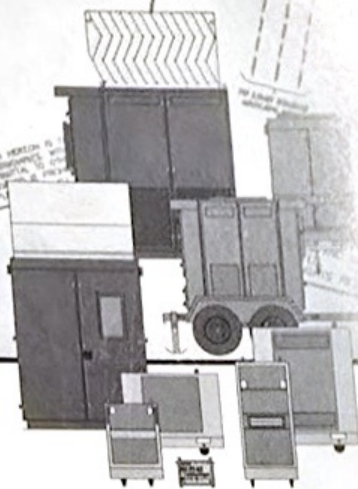


LOAD BANK TECHNICAL MANUAL

Customer: Central Power Systems

Work Order: 65665-07-43

Model: Triton-HV 1000



SIMPLX®

LOAD BANKS & FUEL SUPPLY SYSTEMS

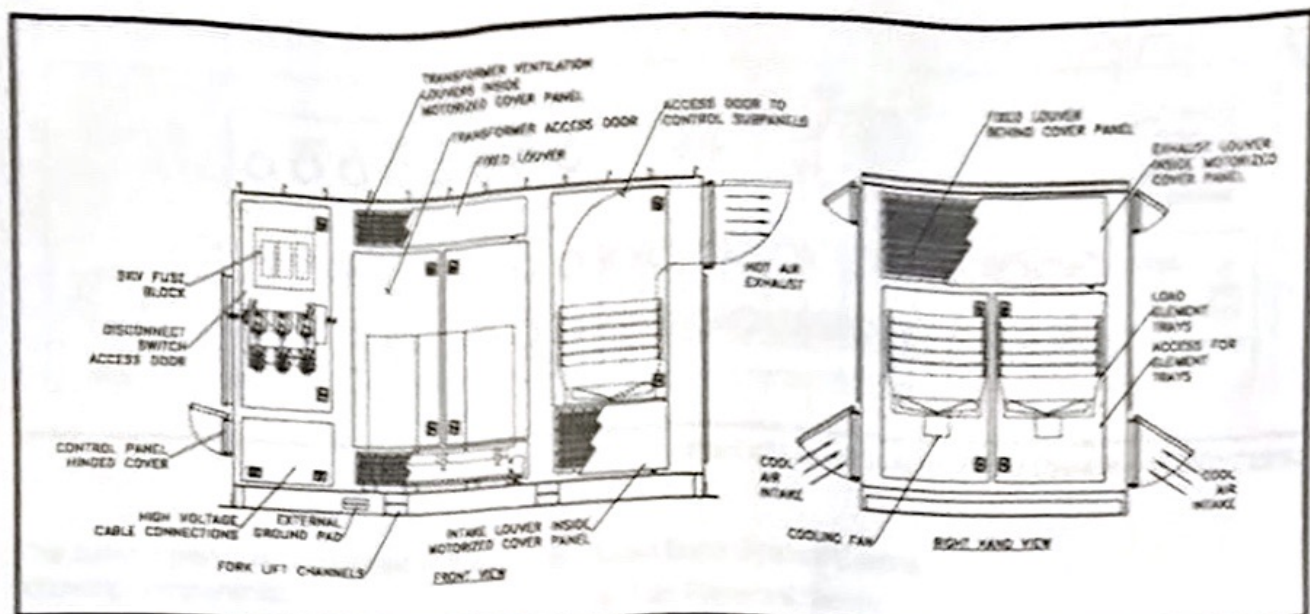
Simplex Inc., 1139 N. MacArthur Blvd., Springfield, IL 62702-2314

217-525-6995 (24 hr.) • Fax: 217-525-7984

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Contents

DESCRIPTION	2
Cooling Failure Subsystem	4
PRIMARY INSPECTION	4
TRAILER INSPECTION	5
LOAD BANK LOCATION	5
REMOTE STOP CIRCUIT	5
EXTERNALLY POWERED LOUVER OPERATION	5
DOOR INTERLOCK CIRCUIT	6
CONNECTING LOAD BANK	6
DISCONNECTING LOAD BANK	6
MAIN DISCONNECT SWITCH	6
METER CONFIGURATION	6
OPERATION	7
LOAD BANK MAINTENANCE	8
Each Operation	8
Every 50 Hours or 6 Months	9
Motor Lubrication	9
TRAILER MAINTENANCE	11
TROUBLESHOOTING	12
Cooling Fan Motor Will Not Operate	12
High Transformer Temp Indicated	12
High Intake Temp Indicated	12
High Exhaust Temp Indicated	12
Fan Failure Indicated	13
Digital Meter Does Not Operate Properly	13
Disconnect Switch Does Not Operate	13
Load Steps Cannot Be Energized	13
DRAWINGS AND PARTS LIST	14
APPENDIX A - ABBREVIATIONS USED IN THIS MANUAL ..	15
APPENDIX B - CALCULATIONS & FORMULAS	16
APPENDIX C - TORQUE VALUES	19
APPENDIX D - COMPONENT MANUFACTURER'S LITERATURE & INFORMATION	21
APPENDIX E- DRAWINGS	23



Part of Pictorial Drawing 47BD1722246

DESCRIPTION

Simplex Load Banks are precision test instruments specifically designed to apply a discrete, selectable resistive and/or inductive electrical load to a power source while measuring the response of the generator to the applied load. They also provide a means for routine maintenance exercise to assure long term reliability and readiness of the standby generator. Exercise Load Banks eliminate the detrimental effects of unloaded operation of diesel engine generators.

This Triton Load Bank is mounted on a 20' trailer which includes hydraulic brakes, 3" adjustable height pintle eye, 12,000 lb. jack, and D.O.T. required sealed and shock mounted LED tail-lights. **This trailer is not intended for over the road use.**

This fully self-contained, two load section, Load Bank includes test instrumentation, cooling system, rugged load elements, local load application control devices and automatic system protection devices. Instrumentation is protected by hinged cover panels.

SPECIFICATIONS

TRITON-HV 1000

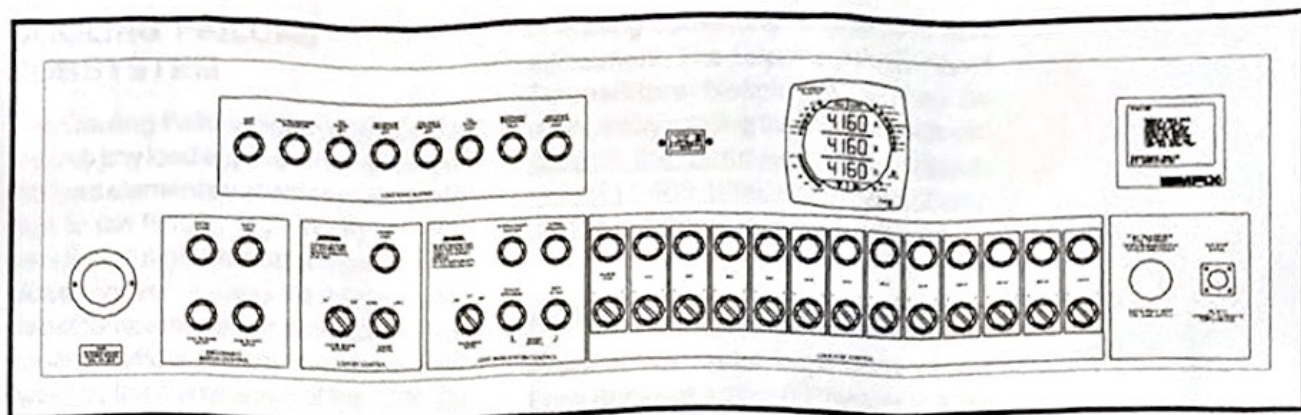
Resistive Load Bank
1000KW @ 1.0 P.F.
4160:480V, 3 ϕ , 60HZ
Forced Air Cooled
35,000 CFM Required
150-300°F Temperature Rise
120°F Max. Intake Temp.
W.O. # 65665-07-43

⚠ WARNING ⚠

This trailer is not intended for over the road use.

⚠ WARNING ⚠

Manually operated Load Banks should never be left unattended.



Part of Local Control Panel Drawing 47BD172263

The control panel is comprised of the following components:

1. Indicator Lamps:

- Door Open
- High Transformer Temperature
- Fan Failure Left
- High Exhaust Temperature Left
- High Intake Temperature Left
- Fan Failure Right
- High Exhaust Temperature Right
- High Intake Temperature Right

2. Running Time Meter

3. Digital Meter

4. Specifications Nameplate

5. External Louver Control Power Inlet

6. Disconnect Switch Control pushbuttons and indicator lamps

7. Louver Control:

- Louver Source Selector and Louver Position switches
- Louvers Open indicator lamp

Visually confirm all louvers are open before operating the Load Bank.

8. Load Bank System Control

- Fan Reversal Switch
- Master Control pushbuttons
- Control Power Available and Normal Operation indicator lamps

Do not run fans until all louvers are open.

Do not reverse fans until the fans fully stop.

Check for correct airflow.

9. Master Load and load step indicator lamps and switches

10. Emergency Stop Trip Main Switch

11. Receptacle 1 Connect To Remote Trip/Stop Coil

The load elements in these Load Banks are cooled by a vertical forced air system which discharges at a high velocity, horizontally through the front. Exhaust temperatures may reach 600°F. Care must be taken to insure personnel safety. Do not allow personnel to walk through exhaust air stream within 50 feet of the Load Bank.

COOLING FAILURE SUBSYSTEM

The Cooling Failure Subsystem de-energizes any load applied when cooling of the load elements becomes inadequate due to fan failure, high intake air temperature or high exhaust temperature. A closed louver, excessive intake or exhaust temperatures or any reduction in cooling airflow for any reason is indicated by the illumination of the "Cooling Failure" lamp on the Control Panel. All load steps are locked out until the problem is corrected and failure related relays are reset by turning the Load Bank "Off" then "On". The Cooling Failure Subsystem consists of the Intake Temperature Switch and Relay (INTS, ITR), Pressure Switch and Relay (PS, FFR), the Exhaust Temperature Switch and Relay (EXTS, ETR), Power Transformer Temperature Switch and Relay (TTS, TTR), and the Normal Operating Relay (NOR). Since these components are all connected in series an intake temperature above 125° F, an exhaust temperature above the setpoint of the EXTS, a closed louver, or a substantial reduction in air flow pressure will open the voltage path to the NOR. NOR de-energizes. The "Cooling Failure" lamp illuminates and the "Normal Operation" lamp is extinguished. The "Master Load" switch is disabled when NOR contacts 4-7 open. The load is de-energized and load cannot be reapplied until the failure is corrected.

Thermocouple Temperature Switch

The exhaust temperature network consists of a type J thermocouple (TC) and a solid state thermocouple sensor (EXTS). The temperature switch has been factory adjusted for precise Load Bank over temperature protection under normal operating conditions. Unusual

operating conditions may require field adjustment. The setpoint of the Exhaust Temperature Switch (EXTS) may be changed by rotating the adjustment knob. Consult the Simplex Service Department (217-483-1600 24hrs) before changing the temperature switch setpoint.

PRIMARY INSPECTION

Preventative visual inspections of this Load Bank are advised. Physical or electrical problems due to handling and vibration may occur. Never apply power to a Load Bank before performing this procedure. The following Six Point / 30 Minute Inspection is recommended before initial operation, as part of the 50 hour / 6 month maintenance schedule and whenever a Load Bank is relocated:

1. Check the entire outside of the Load Bank for any visual damage which could cause internal electrical or mechanical problems due to reduced clearance.
2. Operate all hinged panels and doors for smooth and safe operation, try all latches and knobs.
3. Rotate and push all switches through all positions to ensure smooth operation.
4. Inspect all relays, timers, and control modules by opening all accessible panels. Make sure all components are secure in their bases and safety balls are in place. Spot check electrical connections for tightness. If any loose connections are found inspect and tighten all remaining connections.
5. Examine all accessible internal electrical components such as fuses, contactors and transformers. Check lugged wires at these components.
6. Visually inspect element chamber for foreign objects, broken ceramic insulators, mechanical damage.

If any problems are observed during Primary Inspection call the Simplex Service Manager at 217-483-1600 (24hrs.)

 WARNING

This trailer is not intended for over the road use.

TRAILER INSPECTION

1. Inspect safety chains, ensure solid connection to trailer and chain hooks.
2. Inspect the trailer hydraulic system, lighting system, bulbs, etc.
3. Inspect brake system, brake shoes, etc.
4. Inspect hitch ring, operate lift jack, tighten all hardware as necessary due to vibration

LOAD BANK LOCATION

The load elements in this Load Bank are cooled by a vertical forced air system which discharges horizontally through the front of the cabinet. Location of the Load Bank is of prime importance and should be done by trained personnel. It is one of the most critical factors involved in safe operation. The Load Bank must be positioned and installed according to large airflow requirements, as exhaust temperatures can easily exceed 600°F. Never point the exhaust at a nearby surface or object which may be adversely affected by high temperature. Never operate the Load Bank in a confined space without regard for adequate intake of air and provision for exit of high temperature exhaust. Consider that the Load Bank and a nearby generator set may have to compete for cooling air.

Never bounce hot exhaust air off nearby objects and allow it to recirculate through the cooling system. Never operate the Load Bank in proximity to a sprinkler system.

REMOTE STOP CIRCUIT

It is recommended that Plug-1 be wired to either a circuit breaker shunt trip coil or an engine stop circuit. In the event that the operator pushes the emergency stop push button the normally open contacts of EPB will close providing a signal path from pins 1 to 2 of Plug-1. See *Control Section-1 Drawing* for further details. A 50' cable and plug assembly has been provided for this purpose and is located in the cable storage compartment.

EXTERNALLY POWERED LOUVER OPERATION

A convenience inlet is available to power the motorized louvers from an external 120V source when a 4160V main power source is not available. Install a suitable control power cable into the supplied connector body, attach the opposite end to a customer supplied 120V, 10A source. Plug the connector body into the flanged inlet located on the control panel. See *Control Detail Drawing*. Place the "Louver Source Selector" switch into the EXT position. Place the "Louver Position" switch into the desired position: "Open" or "Close".

Louver position is controlled by an open or close signal to the PLC in conjunction with a 0-5VDC signal level from the louver potentiometers. See *Control Section-4 Drawing* for further details. All louvers must be in the open position and the "Louvers Open" lamp must be illuminated before the Load Bank can be operated.

DOOR INTERLOCK CIRCUIT

All manually operated doors with the exception of the control panel and power connection doors are equipped with interlock switches. These must be closed during Load Bank operation or a failure is signaled by the illumination of the Door Open lamp. No further operation of the Load Bank is allowed until this failure is cleared by closing the open doors and cycling control power by pressing the "Off" and "On" "Fan/Control Power" pushbuttons.

CONNECTING LOAD BANK

Connect the Load Bank to the same ground as the load source using the Cam-Lok plug and receptacle located in the power connection box. A separate ground tab located inside the power connection box may also be utilized. Verify that the bushing inserts are securely screwed into the bushing wells. After verifying the load source is de-energized and the Load Bank is properly grounded, plug the straight receptacles into the bushing inserts. It is the operator's responsibility to ensure that all electrical connections are mechanically secure before energizing the load source.

DISCONNECTING LOAD BANK

After de-energizing the load source, remove the straight receptacles first then the ground connection. Verify that the bushing inserts are still firmly screwed into their bushing wells. Place the protective caps back over the inserts.

Warning - The receptacles supplied with this unit are dead break rated only, connecting or disconnecting the Load Bank should only be done when the load source is de-energized. Failure to follow these precautions can result in injury or death to the operator.

MAIN DISCONNECT SWITCH

The main disconnect switch may be operated with either the motor operator or emergency stop shunt trip circuit.

The emergency stop shunt trip circuit is activated when the operator pushes the emergency stop push button EPB. Voltage is taken directly off the primary of T1, passes through TB'ES'-2 then through EPB to TB'ES'-5 to the Aux contacts of DSW to the shunt trip coil. The shunt trip circuit will only operate when DSW is in the closed position. The shunt trip function should only be utilized under load in an emergency shut down situation since the life time of the disconnect switch may be reduced.

The motor operator should only be used during the start-up or shut-down procedure, no Load Bank load applied. The motor operator will only function when the load source is energized. To close the switch, first press the Open Switch pushbutton to charge the disconnect switch spring, then press the Close Switch pushbutton and verify that the Switch Closed light illuminates after 5 sec.. To open the switch, press the Open Switch push button and verify that the Switch Open light illuminates after 5 sec.

METER CONFIGURATION

The digital meter was configured with the following factory settings:

CT-Ratio: Ct-n:200, Ct-S:1

PT-Ratio: Pt-n:4200, Pt-d:120, Pt-S:1

Connection: Cnct: 2Ct, del

Refer to the Shark-100 operations manual located in Appendix-D for further details.

OPERATION

See addendum for manufacturer's information regarding specific components.

1. Confirm that the load bank and test source are grounded to the same point.
2. Confirm that the Fused Disconnect Switch (DSW) is in the "Off" position.
3. Place the "Louver Source Selector" switch in the appropriate position.
4. It is recommended that Plug-1 be wired to a Remote Circuit Breaker Trip Coil or Remote Engine Stop Relay, see Remote Stop Circuit description for further details.
5. Confirm the "Fan Reversal Switch", the "Master Load" switch, and all of the load step switches are in the "Off" position.
6. See *One Line Diagram Drawing 47B172247*. Connect the Load Bank to the generator as shown.
Consult NEC for proper wire size.
7. Confirm the Fan Circuit Breakers (FCB1, FCB2) are in the "On" position.
8. Start-up generator.
9. Place the fused disconnect switch (DSW) in the "On" position by pressing the "Open Switch" pushbutton first, then press the "Close Switch" pushbutton.
10. Confirm the "Switch Closed" and the "Control Power Available" lamps are illuminated.

WARNING

If the Load Bank airflow direction is reversed stop the fan motor immediately. After the motor has stopped completely change the position of the fan reversal switch and energize the fan motor. Load Bank operation with the airflow direction reversed will damage the Load Bank.

WARNING

This trailer is not intended for over the road use.

WARNING

The louvers located on opposite ends of the Load Bank enclosure must be operated individually.

To open these louvers press pushbuttons on opposite end of the Load Bank.

Before opening these louvers always make sure all securing latches have been disengaged.

WARNING

If the "Close" pushbutton does not close medium voltage switch, press "Open" pushbutton to reset the control circuit.

SHUTDOWN

11. Place the "Louver Position" switch in the "Open" position. The louvers at the front/tongue-end of the Load Bank must be opened with the pushbuttons located at that end. Press and hold the Open button until the "Louver Open" light illuminates. *Visually confirm all louvers are open before operating the Load Bank.*
12. Place the "Fan Reversal" switch in the appropriate position.
13. Refer to the Shark-100 Operation Manual located in Appendix D for digital metering operating instructions.
14. Press the "Fan/Control Power" "On" pushbutton to energize the cooling fans.
If the Load Bank airflow direction is reversed stop the fan motor immediately. After the motor has stopped completely change the position of the fan reversal switch and energize the fan motor. Load Bank operation with the airflow direction reversed will damage the Load Bank.
15. Visually observe correct fan operation and investigate any unusual fan related noises.
16. Check air intake for obstructions and confirm positive air flow.
17. Verify the illumination of the "Normal Operation" lamp before proceeding.
18. Adjust source voltage.
19. Place the desired "Load Step" switches in the "On" position.
20. Place the "Master Load" switch in the "On" position.
21. Adjust the load via the "Load Step" switches and monitor load source as needed.

1. De-energize the load.
2. Running the cooling fan for 5 minutes to assure a thorough cool down of all load elements is recommended.
3. Turn "Off" the cooling fan by placing the "Fan/Control" switch in the "Off" position.
4. Press the "Push To Stop/Reset" pushbutton.
5. Close louvers by placing the "Louver Position" switch in the "Close" position.
6. Open the Main Disconnect Switch (DSW) by pressing the "Open Switch" pushbutton.
7. If louvers are not fully closed, connect the "External Louver Control Power" inlet to a 120V, 1 ϕ , 60Hz source.
8. Close louvers by placing the "Louver Position" switch in the "Close" position. The louvers at the front/tongue-end of the Load Bank must be opened with the pushbuttons located at that end. Press and hold the Close button until the "Louver Open" light is extinguished.

LOAD BANK MAINTENANCE

This Load Bank has been designed to require minimum maintenance. All components have been chosen for a long, reliable life. Two basic intervals of maintenance are required: each operation and every 50 hours or 6 months (whichever comes first).

EACH OPERATION

The air intake screens and louvers, fan and cooling chamber, and exhaust openings must be checked for any obstructions or foreign objects. Due to the high volume of air circulated, paper and other items can be drawn into the air intakes. During Load Bank operation insure that air is exiting from the top exhaust vent.

The load branches should be checked for blown fuses or opened load resistors. To check the fuses or load resistors, operate the Load Bank from a balanced 3-phase source and check the three line currents. The three current readings should be essentially the same. If a sizeable difference is noted one or more load fuses or load resistors may have malfunctioned.

EVERY 50 HOURS OR 6 MONTHS

Check the tightness of the electrical connections. The expansion and contraction caused by Load Bank operation may result in loose connections. The vibrations caused by the cooling fan may also loosen electrical connections. If the Load Bank is transported, the electrical connections should be checked for tightness at a shorter-than-normal time interval. See "Primary Inspection".

WARNING

For continued safety and for maximum equipment protection, always replace fuses with one of equal rating only.

WARNING

Always remove all power from the load bus and all fan/control power before servicing the Load Bank. Never operate or service a Load Bank that is not properly connected to an earthground.

WARNING

If lubrication instructions are shown on the motor nameplate, they will supersede this general instruction.

WARNING

Overgreasing is a major cause of bearing and/or motor failure. The amount of grease added should be carefully controlled. Also make sure dirt and contaminants are not introduced when adding grease.

MOTOR LUBRICATION

Motors are properly lubricated at the time of manufacture. It is not necessary to lubricate at the time of installation unless the motor has been in storage for a period of 12 months or longer (refer to lubrication procedure that follows).

Inspect the fan motor supplied with your Load Bank for grease fittings. If the motor contains grease fittings you must lubricate the motor. If lubrication instructions are shown on the motor nameplate, they will supersede this general instruction. Belt driven cooling fans have bearings which should be lubricated. Bearings should be lubricated every 50 hours of operation or 6 months whichever comes first.

Lubrication Procedure

1. Stop motor. Disconnect and lock out of service.
2. Remove contaminants from grease inlet area.
3. Remove filler and drain plugs.
4. Check filler and drain holes for blockage and clean as necessary.
5. Add property type and amount of grease. See the **Relubrication Time Intervals** table for service schedule and **Relubrication Amounts** table for volume of grease required.
6. Wipe off excess grease and replace filler and drain plugs.
7. Motor is ready for operation.

RELUBRICATION TIME INTERVAL for motors with regreasing provisions.

	NEMA Frame Size					
	140-180		210-360		400-510	
	1800 RPM and less	Over 1800 RPM	1800 RPM and less	Over 1800 RPM	1800 RPM and less	Over 1800 RPM
Standard	3 yrs.	8 mo.	2 yrs.	8 mo.	1 yr.	3 mo.
Severe	1 yr.	3 mo.	1 yr.	3 mo.	6 mo.	1 mo.
Seasonal	See Note 2.					

Standard: Up to 16 hours of operation per day, indoors, 100°F maximum ambient.

Severe: Greater than 16 hours of operation per day. Continuous operation under high ambient temperatures (100° to 150°F) and/or any of the following: dirty, moist locations, high vibration (above NEMA standards), heavy shock loading, or where shaft extension end is hot.

Seasonal: The motor remains idle for a period of 6 months or more.

Note:

1. For motors nameplated as "belted duty only" divide the above intervals by 3.
2. Lubricate at the beginning of the season. Then follow service schedule above.

RELUBRICATION AMOUNTS for motors with regreasing provisions.

NEMA Frame Size	Volume cu. in. (fluid oz.)
140	.25 (.14)
180	.50 (.28)
210	.75 (.42)
250	1.00 (.55)
280	1.25 (.69)
320	1.50 (.83)
360	1.75 (.97)
400	2.25 (1.2)
440	2.75 (1.5)
500	3.00 (1.7)

Grease Type

Unless stated otherwise on the motor nameplate, the motors on this Load Bank are pregreased with a polyurea mineral oil NGLI grade 2 type grease. Some compatible brands of polyurea mineral base type grease are:

- Chevron SRI #2
- Rykon Premium #2
- Exxon Polyrex EM
- Texaco Polystar RB

TRAILER MAINTENANCE

See the chart below. For detailed information see the manufacturer's manual.

Item	Function Required	Weekly	3 Months or 3000 Miles	6 Months or 6000 Miles	12 Months or 12000 Miles
Brakes	Test that they are operational	At Every Use			
Brake Adjustment	Adjust to proper operating clearance		●		
Brake Magnets	Inspect for wear and current draw			●	
Brake Linings	Inspect for wear or contamination				●
Brake Controller	Check for correct amperage & modulation			●	
Brake Cylinders	Check for leaks, sticking				●
Brake Lines	Inspect for cracks, leaks, kinks				●
Trailer Brake Wiring	Inspect, wiring for bare spots, fray, etc.				●
Hub/Drum	Inspect for abnormal wear or scoring				●
Wheel Bearings & Cups	Inspect for corrosion or wear. Clean & repack.				●
Seals	Inspect for leakage. Replace if removed.				●
Springs	Inspect for wear, loss of arch.				●
Suspension Parts	Inspect for bending, loose fasteners, wear.			●	
Hangers	Inspect Welds.				●
Wheel Nuts and Bolts	Tighten to specified torque values.		●		
Wheels	Inspect for cracks, dents or distortion.			●	
Tire Inflation Pressure	Inflate tires to mfg's. specifications.	●			

Trailer Maintenance Schedule

TROUBLESHOOTING

This section is designed to aid the electrical technician in basic Load Bank system troubleshooting. All of the problems listed can be verified with a basic test meter and/or continuity tester. For safety reasons, when troubleshooting a Load Bank system always remove all test source power, fan/control power, anti-condensation heater power, etc.

Note: Most failures can be traced to a loose connection or component such as a relay falling out of its socket. Performing a visual inspection and tightness check before proceeding to the more detailed list below is recommended.

COOLING FAN MOTOR WILL NOT OPERATE

1. Louvers are not open or one of the door interlock switches are not closed. Verify that the Louvers Open light is on and that the Door Open light is not on.
2. Inoperative or Open circuit breakers FCB1,2, verify that they are in the closed position.
3. Control power not available, verify illumination of Control Power Available light.
4. Motor overload contact OLR-A or OLR-B open.
5. Inoperative FMC1-4 or Fan Reversal Switch.
6. Inoperative fan motor MOT-1 or MOT-2.

HIGH TRANSFORMER TEMP INDICATED

1. Airflow restriction on either the intake or exhaust louver for the transformer compartment.
2. Hot exhaust air is being fed into the intake louver of the transformer compartment.
3. Inoperative TTR relay.
4. Inoperative transformer switch TTS-A-C.

HIGH INTAKE TEMP INDICATED

1. Ambient temperature exceeds 120 degrees F.
2. Hot exhaust air is being fed into the intake air stream.
3. Inoperative ITR-A or ITR-B relay.

HIGH EXHAUST TEMP INDICATED

1. Exhaust air temperature exceeding EXT-S-A or EXT-S-B set points.
2. Hot exhaust air is being fed into the intake air stream.
3. Restriction of airflow at the intake or exhaust louvers.
4. Inoperative temperature switch EXT-S or failed thermocouple wire TC.
5. Inoperative ETR-A or ETR-B relay.

FAN FAILURE INDICATED

1. Fan running in the wrong direction.
2. Inoperative or misadjusted pressure switch PS-A or PS-B.
3. Open fan circuit breaker FCB1, FCB2.
4. Overload relay OLR-A or OLR-B open.
5. Inoperative fan motor contactors FMC1-4.
6. Inoperative fan motor MOT-1 or MOT-2.
7. Inoperative or misadjusted Time Delay Relay (TDR1-TDR4).

DIGITAL METER DOES NOT OPERATE PROPERLY

1. Metering fuses CF9 or MF1-MF3 open.
2. Current transformer CT1-CT3 or MT1 failure.
3. Meter not configured properly, see operation manual located in Appendix-D.
4. Digital meter failure.

DISCONNECT SWITCH DOES NOT OPERATE

1. Load source is not energized.
2. Circuit breaker on the motor controller board is open or tripped.
3. Metering fuses MF1-MF3 are open.
4. Inoperative Close or Open switch push buttons.
5. Inoperative motor operator or motor controller board.

LOAD STEPS CANNOT BE ENERGIZED

1. Open load step fuses F1-F66.
2. Inoperative load step contactors C1-C26.
3. Inoperative load step switches S2-S14.
4. Open secondary fuses SF1-SF6.

APPENDIX A - ABBREVIATIONS USED IN THIS MANUAL

Listed below are abbreviations of terms found on Simplex Load Bank Systems. When following a load bank drawing utilize this guide to define abbreviated system and component names. As this is a master list, drawings and text pertaining to your equipment may not contain all these terms.

AC -Alternating current	FFR -Fan failure relay	NEMA -National electrical manufacturer's association
AIC -Ampere interrupting current-maximum short circuit fault current a component can safely interrupt	FMC -Fan motor contactor-controls power to fan motor	NOR -Normal operation relay
BW -Bushing well	Hz -Hertz-cycles per second, measurement of frequency	OLR -Overload relay-used for motor protection
CB -Circuit breaker	INTS -Intake air temperature switch	OLRX -Overload relay AUX
CF -Control fuse	ITR -Intake air temperature relay	PB -Pushbutton
CFM -Cubic feet per minute-used to rate fan air flow capacity and load bank cooling requirement	KVA -Kilovolt amperes	PF -Primary fuse
CPC -Control power contactor	KVAR -Kilovolt amperes-reactive	PLC -Programmable logic controller
CPR -Control power relay	KW -Kilowatts	PS -Pressure switch-switch used to detect fan failure
CT -Current transformer- used in metering circuits	L -Indicating light	PT1 -Power transformer
CXX -AUX contact	L1 -Line 1	RTM -Running time meter-keeps time log of equipment use
DC -Direct current	L2 -Line 2	S -Switch
DCS -DC power supply	L3 -Line 3	SF -Secondary fuse
DOR -Door switch	LCR -Louver close relay	T1 -Control Power XFMR
DMP -Digital meter	LM -Louver motor	TB -Terminal block
DSW -Disconnect switch	LMC -Louver motor contactor	TC -Thermocouple
EPB -Emergency stop pushbutton	LOR -Louver open relay	TDR -Time delay relay-relay which times out before contacts change state
ETR -Exhaust temperature switch	LR -Load resistive element	TEFC -Totally enclosed, fan cooled-refers to motor enclosure
EXTS -Exhaust air temperature switch	LSS -Louver source selector switch	TTR -Transformer temperature relay
F -Load Fuse	LSW -Louver selector switch	V -Voltage
FAN -Cooling fan	LX -Load reactive element	
FCB -Fan circuit breaker-circuit breaker in series with fan control power	MF -Meter fuse	
	MLB -Main Load Bus	
	MOT -Motor	
	MT -Metering XFMR	

APPENDIX B CALCULATIONS & FORMULAS

The following calculations are used to determine the actual kilowatt load being applied by the Load Bank, when line voltages and currents are known (at 1.0 power factor).

3 Phase

1. Read all three line currents and find the average reading.
2. Read all three line-to-line voltages and find the average reading.
3. Multiply the average current times the average voltage.
4. Multiply the answer of step #3 times the square root of 3 (1.732).
5. Divide the answer of step #4 by 1000. The answer is the actual kilowatts of load being applied by the Load Bank.

Single Phase

1. Determine the line current.
2. Determine the line-to-line voltage.
3. Multiply the line current times the line-to-line voltage.
4. Divide the answer of step #3 by 1000.
5. The answer of step #4 is the actual kilowatts being applied by the load bank.

EXAMPLES

Using line voltages and currents:

3 Phase

Current Readings

$$A_1 = 249A$$

$$A_2 = 250A$$

$$A_3 = 254A$$

Voltage Readings

$$V_{1-2} = 481V$$

$$V_{2-3} = 479V$$

$$V_{3-1} = 483V$$

$$\begin{aligned} \text{Average Current} &= \frac{A_1 + A_2 + A_3}{3} \\ &= \frac{249 + 250 + 254}{3} \\ &= 251A \end{aligned}$$

$$\begin{aligned} \text{Average Voltage} &= \frac{V_{1-2} + V_{2-3} + V_{3-1}}{3} \\ &= \frac{481 + 479 + 483}{3} \\ &= 481V \end{aligned}$$

$$\begin{aligned} \text{Kilowatts} &= \frac{\text{Volts} \times \text{Amps} \times 1.732}{1000} \\ &= \frac{481 \times 251 \times 1.732}{1000} \\ &= 209.1KW \end{aligned}$$

Single Phase

Current Reading: 150A

Voltage Reading: 240V

$$\begin{aligned} \text{Kilowatts} &= \frac{\text{Volts} \times \text{Amps}}{1000} \\ &= \frac{150 \times 240}{1000} \\ &= 36.1KW \end{aligned}$$

The following calculations are used to determine the amount of current when the desired amount of kilowatts is applied at 1.0 power factor.

3 Phase

1. Multiply the desired amount of kilowatts to be applied by 1000.
2. Multiply the operating voltage times the square root of 3 (1.732)
3. Divide the answer of step #1 by the answer of step #2.
4. The answer of step #3 is the average line current with the desired kilowatts applied at 1.0 power factor.

Single phase

1. Multiply the desired amount of kilowatts to be applied by 1000.
2. Divide the answer of step #1 by the operating voltage.
3. The answer of step #2 is the average line current with the desired amount of kilowatts applied at 1.0 power factor.

The following calculations are used to determine a step kilowatt rating at other than a rated voltage. This is accomplished by referencing the load step to a KW value at a known voltage.

1. Determine the new unrated operating voltage.
2. Divide the new operating voltage by the reference voltage.
3. Square the answer of step #2.
4. Multiply the answer of step #3 times the reference kilowatt value of the load step which the new kilowatt rating is desired.
5. The answer of step #4 is the kilowatt rating of the load step at the new voltage.

EXAMPLES

When desired amount of kilowatts is applied at 1.0 PF:

3 Phase

Applied: 50KW Operating Voltage: 480V

$$\begin{aligned} \text{Amperage} &= \frac{\text{KW} \times 1000}{\text{Volts} \times 1.732} \\ &= \frac{50 \times 1000}{480 \times 1.732} \\ &= \frac{50,000}{831.36} \\ &= 60.1 \end{aligned}$$

Single Phase

Applied: 25KW Operating Voltage: 240V

$$\begin{aligned} \text{Amperage} &= \frac{\text{KW} \times 1000}{\text{Volts}} \\ &= \frac{25 \times 1000}{240} \\ &= \frac{25,000}{240} \\ &= 104.2 \end{aligned}$$

Determining step KW at other than rated voltage:

Applied: 80KW Operating Voltage: 450V
Rated Voltage: 480V

$$\begin{aligned} \text{Step KW} &= (\text{Oper. Volt.} \div \text{Rated Volt.})^2 \times \text{Applied KW} \\ &= (450 \div 480)^2 \times 80 \\ &= .9375^2 \times 80 \\ &= 70.3 \end{aligned}$$

FORMULAS

Alternating Current

Direct Current

Kilowatts

1 phase

$$\frac{\text{Volts} \times \text{Amps} \times \text{PF}^*}{1000}$$

$$\frac{\text{Volts} \times \text{Amps}}{1000}$$

3 phase

$$\frac{1.732 \times \text{Volts} \times \text{Amps} \times \text{PF}^*}{1000}$$

*Power Factor, expressed as decimal.
(Resistive Load Bank PF is 1.0)

Amperes

(KW known)

1 phase

$$\frac{\text{KW} \times 1000}{\text{Volts} \times \text{PF}}$$

$$\frac{\text{KW} \times 1000}{\text{Volts}}$$

3 phase

$$\frac{\text{KW} \times 1000}{1.732 \times \text{Volts} \times \text{PF}}$$

KVA

1 phase

$$\frac{\text{Volts} \times \text{Amps}}{1000}$$

3 phase

$$\frac{1.732 \times \text{Volts} \times \text{Amps}}{1000}$$

Amperes

(KVA known)

1 phase

$$\frac{\text{KVA} \times 1000}{\text{Volts}}$$

3 phase

$$\frac{\text{KVA} \times 1000}{1.732 \times \text{Volts}}$$

KVAR

1 phase

$$\frac{\text{Volts} \times \text{Amps} \times \sqrt{1-\text{PF}^2}}{1000}$$

3 phase

$$\frac{1.732 \times \text{Volts} \times \text{Amps} \times \sqrt{1-\text{PF}^2}}{1000}$$

APPENDIX C - TORQUE VALUES

FAN BLADES		
FAN PART NO.	BOLT SIZE	TORQUE FT LBS // IN LBS
13820000	SET SCREW	11.7 // 140
13820500	SET SCREW	11.7 // 140
13821000	SET SCREW	8.3 // 100
13822000	1/4 — 20	7.5 // 90
13823000	1/4 — 20	7.5 // 90
13824000	1/4 — 20	7.5 // 90
13825100	1/4 — 20	7.5 // 90
13826000	1/4 — 20	7.5 // 90
13827500	5/16"	13 // 156
13827600	5/16"	13 // 156
13828000	3/8"	24 // 288

MOTORS, BRACKETS, BUS BAR CONNECTIONS		
BOLT/NUT SIZE	GRADE	TORQUE FT LBS // IN LBS
.250 (1/4-20)	Grade 5, dry	8 // 96
.250 (1/4-20)	Grade 2, dry	5.5 // 66
.312 (5/16)	Grade 5, dry	17 // 204
.312 (5/16)	Grade 2, dry	11 // 132
.375 (3/8)	Grade 5, dry	30 // 360
.375 (3/8)	Grade 2, dry	19 // 228
.437 (7/16)	Grade 5, dry	50 // 600
.437 (7/16)	Grade 2, dry	30 // 360
.500 (1/2)	Grade 5, dry	75 // 900
.500 (1/2)	Grade 2, dry	40 // 480
.562 (9/16) & up	Grade 5, dry	110 // 1320
.562 (9/16) & up	Grade 2, dry	55 // 660

CONTACTORS		
<i>See torque values on the front of the contactor.</i>		

ELEMENTS/TRAYS		
TERM/NUT SIZE		TORQUE INCH LBS
#6	Rod ends	4
#10	Element Conn.	20
1/4-20	High Voltage	Contact Simplex

MAIN LOAD BLOCKS- ALL SIZES		
CONNECTION	WIRE SIZE	TORQUE FT LBS // IN LBS
LOAD SIDE	4-14AWG	2.9 // 35
LINE SIDE	500MCM-4/0	31 // 375
	3/0-4/0	20 // 240
	2/0-6AWG	10 // 120
	8AWG	3.3 // 40

CIRCUIT BREAKERS		
STYLE	WIRE SIZE	TORQUE INCH LBS
Cutler-Hammer 1-Phase	14-10 AWG	20
	8 AWG	25
	6-4 AWG	27
	3-1/0 AWG	45
Merlin Gerin 3-Phase	14-1/0	50

APPENDIX C - TORQUE VALUES CONT'D

FUSEBLOCKS		
MANUF. PART NO.	WIRE SIZE	TORQUE INCH LBS
BM6031SQ, BM6032SQ, BM6033SQ; 600V, 30A	10-18 AWG	20
T60060-2SR 600V, 60A	10-18 AWG	20
T60030-3CR, 600V, 30A T60060-3CR, 600V, 60A 60100-3CR, 600V, 100A	10-14 AWG	35
	8 AWG	40
	4-6 AWG	45
	2-3 AWG	50

MISCELLANEOUS-TERMINALS, METERS, SWITCHES, COILS, RELAYS, XFORMERS	
CONNECTION SIZE	TORQUE INCH LBS
4	5
6	10
8	19
10	31
1/4-20"	66

TAPER-LOCK BUSHINGS	
BUSHING NUMBER	TORQUE
1008, 1108	55 IN LBS
1210, 1215, 1310, 1610, 1615	15 FT LBS
2012	23 FT LBS
2517, 2525	36 FT LBS
3020, 3030	67 FT LBS
3535	83 FT LBS
4040	142 FT LBS
4545	204 FT LBS
5050	258 FT LBS
6050, 7060, 8065	652 FT LBS
10085, 12010	1142 FT LBS

CAM-LOK STUDS	
THREADED STUD	MAXIMUM TORQUE
5/16" – 18	15 FT LBS
1/2" – 13	40 FT LBS

DRAWINGS AND PARTS LIST

The drawings included in this manual are the most accurate source of part numbers for your Load Bank. When ordering replacement parts for Simplex Load Banks, always consult the Parts Legend Drawing. When contacting the Simplex Service Department always have your work order and drawing number ready for reference. The Work Order Number and the Drawing Numbers are located on each drawing legend. A typical drawing legend and parts list is illustrated at right.

SIMPLX [®]		SCALE: 1
DATE: 10/25/07	APPROVED BY:	SPRINGFIELD, ILLINOIS
RESISTIVE LOAD BANK 1000KW, 4160:480V, 3Ø, 60Hz		DRAWN BY: CMC
W.O.# 65665-07-43		REVISED:
Triton-HV CONTROL SECTION-1		DRAWING NUMBER 47B172248A

ITEM	QTY.	PART #	DESIG.	DESCRIPTION
1	3	47B172237	LR1-LR3	LOAD ELEMENTS HELICAL COIL, 333W @ 277V
2	6	47B172237	LR4-LR9	LOAD ELEMENTS HELICAL COIL, 667W @ 277V
3	3	47B172237	LR10-LR12	LOAD ELEMENTS POWR-WEB, 1667W @ 277V
4	6	47B172237	LR13-LR18	LOAD ELEMENTS POWR-WEB, 3333W @ 277V
5	6	47B172237	LR19-LR24	LOAD ELEMENTS POWR-WEB, 4167W @ 240V
6	114	47B172237	LR25-138	LOAD ELEMENTS POWR-WEB, 8333W @ 240V
7	11	13027000	C1-C7 FMC1-4	CONTACTOR 35A, 600V, 3POLE 120VAC COIL
8	19	13027040	C8-C26	CONTACTOR 63A, 600V, 3POLE 120VAC COIL
9	14	13027100	FMC1X, 2X C1X-9X C11X, 13X C21X	AUX CONTACT 10A @ 600VAC 1 NC/1 NO
10	1	14015000	CF9	FUSE 2A, 600VAC
11	1	14015500	CF6	FUSE 2A, 500VDC
12	2	-----	CF1, CF4	FUSE 10A, 600V, 200KAIC
13	1	14044100	CF5	FUSE 10A, 500VDC
14	3	14051000	F1-F3	FUSE 15A, 600V, 200KAIC

APPENDIX D - COMPONENT MANUFACTURER'S LITERATURE & INFORMATION

Louver Actuator Specifications; Motion Systems Corporation

Current Limiting Fuses, CEF; ABB Inc.

VersaRupter Family, Installation and Maintenance Instructions; ABB Inc.

200 AMP Deadbreak Connectors; Elastimold

ELRIM Cycloaliphatic Epoxy Bushings; Elliott Molding & Components

3PH Power Transformer; Hammond Power Solutions Inc.

MV Metering Transformer, ITI

Safety-door Switch D4BS; Omron

151SR/K151SR Straight Receptacle, Installation Instructions; Elastimold

Crimping Tools and Dies Recommended for Elastimold Connectors; Elastimold

Solid-State Overload Relay, Instruction Bulletin; Schneider Electric

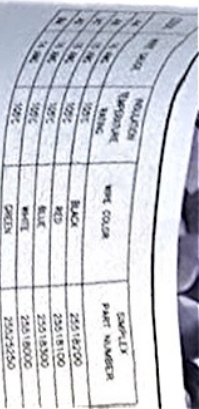
320 Frame and Smaller Motors, Installation, Operation and Maintenance Instructions

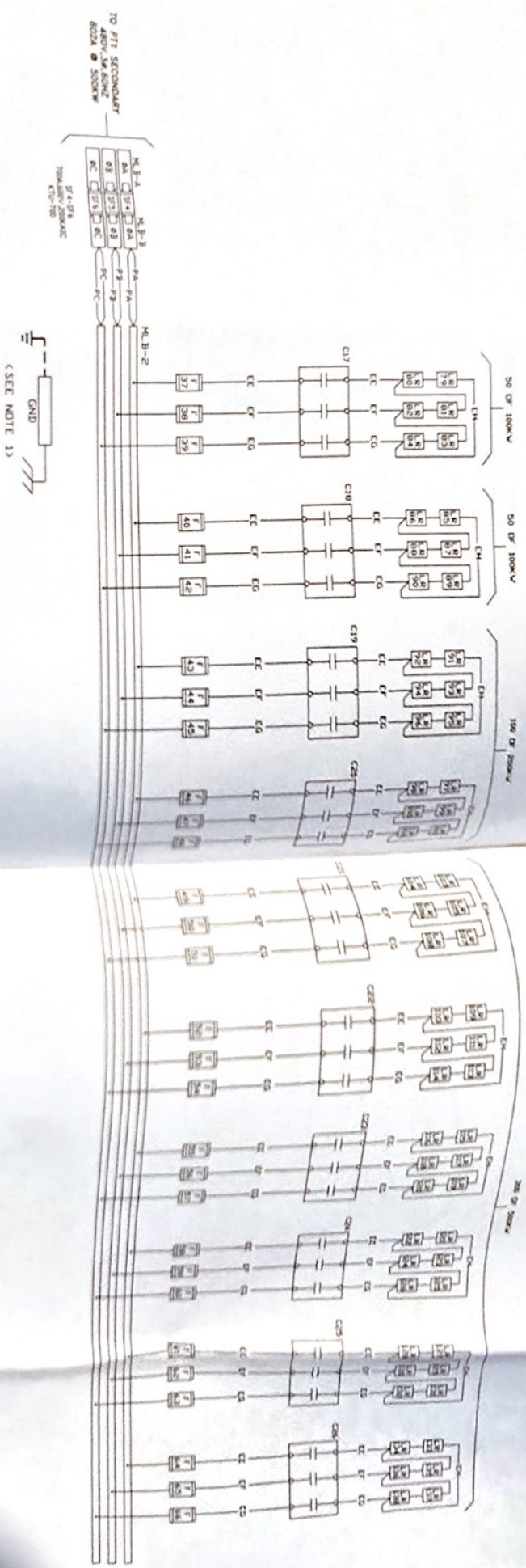
Series 1900 Pressure Switch, Specifications and Operating Instructions; Dwyer Instruments, Inc.

Triple-pole switch disconnecter type NAL, Fuse switch disconnecter typ NALF for indoor installation, Mounting instruction and service and maintenance manual; ABB Kraft

Trailer, Axle Maintenance and Specifications, D

Shark 100 and 100T, Installation and Operation Manual; Electro Industries/Gauge Tech

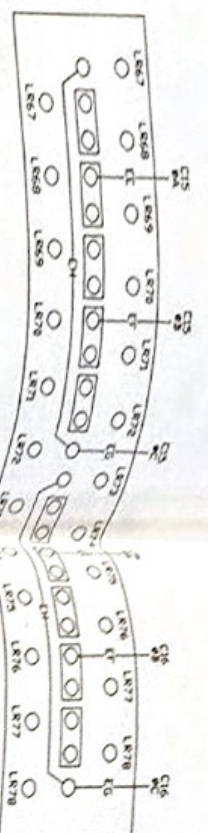




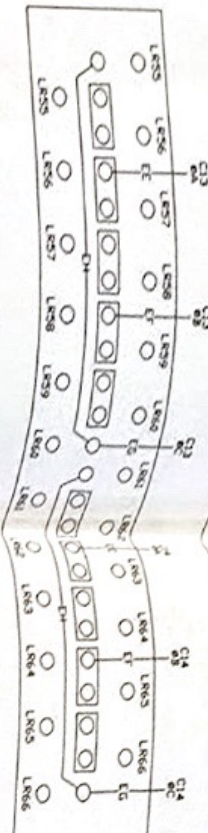
- NOTES:
1. UNIT MUST BE GROUNDED FOR OPERATORS SAFETY.
 2. DASHED LINES INDICATE WIRES NOT SUPPLIED BY SIMPLEX.
 3. FUSE RATINGS: F37-F66: 70A 600V/200KAC
J45-70

CODE	WIRE GAUGE	INSULATION TEMPERATURE RATING	WIRE COLOR	SIMPLEX PART NUMBER
CE	12 AWG	150°C	BLACK	25531130
CF	12 AWG	150°C	RED	25531130
CG	12 AWG	150°C	BLUE	25531140
CH	12 AWG	150°C	WHITE	25531150
CI	12 AWG	150°C	BLACK	25531160
CJ	12 AWG	150°C	RED	25531170
CK	12 AWG	150°C	BLUE	25531180
CL	12 AWG	150°C	WHITE	25531190
CM	12 AWG	150°C	BLACK	25531200
CN	12 AWG	150°C	RED	25531210
CO	12 AWG	150°C	BLUE	25531220
CP	12 AWG	150°C	WHITE	25531230
CQ	12 AWG	150°C	BLACK	25531240
CR	12 AWG	150°C	RED	25531250
CS	12 AWG	150°C	BLUE	25531260
CT	12 AWG	150°C	WHITE	25531270
CU	12 AWG	150°C	BLACK	25531280
CV	12 AWG	150°C	RED	25531290
CW	12 AWG	150°C	BLUE	25531300
CX	12 AWG	150°C	WHITE	25531310
CY	12 AWG	150°C	BLACK	25531320
CZ	12 AWG	150°C	RED	25531330

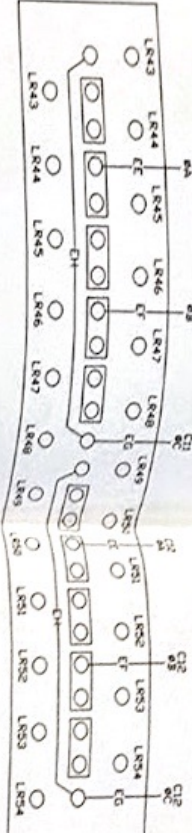
CODE	WIRE G
CE	12 AW
CF	12 AW
CG	12 AW
CH	12 AW
EE	8 AW
EF	8 AW
EG	8 AW
EH	8 AW



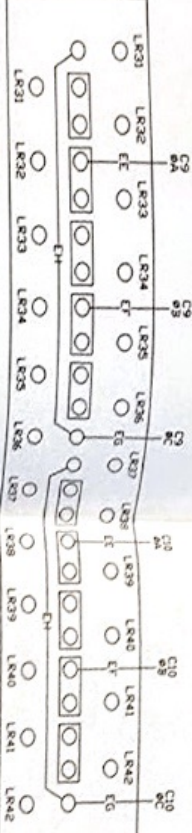
TRAY-6



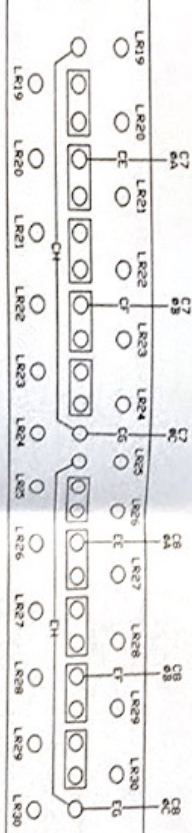
TRAY-5



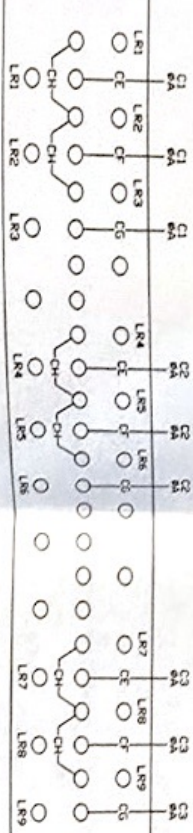
TRAY-4



TRAY-3

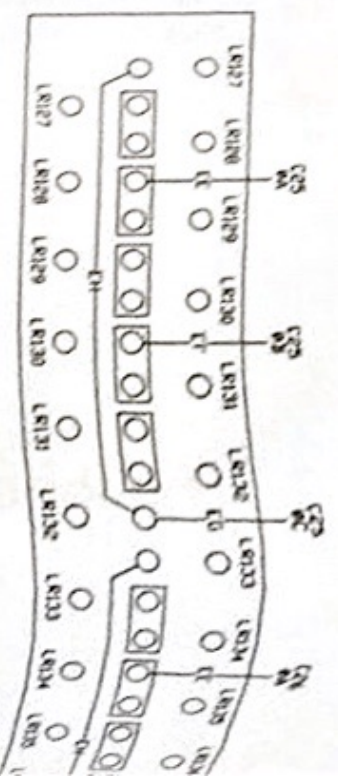


TRAY-2

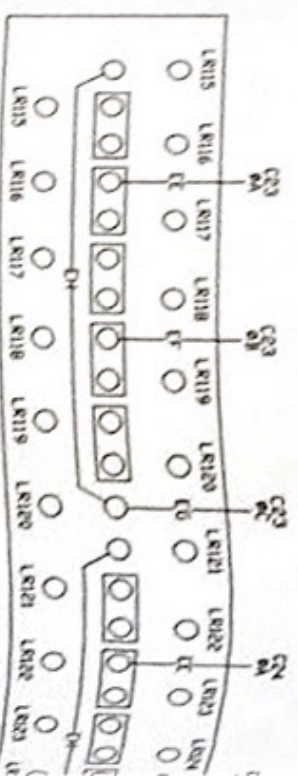


TRAY-1

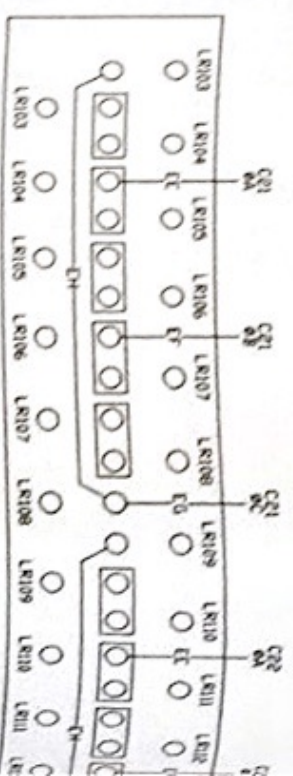
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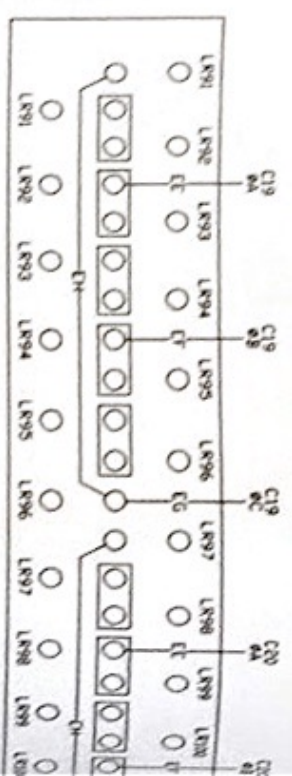
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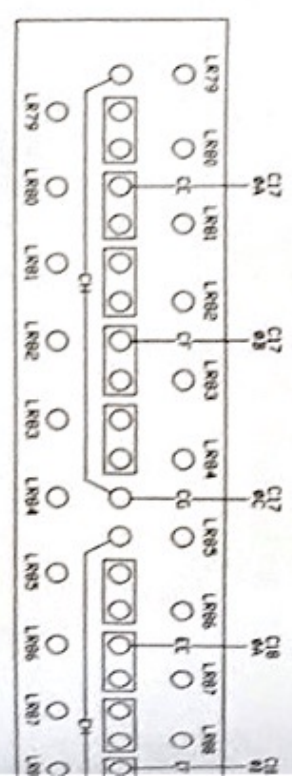
TRAY-10



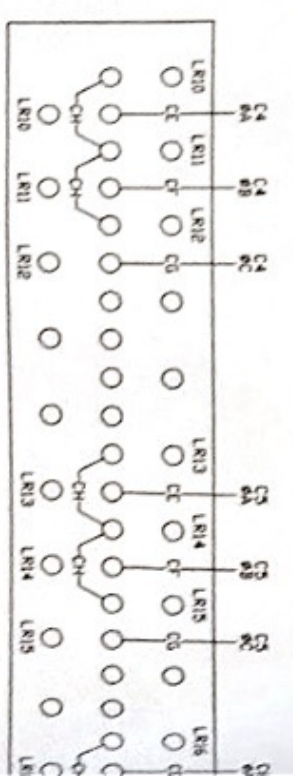
TRAY-9



TRAY-8



TRAY-7



CABLE STORAGE
COMPARTMENT

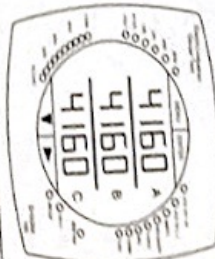
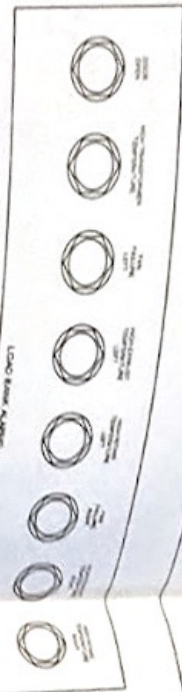
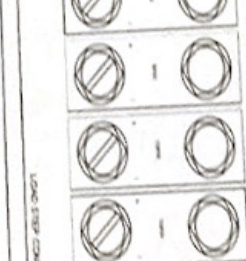
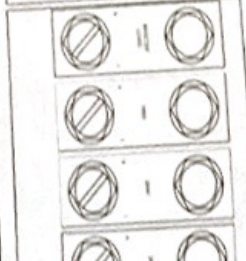
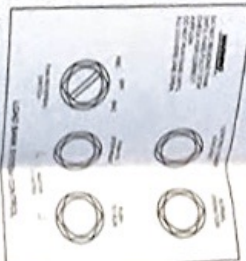
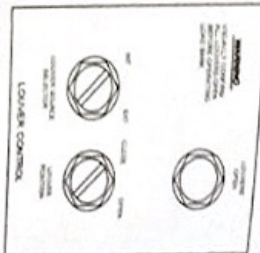
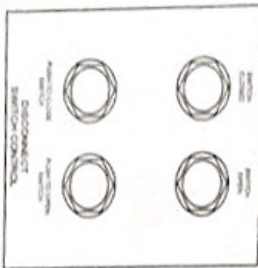
MANUAL STORAGE
COMPARTMENT

WARNING:
THIS TRAILER IS NOT
INTENDED FOR OVER
THE ROAD USE

! OPERATING NOTE !
Please refer to the operating manual for
details of the correct use of the trailer.

! CAUTION !
Load capacity is limited by the weight and
distribution. Always use the correct tie-down
technique to avoid damage to the cargo and
the trailer.

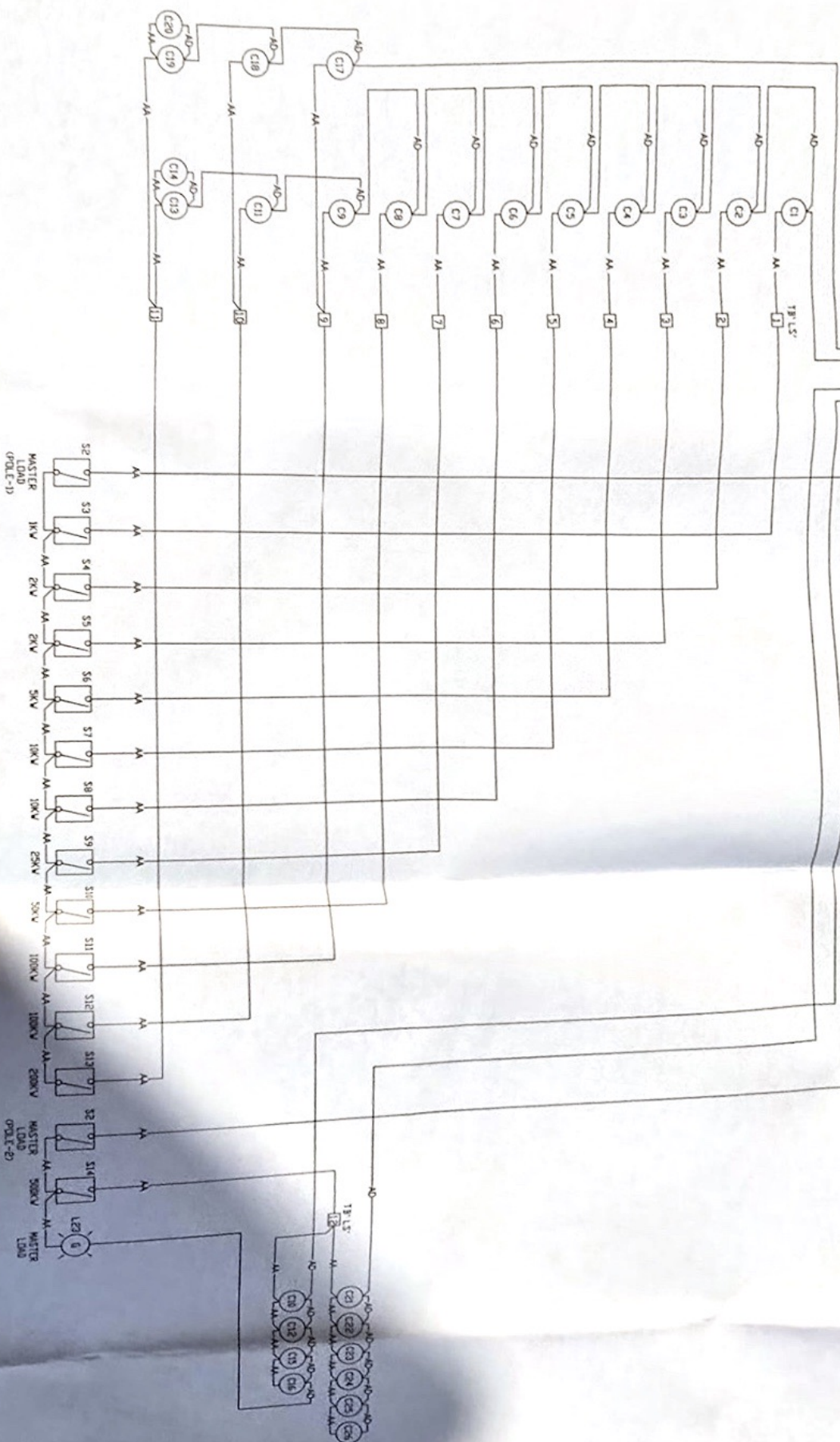
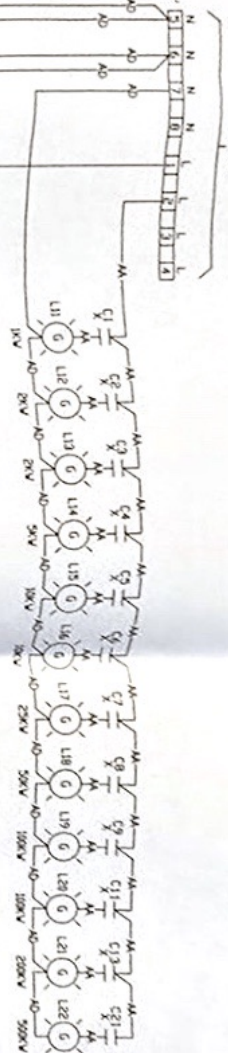
WARNING:
Do not touch the
cables when the
trailer is plugged in.



INFORMATION HEREON IS THE PROPERTY OF SIMPLEX, INC., ITS SUBSIDIARIES, WITHOUT WRITTEN PERMISSION ANY INFORMATION IS NOT TO BE DISCLOSED TO OTHERS AND USE EXCEPT THAT FOR

SEE CONTROL, SEC-1
FOR OTHER CONNECTIONS

120VAC



COLOR	WIRE COLOR	INSULATION	WIRE COLOR	PART NUMBER
MA	16 AWG	1091C	BLACK	22518220
AB	16 AWG	1091C	RED	22518100
AC	16 AWG	1091C	BLUE	22518200
AD	16 AWG	1091C	WHITE	22518200
AE	16 AWG	1091C	BLACK	22519200
AF	16 AWG	1091C	WHITE	22518200
AG	16 AWG	1091C	RED W/WHITE STRIP	22518210
AH	16 AWG	1091C	BLACK W/WHITE STRIP	22518220
AI	16 AWG	1091C	GREEN	22519200

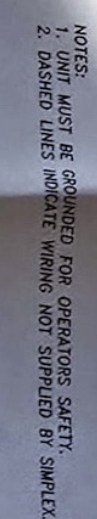
- NOTES:
1. UNIT MUST BE GROUNDED FOR OPERATIONS SAFETY.
2. DASHED LINES INDICATE WIRING NOT SHOWN IN THIS SECTION.
3. CONTROL WIRE #16 AWG, 105°C, UNLESS OTHERWISE NOTED.

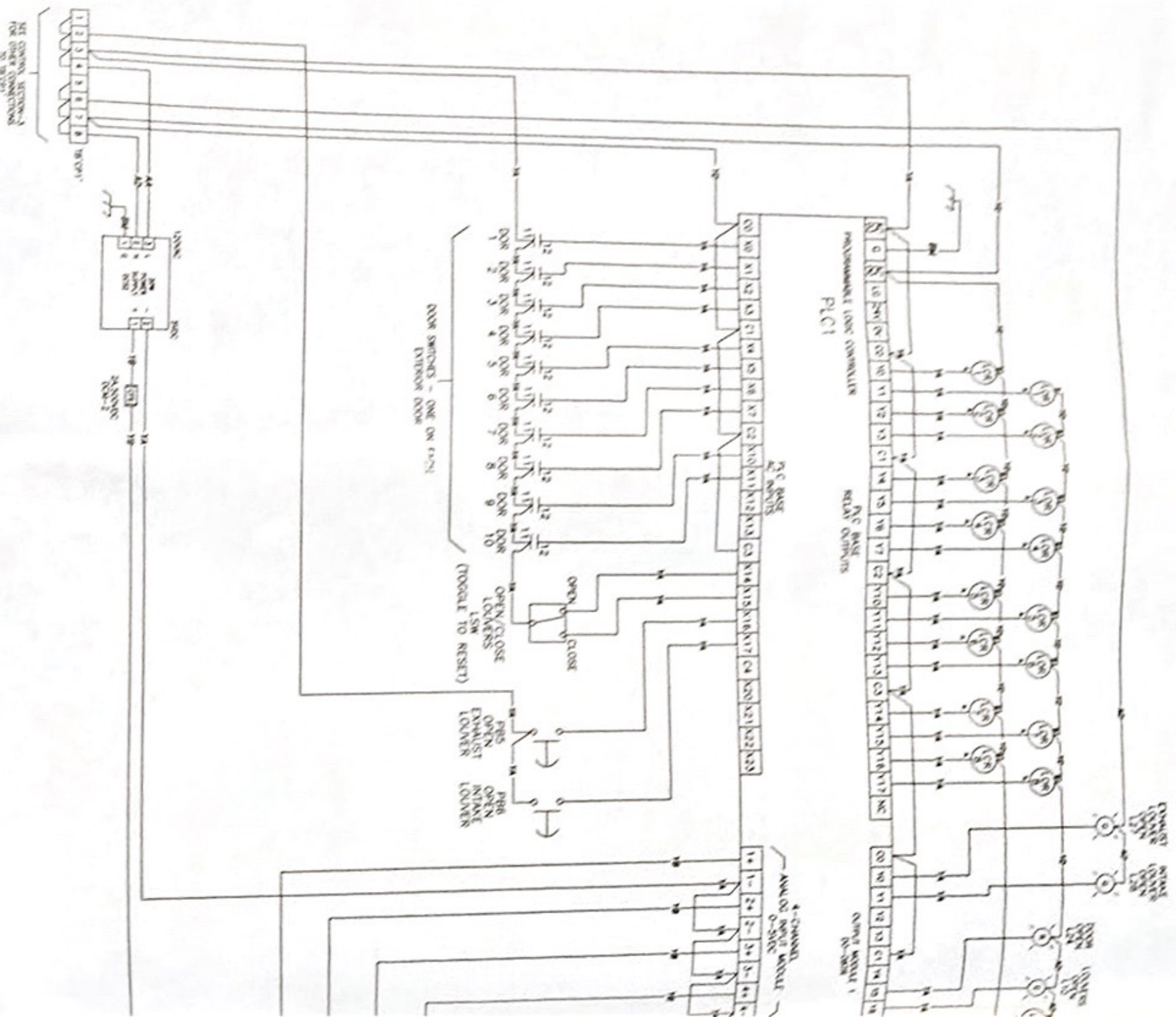
PROPERTY OF SIMPLEX, INC.,

SIMPLEX
SPRING

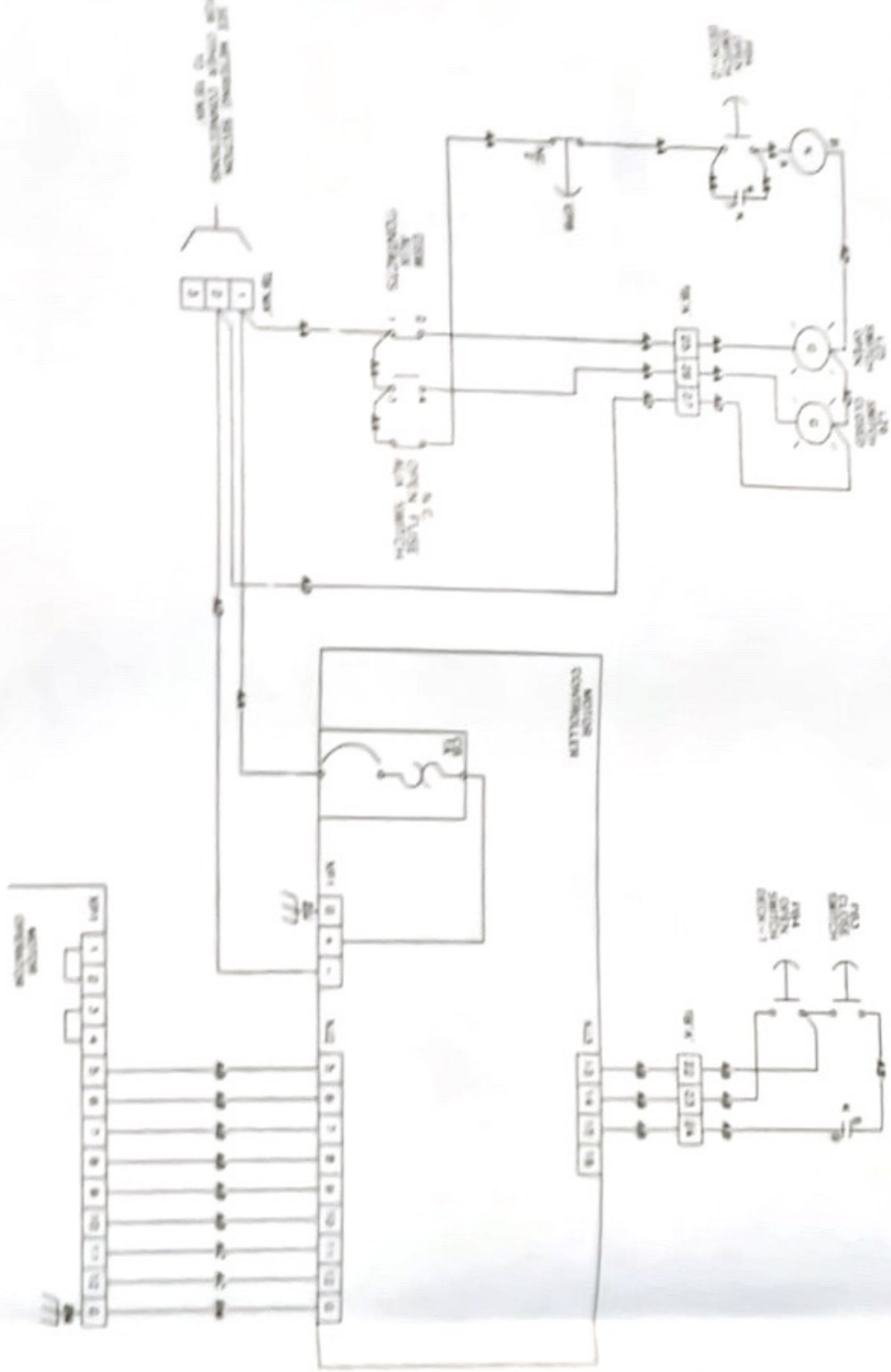
SCALE: 1/8" = 1'-0"
DATE: 10/23/97
DESIGNED: LEO BARK
1000M4160-00V2A-002
TYPED: CONT

W.O. # 65665-07-43

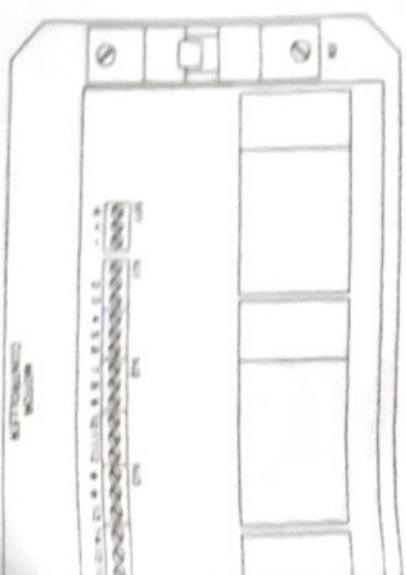




NOTICE: MUST BE OBSERVED FOR OPERATING SAFETY.
 1. LIMIT SWITCHES MUST BE INSTALLED WITHIN 10" OF SWAYING
 2. DANGER: LINES MUST BE KEPT CLEAR OF SWAYING



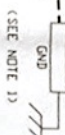
CODE	WIRE GAUGE
AK	18 AWG
AL	18 AWG
AA	18 AWG
AB	18 AWG
AC	18 AWG
AD	18 AWG
BA	18 AWG



NOTICE: MUST BE OBSERVED FOR OPERATING SAFETY.
 1. LIMIT SWITCHES MUST BE INSTALLED WITHIN 10" OF SWAYING
 2. DANGER: LINES MUST BE KEPT CLEAR OF SWAYING

TO PT1 SECONDARY
480V, 5A, 60HZ
602A @ 500KW

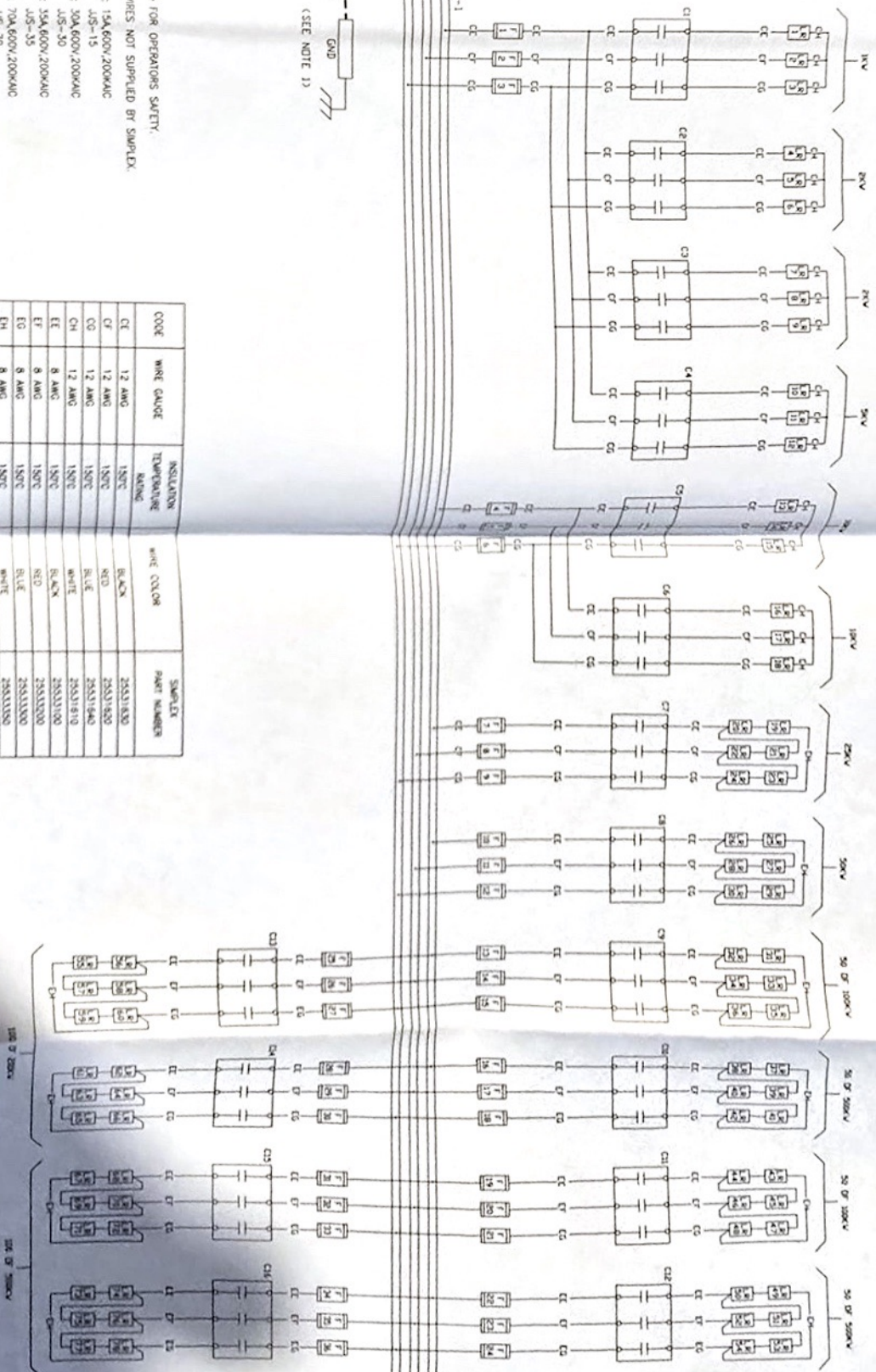
571-573
700A 600V 200KAC
KIT-700



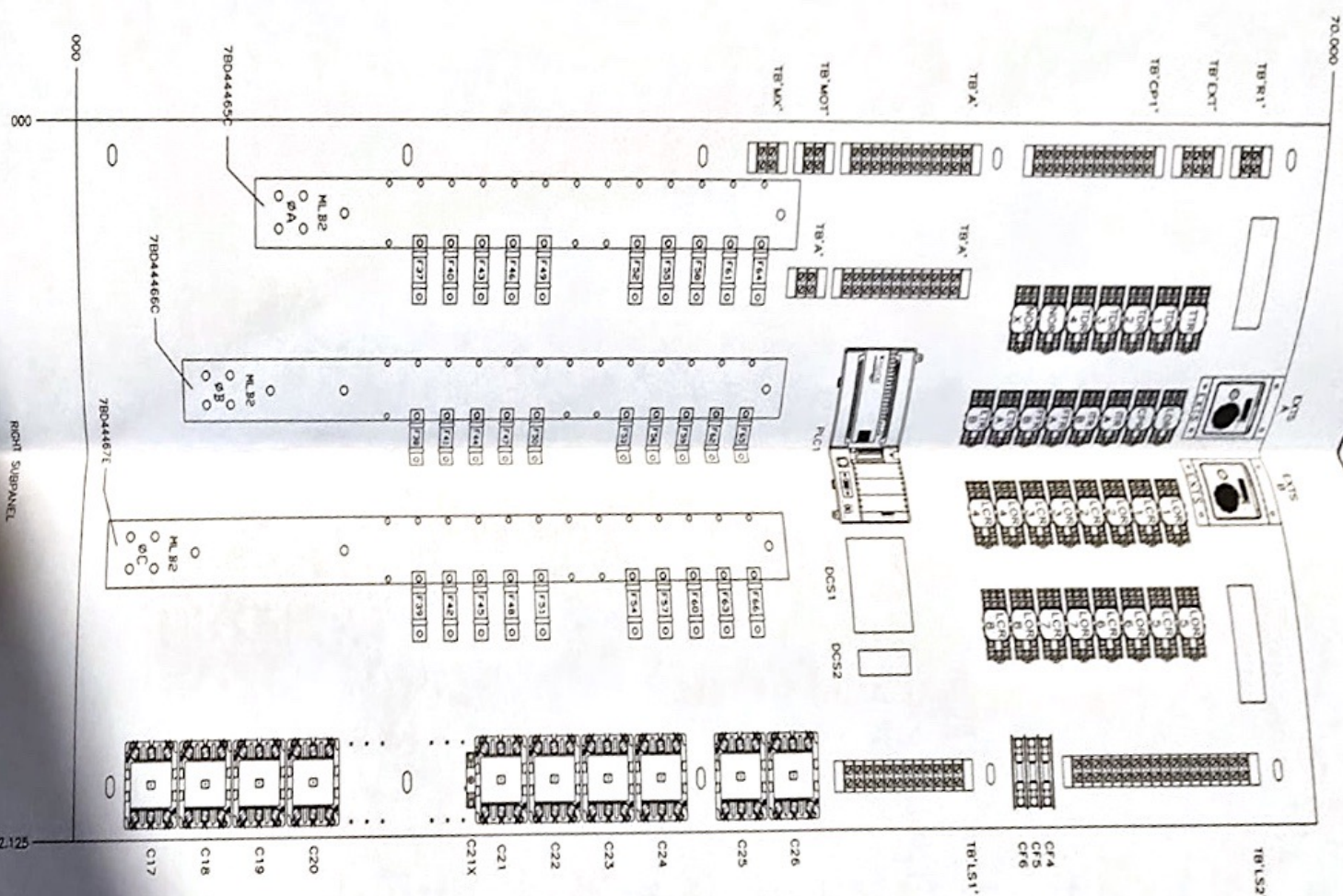
- NOTES:
1. UNIT MUST BE GROUNDED FOR OPERATORS SAFETY.
 2. DASHED LINES INDICATE WIRES NOT SUPPLIED BY SIMPLEX.
 3. FUSE RATINGS:

F1-F3, 15A 600V 200KAC
J5-15
F4-F6, 30A 600V 200KAC
J5-30
F7-F9, 55A 600V 200KAC
J5-35
F10-F16, 70A 600V 200KAC
J5-70

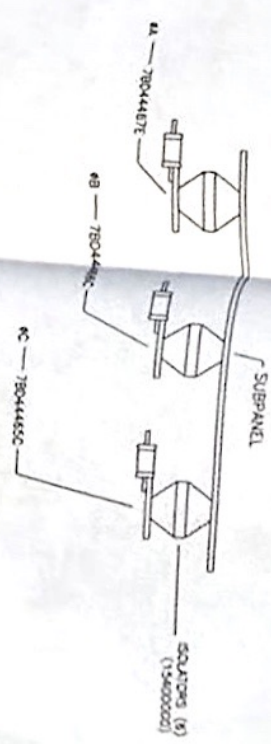
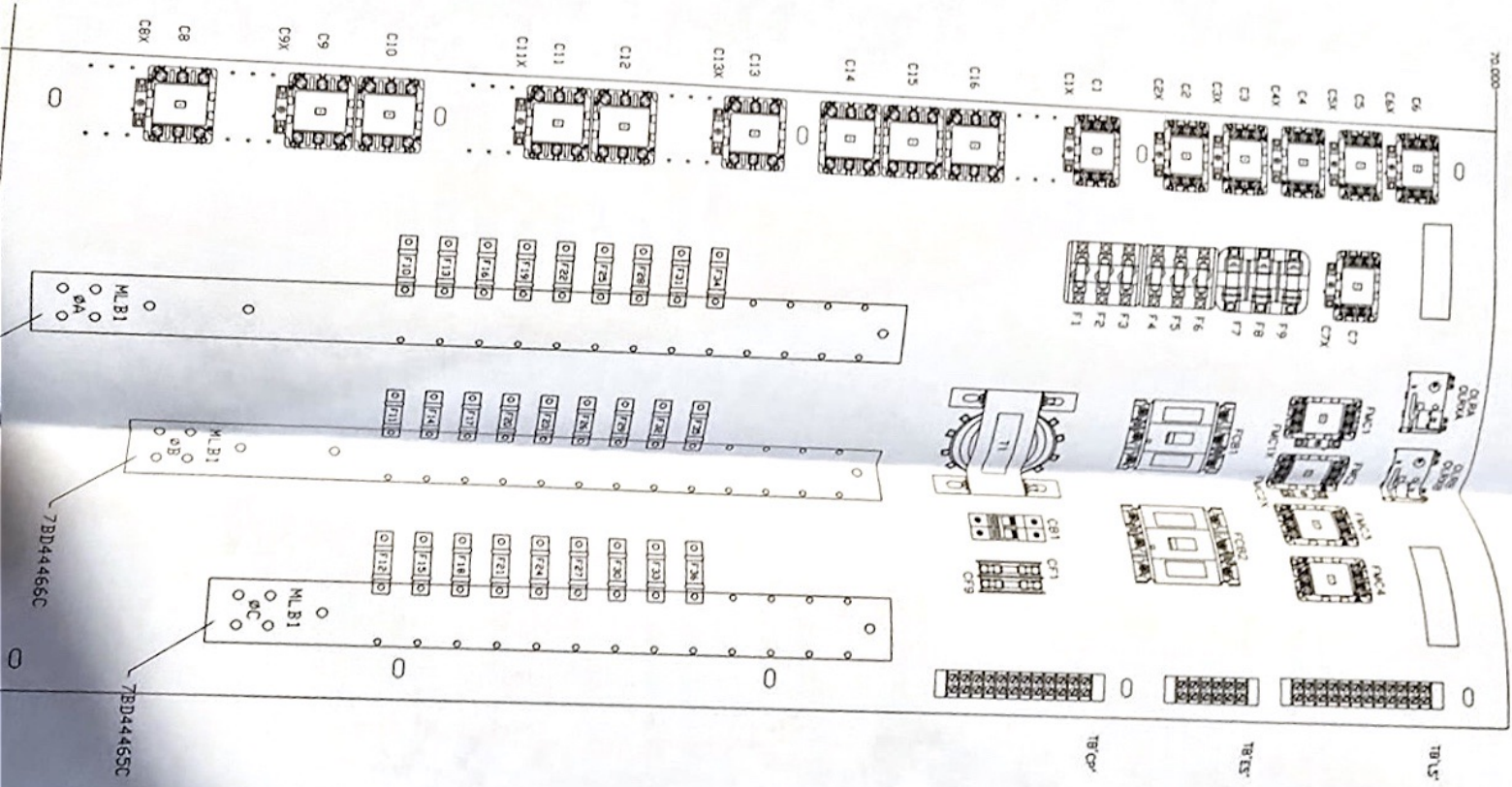
CODE	WIRE GAUGE	INSULATION TEMPERATURE RATING	WIRE COLOR	SIMPLEX PART NUMBER
CE	12 AWG	150°C	BLACK	25531100
CF	12 AWG	150°C	RED	25531100
CG	12 AWG	150°C	BLUE	25531140
CH	12 AWG	150°C	WHITE	25531110
EE	8 AWG	150°C	BLACK	25531100
EF	8 AWG	150°C	RED	25531100
EG	8 AWG	150°C	BLUE	25531100
EH	8 AWG	150°C	WHITE	25531100
PA	4/0 AWG	100°C	BLACK	25545000
PB	4/0 AWG	100°C	BLACK W/ RED TAPE	25545000
PC	4/0 AWG	100°C	BLACK W/ BLUE TAPE	25545000

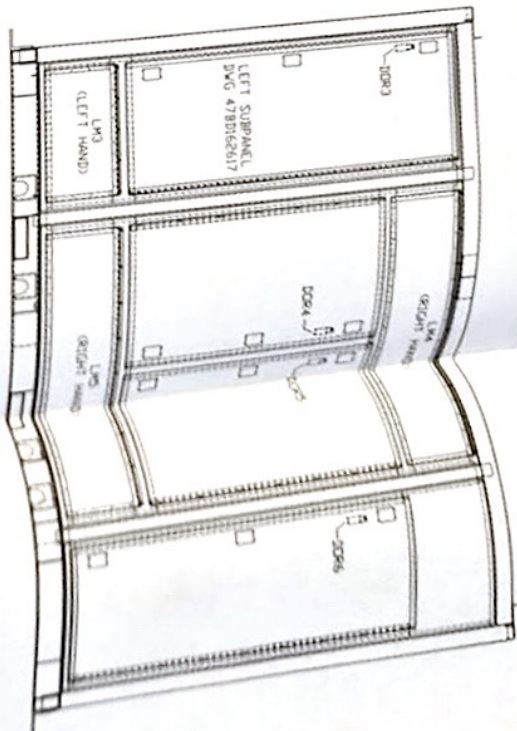


ITEM	QTY.	PART #	DESIG.	DESCRIPTION
1	3	478172259 LR1-LR3		LOAD ELEMENTS HELICAL COIL, 333V @ 277V
2	6	478172259 LR4-LR9		LOAD ELEMENTS HELICAL COIL, 667V @ 277V
3	3	478172259 LR10-LR12		LOAD ELEMENTS POWER-WEB, 1667V @ 277V
4	6	478172259 LR13-LR18		LOAD ELEMENTS POWER-WEB, 3333V @ 277V
5	6	478172259 LR19-LR24		LOAD ELEMENTS POWER-WEB, 4167V @ 240V
6	114	478172259 LR25-138		LOAD ELEMENTS POWER-WEB, 8333V @ 240V
7	11	13027000 FNC1-4		CONTRACTOR 35A, 600V, 3POLE 120VAC COIL
8	19	13027040 C8-C26		CONTRACTOR 600V, 600V, 3POLE 120VAC COIL
9	14	13027100 FNC1X-2X C11X-9X C11X-13X C21X		AUX CONTACT 10A @ 600VAC 1 NC/1 NO
10	1	14015000 CF9		FUSE 2A, 600VAC
11	1	14015500 CF6		FUSE 2A, 500VDC
12	2	----- CF1, CF4		FUSE 10A, 600V, 200KA1C
13	1	14044100 CF5		FUSE 10A, 500VDC
14	3	14051000 F1-F3		FUSE 15A, 600V, 200KA1C
15	3	14069000 F4-F6		FUSE 30A, 600V, 200KA1C
16	3	14073000 F7-F9		FUSE 35A, 600V, 200KA1C
17	57	14086000 F10-F66		FUSE 70A, 600V, 200KA1C
18	1	15011500 (CF1, 9)		FUSEBLOCK 30A, 600V, 2 POLE
19	1	15012500 (CF4-6)		FUSEBLOCK 30A, 600V, 3 POLE
20	2	15013000 (F1-F6)		FUSEBLOCK 30A, 600V, 3 POLE
21	1	15015500 (F7-F9)		FUSEBLOCK 60A, 600V, 3 POLE
22	2	24646000 MD1, 2		MOTOR, SHP, 3 PHASE 208-230/460VAC, 11FC 1800 RPM
23	2	13827100 (MD1, 2)		FAN BLADE, 30"
24	2	12046300 FCB1, 2		FAN CIRCUIT BREAKER 100A FRAME, 15A TRIP, 3 POLE, 600V
25	2	25663600 TB R1, TB MOT, TB EXT, TB G, TB A, KW		TERMINAL BLOCK 30A, 300V, 2 LINE TERMINAL BLOCK 30A, 300V, 3 LINE
26	4	25663700		TERMINAL BLOCK 30A, 300V, 3 LINE
27	1	25667000 TB ES		TERMINAL BLOCK 30A, 300V, 6 LINE
28	6	25670000 TB LS, LST, TB CP, TB CP1		TERMINAL BLOCK 30A, 300V, 12 LINE
29	1	25672000 TB LSE		TERMINAL BLOCK 30A, 300V, 18 LINE
30	1	25457680 T1		TRANSFORMER, 1000VA 480/240-120V
31	28	24771000 LCR1-8 LDR1-8 LDR1-CPR LTRA, B LTRA, B LDR, X LDR, X		GENERAL PURPOSE RELAY 10A, 3PDT, 120VAC COIL
32	4	24870001 TDR1-4		TIME DELAY RELAY, DDT 0-10HRS ADJUSTMENT 120VAC
33	32	24891000 (ITEM-31) (ITEM-32)		RELAY BASE 11 PIN SCREW TERM
34	32	24893001 (ITEM-33)		RELAY BAIL
35	2	25256500 PS-A, B		PRESSURE SWITCH, SPDT DIFFERENTIAL SENSING
36	2	25309650 INTS-A, B		INTAKE TEMP SWITCH SPST, DPENS @ 120 DEG F
37	2	25309570 EXTS-A, B		EXHAUST TEMP SWITCH RELAY OUTPUT 2A, 120VAC 120VAC CONTROL POWER
38	AR	25512400 TC-A, B		THERMOCOUPLE, TYPE J (FOR EXTS)
39	1	----- DCS2		POWER SUPPLY, 20W 120V INPUT, SYNC OUTPUT
40	1	----- DCS1		POWER SUPPLY, 600W 80-264VAC INPUT 24VDC 2S, 0A OUTPUT
41	2	24827900 DLR-A, B		DISSIPATED RELAY 3 POLE 600V, 120VAC 6-18A ADJUSTABLE
42	2	24829000 DLR-A, B		DLR AUXILIARY CONTACT
43	1	24397000 RTM		RUNNING TIME METER
44	1	24955000 PLC1		PLC COMMUNICATIONS PORTS RS232C OR RS485
45	1	24955010 (PLC1)		OUTPUT MODULE 8PT RELAY
46	2	----- (PLC1)		ANALOG INPUT MODULE 0-5VDC
47	10	----- DOR1-10		DOOR SWITCH 11 N.C. CONTACT 120VAC, 10A
48	1	----- DMP		DIGITAL METERING PWD 721V L-L, 3-Phase 90-265V POWER SUPPLY
49	1	----- MT1		M.V. MFR., 700VA, 3PH 4.2KV PRI., 35:1 RATIO 60HZ, METEERING CLASS W/INTEGRAL D.C. FUSES
50	3	----- C11-C13		CURRENT TRANSFORMER 200:5, 30A/400HZ 2.50" JINDRO DIA
51	8	24290100 LG-L8		INDICATOR LIGHT 120V, RED, LED DILIGHT, 22MM
52	1	24290105 LG		INDICATOR LIGHT 120V, GREEN, LED DILIGHT, 22MM
53	19	24290105 LG		INDICATOR LIGHT 120V, GREEN, LED DILIGHT, 22MM
54	14	25219060 L54		SELECTOR SWITCH 2-POSITION, 1 N.D. DILIGHT, 22MM
55	3	25219180 (LS2, P84)		CONTACT BLOCK 1 N.D.
56	5	25219120 P83-P86		PUSHBUTTON 1 N.D., BLACK DILIGHT, 22MM
57	1	25219125 P82		PUSHBUTTON 1 N.C., RED DILIGHT, 22MM
58	2	25219050 L55		SELECTOR SWITCH 3-POS, 2-N.D., 2-N.C. DILIGHT, 22MM
59	1	----- EP8		EMERGENCY STOP P.B. RED MISWASH HEAD OPERATOR
60	2	----- (EP8)		CONTACT BLOCK 1 N.D., N.C.
61	4	24615000 LMA-7		

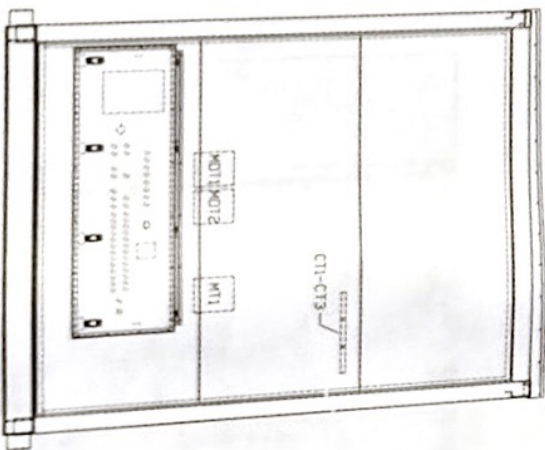


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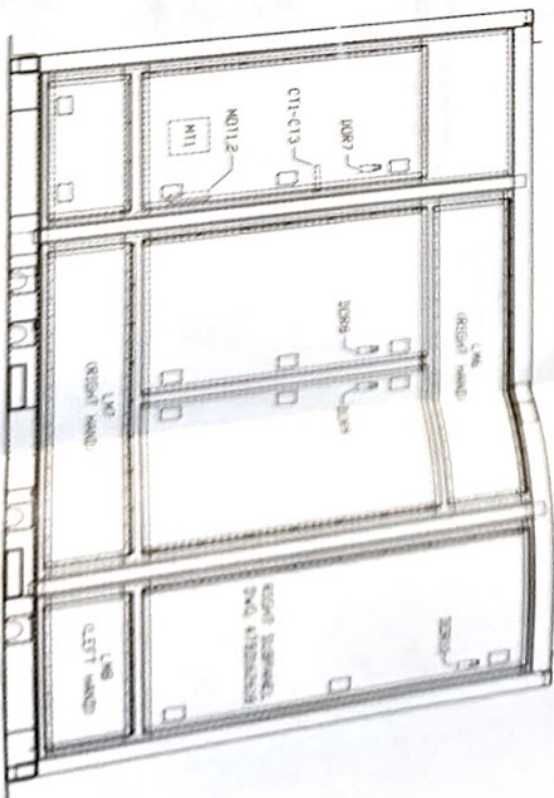




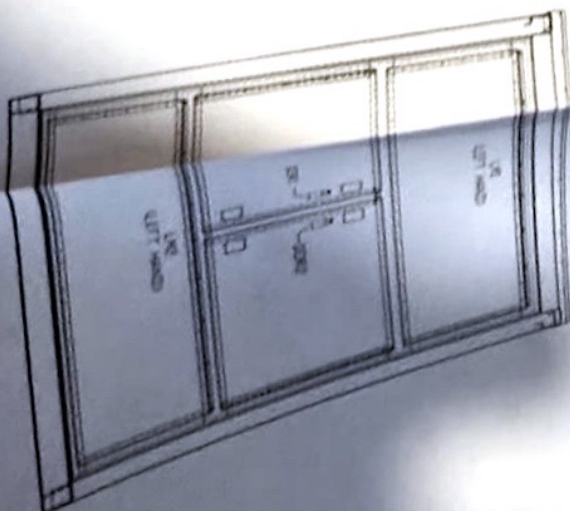
BACK VIEW



LEFT HAND VIEW

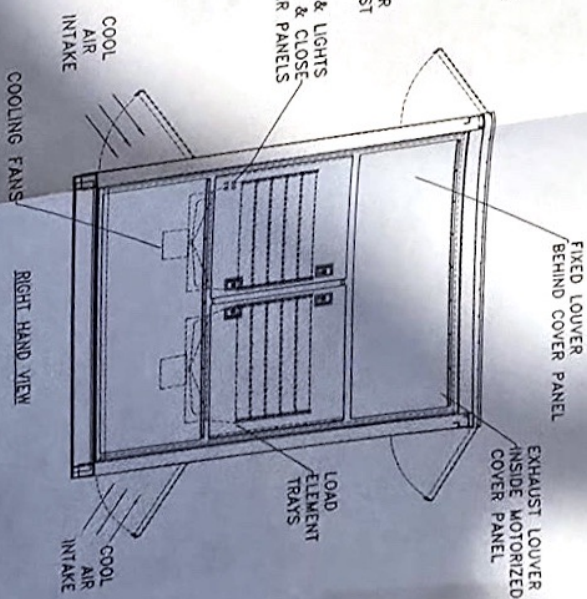
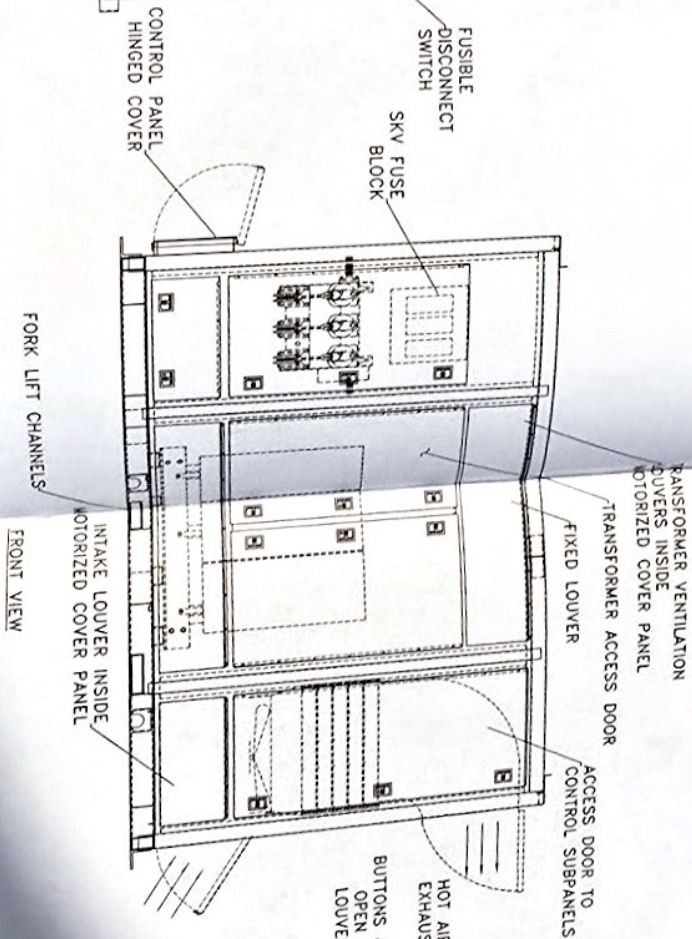
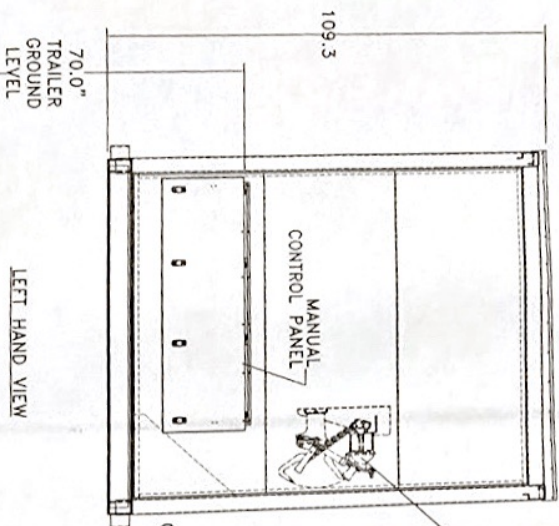
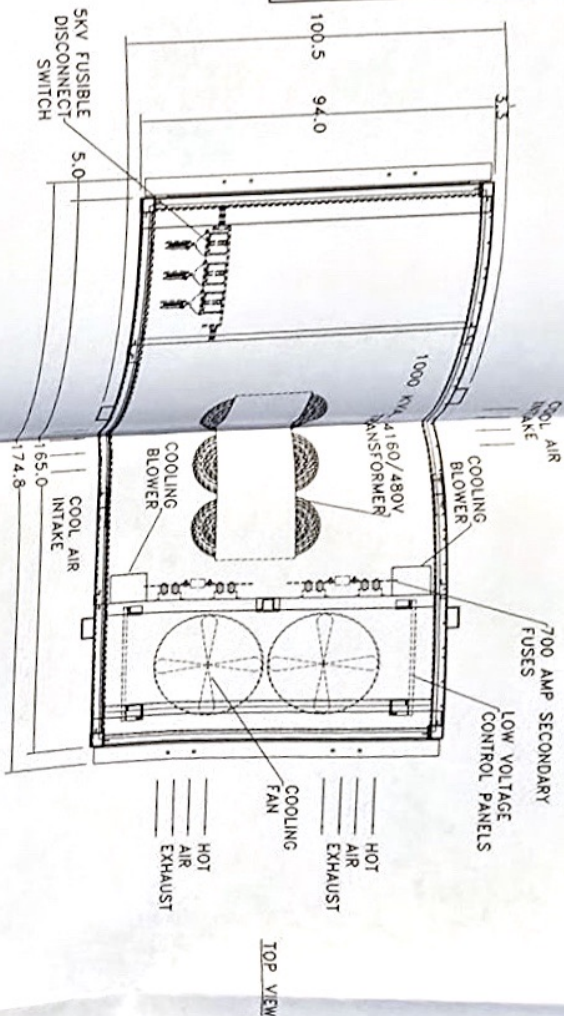
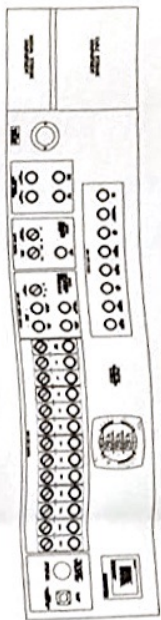


FRONT VIEW

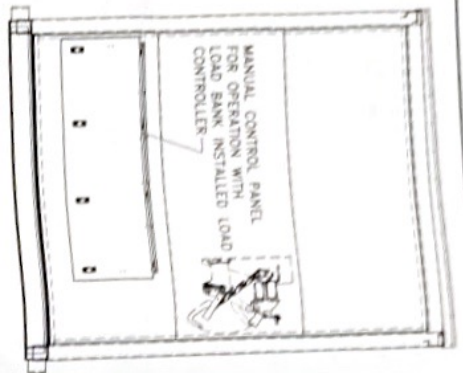


RIGHT HAND VIEW

MANUAL CONTROL DETAIL LOCATED
BEHIND CONTROL PANEL COVER
SCALED 3:1



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SECTION A-A
(CONTROL END)

MAIN FRAME:
FRAME BEAMS:
BED CROSS MEMBERS:

TONGUE:
AXLES:

BRAKES:
SUSPENSION:

TIRES:
WHEELS:
DECKING:
DECK DIMENSIONS:
DECK HEIGHT:

COUPLER:
LANDING JACK:
WIRING:
LIGHTS:
EXTRAS:

G.V.W.R.
CAPACITY:
HOT
AIR
EXHAUST

12" x 19# I BEAM A36 STRUCTURAL STEEL
6" x 8.5# CHANNEL A36 STRUCTURAL STEEL
3" x 3.5# CHANNEL A36 STRUCTURAL STEEL

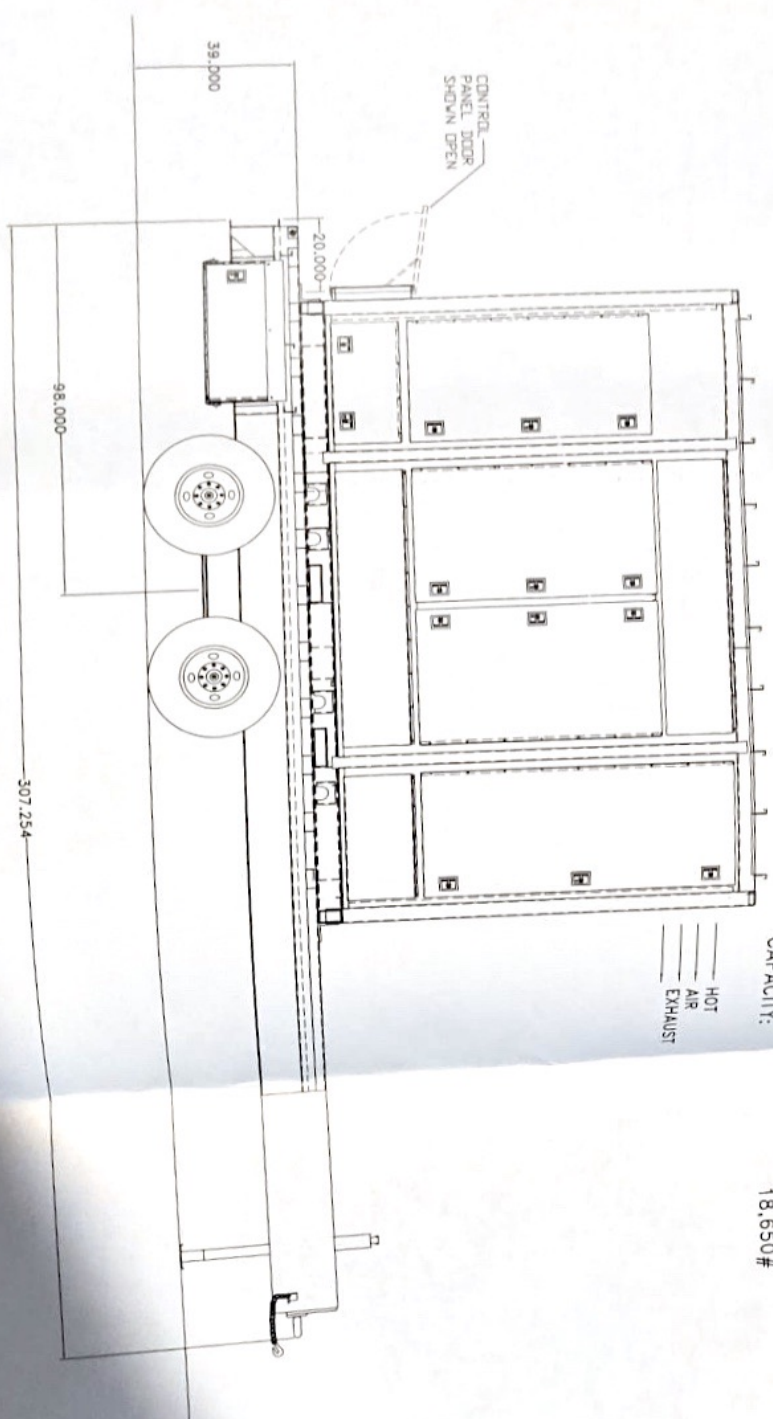
FORMED PART OF MAIN FRAME W/ CHAIN BOX IN TONGUE
2-12,000# REGULAR DUTY DUAL WHEEL AXLE; 5" O.D. BEAM,
.44 WALL; INNER BEARING, 2.625 I.D. OUTER BEARING 2.250 I.D.
12 1/4" x 5" HYDRAULIC BRAKES ON ALL WHEELS
DEXTER SERIES SLIPPER SPRING W/ EQUALIZER, 6 LEAF SPRING x 3" WIDE PER
AXLE PER SIDE, 6,000# PER SIDE PER AXLE
8 - ST235/80R16(E) 3090# EA. @ 80 PSI
16 x 6D RIMS
2" NOMINAL WOOD DECK BOLTED DOWN
20' LONG (20' FLAT) 102" O.A.W.
39"

3" ADJUSTABLE HEIGHT PINTLE EYE
12,000# DROP LEG JACK
SEALED MODULAR WIRING
ALL D.O.T. REQUIRED; SEALED AND SHOCK MOUNTED LED TAILLIGHTS
ANTI-SAIL MUD FLAPS, 1/2 x 36" GRADE 70 SAFETY CHAINS
W/ SLIP HOOK & SAFETY LATCHES
24,000#
18,650#

NOTE:
1. LOAD BANK APPROXIMATE
WEIGHT = 14,000 LBS.,
TOTAL APPROXIMATE
WEIGHT = 19,350 LBS.

2. LOAD BANK LOCATION
PER CUSTOMER SPECIFICATION FOR
TONGUE WEIGHT CONSIDERATION.

3. TRAILER:
MODEL HD HIGH DECK 20' FLAT #92725-7
102" x 20" TANDEM AXLE
2-12,000 LB DUAL WHEEL AXLE
GVWR 24,000 LB
CAPACITY 18,650 LB



LOUVER ACTUATOR SPECIFICATIONS

Motion Systems Corporation

600 Industrial Way West

Eatontown, NJ 07724

Phone: (732) 222-1800

<http://www.motionsystem.com/>

85615 30:1 Gear Ratio -- 24 VDC 7500 RPM

Max. Stroke (inch)	1.00 to 12.00
Rated Load/Force (lbs)	100
Rated Speed (in/sec)	0.5000
Drive Configuration	Ball Screw
Motor Type	DC
Motor Volts (volts)	24.00
Motor Features	Home, Limit, Position Switches (optional feature)
Features	Adjustable (optional feature); Holding Brake (optional feature); Protective Boot (optional feature); Freewheel, Cover Tubes, Rod End
Material	Steel
Mounting Method	Clevis Mount; Translating Tube
Notes	Interim strokes available, gearbox mounting options, adjustable boot

APPENDIX E- DRAWINGS

<u>Title</u>	<u>Drawing</u>
Load Bank Pictorial	7BD172245
Trailer Pictorial	7BD172246
One Line Diagram	47B172247
Control Section 1 of 4	47B172248A
Control Section 2 of 4	47B172249
Control Section 3 of 4	47B172250
Control Section 4 of 4	47B172251
Metering Section	47B172252
Transformer Section	47B172253
Load Section 1 of 2	47B172254
Load Section 2 of 2	47B172255
Load Strapping 1 of 2	47B172256
Load Strapping 2 of 2	47B172257
Load Tray Layout	47BD172258
Non-Standard Elements	47B172259
Parts Legend	47B172260A
Subpanel Layout - Left	47BD172261
Subpanel Layout - Right	47BD172262A
Local Control Detail	47BD172263
Nameplates	47BD172264
Door Switch Locations	47BD172265
Motor Operator Control	47B172266

PRODUCT WARRANTY

SIMPLEX, Inc., warrants the industrial electrical control, test and accessory equipment and parts and accessories thereof to be the kind and quality described in Simplex's specifications and to be free from defects in material or workmanship under normal service, its obligations under this warranty being limited to repairing or replacing, at its option, any part or parts which shall, within twelve (12) months from date of shipment from its factory, as indicated by serial date code on the nameplate or sales records, be returned to Simplex or an authorized Simplex repair station, with transportation costs prepaid, and which its examination shall disclose to its satisfaction to have been thus defective.

The provisions of this warranty shall not apply to any equipment, part or accessory which

- (a) has been improperly specified by buyer;
- (b) has been improperly stored or handled prior to placing in service;
- (c) has been improperly mounted or connected;
- (d) has not been operated within specifications stated on its nameplate, label or placard;
- (e) has not been properly maintained;
- (f) parts supplied by buyer for inclusion in finished equipment are not covered by this warranty;
- (g) components or assemblies specified by buyer with no substitution permissible that are not normally used by Simplex.

Simplex reserves the right to reject warranty claims of any kind against assembled equipment, parts or material for which Simplex has not received payment in full.

Should buyer, at his own risk, elect to replace defective equipment or parts in the field rather than return equipment to Simplex's factory or authorized repair station, Simplex will supply and invoice parts at normal prices upon receipt of buyer's bonafide purchase order. Defective equipment or parts returned for in-warranty crediting in exchange for replacement parts must be returned within 45 days from date of shipment of replacement in order to qualify for warranty consideration. Defective equipment or parts returned after 45 days may be subject to a restocking charge of 20% or a minimum charge of \$50.00 whichever is greater.

This warranty is in lieu of all other warranties, express or implied, and all other obligations or liabilities on the part of Simplex, and Simplex neither assumes nor authorizes any other person to assume for it any other liability in connection with any such electrical control, test or access equipment or accessories or parts.

CONDITIONS OF SALE

The following conditions apply without exception unless such exception is made in writing and signed by an officer of Simplex.

Simplex will, at its option, sell or rent technical industrial equipment or parts thereof or material only on condition that buyer assumes responsibility for correct specification, storage, installation, field adjustments when normally required, testing and appropriate training of users by technically competent personnel before release to user and that any malfunction or failure of Simplex supplied material will be reported to Simplex immediately and that no back-charges of any nature will accrue to Simplex, without the express written consent of Simplex.

Quotations. Unless specifically stated otherwise, quotations are based on standard pricing, handling, delivery and warranty. Substantial alterations in details or intent of Simplex's quotation on buyer's purchase order, subject to additional charges based on increased cost incurred by Simplex. Written quotations are firm for 60 days unless otherwise noted. Acceptance of orders based on oral quotes, published literature or written quotations older than 60 days are subject to approval by an officer of Simplex. Delivery dates are the best estimates as of date of issue.

Prices. All prices are f.o.b. Springfield, Illinois, with buyer paying all freight costs, unless allowed in written quotation. Prices and other published data are for reference purposes only and do not imply availability of product. Prices are subject to change without notice and prices in effect at the time of shipment will apply to new orders and unreleased existing orders unless otherwise quoted in writing.

Minimum billing. A minimum billing of not less than \$50 will apply to all orders. Minimal fees to offset in part extra costs incurred during order entry process, special services as ordered by customer, shipping processes and collection efforts will be charged where applicable.

Taxes. Published or quoted pricing does not include any federal, state or local taxes. Buyer should report any federal, state or local taxes as may be required by local law.

Penalty clauses. Unless specifically accepted in writing Simplex, price quotations do not include participation by Simplex in any penalties or damages incurred by buyer.

Acceptance of orders and contracts. All orders must be in writing and include complete description of material, including technical specifications as quoted by Simplex, price, terms, delivery, shipping instructions, etc. Buyer's failure to object to any provisions contained in any order or any other communications shall not constitute a waiver of Simplex's terms and conditions notwithstanding such provisions. No order shall be considered accepted unless acknowledged in writing by Simplex.

Terms of payment - purchased material. Net cash U.S. 30 days from date of invoice, which shall be the same as date of shipment from our factory, to approved open account customer. All other orders are cash in advance or material ordered to ship on a given date and later

ordered by buyer to be held for later shipment will be invoiced on date shipment originally scheduled or on date material becomes available for shipment, whichever occurs later, and terms of payment will apply from that invoice date. No cash discounts are allowed.

Terms of payment - rental equipment or field service. Payable upon receipt of invoice in U.S. funds to approved open account customers. In other cases, payment by cash in advance, COD or security deposit.

Service charges. Service charges apply from 31st day after invoice date. Failure to pay such charges as billed may result in suspension of open account terms.

Cancellation. Upon acceptance by Simplex your order will be entered for production and will not thereafter be subject to cancellation or deferment of delivery schedule without written consent from Simplex. Any expenses incurred by Simplex due to cancellation of an order, or the extra expense of deferment of a delivery schedule, will be borne by the customer.

Packing and marking. Prices include our standard packing and marking for domestic shipment within the continental U.S. Additional expenses incurred for special packing or marking as specified by buyer will be paid by the buyer. No allowance in lieu of packing will be made if buyer accepts material unpacked at our factory or authorized service station.

Shipping weights. Published shipping weights are approximate and are provided only for estimating freight costs.

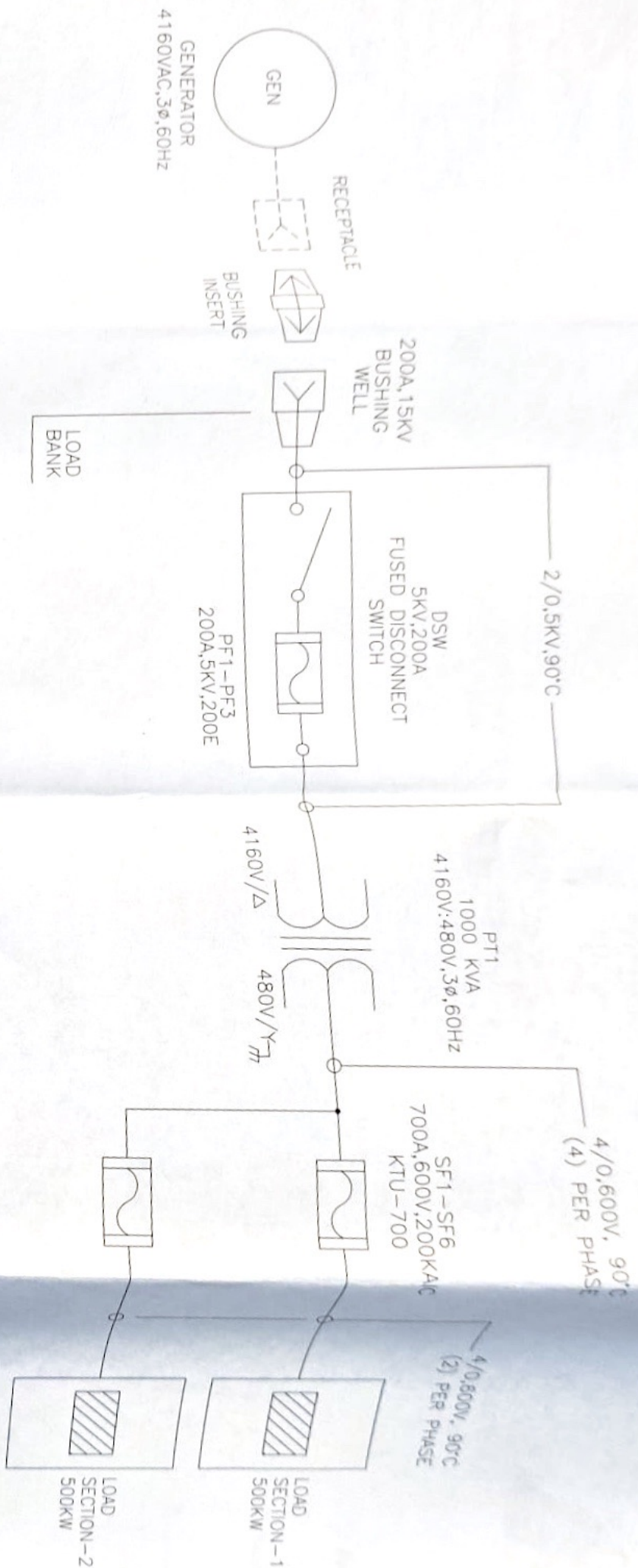
Shipments. Shipments will be made best way surface unless otherwise specified by buyer. Responsibility for lowest cost and fastest means shipping method is buyer's and details are to be specified in the buyer's purchase order. Simplex's responsibility ceases when the carrier signs for and accepts shipment and claims for nondelivery of material or damage should be filed with carrier by buyer.

Returning material. Written authorization to return material for credit or repair or replacement must be obtained from Simplex. Such returns are subject to restocking, exchange or repair charges with all transportation charges paid by buyer and are subject to acceptance by Simplex. Simplex, at its option, will apply credited amounts to buyer's account, current or future balances, or issue cash refund.

Drawings. One copy of standard drawings, wiring diagrams and instruction manual conforming to Simplex's standard practices will be furnished per unit purchased at no charge. Prices quoted upon request for special drawings or additional copies of standard drawings and instruction manuals.

Warranty. Simplex warrants new industrial equipment or parts or material to be the kind and quality described in Simplex's specifications and to be free from defects in material or workmanship under proper conditions of application and use, for a period of 12 months.

SIMPLX®



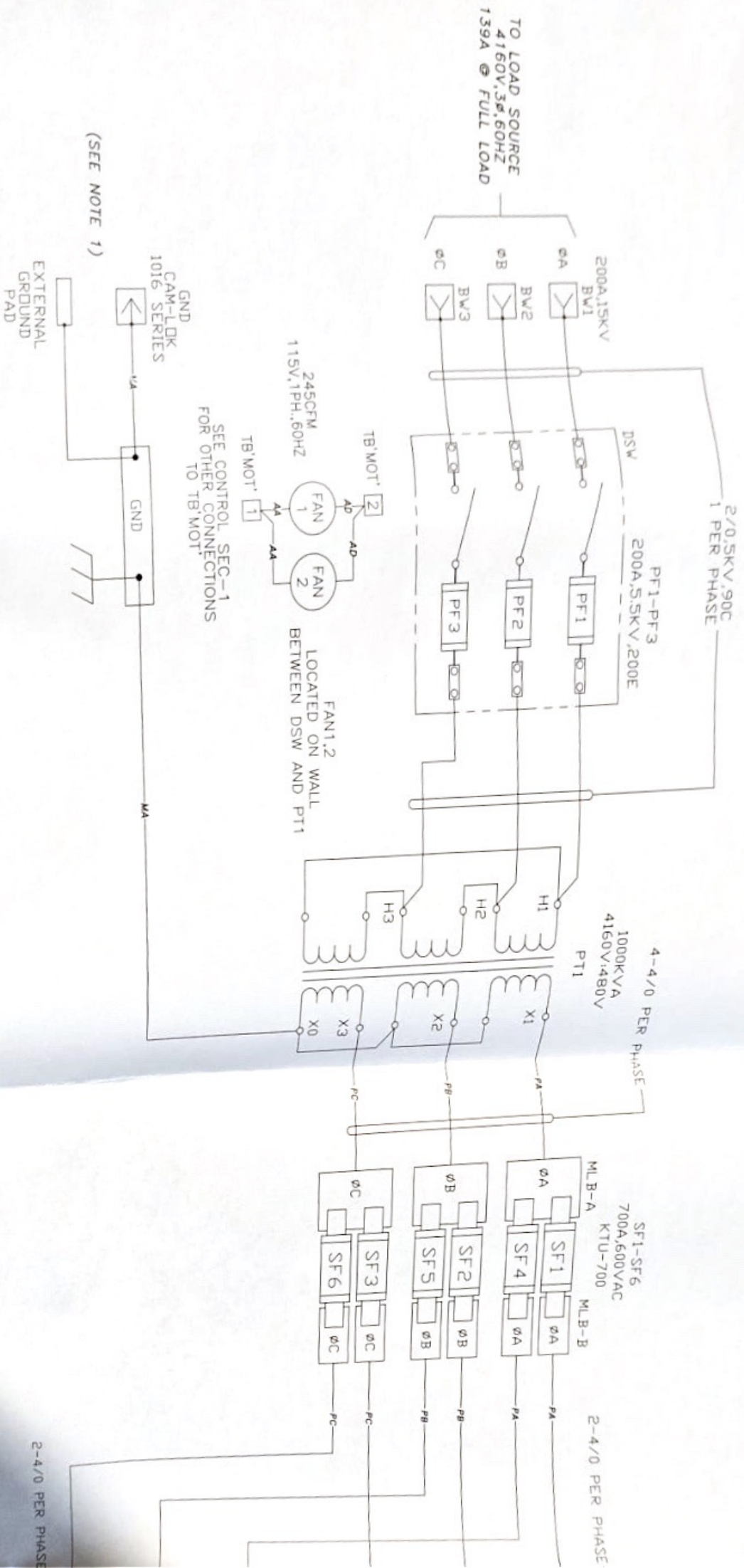
NOTES:

1. SINGLE LINE DIAGRAM PROVIDED FOR BETTER UNDERSTANDING OF SPECIFIED INTEGRAL COMPONENTS OF THIS PROJECT.
2. DASHED LINES INDICATE WIRING NOT SUPPLIED BY SIMPLEX.
3. UNIT MUST BE GROUNDED FOR OPERATOR SAFETY.

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7 SIMPLEX, INC. ALL RIGHTS RESERVED.

SIMPLEX		SPRINGFIELD, ILLINOIS	
DATE: 10/26/07	APPROVED BY: CMC	DATE: 10/26/07	APPROVED BY: CMC
REVISION: 1000		REVISION: 1000	
1000W/4160V/3Ø, 60Hz		1000W/4160V/3Ø, 60Hz	
W.D. # 65665-07-43		478172247	



NOTES:

1. UNIT MUST BE GROUNDED FOR OPERATORS SAFETY.
2. DASHED LINES INDICATE WIRING NOT SUPPLIED BY SIMPLEX.