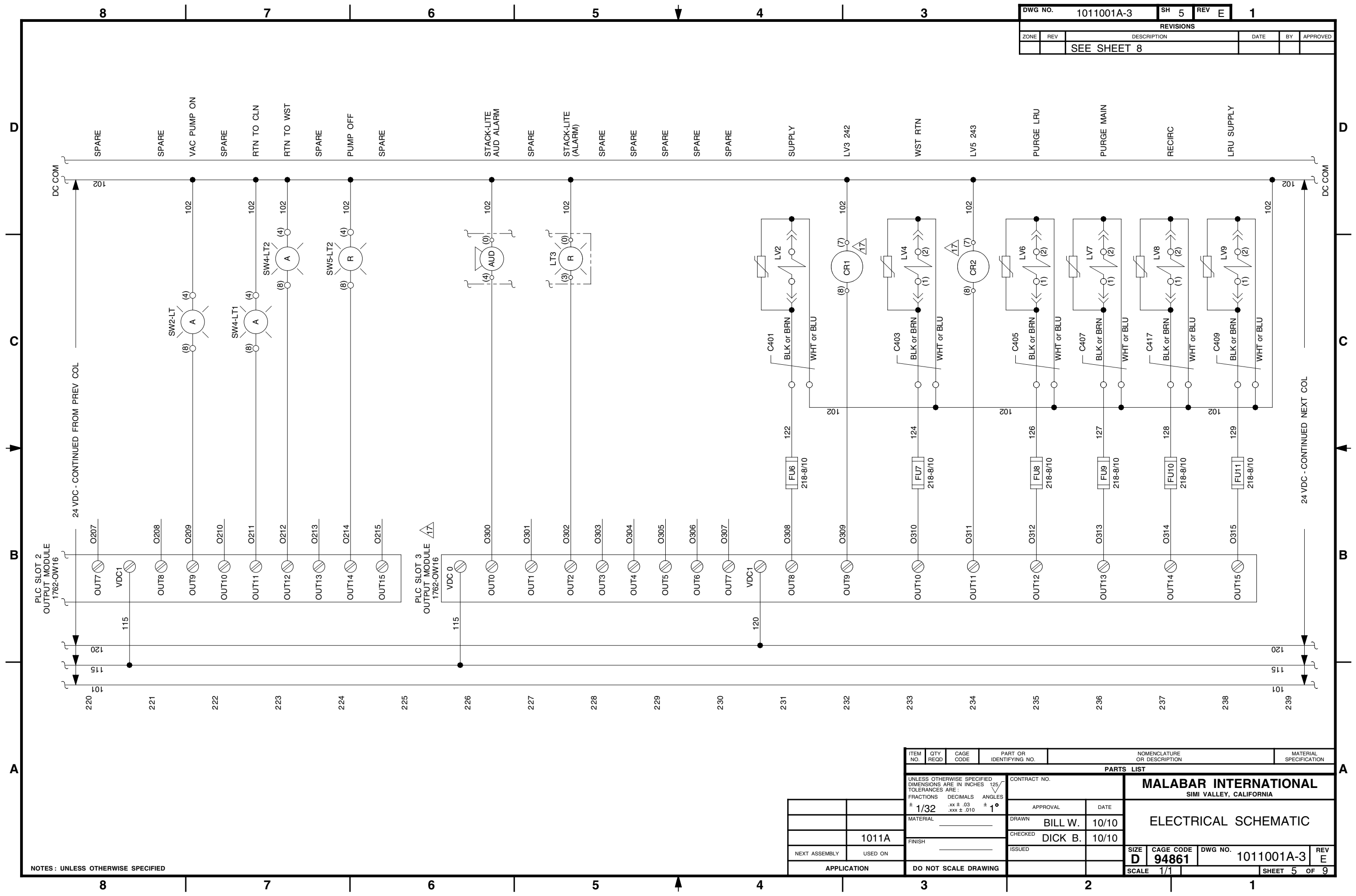


2 00, 2 01, 2 02, 2 03, 2 04, 2 05, 2 06, 2 07, 2 08, 2 09, 2 10, 2 11, 2 12, 2 13, 2 14, 2 15, 2 16, 2 17, 2 18, 2 19

NOTES: UNLESS OTHERWISE SPECIFIED

ITEM NO.	QTY REQD	CAGE CODE	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MATERIAL SPECIFICATION
PARTS LIST					
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE:			CONTRACT NO.		
FRACTIONS	DECIMALS	ANGLES	MALABAR INTERNATIONAL SIMI VALLEY, CALIFORNIA ELECTRICAL SCHEMATIC		
± 1/32	± .03	± 1°			
MATERIAL	FINISH		APPROVAL	DATE	
1011A			DRAWN	BILL W.	10/10
NEXT ASSEMBLY	USED ON		CHECKED	DICK B.	10/10
APPLICATION	DO NOT SCALE DRAWING		ISSUED		
SCALE 1/1			SIZE D	CAGE CODE 94861	DWG NO. 1011001A-3
				REV E	SHEET 4 OF 9

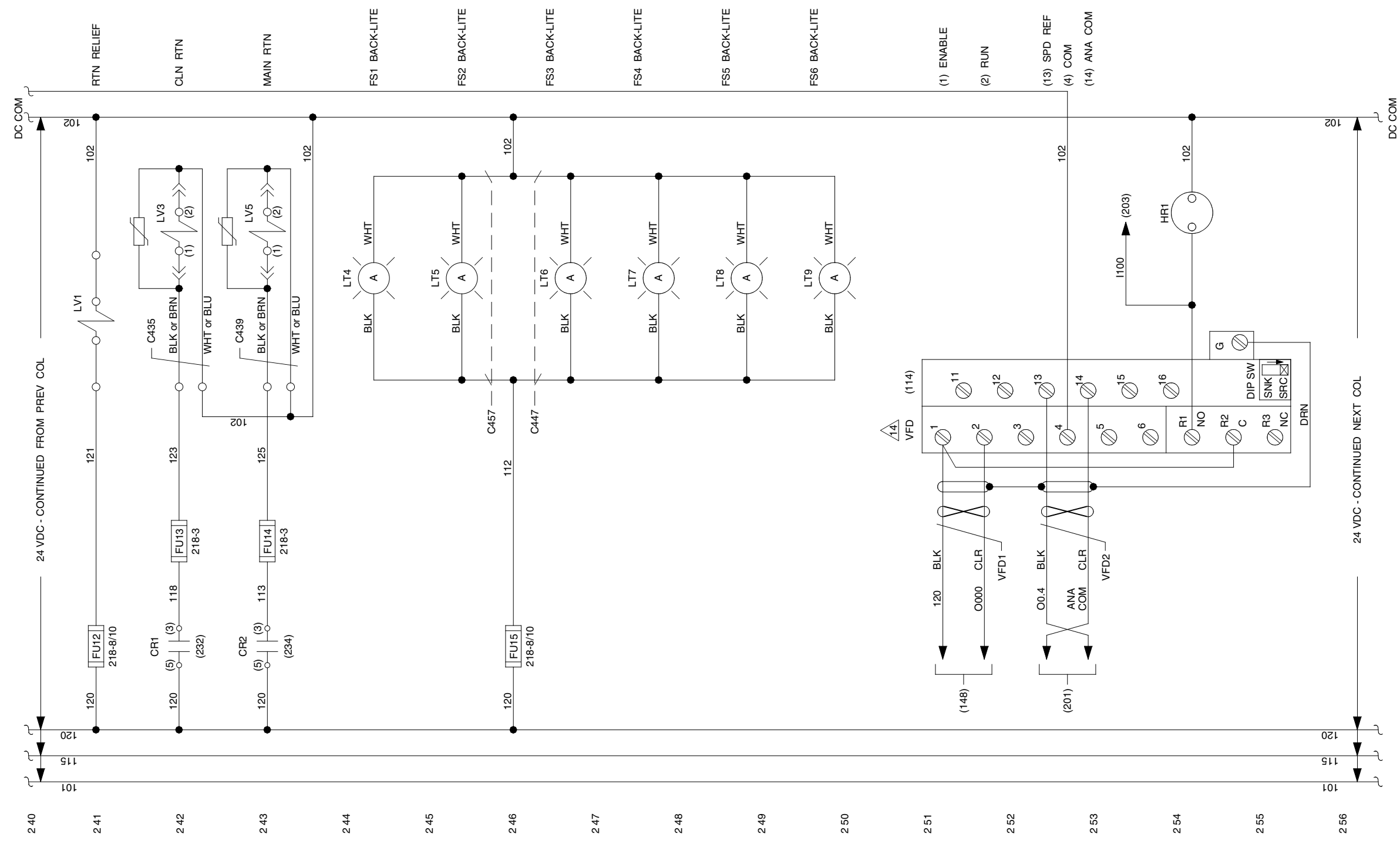
DWG NO.	1011001A-3	SH	5	REV	E	1
REVISIONS						
ZONE	REV	DESCRIPTION	DATE	BY	APPROVED	
		SEE SHEET 8				



NOTES: UNLESS OTHERWISE SPECIFIED

ITEM NO.	QTY REQD	CAGE CODE	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MATERIAL SPECIFICATION
PARTS LIST					
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE:				CONTRACT NO.	
FRACTIONS	DECIMALS	ANGLES		MALABAR INTERNATIONAL	
± 1/32	.xx ± .03	± 1°		SIMI VALLEY, CALIFORNIA	
MATERIAL			APPROVAL	DATE	ELECTRICAL SCHEMATIC
FINISH			DRAWN	10/10	
NEXT ASSEMBLY USED ON			CHECKED	10/10	
APPLICATION			ISSUED		
DO NOT SCALE DRAWING			SIZE	CAGE CODE	DWG NO.
			D	94861	1011001A-3
			SCALE	1/1	REV
					E
			SHEET 5 OF 9		

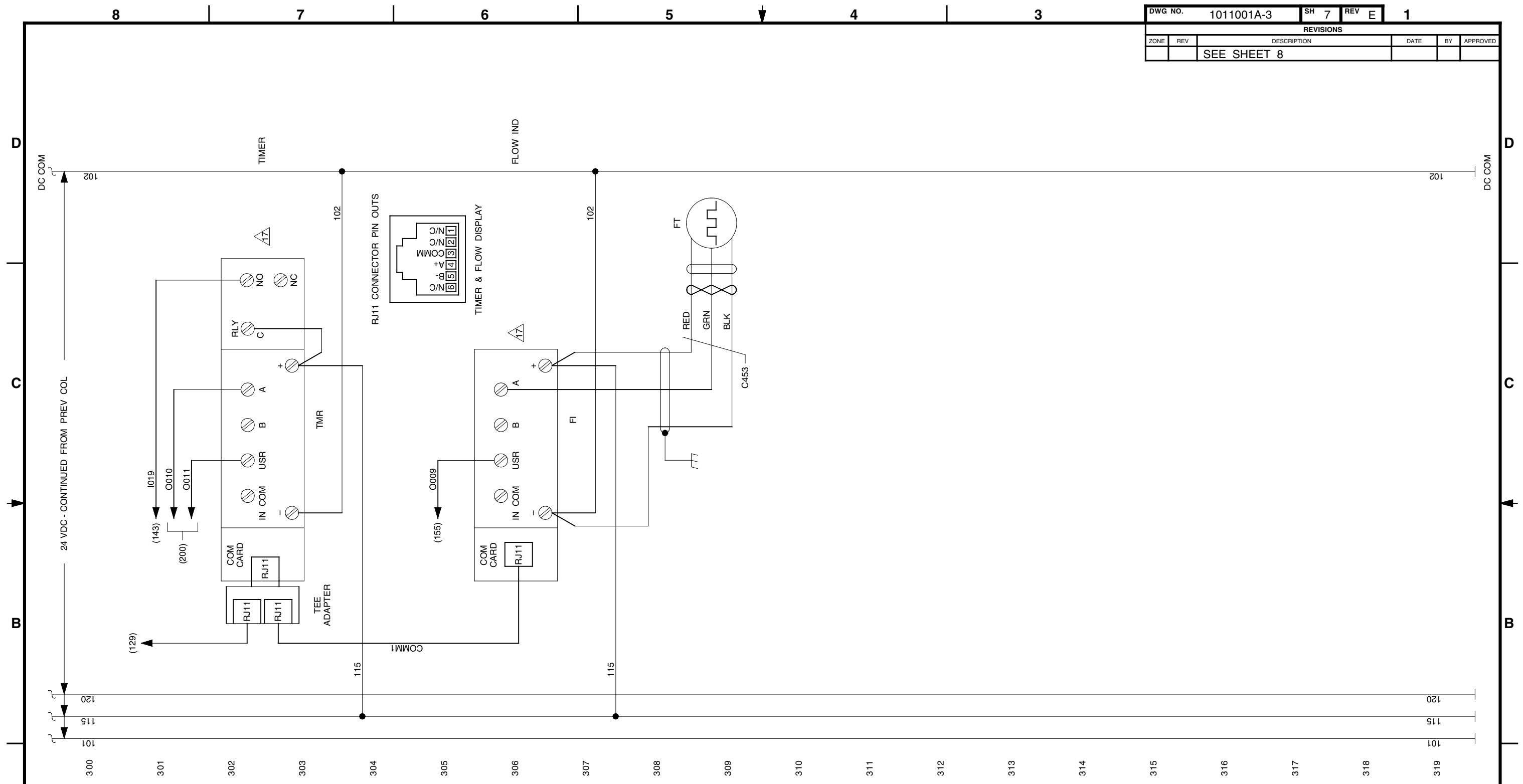
DWG NO.	1011001A-3	SH	6	REV	E	1
REVISIONS						
ZONE	REV	DESCRIPTION	DATE	BY	APPROVED	
SEE SHEET 8						



NOTES: UNLESS OTHERWISE SPECIFIED

ITEM NO.	QTY REQD	CAGE CODE	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MATERIAL SPECIFICATION
PARTS LIST					
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES				CONTRACT NO.	
TOLERANCES ARE:				MALABAR INTERNATIONAL	
FRACTIONS: ± 1/32				SIMI VALLEY, CALIFORNIA	
DECIMALS: .xx ± .03				ELECTRICAL SCHEMATIC	
ANGLES: xxx ± .010				DRAWN: BILL W. 10/10	
MATERIAL: _____				CHECKED: DICK B. 10/10	
FINISH: _____				ISSUED: _____	
NEXT ASSEMBLY USED ON: _____				SIZE: D	
APPLICATION: DO NOT SCALE DRAWING				CAGE CODE: 94861	
				DWG NO.: 1011001A-3	
				REV: E	
				SCALE: 1/1	
				SHEET 6 OF 9	

DWG NO.	1011001A-3	SH 7	REV E	1
REVISIONS				
ZONE	REV	DESCRIPTION	DATE	BY
		SEE SHEET 8		



NOTES: UNLESS OTHERWISE SPECIFIED

containment, unless otherwise specified. Panduit F77-7-M or equal (0.28 in. lg).



ITEM NO.	QTY REQD	CAGE CODE	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MATERIAL SPECIFICATION
PARTS LIST					
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE:				CONTRACT NO. MALABAR INTERNATIONAL SIMI VALLEY, CALIFORNIA	
FRACTIONS	DECIMALS	ANGLES	APPROVAL		
± 1/32	.xx ± .03 .xxx ± .010	± 1°	DRAWN	BILL W.	10/10
MATERIAL			CHECKED	DICK B.	10/10
FINISH			ISSUED		
NEXT ASSEMBLY	USED ON			SIZE	D
APPLICATION		DO NOT SCALE DRAWING		CAGE CODE	94861
				DWG NO.	1011001A-3
				REV	E
				SCALE	1/1
				SHEET 7 OF 9	

DWG NO.	1011001A-3	SH	8	REV	E	1
REVISIONS						
ZONE	REV	DESCRIPTION	DATE	BY	APPROVED	
	A	SEE ECN 5645	10/19/11	JW	BW	
	B	SEE ECN 5684	1/16/12	TT	BW	
	C	SEE ECN 5697	2/28/12	JW	BW	
	D	SEE ECN 5757	6/15/12	BW	BW	
	E	SEE ECN 5766	7/20/12	TT	BW	

Construction Notes:

- All wire & cord is stranded copper conductor. Solid conductor shall not be used.
 - Individual hook up wire, unspecified:
 - 18 awg & smaller - type MTW (600V) / H05V-K (300/500V)
 - 16 awg & larger - type MTW (600V) / H07V-K (450/750V)
 - Individual hook up wire, specified:
 - TFE - teflon hook up wire, NEMA HP-3 Type E (Mil-W-16878/4), 600V nom., 2 kV dielectric withstand voltage, NPC, -65 to 200°C
 - Multi-Conductor Power Cords over 50 V, specified:
 - Utility Power Cord - type W (UL), 2000V, 90°C
 - Generator Power Cord - type W (UL), 2000V, 90°C
 - Multi-Conductor Control & Actuator Cordage, less than 50V, unspecified:
 - Type SJOOW or H05VVF or SOOW
- Shielded instrument cable within enclosures (except flowmeter cable) is UL type TC, Belden 9341 or equal, (1) pair, 18 awg, 600V, 90°C
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 - 18 AWG for individual conductors
 - 22 AWG for multiconductor jacketed cable
- Wire sizes indicated are minimum. Larger sizes may be substituted.
- Wire color for individual wires shall be:
 - (Colored shrink-tube at wire termination may be used to designate wire color)
 - BLACK - Ungrounded conductors at line voltage (greater than 150 volts).
 - BLUE - Ungrounded DC control conductors. (DC+)
 - WHITE w/ BLUE Stripe - Grounded DC control conductors (DC-)
 - GREEN w/ YELLOW Stripe - Equipment ground conductor.
- Each wire shall be clearly marked at each termination with commercial wire markers, with the wire number or cable number shown on this schematic diagram.
- Grounding: All metal enclosures and panels exposed to electrical wiring shall be grounded. Use internal toothed star washer under ground lug on painted surfaces.
- Grounding conductors shall be copper. Conduit and enclosures shall not be used as a grounding conductor. Grounding conductors shall be sized per NFPA-70(NEC), Art. 250-95.
 - 9. Circuit shown de-energized and empty, 70°F ambient temperature.
 - 10. Wrap exposed terminals w/ glass tape: LT18.

General Notes:

- To restart after an EMERGENCY STOP, reset (twist-pull) E-Stop mushroom button and turn MASTER switch off and back on. Then restart.
- LAST WIRE NO. USED: 129, NOT USED: 107-111
- LAST CABLE NO. USED: C457
-  = Located in Electrical Enclosure Assembly power panel. See dwg 1011012A for Cord/Cable specifications.
-  JMP 1 (Jumper 1): Remove jumper to enable Purge Return to Clean Reservoir.
 JMP 2 (Jumper 2): Remove jumper to enable System Clean Reservoir to Waste Reservoir.
 All 18 awg stranded wire may be terminated using non-insulated crimp-on ferrules for strand containment, unless otherwise specified. Panduit F77-7-M or equal (0.28 in. lg).

ITEM NO.	QTY REQD	CAGE CODE	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MATERIAL SPECIFICATION
PARTS LIST					
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE:			CONTRACT NO.		
FRACTIONS	DECIMALS	ANGLES	MALABAR INTERNATIONAL SIMI VALLEY, CALIFORNIA		
± 1/32	.xx ± .03 .xxx ± .010	± 1°			
MATERIAL	FINISH	APPROVAL		DATE	ELECTRICAL SCHEMATIC
1011A		DRAWN		10/10	
NEXT ASSEMBLY	USED ON	CHECKED		10/10	
APPLICATION	DO NOT SCALE DRAWING	ISSUED			SIZE D CAGE CODE 94861 DWG NO. 1011001A-3 REV E SCALE 1/1 SHEET 8 OF 9

NOTES: UNLESS OTHERWISE SPECIFIED

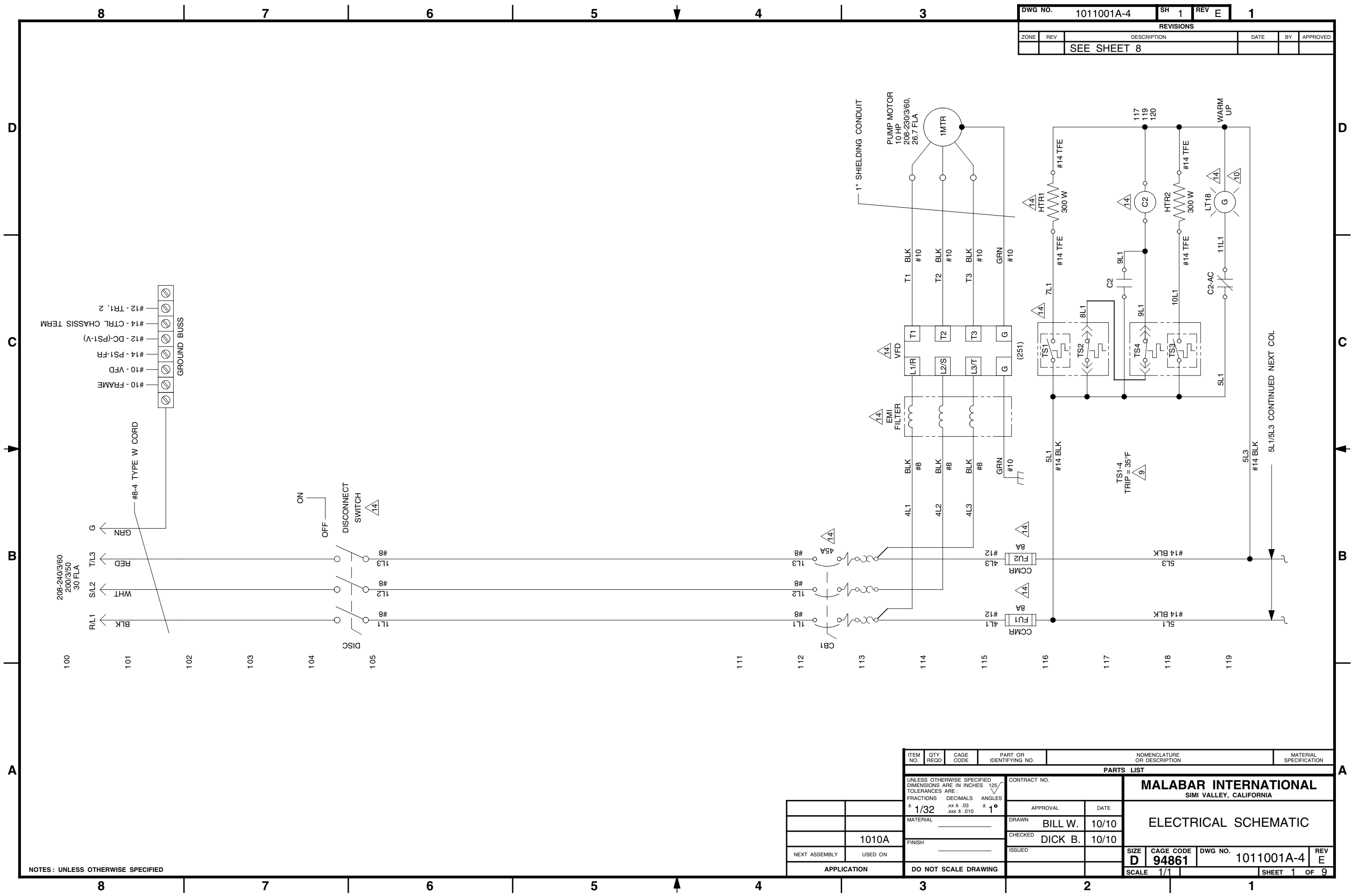
IEC CROSS REFERENCE LEGEND

IEC 617 SYMBOL	MALABAR SYMBOL	DEVICE DESCRIPTION
		RELAY OR CONTACTOR, NORMALLY OPEN CONTACT
		RELAY OR CONTACTOR, NORMALLY CLOSED CONTACT
		MANUAL SWITCH, SPDT, MAINTAINED
		RELAY OR CONTACTOR COIL
		CIRCUIT BREAKER THERMAL & MAGNETIC TRIP
		DISCONNECT SWITCH
		CHANGEOVER SWITCH
		MOTOR, 3-PHASE INDUCTION
		GENERATOR, 3-PHASE
		MOTOR, DC PERMANENT MAGNET
		LINE FILTER / REACTOR / TRANSFORMER
		MUSHROOM PUSHBUTTON, TWIST-LATCH
		FUSE
		MANUAL SWITCH, SPST, MAINTAINED
		MANUAL SWITCH, SPNO, MOMENTARY
		MANUAL SWITCH, SPDT, CENTER-OFF
		INDICATOR LAMP, SWITCH LAMP, PANEL LAMP, STACK LIGHT (LETTER INDICATES COLOR)
		CABLE MARKERS

IEC 617 SYMBOL	MALABAR SYMBOL	DEVICE DESCRIPTION
		SELECTOR SWITCH, ROTARY, 8-POSITION
		EQUIPOTENTIAL BOND (FRAME GROUND)
		SOLENOID VALVE
		PRESSURE SWITCH, OPEN ON RISE
		DIFFERENTIAL PRESSURE SWITCH, CLOSE ON RISE
		LEVEL SWITCH, CLOSE ON RISE
		LEVEL SWITCH, OPEN ON RISE
		THERMOSTAT, CLOSE ON RISE
		THERMOSTAT, OPEN ON RISE
		RESISTANCE HEATER ELEMENT
		BUZZER, AUDIBLE ALARM
		HOUR METER
		SPEED PICK-UP, PULSE OUTPUT
		VARISTOR
		PLUG / JACK
		TERMINALS
		SHIELD + DRAIN WIRE
		TWISTED WIRES, PAIRS OR TRIADS

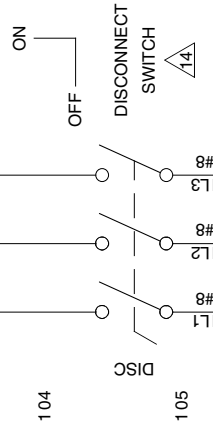
NOTES: UNLESS OTHERWISE SPECIFIED

DWG NO.	1011001A-4	SH	1	REV	E	1
REVISIONS						
ZONE	REV	DESCRIPTION	DATE	BY	APPROVED	
		SEE SHEET 8				



#12 - TR1, 2	GROUND BUSS
#14 - CTRL CHASSIS TERM	
#12 - DC-(PS1-V)	
#14 - PS1-FR	
#10 - VFD	
#10 - FRAME	

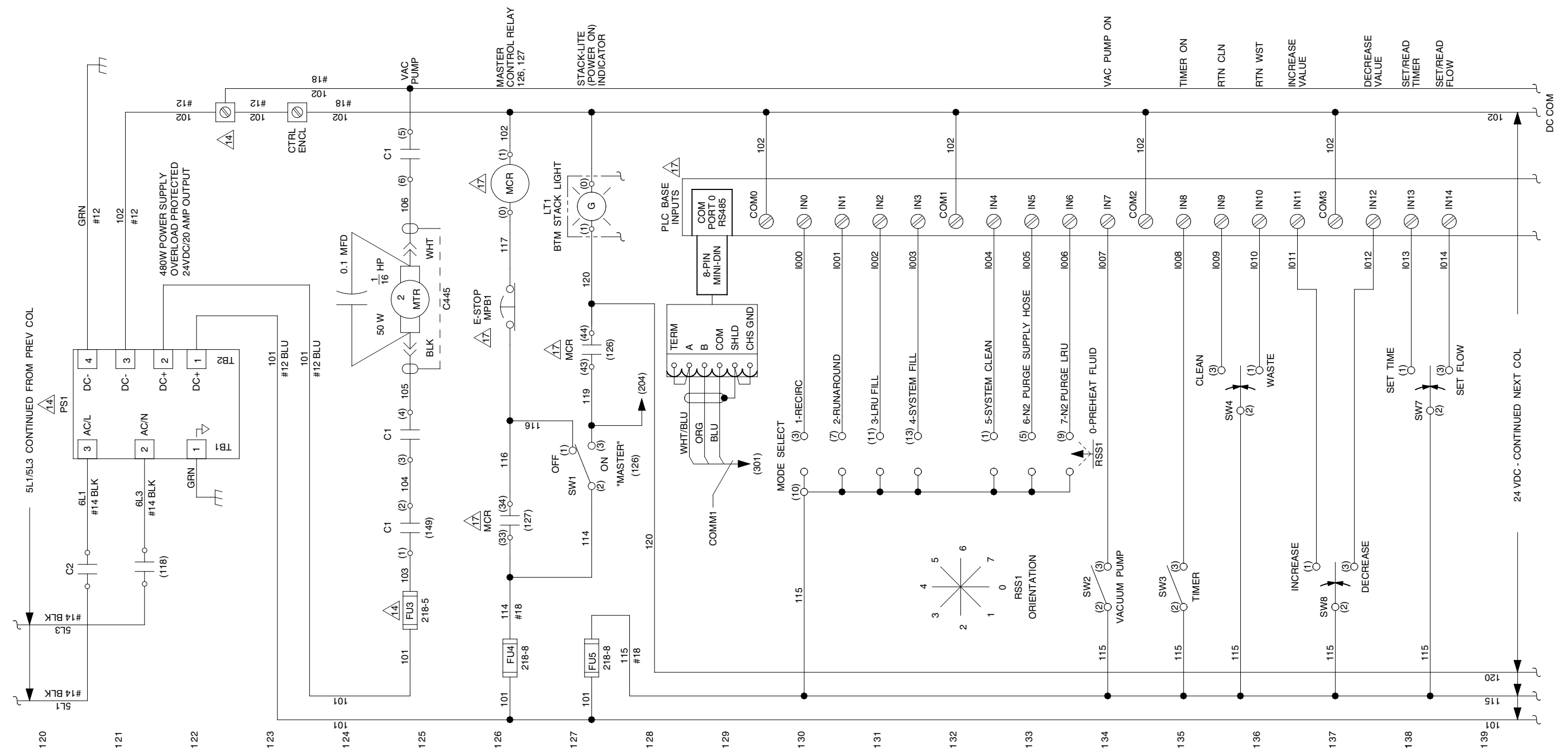
208-240/3/60	
200/3/50	
30 FLA	
T/L3	RED
S/L2	WHT
R/L1	BLK



NOTES : UNLESS OTHERWISE SPECIFIED

ITEM NO.	QTY RECD	CAGE CODE	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MATERIAL SPECIFICATION
PARTS LIST					
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES 125 TOLERANCES ARE:				CONTRACT NO.	
FRACTIONS DECIMALS ANGLES				MALABAR INTERNATIONAL	
± 1/32 .xx ± .03 ± 1°				SIMI VALLEY, CALIFORNIA	
MATERIAL				APPROVAL	DATE
FINISH				DRAWN	BILL W. 10/10
NEXT ASSEMBLY USED ON				CHECKED	DICK B. 10/10
APPLICATION				ISSUED	
DO NOT SCALE DRAWING				SIZE	D
				CAGE CODE	94861
				DWG NO.	1011001A-4
				SCALE	1/1
				REV	E
				SHEET	1 OF 9

DWG NO.	1011001A-4	SH	2	REV	E	1
REVISIONS						
ZONE	REV	DESCRIPTION	DATE	BY	APPROVED	
		SEE SHEET 8				



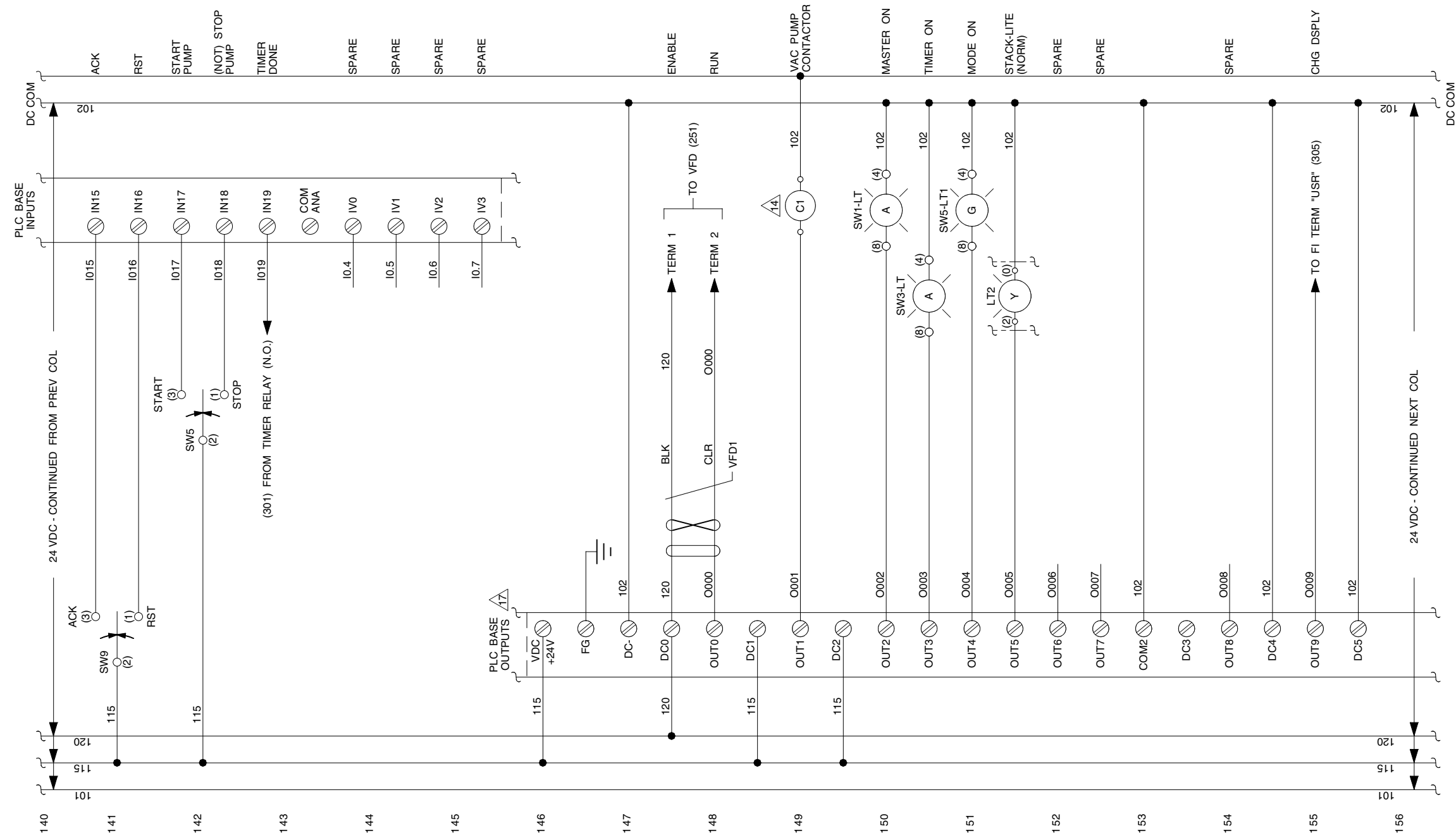
NOTES: UNLESS OTHERWISE SPECIFIED

ITEM NO.	QTY REQD	CAGE CODE	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MATERIAL SPECIFICATION
PARTS LIST					
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES 125			CONTRACT NO.		
TOLERANCES ARE:			APPROVAL		
FRACTIONS: ± 1/32			DATE		
DECIMALS: .xx ± .03			DRAWN: BILL W. 10/10		
ANGLES: ± 1°			CHECKED: DICK B. 10/10		
MATERIAL			ISSUED		
FINISH			SIZE: D		
NEXT ASSEMBLY			CAGE CODE: 94861		
USED ON			DWG NO.: 1011001A-4		
APPLICATION			SCALE: 1/1		
DO NOT SCALE DRAWING			SHEET 2 OF 9		

MALABAR INTERNATIONAL
SIMI VALLEY, CALIFORNIA

ELECTRICAL SCHEMATIC

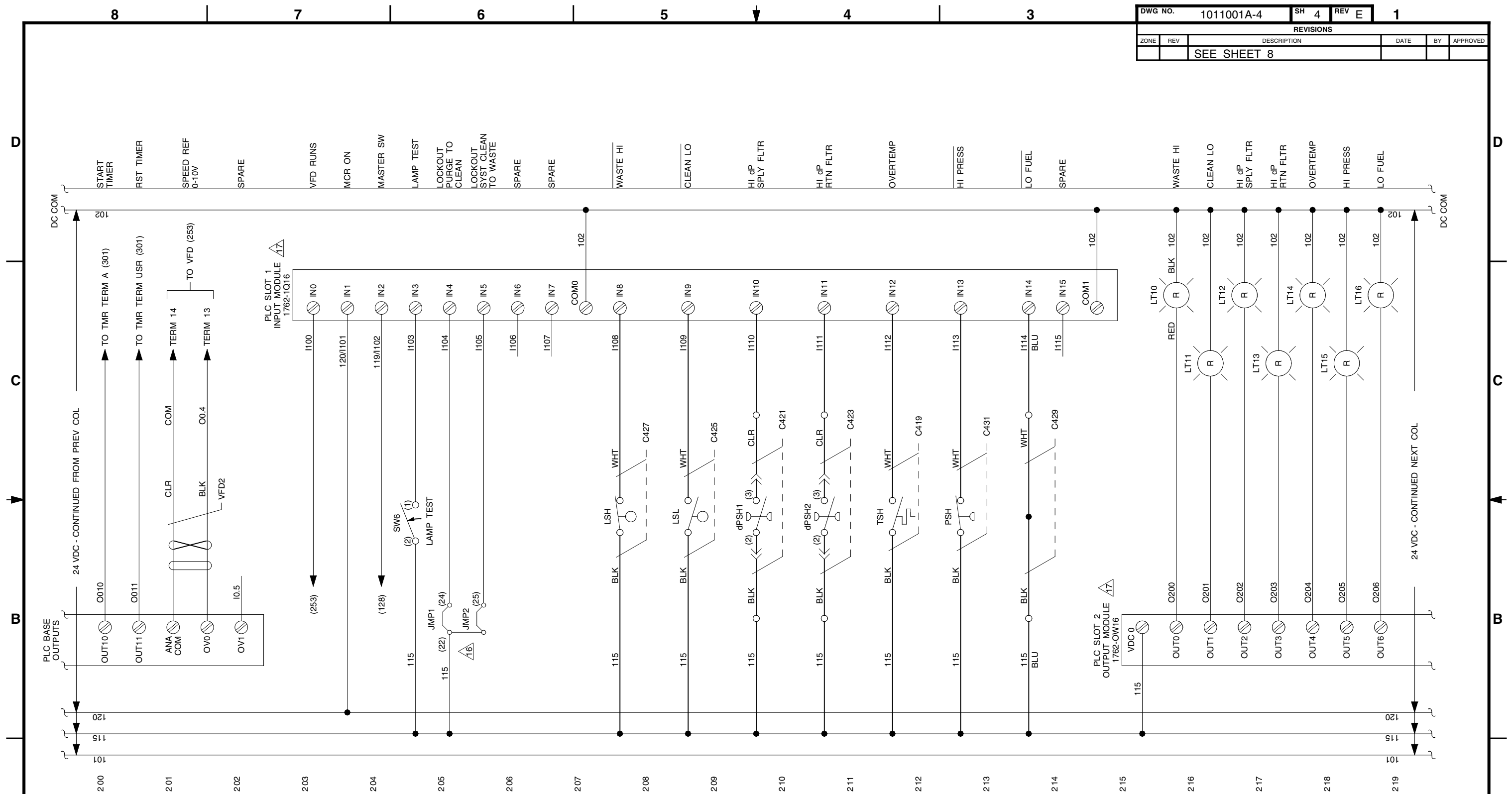
DWG NO.	1011001A-4	SH	3	REV	E	1
REVISIONS						
ZONE	REV	DESCRIPTION	DATE	BY	APPROVED	
		SEE SHEET 8				



NOTES: UNLESS OTHERWISE SPECIFIED

ITEM NO.	QTY RECD	CAGE CODE	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MATERIAL SPECIFICATION												
PARTS LIST																	
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES 125 TOLERANCES ARE:				MALABAR INTERNATIONAL SIMI VALLEY, CALIFORNIA													
FRACTIONS DECIMALS ANGLES																	
± 1/32 .xx ± .03 .xxx ± .010 ± .1°				ELECTRICAL SCHEMATIC													
MATERIAL _____																	
FINISH _____				<table border="1"> <tr> <td>APPROVAL</td> <td>DATE</td> </tr> <tr> <td>DRAWN BILL W.</td> <td>10/10</td> </tr> <tr> <td>CHECKED DICK B.</td> <td>10/10</td> </tr> <tr> <td>ISSUED</td> <td></td> </tr> </table>		APPROVAL	DATE	DRAWN BILL W.	10/10	CHECKED DICK B.	10/10	ISSUED					
APPROVAL	DATE																
DRAWN BILL W.	10/10																
CHECKED DICK B.	10/10																
ISSUED																	
NEXT ASSEMBLY USED ON				<table border="1"> <tr> <td>SIZE</td> <td>CAGE CODE</td> <td>DWG NO.</td> <td>REV</td> </tr> <tr> <td>D</td> <td>94861</td> <td>1011001A-4</td> <td>E</td> </tr> <tr> <td>SCALE</td> <td>1/1</td> <td colspan="2">SHEET 3 OF 9</td> </tr> </table>		SIZE	CAGE CODE	DWG NO.	REV	D	94861	1011001A-4	E	SCALE	1/1	SHEET 3 OF 9	
SIZE	CAGE CODE	DWG NO.	REV														
D	94861	1011001A-4	E														
SCALE	1/1	SHEET 3 OF 9															
APPLICATION DO NOT SCALE DRAWING																	

DWG NO.	1011001A-4	SH	4	REV	E	1
REVISIONS						
ZONE	REV	DESCRIPTION	DATE	BY	APPROVED	
		SEE SHEET 8				



NOTES: UNLESS OTHERWISE SPECIFIED

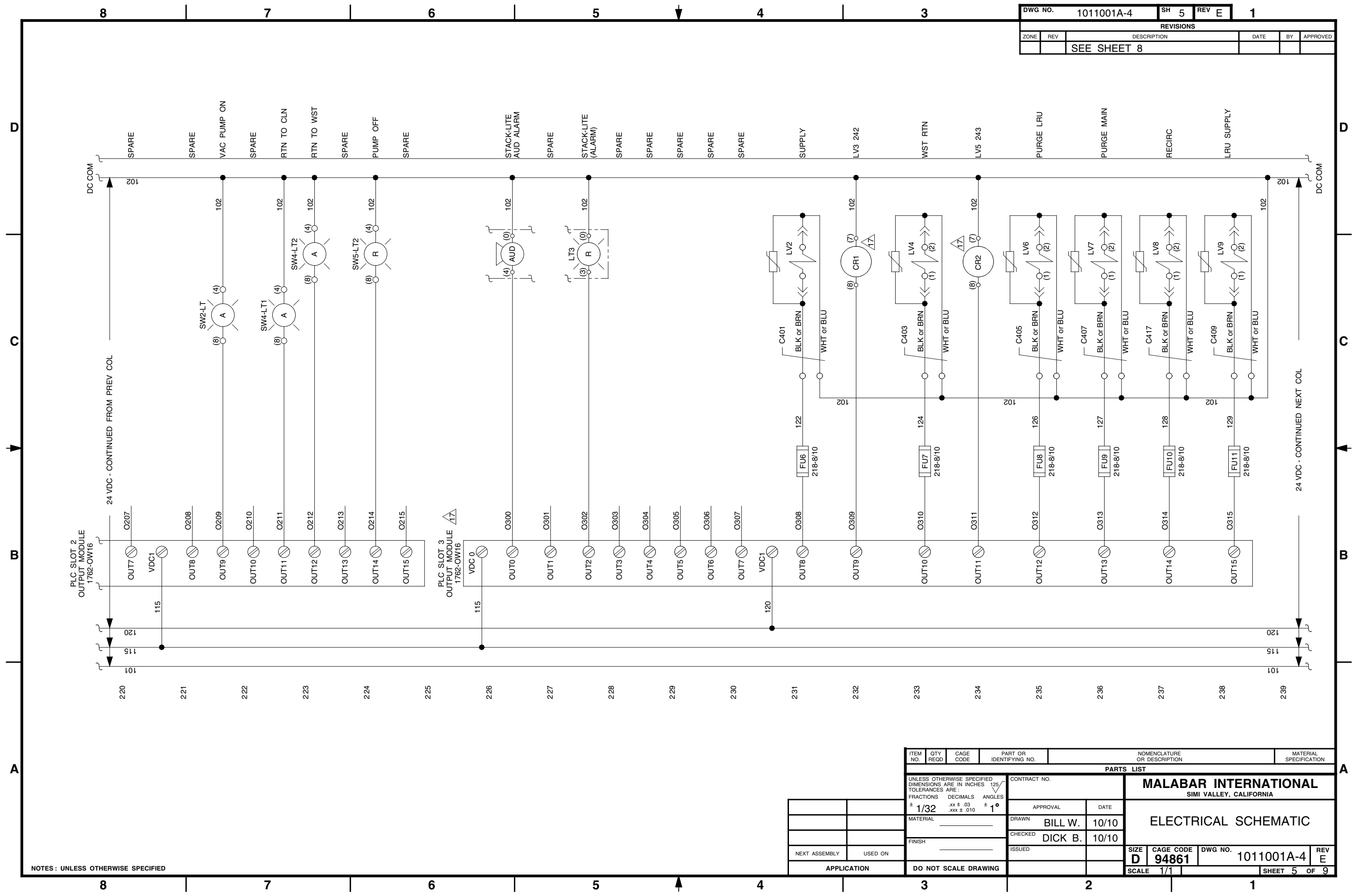
ITEM NO.	QTY REQD	CAGE CODE	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MATERIAL SPECIFICATION
PARTS LIST					
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES 125/1000 TOLERANCES ARE:				CONTRACT NO.	
FRACTIONS	DECIMALS	ANGLES		APPROVAL	DATE
± 1/32	± .03	± 1°		DRAWN	10/10
	± .010			CHECKED	10/10
				ISSUED	
NEXT ASSEMBLY		USED ON		SCALE	
APPLICATION		DO NOT SCALE DRAWING		SIZE	SCALE
				CAGE CODE	DWG NO.
				94861	1011001A-4
				REV	E
				SHEET	4 OF 9

MALABAR INTERNATIONAL
SIMI VALLEY, CALIFORNIA

ELECTRICAL SCHEMATIC

SCALE 1/1 SHEET 4 OF 9

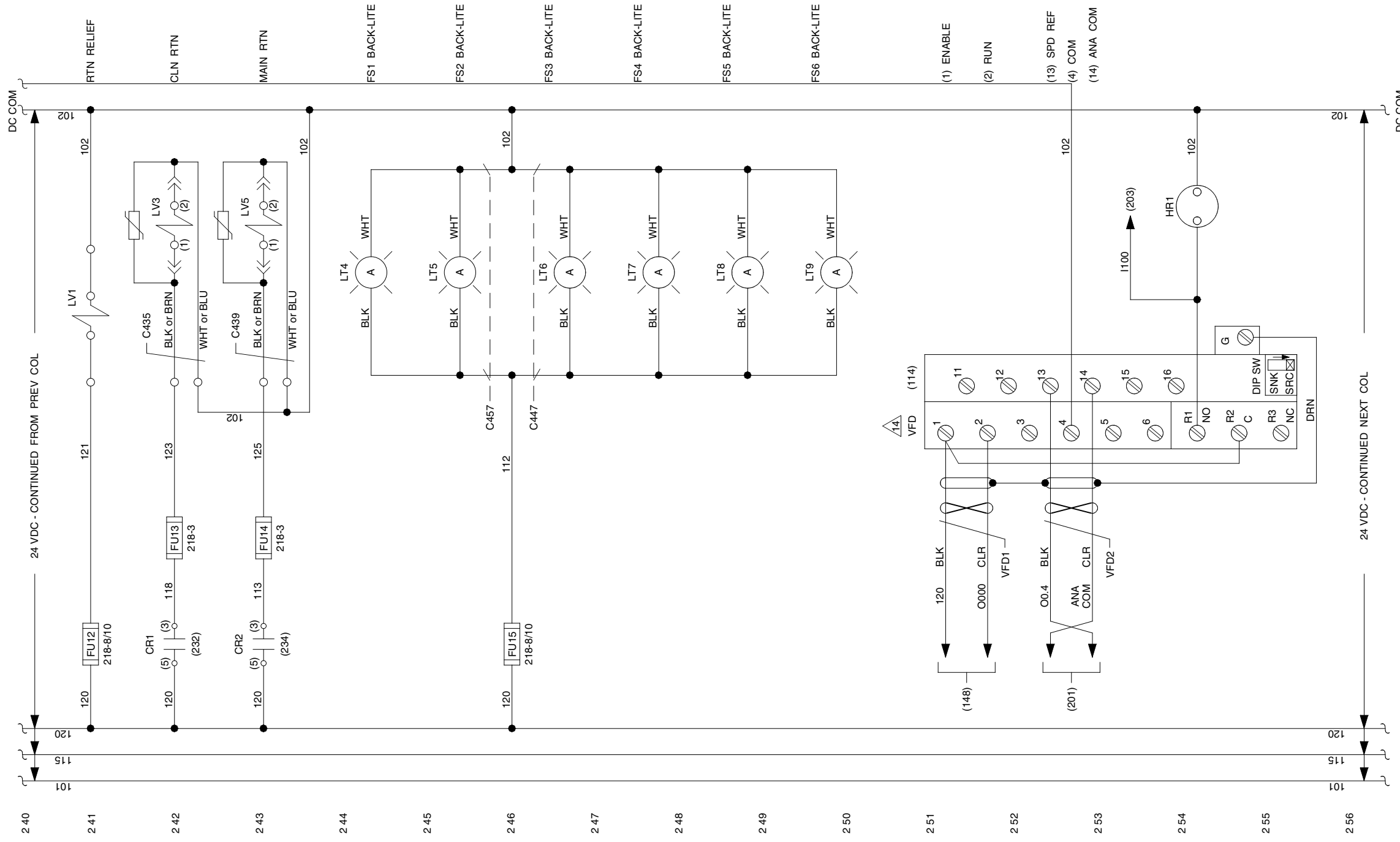
DWG NO.	1011001A-4	SH	5	REV	E	1
REVISIONS						
ZONE	REV	DESCRIPTION	DATE	BY	APPROVED	
		SEE SHEET 8				



NOTES: UNLESS OTHERWISE SPECIFIED

ITEM NO.	QTY REQD	CAGE CODE	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MATERIAL SPECIFICATION
PARTS LIST					
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES 125 TOLERANCES ARE:			CONTRACT NO.		
FRACTIONS	DECIMALS	ANGLES	APPROVAL	DATE	MALABAR INTERNATIONAL SIMI VALLEY, CALIFORNIA ELECTRICAL SCHEMATIC
± 1/32	.xx ± .03	± 1°	DRAWN	10/10	
	.xxx ± .010		CHECKED	10/10	
			ISSUED		
NEXT ASSEMBLY		USED ON		SCALE	
APPLICATION		DO NOT SCALE DRAWING		SIZE	REV
				D	E
				CAGE CODE	DWG NO.
				94861	1011001A-4
				SCALE	SHEET
				1/1	5 OF 9

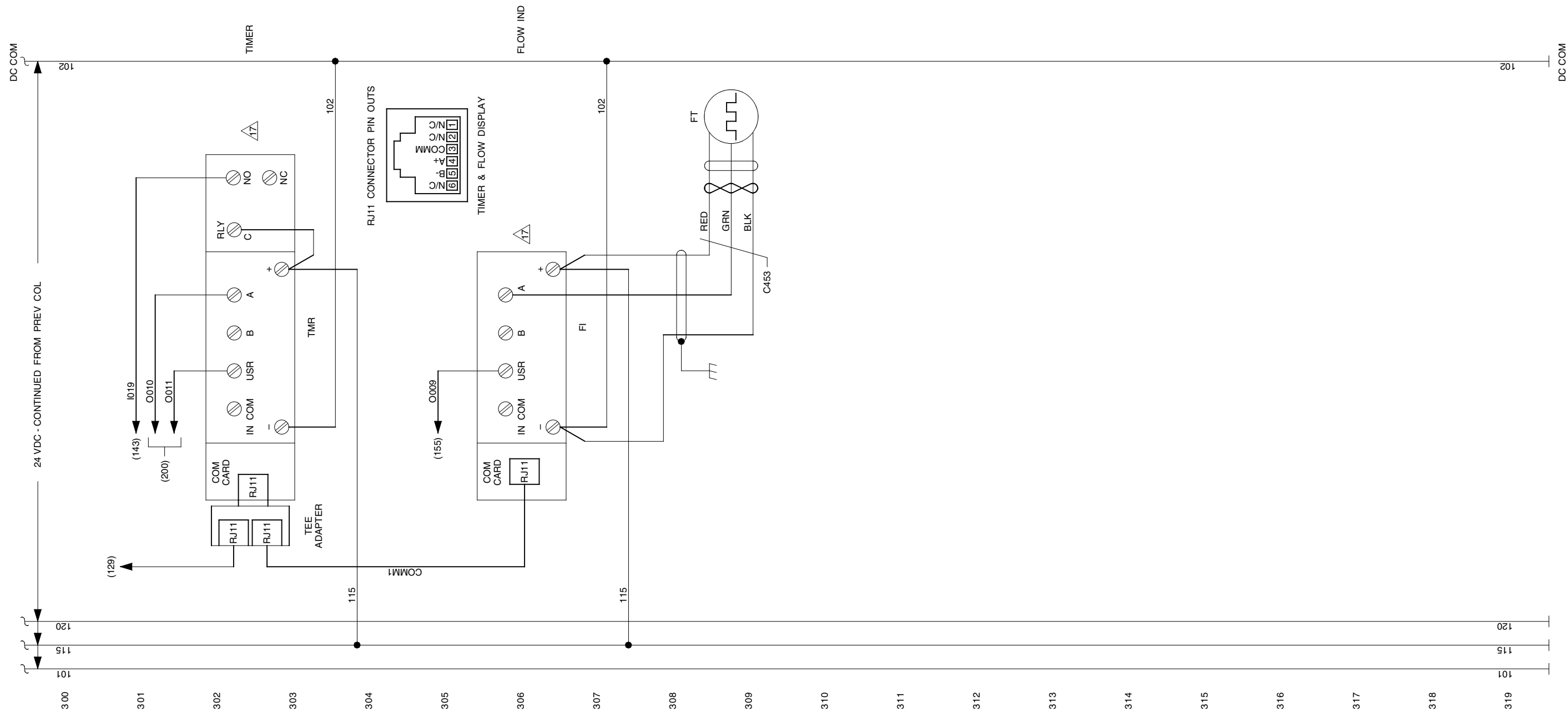
DWG NO.	1011001A-4	SH	6	REV	E	1
REVISIONS						
ZONE	REV	DESCRIPTION	DATE	BY	APPROVED	
		SEE SHEET 8				



NOTES: UNLESS OTHERWISE SPECIFIED

ITEM NO.	QTY REQD	CAGE CODE	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MATERIAL SPECIFICATION
PARTS LIST					
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES				CONTRACT NO.	
TOLERANCES ARE:				MALABAR INTERNATIONAL	
FRACTIONS	DECIMALS	ANGLES	SIMI VALLEY, CALIFORNIA		
± 1/32	± .03	± 1°	ELECTRICAL SCHEMATIC		
MATERIAL			APPROVAL	DATE	SIZE
FINISH			DRAWN	10/10	D
NEXT ASSEMBLY			CHECKED	10/10	CAGE CODE
USED ON			ISSUED		94861
APPLICATION			DO NOT SCALE DRAWING		DWG NO.
					1011001A-4
					REV
					E
					SCALE
					1/1
					SHEET
					6 OF 9

DWG NO.	1011001A-4	SH 7	REV E	1
REVISIONS				
ZONE	REV	DESCRIPTION	DATE	BY
		SEE SHEET 8		



NOTES: UNLESS OTHERWISE SPECIFIED

ITEM NO.	QTY REQD	CAGE CODE	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MATERIAL SPECIFICATION
PARTS LIST					
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE:				CONTRACT NO.	
FRACTIONS	DECIMALS	ANGLES		MALABAR INTERNATIONAL SIMI VALLEY, CALIFORNIA	
± 1/32	.xx ± .03	± 1°		APPROVAL	DATE
MATERIAL				DRAWN	BILL W. 10/10
FINISH				CHECKED	DICK B. 10/10
NEXT ASSEMBLY	USED ON			ISSUED	
APPLICATION			DO NOT SCALE DRAWING	SIZE	D 94861
				DWG NO.	1011001A-4
				REV	E
				SCALE	1/1
				SHEET	7 OF 9

REVISIONS					
ZONE	REV	DESCRIPTION	DATE	BY	APPROVED
	A	SEE ECN 5645	10/19/11	JW	BW
	B	SEE ECN 5684	1/16/12	TT	BW
	C	SEE ECN 5697	2/28/12	JW	BW
	D	SEE ECN 5757	6/15/12	BW	BW
	E	SEE ECN 5766	7/20/12	TT	BW

Construction Notes:

- All wire & cord is stranded copper conductor. Solid conductor shall not be used.
 - Individual hook up wire, unspecified:
18 awg & smaller - type MTW (600V) / H05V-K (300/500V)
16 awg & larger - type MTW (600V) / H07V-K (450/750V)
 - Individual hook up wire, specified:
TFE - teflon hook up wire, NEMA HP-3 Type E (Mil-W-16878/4), 600V nom.,
2 kV dielectric withstand voltage, NPC, -65 to 200°C
 - Multi-Conductor Power Cords over 50 V, specified:
Utility Power Cord - type W (UL), 2000V, 90°C
Generator Power Cord - type W (UL), 2000V, 90°C
 - Multi-Conductor Control & Actuator Cordage, less than 50V, unspecified:
Type SJOOW or H05VVF or SOOW
- Shielded instrument cable within enclosures (except flowmeter cable) is UL type TC, Beiden 9341 or equal, (1) pair, 18 awg, 600V, 90°C
- Minimum wire size, unless otherwise noted, shall be:
18 AWG for individual conductors
22 AWG for multiconductor jacketed cable
- Wire sizes indicated are minimum. Larger sizes may be substituted.
- Wire color for individual wires shall be:
(Colored shrink-tube at wire termination may be used to designate wire color)
BLACK - Ungrounded conductors at line voltage (greater than 150 volts).
BLUE - Ungrounded DC control conductors. (DC+)
WHITE w/ BLUE Stripe - Grounded DC control conductors (DC-)
GREEN w/ YELLOW Stripe - Equipment ground conductor.
- Each wire shall be clearly marked at each termination with commercial wire markers, with the wire number or cable number shown on this schematic diagram.
- Grounding: All metal enclosures and panels exposed to electrical wiring shall be grounded. Use internal toothed star washer under ground lug on painted surfaces.
- Grounding conductors shall be copper. Conduit and enclosures shall not be used as a grounding conductor. Grounding conductors shall be sized per NFPA-70(NEC), Art. 250-95.
- Circuit shown de-energized and empty, 70°F ambient temperature.
 - Wrap exposed terminals w/ glass tape: LT18.

General Notes:

- To restart after an EMERGENCY STOP, reset (twist-pull) E-Stop mushroom button and turn MASTER switch off and back on. Then restart.
- LAST WIRE NO. USED: 129, NOT USED: 107-111
- LAST CABLE NO. USED: C457
- △14 = Located in Electrical Enclosure Assembly power panel.
See dwg 1011012A for Cord/Cable specifications.
- △16 (Jumper 1): Remove jumper to enable Purge Return to Clean Reservoir.
△16 (Jumper 2): Remove jumper to enable System Clean Reservoir to Waste Reservoir.
- All 18 awg stranded wire may be terminated using non-insulated crimp-on ferrules for strand containment, unless otherwise specified. Panduit F77-7-M or equal (0.28 in. lg).

NOTES: UNLESS OTHERWISE SPECIFIED

ITEM NO.	QTY REQD	CAGE CODE	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MATERIAL SPECIFICATION
PARTS LIST					
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE: FRACTIONS DECIMALS ANGLES ± 1/32 ± .03 ± 1° xxx ± .010			CONTRACT NO.		MALABAR INTERNATIONAL SIMI VALLEY, CALIFORNIA ELECTRICAL SCHEMATIC
MATERIAL		APPROVAL	DATE		
FINISH		DRAWN	10/10		
NEXT ASSEMBLY USED ON		CHECKED	10/10		
APPLICATION		ISSUED			
DO NOT SCALE DRAWING		SCALE 1/1		DWG NO. 1011001A-4	REV E
				SHEET 8	OF 9

8

7

6

5

4

3

DWG NO.	1011001A-4	SH	9	REV	E	1
REVISIONS						
ZONE	REV	DESCRIPTION	DATE	BY	APPROVED	
		SEE SHEET 8				

IEC CROSS REFERENCE LEGEND

IEC 617 SYMBOL	MALABAR SYMBOL	DEVICE DESCRIPTION
		RELAY OR CONTACTOR, NORMALLY OPEN CONTACT
		RELAY OR CONTACTOR, NORMALLY CLOSED CONTACT
		MANUAL SWITCH, SPDT, MAINTAINED
		RELAY OR CONTACTOR COIL
		CIRCUIT BREAKER THERMAL & MAGNETIC TRIP
		DISCONNECT SWITCH
		CHANGEOVER SWITCH
		MOTOR, 3-PHASE INDUCTION
		GENERATOR, 3-PHASE
		MOTOR, DC PERMANENT MAGNET
		LINE FILTER / REACTOR / TRANSFORMER
		MUSHROOM PUSHBUTTON, TWIST-LATCH
		FUSE
		MANUAL SWITCH, SPST, MAINTAINED
		MANUAL SWITCH, SPNO, MOMENTARY
		MANUAL SWITCH, SPDT, CENTER-OFF
		INDICATOR LAMP, SWITCH LAMP, PANEL LAMP, STACK LIGHT (LETTER INDICATES COLOR)
		CABLE MARKERS

IEC 617 SYMBOL	MALABAR SYMBOL	DEVICE DESCRIPTION
		SELECTOR SWITCH, ROTARY, 8-POSITION
		EQUIPOTENTIAL BOND (FRAME GROUND)
		SOLENOID VALVE
		PRESSURE SWITCH, OPEN ON RISE
		DIFFERENTIAL PRESSURE SWITCH, CLOSE ON RISE
		LEVEL SWITCH, CLOSE ON RISE
		LEVEL SWITCH, OPEN ON RISE
		THERMOSTAT, CLOSE ON RISE
		THERMOSTAT, OPEN ON RISE
		RESISTANCE HEATER ELEMENT
		BUZZER, AUDIBLE ALARM
		HOUR METER
		SPEED PICK-UP, PULSE OUTPUT
		VARISTOR
		PLUG / JACK
		TERMINALS
		SHIELD + DRAIN WIRE
		TWISTED WIRES, PAIRS OR TRIADS

NOTES: UNLESS OTHERWISE SPECIFIED

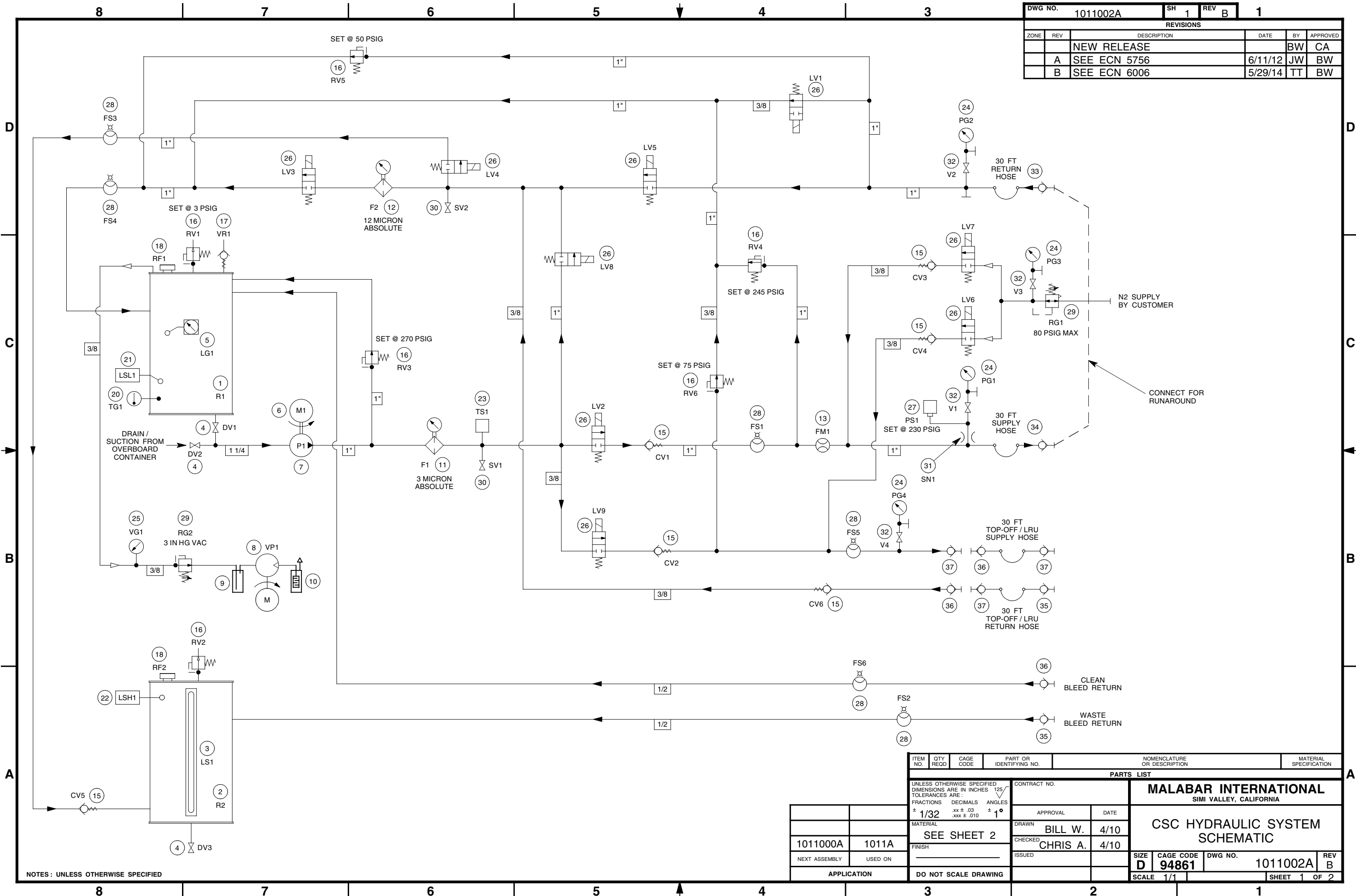
SIZE	D	CAGE CODE	94861	DWG NO.	1011001A-4	REV	E
SCALE	1/1			SHEET	9	OF	9



APPENDIX II

Hydraulic Schematic 1011002A

DWG NO.	1011002A	SH	1	REV	B	1
REVISIONS						
ZONE	REV	DESCRIPTION	DATE	BY	APPROVED	
		NEW RELEASE		BW	CA	
	A	SEE ECN 5756	6/11/12	JW	BW	
	B	SEE ECN 6006	5/29/14	TT	BW	



NOTES: UNLESS OTHERWISE SPECIFIED

ITEM NO.	QTY REQD	CAGE CODE	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MATERIAL SPECIFICATION
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES 1/25 TOLERANCES ARE:					
FRACTIONS		DECIMALS		ANGLES	
± 1/32		± .03		± 1°	
		± .010			
CONTRACT NO.				MATERIAL	
APPROVAL				DATE	
DRAWN BILL W.				4/10	
CHECKED CHRIS A.				4/10	
ISSUED					
SIZE D		CAGE CODE 94861		DWG NO. 1011002A	
SCALE 1/1				REV B	
				SHEET 1 OF 2	

1011000A	1011A	SEE SHEET 2
NEXT ASSEMBLY	USED ON	
APPLICATION		
DO NOT SCALE DRAWING		

MALABAR INTERNATIONAL
SIMI VALLEY, CALIFORNIA

CSC HYDRAULIC SYSTEM SCHEMATIC

DWG NO.	1011002A	SH	2	REV	B	1
REVISIONS						
ZONE	REV	DESCRIPTION	DATE	BY	APPROVED	
		SEE SHEET 1				

37	3/8 QD COUPLER (PARKER FS371-6FP)	
36	3/8 QD NIPPLE (PARKER FS372-6FP)	
35	1/4 QD NIPPLE (PARKER FS252-4FP)	
34	SUPPLY HOSE W/1" QD COUPLER (PARKER FS-1001-16FP)	
33	RETURN HOSE W/1" QD NIPPLE (PARKER FS-1002-16FP)	
32	GAUGE ISOLATION VALVE	V1-4
31	SNUBBER	SN1
30	SAMPLING VALVE	SV1-2
29	REGULATOR	RG1-2
28	FLOW SIGHT	FS1-6
27	PRESSURE SWITCH	PS1
26	SOLENOID VALVE	LV1-9
25	VACUUM GAUGE	VG1
24	PRESSURE GAUGE	PG1-4
23	TEMPERATURE SWITCH	TS1
22	HIGH LEVEL SWITCH	LSH1
21	LOW LEVEL SWITCH	LSL1
20	TEMPERATURE GAUGE	TG1
19		
18	NON-VENTED RESERVOIR FILL CAP	RF1-2
17	VACUUM RELIEF VALVE	VR1
16	PRESSURE RELIEF VALVE	RV1-6
15	CHECK VALVE	CV1-6
14		
13	FLOW METER	FM1
12	12 MICRON ABSOLUTE RETURN FILTER	F2
11	3 MICRON ABSOLUTE SUPPLY FILTER	F1
10	MUFFLER	
9	VAPOR TRAP	
8	VACUUM PUMP	VP1
7	MAIN PUMP	P1
6	ELECTRIC MOTOR	M1
5	LEVEL GAUGE	LG1
4	DRAIN VALVE	DV1-3
3	LEVEL SIGHT	LS1
2	50 GALLON WASTE FLUID RESERVOIR	R2
1	50 GALLON CLEAN FLUID RESERVOIR	R1
ITEM NO.	DESCRIPTION	REF DESIGNATOR

ITEM NO.	QTY REQD	CAGE CODE	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MATERIAL SPECIFICATION
PARTS LIST					
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES 125/				CONTRACT NO.	
TOLERANCES ARE:				MALABAR INTERNATIONAL	
FRACTIONS DECIMALS ANGLES				SIMI VALLEY, CALIFORNIA	
± 1/32 .xx ± .03 ± 1°				CSC HYDRAULIC SYSTEM SCHEMATIC	
MATERIAL				APPROVAL	DATE
SEE ABOVE				DRAWN	BILL W. 4/10
FINISH				CHECKED	CHRIS A. 4/10
NEXT ASSEMBLY USED ON				ISSUED	
APPLICATION				SIZE	D
DO NOT SCALE DRAWING				CAGE CODE	94861
				DWG NO.	1011002A
				REV	B
				SCALE	1/1
				SHEET 2 OF 2	

NOTES: UNLESS OTHERWISE SPECIFIED

D
C
B
A

D
C
B
A

8 7 6 5 4 3

8 7 6 5 4 3 2 1



APPENDIX III

Control System Operation Control System Configuration Record

Control System Operation

Model 1010A-1011A-1012A CSC

OPERATING MODE ⁴	FACTORY PRESET GPM	FACTORY PRESET TIMER	ADJ. RANGE GPM	SOLENOID VALVES									VAC PUMP ³	
				LV 1	LV 2	LV 3 ⁶	LV 4 ⁶	LV 5	LV 6	LV 7	LV 8	LV 9		
PREHEAT	20	8.00	15-30*	ON ²	-	-	-	-	-	-	-	-	-	A
RECIRCULATE	30	2.30	10-32	ON ²	-	ON	-	-	-	-	ON	-	-	A
RUNAROUND	30	2.30	10-32	ON ²	ON	ON	-	ON	-	-	-	-	-	A
LRU FILL	2	3.00	1-3	ON ²	-	ON	-	-	-	-	-	ON	-	A
SYSTEM FILL	4	4.30	1-15	ON ²	ON	ON	-	ON	-	-	-	-	-	A
SYSTEM CLEAN	7	5.00	5-32	ON ²	ON	ON	-	ON	-	-	-	-	-	A
N2 PURGE SUPPLY	NA	7.00	NA	ON ²	-	-	ON	ON	-	ON	-	-	-	-
N2 PURGE LRU	NA	7.00	NA	ON ²	-	-	ON	-	ON	-	-	-	-	-

KEY: ON.....Energized -.....De-energized A.....Allowed NA..... Not Applicable

*Observe the following flow rate limits in PREHEAT mode to avoid motor overload:

Reservoir temperature: <30 °F, 18 GPM max.
 30 °F - 45 °F, 25 GPM max.
 >45 °F, 30 GPM max.

Solenoid Valve Functions^{1, 2}

LV1: Equalizer Valve, vents return line to reservoir (NO) LV2: Main Supply Line Shutoff (NC)
 LV3: Main Return to Clean Reservoir (NC) LV4: Main Return to Waste Reservoir (NC) LV5: Main Return Line Shutoff (NC)
 LV6: Purge Valve, LRU Supply (NC) LV7: Purge Valve, Main Supply (NC) LV8: Recirculation (NC)
 LV9: LRU Supply Line Shutoff (NC)

Notes:

- All solenoid valves are normally closed except LV1.
- LV1 (N.O. equalizer valve) turns on (closes) when MASTER switch is on, opens when MASTER switch is off or E-Stop.
- VACUUM PUMP can be turned on/off with a control panel switch in all modes except N2 PURGE.
- In PREHEAT, RECIRCULATE, and LRU FILL mode, the flow display shows flow setpoint only, not actual flowrate because the flowmeter is bypassed in these modes and flow control is open loop. Actual flow is displayed and actively controlled (closed loop) in RUNAROUND, SYSTEM FILL, and SYSTEM CLEAN modes only. The flowmeter is not applicable to N2 PURGE modes.
- The hourmeter on the instrument panel accumulates main pump runtime.
- Either LV3 (CLN RETURN) or LV4 (WST RETURN) may be selected by the operator in any mode unless restricted by jumper configuration (see manual). Table shows factory preset values.

Control System Configuration Record

Model 1010A & 1011A CSC
Rev. 2, December 18, 2013

Variable Frequency Drive Configuration

Allen-Bradley PowerFlex 4M Drive: 22F-B033N104		
SNK/SRC Dipswitch: SRC (down)		
*Parameter	Value	Function / Comments
P101	208	Motor Nameplate Volts
P102	60	Motor Nameplate Hz
P103	31.5**	Motor Overload Current **(1.25 x FLA if SF=1.15, otherwise use 1.15 x FLA)
P104	0	Min. Freq.
P105	90	Max. Freq.
P106	2	Start Source: 2-Wire
P107	1	Stop Mode: Coast to Stop
P108	2	Speed Reference: 0-10V Analog Input
P109	10.0	Accel. Time 1
t221	2	Relay function: VFD Running
A451	2	Auto restart tries
A452	2.0	Auto restart delay, Secs
Parameters not listed are left at the factory default values. See PowerFlex 4M User Manual		
*Note: The Parameters are locked at the factory. If necessary, contact Malabar for instructions.		

PLC Configuration

Allen-Bradley MicroLogix 1400 Controller: 1766-L32BXBA
Expansion I/O: Allen-Bradley 1762-IQ16, (2)1762-OW16
Program File Name: 1011A_Rn ("n" is revision number)
Processor Name: CSC1011A
IP Address: 192.168.1.10
Subnet Mask: 255.255.255.0

Wired Jumpers for Program Configuration Options

JMP1 (Jumper 1): Remove jumper to enable Purge Return to Clean Reservoir.

JMP2 (Jumper 2): Remove jumper to enable System Clean Return to Waste Reservoir.

Control System Configuration - Model 1010 & 1011

Flowrate Display Meter Parameters

Note: see Red Lion CUB5 Operating Manual, *Programming the Meter*

Red Lion: CUB5 Counter/Rate Indicator			
Dipswitch settings (rear of unit): Switches 1-4 OFF (down)			
Security Code: 000			
**Parameter	Value	Function	Comment
Module 1: Input Setup Parameters (1-INPUt)			
InP A-b	RAtE	Rate only (counter A)	Mode
CntA dP	0.0	Counter A Decimal Point	
USEr InP	d-SELEct	Display Select	USR Input Function
Module 2: Rate Parameters (2-rAtE)			
RAtE	Yes	Rate Enable	
RAtE dP	0.0	Rate Decimal Point	
RAtE dSP	60	Rate Scaling Display Value	
RAtE InP	*1830.0	Rate Scaling Input Value	*Use actual pusle/gal. from cal. data
LO-Udt	1.0	Rate Low Update Time	
HI-Udt	2.0	Rate High Update Time	Must be higher than LO-Udt
Module 3: Display and Front Panel Key Parameters: (3-dSPLAY)			
SEL Enb	No	Front Panel Display Select Enable	Must set when "R" (rate) is displayed
RSt Enb	No	Front Panel Reset Enable	
Module 4: Setpoint Output Parameters (4 - SEtPt)			
	None		
Module 5: Serial Communications Parameters (5 - SEriAL)			
bAUd	9600	Baud Rate	
dAtA	7-bit	Data Bits	
PARity	no	Parity	Note: 2 Stop bits
Addr	2	Meter Address	
Abbr	yES	Abbreviated Printing	

****Note: The Parameters are locked at the factory. If necessary, contact Malabar for instructions.**

Control System Configuration - Model 1010 & 1011

Timer Parameters

Note: see Red Lion CUB5T Operating Manual, *Programming the Meter*

Red Lion: CUB5T Preset Timer			
Dipswitch settings (rear of unit): Switches 1-4 OFF (down)			
Security Code: 000			
*Parameter	Value	Function	Comment
Module 1: Timer Input (1-INPUt)			
RAN6E	NNNNN.SS	Minutes. Seconds	Timer Range
INPUt OP	LEVEL	Input "A"	Start Timer
FILtEr	ON	Timer Input Filter	50 ms debounce
t-dir	dn	Timing direction	Down
t-Strt	nnnnnnn	Timer Start Value	non-zero for timing down
t-STOP	yES		Timer STOP functionality
	STOP-VAL		
	0000000.00	Timer Stop Value	
t-FLASH	yES	Flash Annunciator	"t" flash when timer is running
Run P-UP	StOP	Run state at power up	
RSt P-UP	yES	Reset at power up	
USEr InP	rESet	Maintained reset	
Module 2: Cycle Counter (2-Count)			
SEL ENB	NO	Cycle Counter Enable	
Module 3: Display and Front Panel Key Parameters: (3-dSPLAy)			
SEL Enb	NO	Display Select	
RSt Enb	NO	Front Panel Reset	
d-ScroLL	NO	Display Scroll Enable	
d-COLOr	rEd	Display Color	
d-LEVEL	5	Display Intensity	
Pro CodE	000	Programming Security	Immediate Access
FAcT Set	No	Load Factory Defaults	
Module 4: Setpoint Output Parameters (4 - SEtPt)			
SPT ASN	t-VALUE	Setpoint Assignment	Timer value
SPT Act	LAtCH	Setpoint Output Action	Output ON when time=0, OFF at Rst
SPT ON	VALUE	Setpoint ON Value	000000
StOP-t	Out-ON	Stop Timer	Stop timer when output activates
AUtO rSt	NO	Timer Auto Reset	
SPT rSt	yES	SP output rst w/display	Output OFF when display resets
Ch-COLOR	NO	Change color w/output	
SPT P-UP	OFF	Setpoint out w/power up	

Control System Configuration - Model 1010 & 1011

Module 5: Serial Communications Parameters (5 - SERIAL)			
bAUd	9600	Baud Rate	
dAtA	7-bit	Data Bits	
PArity	no	Parity	Note: 2 Stop bits
Addr	1	Meter Address	
Abbr	yES	Abbreviated Printing	

***Note: The Parameters are locked at the factory. If necessary, contact Malabar for**



APPENDIX IV

**Allen Bradley
MicroLogic 1400 Programmable Controllers**



APPENDIX V

IMO Pump



APPENDIX VI

Perkins Engine Operation and Maintenance Manual



APPENDIX VII

**Red Lion
Model Cub5, Model Cub5T**



APPENDIX VIII

United Electric 100 Series Pressure, Vacuum, Differential Pressure and Temperature Switches



APPENDIX IX

Mean Well SDR-480 Series



APPENDIX X

Flow Dynamics Turbine Flowmeter Operation Manual



APPENDIX XI

FenWall Thermoswitch – Temperature Controller Installation Instructions



APPENDIX XII

Tescom
44-5200 Series Regulators
Operation and Service Manual
Safety, Installation & Operation Precautions



APPENDIX XIII

Granzow
8-Watt Valve Coil
Series 21XN4 Solenoid Valve
Series 21XN6 Solenoid Valve
Series 21L Solenoid Valve



APPENDIX XIV

Omega SV100 and SV200 Series Solenoid Valves



APPENDIX XV

Gast Oil-Less Diaphragm Vacuum Pumps & Compressors Operation & Maintenance Manual



APPENDIX XVI

**Lovejoy
L, CJ, C & H Type Elastomeric Jaw Type Hubs**



APPENDIX XVII

Coxreels Installation and Maintenance Manual



APPENDIX XVIII

Declaration of Conformity



EU Declaration of Conformity

Model Number(s) 1010A / 1011A
Product Type/Name: Coolant Service Cart (CSC)

Declaration: Tronair has assessed the equipment described above against the Essential Health and Safety Requirements of one or more Directives. Based on this assessment, the equipment described above is deemed to comply with the directive(s) listed below.

This declaration of conformity is issued under the sole responsibility of the manufacturer.

Directives: European Machinery Directive 2006/42/EC
Electromagnetic Compatibility Directive 2004/108/EC

Standards: EN ISO 12100-1:2003/+A1:2009 - Safety of machinery
General principles for design – Risk assessment and risk reduction

EN ISO 12100-2:2003/+A1:2009 - Safety of machinery
General principles for design – Technical principles

EN ISO 13849-1:2008 - Safety related parts of control systems – General principles for design

EN 60204-1:2006 - Safety of machinery
Electrical equipment of machines – Part 1:General requirements

EN 6100-6-2:2005 - Electromagnetic compatibility (ECM) generic standards
Part 6-2: Generic standards – Immunity for industrial environments

EN 6100-6-4:2007 - Electromagnetic compatibility (ECM) generic standards
Part 6-4: Generic standards – Emission standard for industrial environments

Markings: The CE mark, consisting of the letters 'C' and 'E' in a stylized, bold, sans-serif font.

Location of Issue: Tronair, 1 Air Cargo Parkway East, Swanton, OH 43558

Identification of person empowered to sign on behalf of the Manufacturer: Quality Assurance Representative