L-K INDUSTRIES

Demand a higher standard

Transport Centrifuge Series

Models: 3100, 7100 & 9100

Operating Manual

MISSION: To set the standard for **MANUFACTURING QUALITY** and customer service in the **PETROLEUM TESTING** industry.

HISTORY: Petroleum Testing Equipment Suppliers Worldwide **Since 1930**

Limited Product Warranty

L-K Industries warrants its manufactured products against defects in materials and workmanship for a period limited to one year from the date of shipment. If purchased from a Distribution Partner, the warranty lasts one year from the in-service date. During the one-year warranty period, L-K Industries shall repair or replace defective equipment free of charge. L-K Industries shall only be liable for repairs or replacements if L-K is contacted immediately following discovery of defect(s).

Defective products (under warranty) shall only be returned after contacting and receiving permission from L-K Industries. The warranty does not extend to L-K Industries products that have been misused, neglected, independently modified (without L-K Industries' approval), improperly installed or accidentally damaged. L-K Industries shall not be liable for damage or loss resulting from use of L-K Industries products–separately or in combination with other equipment.

Contact Information

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Getting Started

Introduction and Safety Precautions

The Transport Portable Oil Centrifuge series includes the 3100, 7100 and 9100 models. This centrifuge is intended for outdoor use on crude oil hauler trucks and at refineries. It comes completely assembled and ready for installation. Unpacking and lifting the centrifuge should always be done by at least two people. Retain the custom packaging materials for future shipping or storage.

The pre-heater pockets (available only on 7100 and 9100 models) enable faster sample testing. Its compact design allows for easy installation and maintenance. The sliding lid door allows for easy access and includes a hole for tachometer measurements. The solid-state motor controller with epoxy-coated electronics ensures that the unit lasts longer in the field.

Here are some other highlighted features of each Transport model:

- Transport 3100 – non-heated, compact unit; available in 12VDC only
- Transport 7100 – heated unit with adjustable speed control; available in 12VDC only
- Transport 9100 – heated unit with adjustable speed/temperature controls and digital LCD displays; available in 12VDC or 115VAC

The following safety guidelines can help prevent user error/injury and improve operation:

- REMOVE all foreign objects from the centrifuge bowl.
- Keep the sliding door CLOSED, especially while samples are spinning.
- NEVER try to slow the trunnion arm manually. Allow the trunnion arm to come to a complete stop before removing samples.
- Turn all switches OFF when not in use.
- NEVER leave the centrifuge unattended while it is operating.
- DISCONNECT the power supply before removing or replacing electrical or mechanical parts.
- DO NOT leave oily or solvent saturated rags in or around the unit.
- DO NOT allow unauthorized persons to operate the centrifuge.
- BE AWARE of surroundings. DO NOT operate the unit when fatigued or under the influence of medication, alcohol or illegal substances.
- If a tube has broken inside of a shield, the cushion MUST be replaced.
- Use CAUTION during heated operation, as the top of the unit can become hot to the touch.

Specifications

Equipment Ratings

- Electrical Input: 12VDC/115VAC (built-in active PFC function, universal AC input, built-in DC cooling)
- Inner Bowl Operating Range: Maximum 250°F (121°C)
- Outdoor use

Applicable Testing Standards

- API MPMS Ch. 10.4 (withdrawn ASTM D96): Determination of Sediment and Water in Crude Oil by the Centrifuge Method (Field Procedure)
- ASTM D2709: Standard Test Method for Water and Sediment in Middle Distillate Fuels by Centrifuge

Getting Started

Warnings

⚠ 1. Exposure to solvents (i.e. toluene) may degrade the sealing properties of materials used in the front panel switches.

⚠ 2. EXPLOSION HAZARD – DO NOT replace fuses unless the main power has been switched off.

⚠ 3. EXPLOSION HAZARD – DO NOT disconnect or disassemble equipment unless the main power has been switched off or the area is known to be non-hazardous.

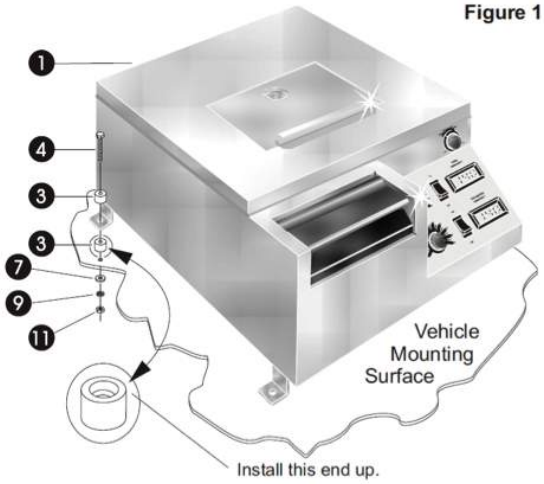
⚠ 4. DO NOT operate this machine with unbalanced tubes and shields.

Installation

The unit is designed to withstand outdoor use. However, for best results, the centrifuge should be housed in an enclosure to minimize weather exposure. Wind and rain can lengthen the time it takes to warm samples and reduce the ability to maintain sample temperature inside the centrifuge. It is recommended that the centrifuge be secured inside a tool box, truck bed, car trunk, etc. using the ¼-20 x 3" bolts (Item 4), star washers (Item 9), ¼" washer (Item 7), shock mounts (Item 3) and ¼-20 lock nuts (Item 11) provided with the unit. See Figure 1 for reference.

ITEM	QTY	PART#	DESCRIPTION
1	1		Centrifuge
2	1	J-243	Circuit Breaker 12V 50AMP
3	8	J-239	Shock Mount
4	4		Mounting Screw 1/4-20X3
5	2		Grounding Screw 1/4-20X3/4
6	2		Screw #10 -32X3/4"
7	6		Washer 1/4 SAE
8	2		Star Washer #10
9	6		Star Washer 1/4
10	4		Lock Nut 10-32 W/Insert
11	6		Lock Nut 1/4-20 W/Insert
12	2	J-244	Ring Terminal 8 ga X#10
13	1	J-260	Relay ground 14 ga black
14	36"		Wire 14 ga Red

Figure 1



Getting Started

Electrical Connection

Figure 2 displays the wiring configurations for a 12VDC negative ground system. All switches and knobs should be in the “OFF” position before proceeding with installation.

NOTE: DO NOT use existing/previous equipment wiring.

Two (red and black) wires extend from the centrifuge. Attach the ground lug on the black wire to the vehicle chassis using a ¼-20 x ¾” bolt (Item 5), star washer (Item 9), ¼” washer (Item 7) and lock nut (Item 11). Ensure that the ground connection is secure. If additional wire length is needed, extend using a minimal amount of the same gage wire.

Connect the red wire to a dedicated solenoid or relay (available for separate purchase) with a minimum 60-amp continuous rating. Remove excess wire and attach using an appropriate terminal. Figure 2a shows the appropriate connection point on the solenoid (or relay).

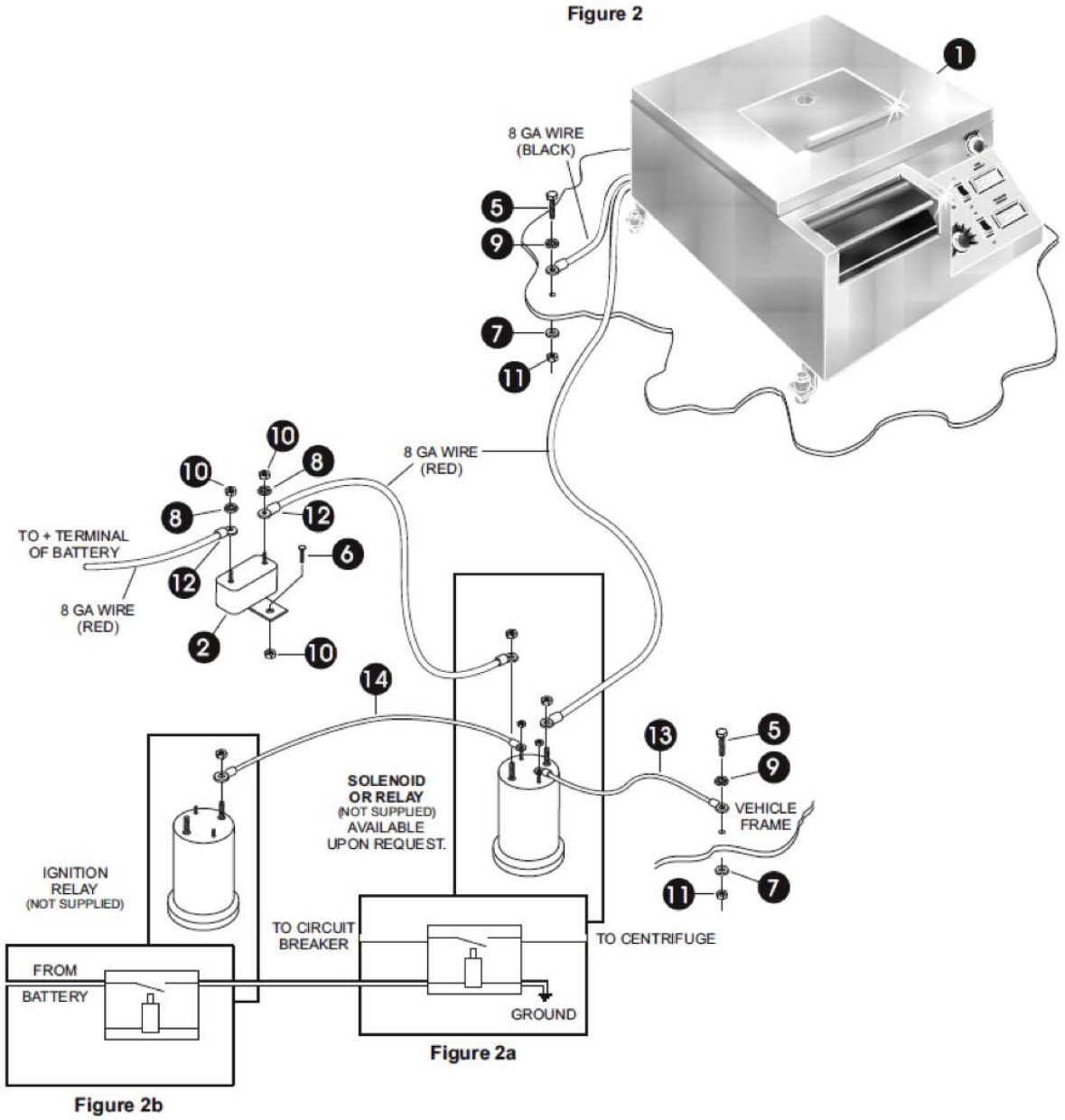
Using the excess 8-gage red wire, attach one end to the solenoid or relay using an appropriate terminal and run the other end of the wire to the circuit breaker (Item 2). The circuit breaker should be mounted as close to the battery as possible, using the #10-32 x ¾” screws (Item 6) and the #10-32 lock nut (Item 10). Remove excess wire and attach to the auxiliary side of the circuit breaker using the ring terminal (Item 12), star washer (Item 8) and 10-32 lock nut (Item 10).

Again, using the excess 8-gage red wire, attach one end to the battery side of the circuit breaker using the ring terminal (Item 12), star washer (Item 8) and 10-32 lock nut (Item 10). Attach the other end to the battery using the appropriate terminal for the vehicle battery.

Attach one end of the black ground wire (Item 13) to the solenoid or relay using the appropriate terminal and attach the ground lug on this wire to the vehicle chassis using a ¼-20 x ¾” bolt (Item 5), star washer (Item 7) and lock nut (Item 11). Ensure that the ground connection is sound. See Figure 2a for the connection point on the solenoid or relay.

Attach one end of the red ground wire (Item 14) to the solenoid or relay using an appropriate terminal and attach the other end to the vehicle ignition switch solenoid or relay. Figure 2b shows the connection point.

Getting Started



Operation

This unit and all L-K Industries sample tubes are designed and fabricated in compliance with API and ASTM standards. For optimal results, L-K Industries sample tubes (along with matching shields, cushions and collars) should be used. Verified and certified tubes are also available.

Before centrifugation, all tubes, collars, cushions and shields should be visually inspected for damage. Check for oil residue on cushions and ensure that the cushions rest flat inside the bottom of each shield. Damaged parts must not be centrifuged, as they may break and cause further damage to the centrifuge.

Loading and Powering On

To supply power to the unit, ensure that the vehicle is running. For 7100 and 9100 models, two sample centrifuge tubes may be heated in the two pre-heater pockets (left side). Two extra sample pockets are located next to the heated pockets.

Preheat the centrifuge bowl by moving the “BOWL HEATER” switch to the ON position. Keep the sliding door closed as often as possible to minimize heat loss.

Call the L-K Industries Tech Helpline if any assistance is required.

Transport 9100

Set the temperature of the pre-heater and bowl to 160°F. Place two prepared samples in the pre-heater pockets (left side) with thermometers inserted in the tubes. It is recommended to use tooled top tubes, with a small hold drilled through the rubber stopper to allow for thermometers. This allows samples to be shaken without taking out the thermometer, and reduces heat loss and spillage. Use a digital thermometer for best results.

Figure 3

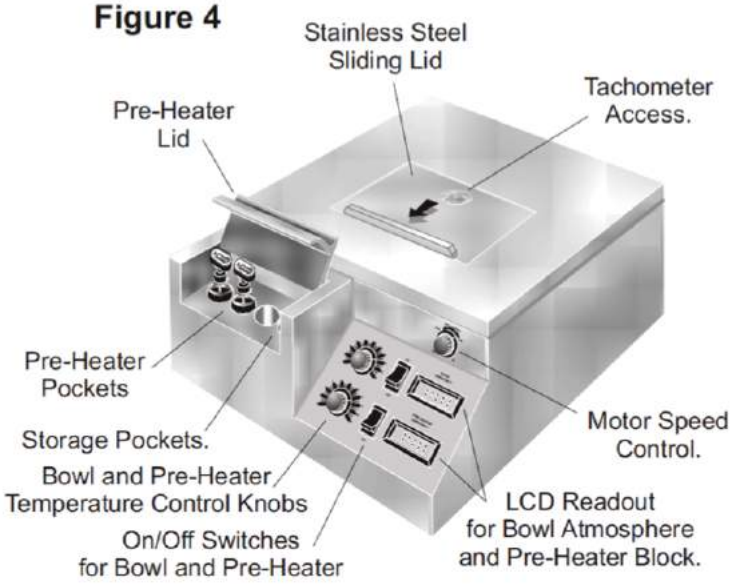
When the pre-heater LCD display reaches approximately 155°F, turn the temperature control knob to 140°F. Shake the sample tube, as shown in Figure 3, and check the actual temperature inside the tube. At an ambient temperature of 72°F, it should take 10-12 minutes for samples to reach 140°F.

Open the sliding door and place the filled, heated sample tubes into the shields. Ensure that the tip of each tube rests firmly in the cushion (if cushion is needed). Before every test, inspect the inner bowl for foreign objects and close the door. Close the lid and slowly turn the “MOTOR SPEED” knob until the desired speed is reached. If the same speed is used during each test, mark that speed for future reference. The unit is designed to operate at a maximum of 2200 rpm. The slower the speed, the longer the lifespan of the unit.

Operation

NOTE: Speed (rpm) can be checked manually with a tachometer, through the pop-open cap in the centri fuge lid (Figure 4). See Appendix A for the RCF vs. RPM values.

Figure 4



Keep the bowl lid closed during centrifuge operation. Once a test is complete, turn the “MOTOR SPEED” knob to the off position. Allow ample time for the motor to slow down before opening the lid.

CAUTION: DO NOT try to slow down the trunnion arm or place hands (objects) inside the bowl while the trunnion arm is still spinning. Allow the trunnion arm to come to a complete stop before removing samples.

Transport 7100

Set the pre-heater switch to the “HIGH” position and the bowl heater switch to the “ON” position. Place two prepared samples in the pre-heater pockets (left side) with thermometers inserted in the tubes. It is recommended to use tooled top tubes, with a small hold drilled through the rubber stopper to allow for thermometers. This allows samples to be shaken without taking out the thermometer, and reduces heat loss and spillage. Use a digital thermometer for best results.

Figure 5

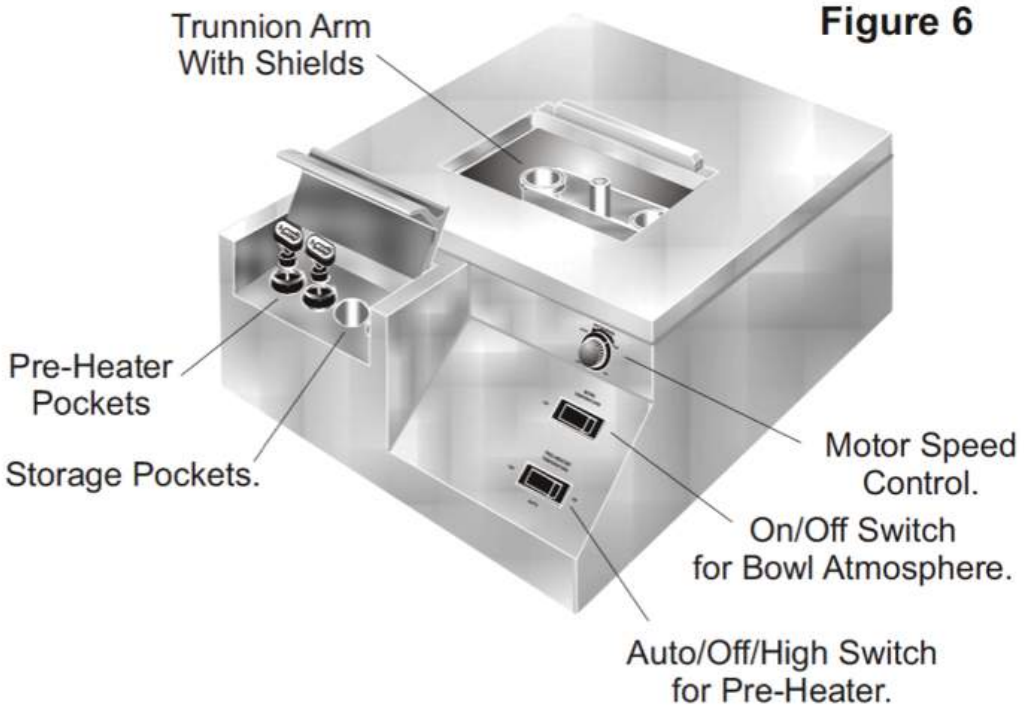
Operation

After approximately 5 minutes, shake the sample tube, as shown in Figure 5, and check the actual temperature inside the tube. When the sample temperature reaches approximately 125°F, turn the pre-heater switch to the "AUTO" position to prevent overshooting the target sample temperature. At an ambient temperature of 72°F, it should take 10-12 minutes for samples to reach 140°F.

Open the sliding door and place the filled, heated sample tubes into the shields. Ensure that the tip of each tube rests firmly in the cushion (if cushion is needed). Before every test, inspect the inner bowl for foreign objects and close the door. Close the lid and slowly turn the "MOTOR SPEED" knob until the desired speed is reached. If the same speed is used during each test, mark that speed for future reference. The unit is designed to operate at a maximum of 2200 rpm. The slower the speed, the longer the lifespan of the unit.

NOTE: Speed (rpm) can be checked manually with a tachometer, through the pop-open cap in the centrifuge lid (Figure 6). See Appendix A for the RCF vs. RPM values.

Figure 6



Keep the bowl lid closed during centrifuge operation. Once a test is complete, turn the "MOTOR SPEED" knob to the off position. Allow ample time for the motor to slow down before opening the lid.

CAUTION: DO NOT try to slow down the trunnion arm or place hands (objects) inside the bowl while the trunnion arm is still spinning. Allow the trunnion arm to come to a complete stop before removing samples.

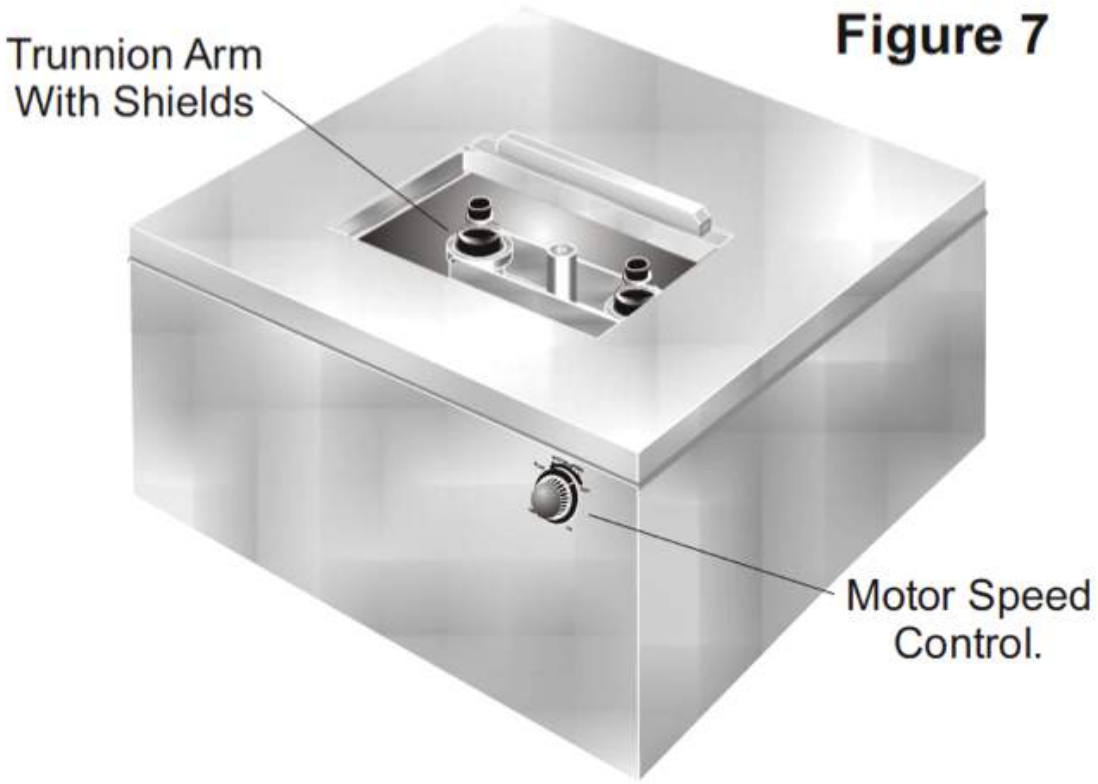
When the centrifuge is not in use, ensure that all knobs and switches are in the off position.

Operation

Transport 3100

Open the sliding door and place the prepared sample tubes into the shields. Ensure that the tip of each tube rests firmly in the cushion (if cushion is needed). Before every test, inspect the inner bowl for foreign objects and close the door. Close the lid and slowly turn the "MOTOR SPEED" knob until the desired speed is reached. If the same speed is used during each test, mark that speed for future reference. The unit is designed to operate at a maximum of 2200 rpm. The slower the speed, the longer the lifespan of the unit.

NOTE: Speed (rpm) can be checked manually with a tachometer, through the pop-open cap in the centrifuge lid (Figure 6). See Appendix A for the RCF vs. RPM values.



Keep the bowl lid closed during centrifuge operation. Once a test is complete, turn the "MOTOR SPEED" knob to the off position. Allow ample time for the motor to slow down before opening the lid.

CAUTION: DO NOT try to slow down the trunnion arm or place hands (objects) inside the bowl while the trunnion arm is still spinning. Allow the trunnion arm to come to a complete stop before removing samples.

When the centrifuge is not in use, ensure that all knobs and switches are in the off position.

Maintenance

Replacement Parts and Repair Services

Replacement parts for all centrifuges can be purchased through the L-K Industries warehouse, on the L-K Industries website or from a Distribution Partner (see back cover). L-K Industries also repairs and rebuilds all centrifuge models in-house. For repairs, first obtain the RMA (Return Merchandise Authorization) number from L-K Industries. Then ship the unit to L-K Industries with a completed RMA form describing any problems.

Housekeeping

Vibration occurs especially when driving over washboard roads – this can loosen screws. Periodically check the centrifuge for loose screws, namely the mounting screws.

Clean the unit after each test. Oil residue can build up and cause difficulty operating the unit. Periodically check the sample tube cushions inside the trunnion shields for excess wear. Before each test, examine moving parts (electrical and mechanical) for wear and stress. Replace parts as necessary.

If a tube has broken inside a shield, the cushion MUST be replaced. Glass particles (not visible to the naked eye) can become embedded in the cushions and cause future breakage of tubes. Two extra cushions are provided.

NOTE: "B" style tubes DO NOT require cushions or collars.

Fuses

The fuses are used for over-current protection due to voltage spikes or other accidents. If replacement becomes necessary, disconnect power. Remove the fuses and replace with an appropriate L-K fuse that is CSA or UL certified. Contact L-K Industries Warehouse for the correct fuse part numbers.

Troubleshooting

Common Issues

Issues that may occur during centrifuge operation include excessive vibration, broken tubes, broken or malfunctioning LCD screens, cushions stuck in shields, etc. For issues that cannot be identified and resolved by the user, more technical troubleshooting details can be found on the L-K Industries website. Alternatively, contact the L-K Industries Tech Helpline for assistance.

Motor

If the motor stalls or does not come up to speed properly or the heaters do not turn on, check the fuses inside the front panel. Contact the L-K Industries Tech Helpline if assistance is needed in checking or changing fuses.

Appendices

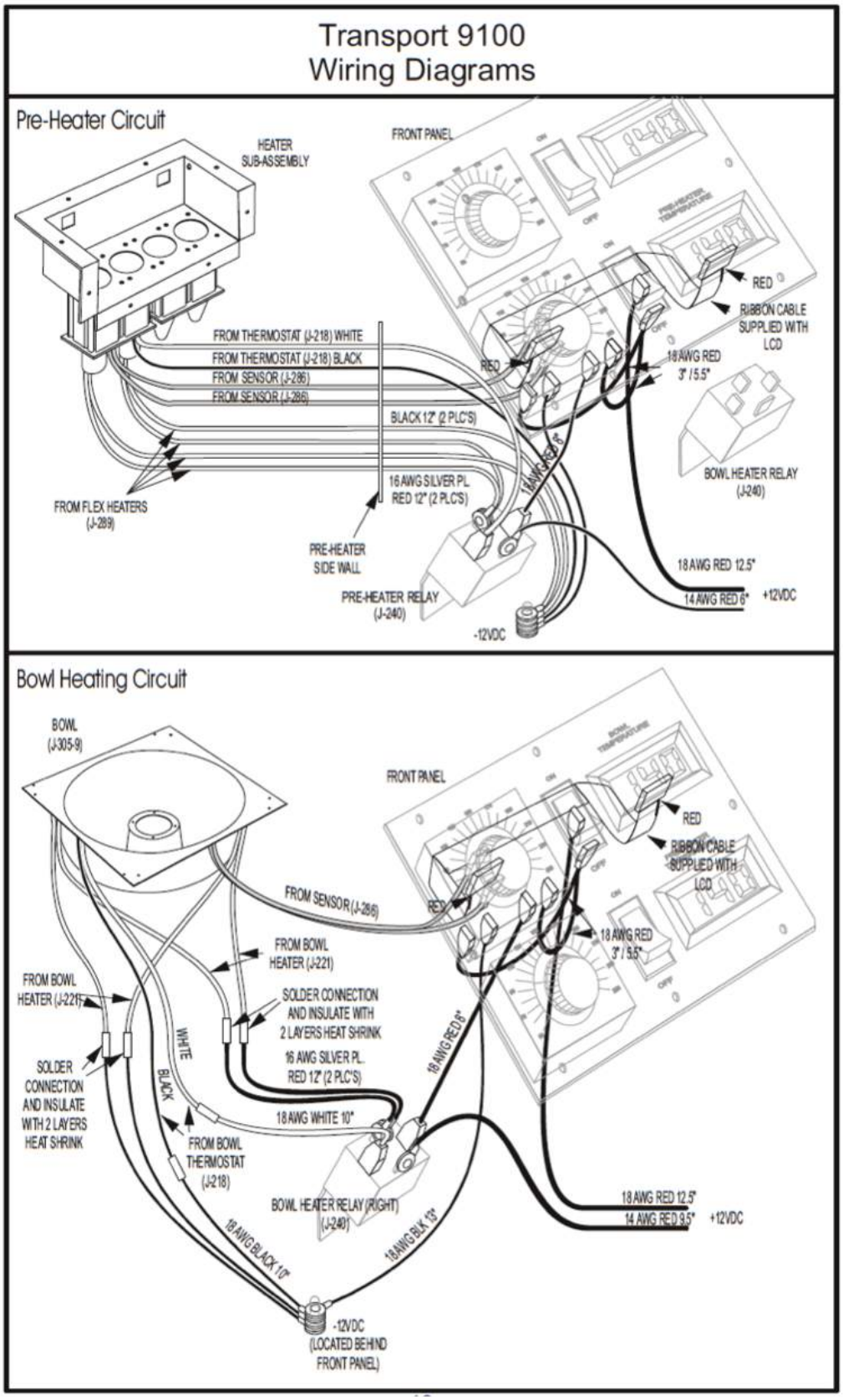
Appendix A: RCF/RPM Conversions

Tip-to-tip Diameter (")	15.29
RPM*	RCF
200	9
250	14
300	20
350	27
400	35
450	44
500	54
550	66
600	78
650	92
700	107
750	122
800	139
850	157
900	176
950	197
1000	218
1050	240
1100	263
1150	288
1200	314
1250	340
1300	368
1350	397

Tip-to-tip Diameter (")	15.29
RPM*	RCF
1400	427
1450	458
1500	490
1550	523
1600	557
1650	593
1700	629
1750	667
1800	705
1850	745
1900	786
1950	828
2000	871
2050	915
2100	960
2150	1006
2200	1054

RPM =265×√(RCF/D), where D = tip-to-tip tube diameter in inches
**ASTM minimum recommended RCF: 600

Appendix B: Wiring Diagrams



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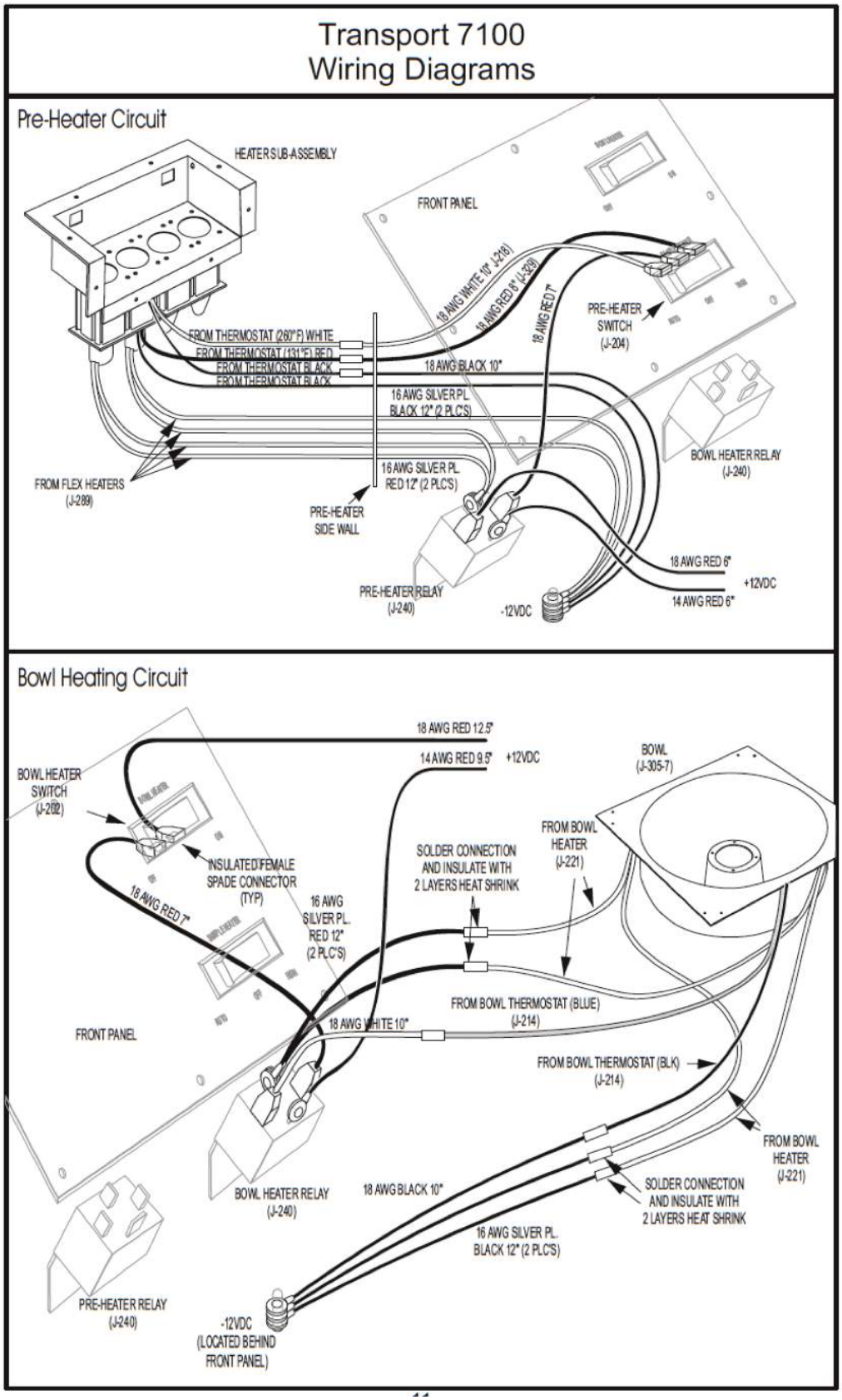

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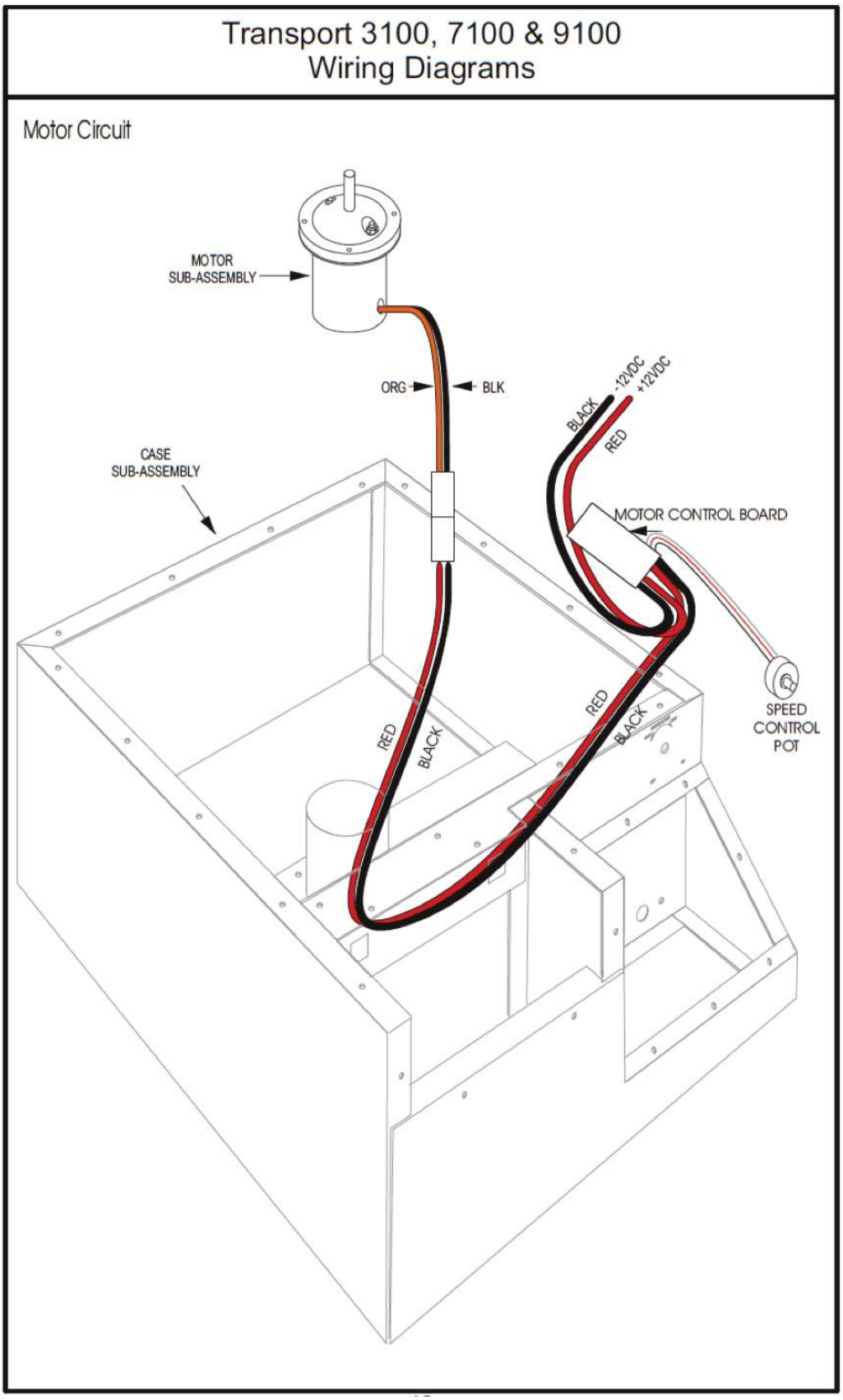
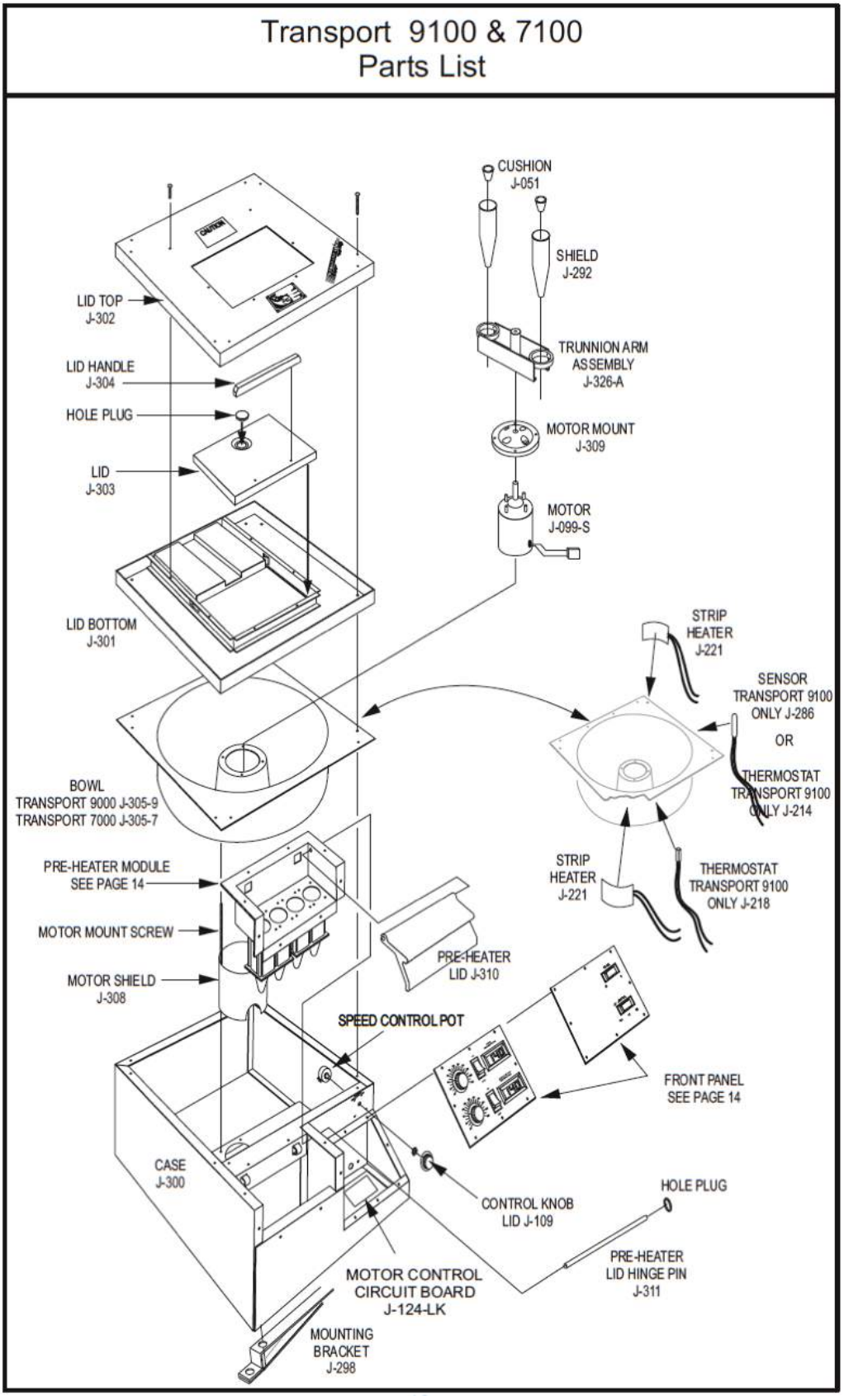


Appendix C: Parts List



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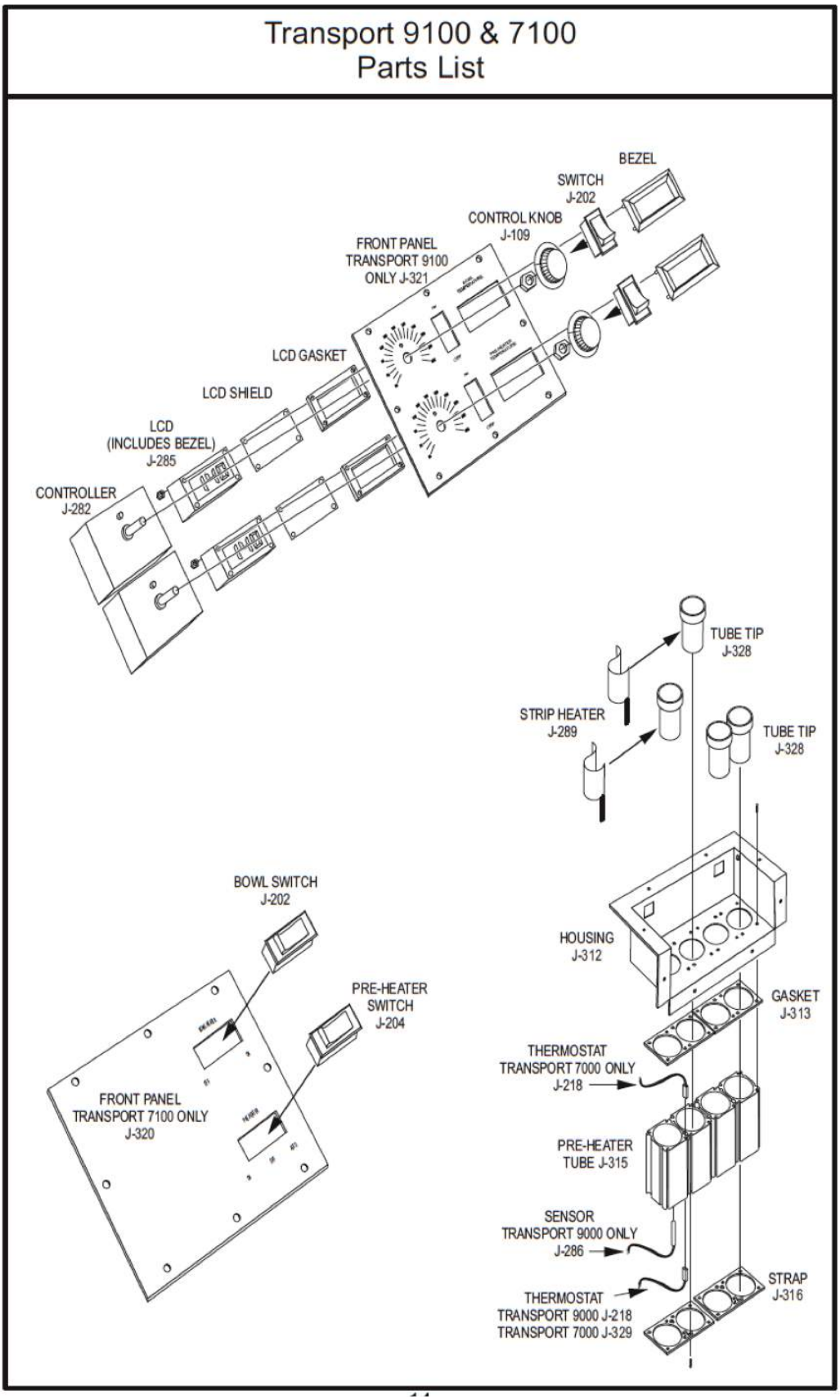

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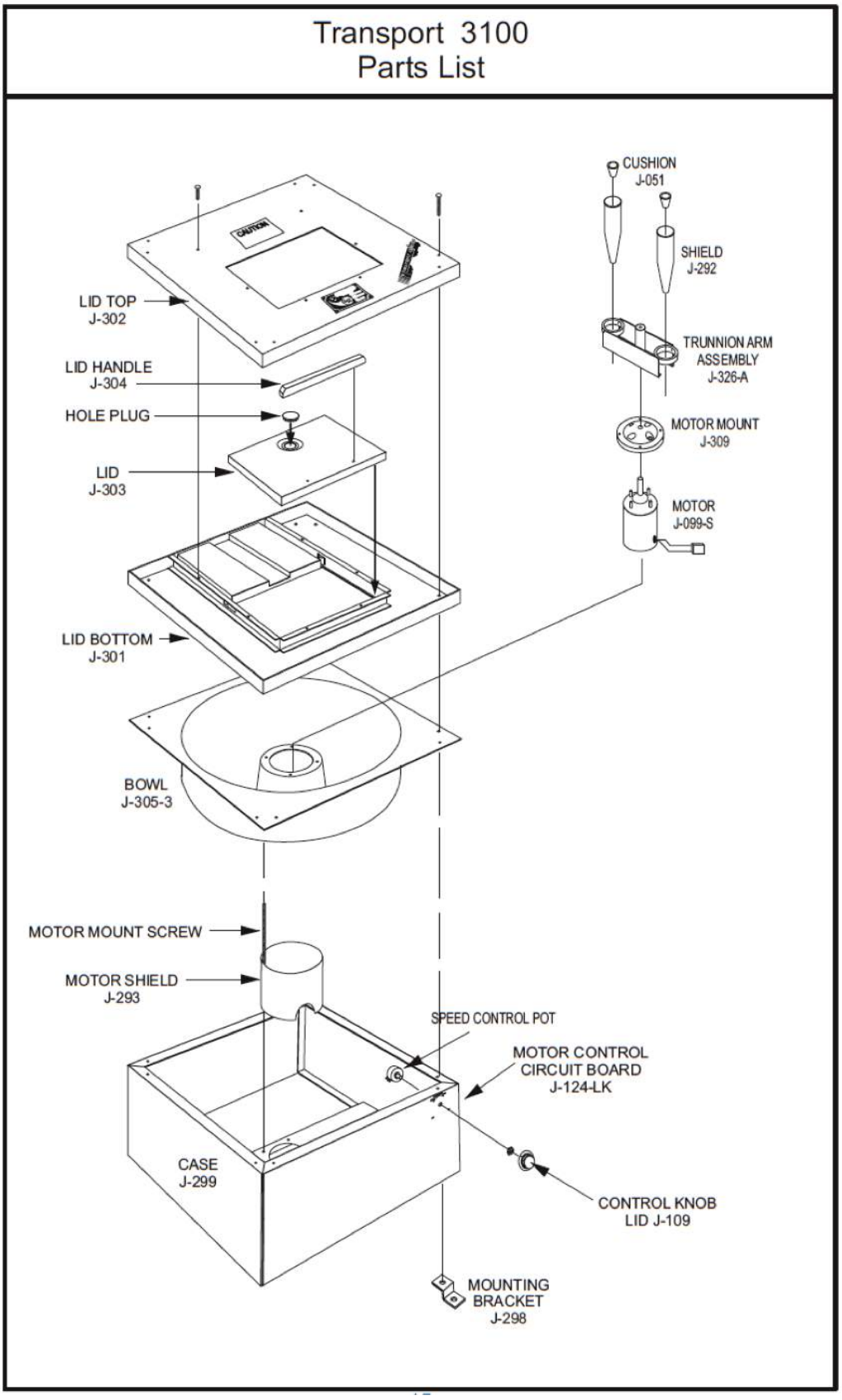

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