I. INTRODUCTION

The LAKOS Tower Clean and Side Stream Clean are compact filtration packages for the removal of grit, airborne particles and scale from cooling tower water in order to avoid system fouling.

Featuring the centrifugal-action performance of a LAKOS Separator, the packages combine quality, reliability and engineered efficiency to control the accumulation of troublesome solids in a heat transfer system. This control leads to a reduction in tower cleaning, system shutdown, maintenance & servicing costs, blowdown and water/chemical loss. You will enjoy the energy/operating savings of reduced solids fouling.

The Tower Clean System continuously recirculates the tower basin water, where appropriate using LAKOS HydroBoosters to provide the necessary directed turbulence and to prevent not only solids accumulation in the basin, but also help protect the entire system from solids fouling. The Side Stream Series is installed as a side stream system off of a pump discharge in a main water line.

II. Warranty

All products manufactured and marketed by this corporation are warranted to be free of defects in material and workmanship for a period of at least one-year from the date of delivery. Extended warranty or no coverage applies as follows:

**All LAKOS separators---five year warranty
**Pump seals are not covered under warranty

All other components and coatings: 12 months from the date of installation; if installed 6 month or more after ship date, warranty shall be a maximum of 18 months from ship date.

If a fault develops, notify us or your local representative, giving a complete description of the alleged malfunction. Include the model numbers(s), date of delivery and operating conditions of subject products(s). We will subsequently review this information and, at our option, supply you with either servicing data or
shipping instructions with a returned materials authorization number. Upon prepaid receipt of subject product(s) at the instructed destination, we will perform such necessary product repairs or replace such product(s) at our expense. This limited warranty does not cover any products, damages or injuries resulting from misuse, misapplication, neglect, normal expected wear, chemically-caused corrosion, improper installation or operation contrary to factory recommendation. Nor does it cover equipment that has been modified, tampered with or altered without authorization.

No other extended liabilities are stated or implied and this warranty in no event covers incidental or consequential damages, injuries or cost resulting from any such defective product(s).

This warranty supersedes any and all previous warranties provided by LAKOS Claude Laval Corporation.

III. PRE-ASSEMBLY/PRE-START-UP CHECK LIST

1. A licensed and/or trained/experienced plant electrician and millwright-pipe fitter should install this packaged system.

2. Ensure that the concrete pad is level and structurally sound to accommodate the weight of the system, including liquid weight.

3. To firmly position this unit, appropriate size anchor bolts are necessary.

4. To minimize pipe strain to the separator, suction and discharge pipes should be supported independently.

5. The pump suction line should be sized for about 5 ft/sec. regardless of the actual pump suction size. Minimize suction lengths (no more than 30’) and restrictions such as elbows. These practices will minimize friction losses and help extend pump seal life. Exceptions may apply if a qualified individual calculates NPSHA and NPSHR for the pump.

6. The threads of the pipe fittings screwed into the pump must be sealed with pipe sealants, Teflon tape, R.T.V. or other sealing materials approved for pipe threads. In case of flanged connections, rubber gaskets should be used.

7. Tighten pump and pipe fittings only as much as required to avoid leaks and air intrusion. Air entrapment into the pump may affect its efficiency and result in cavitation. DO NOT OVER-TIGHTEN.

8. The control panel must be wired for the proper voltage and rotation of
the pump (see wiring diagram in control box door). All wiring should be done by a licensed electrician in accordance with local codes.

Motor nameplates indicate voltage, amperage draw, cycles, phase, speed and other motor information.

9. **Allow water to enter the pump**, jog-start the pump to verify correct rotation as indicated in the pump’s housing. Reverse terminal leads as necessary.

### IV. START-UP AND OPERATION

1. **FOR FLOODED SUCTION**

   The pump suction strainer needs to be filled with water before starting the Pump (Tower Clean Systems only). Partially close (approximately 25%) the discharge valve and make sure that the suction valve is fully open (valves may be used as dual purpose throttling/isolation). Start the pump and observe the pressure gauge which reads the discharge pressure of the pump at the inlet of the separator. The needle of the gauges might flicker for a few seconds and will then settle, indicating that any air in the system is being bled off naturally. If it continuously flickers and if the pump cavitates for more than a minute, bleed-off air from the system.

   Once pressure has reached 20 psi or more (Tower Clean System) or 15 psi (Side Stream System), slowly open the discharge valve to ensure proper pump operation. If the valve cannot be fully opened without the pump cavitating, be sure there are the correct number of Hydro-Boosters installed downstream of the Tower Clean System. The hydroboosters do provide some back pressure to the system, but the piping between the LAKOS filtration package may create a need for additional throttling of the discharge valve to bring the system within the acceptable pressure drop range. So in Tower Clean and Side Stream System applications, the discharge valve (throttling/isolation) may need to be adjusted to ensure proper back-pressure on the pump. This is normal.

**NOTE:**

Make sure that all suction valves (from the source of water to the pump intake) are fully opened when the pump is running. Operating the system with a partially closed suction valve can damage the pump and/or affect the system’s performance. Each model requires a minimum liquid submergence level (above the pump intake) to meet the pump’s Net Positive Suction Head Required (NPSHR) to avoid air intrusion or cavitation (vortexing at point of source). See appropriate pump curve.
included with this manual. This is also very important when LAKOS Hydroboosters are in use.

Entrapped air will always seek the highest elevation in the system. A valve in the system outlet will be at the highest elevation. When partially opened during start-up, it will relieve air from the system.

The Solids Recovery System, if installed with your system, must also be primed and vented at the solids collection vessel (SRV). Please see SRV operating procedure.

**DO NOT DRY-RUN THE PUMP.** All pumps require a wet/primed suction before starting, using water as a lubricant for their seals. John Crane-type seals (e.g., Silicon Carbide Seals) can wear out in 20 seconds of dry operation. It only takes a small amount of water to lubricate the seal, and it vaporizes during pump operation. Also, when replacing the seals, avoid touching the Silicon Carbide faces; oils, moisture and dirt from fingers escalate seal wear.

2. **FOR NEGATIVE SUCTION (LIFT)**

If the water level of the sump is lower than the centerline of the pump inlet, the use of a self-priming pump might be necessary. Follow priming procedures every time the pump is started.

Consult the factory for systems requiring suction lift.

3. **WINTERIZING**

In areas subject to freezing winter temperatures, protect the pump when not in use by removing both drain plugs (from the pump volute and from the suction strainer). Use a compressed air hose to remove any water trapped in the pump casing or flush the system with antifreeze. Do not replace the plugs. Store them in the strainer basket for the winter.

Alternatively, remove the pump and motor from the plumbing entirely. Store them indoors in a warm and dry place.

The separator and the purge line should also be drained of liquid to prevent damage from freezing. To remove trapped water from the separator, use a compressed air hose, directed into the acceptance chamber. Alternatively, flush system with antifreeze.

Heat tracing or pipe insulation may be used. Please contact your local supplier of these products to ensure proper usage.
V. MAINTENANCE

1. A TC/TB System START-UP FORM is included in this manual. Record all readings (inlet and outlet pressures, motor amperage draw and liquid flow rate) during start-up as reference point (see note 3). Please complete the required information and return this form to your local representative as soon as possible. You may want to keep a copy for your records.

2. Record and compare these readings whenever periodic check-up and maintenance is required. These records will be helpful in troubleshooting the system when a problem occurs during the operational life of the system.

A. SUCTION STRAINER BASKET:

The suction strainer basket is sized to allow a maximum pressure drop of 2 psi at the specified flow rate. It will protect the pump, separator, flow control valves and other equipment from becoming plugged by dirt and debris 1/4" in size and greater. The strainer basket is easy to clean. Isolate the strainer by closing the isolation valves installed before the pump and after the separator outlet. These are not provided as a standard option by Lakos, but are available if a valve kit is ordered. Loosen the nuts or threaded stud and remove the lid. Remove the basket and clean. Inspect the ‘O’ ring or gasket and, if damaged, replace. Replace the lid and tighten the nuts.

B. PUMP AND MOTOR

Make sure that there are no leaks in the pump housing. If leaks occur at the back of the volute casing, you may have a damaged seal (pump seals are not covered under warranty) and/or loose bolts. Replace and/or tighten as necessary.

Whenever maintenance or repair is needed for the pump, SHUT-OFF and LOCK-OUT power into the panel feeding the pump; close the suction and discharge valves, open drain plug/valve, making sure no air or hydraulic pressure is in the system before unhooking the pump. Refer to Pump Manual.

Outside air is very important to cool the motor. The TEFC motor has a fan in the back. Ensure that the fan is rotating when motor is energized. Zerk fittings were installed in the front and back of the
pump shaft/bearing housing. A small amount of grease might be needed periodically to replenish the old grease in the housing. Whenever new grease is injected, the old grease will ooze out on the opposite side. Wipe it clean. Whenever motor is required to be unhooked/repaired, follow shut-off lock-out procedure and refer to the pump/motor manufacturers I&O manual as required.

C. CONTROL PANEL/PUMP STARTER:

A blown-out fuse and/or consistently kicked-back circuit breaker is indicative of a motor overloading/overheating. The built-in thermostat in the motor is experiencing an excessive rise in temperature, which might be caused by sudden voltage increase/drop, phase imbalance or over-torqued shaft. Verify motor bearings, terminal connections for looseness and correctness. Verify pump is rotating freely. Mechanical interference inside the pump might be causing this problem.

Under-rated circuit breakers, contactors, relays and/or heaters will also cause this situation. Use appropriately sized components. Also, undersized wires/cables might cause shorting and overheating. An excessively hot environment might also cause premature failure of motor and electrical components. Avoid installing system in direct sunlight or near heated objects or equipment. Vibrating equipment may cause loosening of terminal bolts and screws; make sure vibration is dissipated whenever the TC System is required to be installed in such a location.

D. PRESSURE GAUGES:

Stuck needles/pegged gauges might indicate false readings. Verify their operation by opening and closing petcock valve installed before the gauges. Replace gauges, if necessary.

**NOTE:** Each System is provided with either a SRV Solids Recovery System (see “E” below), Compact Motorized Ball Valve (see “F” below) or ABV (see G below) for evacuating separated solids from the system. Follow the appropriate instructions for your system componentry.

E. SRV SOLIDS RECOVERY VESSEL:

SYSTEM DESCRIPTION
LAKOS Solids Recovery Systems are intended for the purpose of continuously collecting and concentrating separated particle matter from the purge outlet of a LAKOS Separator.
EQUIPMENT CHECK & ASSEMBLY
The basic SRV System includes a bag-like housing. Standard systems include an auto air vent assembly and either 2 solids collection bags (single bag units) or 6 solids collection bags (triple bag units), typically inserted in the SRV vessel for shipping. Open the vessel and remove all extra items (except for one bag per basket assembly, properly seated in the internal basket). Be sure the stainless steel basket is seated properly with the o-ring under the upper lip.

START-UP PROCEDURES
Do not attempt to start-up the SRV System until the LAKOS Separator is in full operation. Then, follow these steps:
1. Close the manual valve going to the pump suction.
2. Fully open the manual valve on the purge line coming from the separator.
3. The Auto Vent on the top of the SRV lid will vent air (this will be audible) until the SRV is filled with water.
4. Fully open the valve going to the pump suction. If the Indicator Package is installed, check the sight glasses for proper flow to and from the SRV vessel. System is now in operation.

MAINTENANCE PROCEDURES
Separated solids collected in the SRV vessel must be periodically removed. The collector bag may be cleaned and re-used (up to three times) or discarded and replaced. This operation can be performed without interrupting system flow or the LAKOS Separator’s operation (see instructions below). Recommended maximum solids load per bag is 25 lbs. (11 kg) or until 18 psid is reached indicated by the “red” zone on the differential gauge attached to the SRV.

The Indicator Package uses a pressure-differential sensor to identify when the bag should be serviced. The standard gauge will point to a red zone, indicating service is needed. The optional dry electric contact will engage whatever indicator is connected (a light, buzzer, horn, etc. which is not provided as a standard option).

Follow these steps:
1. Close the manual valve on the purge line off the separator.
2. Close the manual valve on the line going to the pump suction.

IMPORTANT: Wait until all pressure has been released before proceeding. Open the lid to the SRV vessel. Grasp the handle
and remove the entire assembly from the SRV vessel. Remove
the bag(s) and clean/replace in the basket.
3. Check o-rings on the basket lip and SRV vessel lid; replace if
damaged. Replace the basket/bag assembly in the SRV vessel.
Close lid and secure properly.
4. Fully open the manual valve on the purge line.
5. The Auto Vent will vent all air from the SRV vessel.
6. Fully open the valve going to the pump suction. If the Indicator
   Package is installed, check the sight glasses for proper flow to
   and from the SRV vessel. System is now back in operation.

F. COMPACT MOTORIZED BALL VALVE:

COMPONENT FUNCTION
The LAKOS Compact Motorized Ball Valve provides for periodic
and automatic flushing of separated solids at timed intervals
selected by the system operator.

PROGRAMMING FUNCTIONS
The controls for programming this valve are located within the
cover on the valve’s actuator. **CAUTION: Before removing the
valve cover to program the valve, disconnect power to the TC
System’s control box in order to avoid electrical shock.**

Loosen the valve cover’s screws and remove the cover to reveal a
bank of eight (8) switches. Each must be programmed in order to
set the Purge Duration (how long the valve will stay open each
time) and the Purge Frequency (how often the valve will open). To
set these times, the switches must be set ON (marked below as an
“O”) or OFF (marked below as an “X”) in the exact pattern as
shown.
*(see charts on next page)*
### PURGE DURATION

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Once the valve has been programmed, be sure to replace the cover and tighten securely.

To manually open the valve, press and hold the external button on the valve housing. Valve will open for the purge duration that has been programmed.
G.  **ABV (Automatic Ball Valve w/ controller)**

**COMPONENT FUNCTION**
The LAKOS Automatic Ball Valve provides for periodic and automatic flushing of separated solids at timed intervals selected by the system operator.

**PROGRAMMING FUNCTIONS**
The controls for programming this valve are located in the main motor starter control panel. Timer should be factor preset to the settings below. If settings need to be changed based on field conditions, please consult the programming instructions on the next page. **CAUTION:** *Before changing time settings, be sure the main power is off.*

---

**TC/TB Package Factory Setting**
(20 second purge every 12 hours)
See ABV programming instructions below. Please note that the picture shown represents a separate timer box assembly that was supplied on older systems. All newer TC and TB systems have the timer located in the main starter control panel and a manual purge button on the panel front door. Timer settings can still be made using the instructions below.

See programming instructions below if you have this option.

---

**TIME RANGE**

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**NOTE:** The time range number corresponds with the last number on the scale.

**INSTRUCTIONS**

**Setting Purge Frequency ("OFF" Time):** Use the chart above to select the appropriate display window setting. Use outer dial to adjust time setting.

**Setting Purge Duration ("On" Time):** Use the chart above to select the appropriate display window setting. Use inner dial to adjust time setting. 

"Motorized Ball Valve Purge Duration Must be a Minimum of 10sec" 

"Time Range Selector: The time range is factory set for a range of 1.2.

**Manual Purge:** The manual purge can be performed at any time when the timer is not purging. Press and release the purge switch. A timed purge will occur at the current time setting. Repeat as necessary.

**WARNING:**

All time adjustments are to be made with the power switch off!
VII. TROUBLESHOOTING PROCEDURES

A. PUMP WILL NOT PRIME (if pump is not self-priming). Possible causes and solutions:
   1. Make sure the strainer basket is not clogged (if applicable).
   2. Make sure the strainer basket is positioned correctly (if applicable).
   3. Tighten the strainer lid down completely (if applicable).
   4. Make sure the strainer is full of water (if applicable).
   5. Tighten all the fittings and seal all the joints on the suction side.
   6. Open all the valves on the return and suction lines.
   7. Remove and replace the pump seal if needed.
   8. Check the compatibility of the pump and motor.

B. MOTOR RUNS HOT Possible causes and solutions:
   1. Motors will run warm to the touch. The motor starter thermal and overload module will function to turn off the motor if there is an overload current problem.
   2. Factors which will increase the operating temperature:
      a. The pump is installed in the direct sun.
      b. Poor ventilation in the area the pump is located.
      c. Low voltage is available to the pump.
      d. The wiring is the incorrect size for the load.
      e. The solids loading requires more than the pump’s motor horsepower rating.
      f. The pump is operated above the full load amp rating of the motor.
      g. Motor is experiencing imbalance load (in case of 3 phase; it is doing a single phase.)
      h. Fan is broken/missing.

C. THE MOTOR WILL NOT TURN The following procedure advises a warning and caution:
   There is a safety/shock hazard. Have a qualified electrician perform the testing. Opening the motor starter box does not shut off power into the box; it only disconnects the starter module and control transformer. Follow electro-mechanical safety lock-out procedure.
   1. If the system does not start, open the motor control box and check for power and/or blown control transformer fuses. If the motor overload trips, check the overload amp setting. Adjust the overload module to the motor’s full load amp rating. Replace the overload...
with the correct overload module going from 460 to 230 system and re-wire the control transformer and motor terminals inside the motor junction box. Do not set or adjust to above full load amp rating.

2. If deadhead pressure cannot be met:
   a. First determine if the pump motor is rotating in the correct direction. Jog-start the motor control box, hand switch off and on while observing the motor shaft/fan rotation.
   b. If the pump is not rotating correctly, shut off the power and switch two of the motor lead wires.
   c. If the pump is rotating correctly, check for shut valves on the suction line, a clogged suction line at inlet, a clogged strainer basket, or a clogged pump.

Adjust the separator outlet valve to the required pressure drop across the separator for the desired flow. If the flow rate cannot be obtained, check for closed valves downstream of the separator, or restricted outlet piping. Systems with LAKOS HydroBoosters can use the HydroBoosters to act as a control valve.

D. NO SOLIDS IN THE SOLIDS RECOVERY VESSEL (Filter Bag Housing)

1. Purge valve to the inlet of the SRV is closed.

2. Air is locked in the system, bleed SRV of trapped air. Follow SRV maintenance procedure.

3. Purge line is blocked. Isolate the system from pressure by closing the purge line and liquid recovery line valves. Remove piping and clean out the blockage or replace the appropriate components.
VII. STANDARD PUMP CURVES & PARTS LIST

Models: TCX & TCI (0030)
Flow-rate: 30gpm
Impeller Trim: 4.88
Motor HP: 1
Pump part number: 128936
Pump Repair Kit number: 129137

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MOTOR:

- J56, 3 1/2 x 1 NPT RIGID BASE
- J56, 3 1/2 x 1 NPT RIGID BASE
- D WASHER, STAINLESS
- D WASHER, STAINLESS
- FINGER, NITRILE
- FINGER, NITRILE
- BASE, STEEL
- BASE, STEEL
- ADAPTER, IRON
- ADAPTER, IRON
- BUNA GASKET CASE, BUNA
- BUNA GASKET CASE, BUNA

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* * DENOTES COMPONENTS INCLUDED IN REPAIR KIT
* NOT REQUIRED ON 1/3 TO 1 1/2 HP 1 PHASE MOTORS.
* USE 3 PHASE KIT ON 2 3/4 HP 1 PHASE MOTORS.

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PUMPSIZE: 1.25 x 4.5 x 6.0
PUMP LEDGE: 5.0 HZ
PUMP HEAD: 5.0 HZ
PUMP FLOW: 5.0 HZ
PUMP HP: 5.0 HZ
PUMP RPM: 5.0 HZ
PUMP MAX: 5.0 HZ
PUMP MAX: 5.0 HZ
PUMP MAX: 5.0 HZ
Models: TCX & TCI (0065)
Flow-rate: 65gpm
Impeller Trim: 5.13
Motor HP: 3
Pump part number: 124026
Pump Repair Kit number: 112197

IRON - 3500 RPM - 5.5" IMPELLER - JM FRAME - 1.5-15 HP

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* ALL REPAIR KITS INCLUDE THE BRONZE SHAFT SLEEVE EXCEPT THE VN-C56 SEAL, WHICH IS STAINLESS.

ENCLOSED IMPELLERS - SPECIFY DIAMETER

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* PUMP NO. 19 & 20 HAVE SEGMENT IMPELLERS.
Models: TCX & TCI (0100)
Flow-rate: 100gpm
Impeller Trim: 5.37
Motor HP: 5
Pump part number: 124027
Pump Repair Kit number: 112197

Models: TCX & TCI (0145)
Flow-rate: 145gpm
Impeller Trim: 5.37
Motor HP: 5
Pump part number: 124027
Pump Repair Kit number: 112197
Models: TCX & TCI (0200) – Used on 2010 and newer
Flow-rate: 200gpm
Impeller Trim: 5.25
Motor HP: 7 1/2
Pump part number: 130185
Pump Repair Kit number: 112197
Models: TCX & TCI (0200) – Used on 2009 and older
Flow-rate: 200gpm
Impeller Trim: 5.25
Motor HP: 7 1/2
Pump part number: 124029
Pump Repair Kit number: 113206

Models: TCX & TCI (0280)
Flow-rate: 280gpm
Impeller Trim: 5.37
Motor HP: 10
Pump part number: 124030
Pump Repair Kit number: 113206
Models: TCX & TCI (0400)
Flow-rate: 400gpm
Impeller Trim: 5.50
Motor HP: 15
Pump part number: 124031
Pump Repair Kit number: 113206

IRON - 3500 RPM - 6.5" IMPELLER - JM - 2-15 HP

INDEX BY PUMP NUMBER
INDEX BY PRODUCT CONSTRUCTION GUIDE

SEALS TV

ENCLOSED IMPELLERS
SPECIFY DIAMETER

REPAIR KITS
BRONZE SEAL
VITON SEAL
REPAIR SEAL

WEAR RINGS

** ALL REPAIR KITS INCLUDE THE BRONZE SHAFT SLEEVE EXCEPT THE VN-CM SEAL, WHICH IS STAINLESS.

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* All clearances are NPT, except 3F4, 4F7X, 4F7X, and 5F5 which are 26.
* Includes bronze shaft ring. For steel wear parts, replaceayne 3F5 with 2.6.
Models: TCX & TCI (0525)
Flow-rate: 525gpm
Impeller Trim: 5.50
Motor HP: 20
Pump part number: 124032
Pump Repair Kit number: 124074

Models: TCX & TCI (0600)
Flow-rate: 600gpm
Impeller Trim: 5.50
Motor HP: 20
Pump part number: 124032
Pump Repair Kit number: 124074
Models: TCX & TCI (0825)
Flow-rate: 825gpm
Impeller Trim: 9.88
Motor HP: 30
Pump part number: 134911
Pump Repair Kit number: 132636
Models: TBX & TBI (0065)
Flow-rate: 65gpm
Impeller Trim: 4.50
Motor HP: 1 1/2
Pump part number: 116474
Pump Repair Kit number: 104111

IRON - 3500 RPM - 5.5" IMPELLER - JM FRAME - 1.5-15 HP

KEY | PART | NAME
--- | --- | ---
1 | CASE | See Chart
2 | IMPELLER | See Chart
3 | MOTOR, JM | See Chart
4 | SHAFT SLEEVE, BRONZE | 110,000.175
5 | SHAFT SLEEVE, STAINLESS | 110,000.162
6 | IMPELLER RETAINER | 110,000.119A
7 | KEY | 110,000.152
8 | O-RINGS, SHAFT | 110,000.117
9 | PUMP| 110,000.105
10 | ADAPTER, IRON - JM240106 | 132,000.182
11 | ADAPTER, IRON - JM2510 | 132,000.155
12 | GASKET CASE | 110,000.146
13 | SEAL 1 1/2 | See Chart
14 | SEAL RETAINER | 110,000.175
18 | BLM-CM SEAL | 118,000.343
19 | YLM-CM SEAL | 118,000.343A
20 | VNAR SEAL | 118,000.343B
27 | SEALS | 110,000.175
27A | SEAL RETAINER | 110,000.175

* ALL REPAIR KITS INCLUDE THE BRONZE SHAFT SLEEVE EXCEPT THE YLM-CM SEAL, WHICH IS STAINLESS.

ENCLOSED IMPELLERS - SPECIFY DIAMETER

7/8" KEYED DESIGN

PUMP | CONSTRUCTION | IRON | BLM-CM  | YLM-CM  | VNAR  | SEALS | SEAL RETAINER | 1/2" S+H SEALS | 1 1/2" S+H SEALS | 2" S+H SEALS | 2 1/2" S+H SEALS | 3" S+H SEALS | 4" S+H SEALS | 5" S+H SEALS | 6" S+H SEALS | 7" S+H SEALS
--- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | ---
15 | 118,000.021  | 137,000.127  | 131,000.900 | 137,000.127  | 131,000.900 | 137,000.127  | 131,000.900 | 137,000.127  | 131,000.900 | 137,000.127  | 131,000.900 | 137,000.127  | 131,000.900 | 137,000.127  | 131,000.900 | 137,000.127  | 131,000.900
16 | 131,000.526  | 137,000.127  | 131,000.900 | 137,000.127  | 131,000.900 | 137,000.127  | 131,000.900 | 137,000.127  | 131,000.900 | 137,000.127  | 131,000.900 | 137,000.127  | 131,000.900 | 137,000.127  | 131,000.900 | 137,000.127  | 131,000.900
17 | 131,000.025  | 137,000.127  | 131,000.900 | 137,000.127  | 131,000.900 | 137,000.127  | 131,000.900 | 137,000.127  | 131,000.900 | 137,000.127  | 131,000.900 | 137,000.127  | 131,000.900 | 137,000.127  | 131,000.900 | 137,000.127  | 131,000.900
18 | 137,000.131  | 137,000.127  | 131,000.900 | 137,000.127  | 131,000.900 | 137,000.127  | 131,000.900 | 137,000.127  | 131,000.900 | 137,000.127  | 131,000.900 | 137,000.127  | 131,000.900 | 137,000.127  | 131,000.900 | 137,000.127  | 131,000.900
19+ | 137,000.126  | 137,000.127  | 131,000.900 | 137,000.127  | 131,000.900 | 137,000.127  | 131,000.900 | 137,000.127  | 131,000.900 | 137,000.127  | 131,000.900 | 137,000.127  | 131,000.900 | 137,000.127  | 131,000.900 | 137,000.127  | 131,000.900
25+ | 137,000.342  | 131,000.900 | 137,000.127  | 131,000.900 | 137,000.127  | 131,000.900 | 137,000.127  | 131,000.900 | 137,000.127  | 131,000.900 | 137,000.127  | 131,000.900 | 137,000.127  | 131,000.900 | 137,000.127  | 131,000.900 | 137,000.127  | 131,000.900

* PUMP NO. 19 & 25 HAVE SPECIFIC IMPELLERS.
Models: TBX & TBI (0100)
Flow-rate: 100gpm
Impeller Trim: 4.25
Motor HP: 2hp
Pump part number: 114296
Pump Repair Kit number: 104111

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**IRON - 3500 RPM - 5.5" IMPELLER - JM FRAME - 1.5-15 HP**

---

**KEY**

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**SEALS 1 1/2"**

**TYPE 24**

- **BN-CM**
- **VN-CM**
- **VS-CM**
- **EP-CM**
- **EP-CM-NR**

**CASSETES**

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**ENCLOSED IMPELLERS - SPECIFY DIAMETER**

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* PUMPNO. 18 & 25 HAVE SLEEVE SEAL IMPELLERS

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**ENCLOSED IMPELLERS - SPECIFY DIAMETER**

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* PUMPNO. 18 & 25 HAVE SLEEVE SEAL IMPELLERS
Models: TBX & TBI (0145)
Flow-rate: 145gpm
Impeller Trim: 7.00
Motor HP: 3hp
Pump part number: 116270
Pump Repair Kit number: 118206

IRON - 1750 RPM - 8.0" IMPELLER - JP FRAME - 2.5 HP

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ENCLOSED IMPELLERS

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<td>102</td>
<td>IRON/BRONZE</td>
</tr>
<tr>
<td>103</td>
<td>IRON/BRONZE</td>
</tr>
</tbody>
</table>

TOTAL HEAD PERFORMANCE CURVE: 1750 RPM
1.0 S.G. PUMP NO. 102

CASES

<table>
<thead>
<tr>
<th>PUMP NO.</th>
<th>IRON/BRONZE</th>
</tr>
</thead>
<tbody>
<tr>
<td>102</td>
<td>IRON/BRONZE</td>
</tr>
<tr>
<td>103</td>
<td>IRON/BRONZE</td>
</tr>
</tbody>
</table>

* INCLUDES BONDED WEAR RING.
Models: TBX & TBI (0200)
Flow-rate: 200gpm
Impeller Trim: 6.88
Motor HP: 5hp
Pump part number: 132177
Pump Repair Kit number: 118206

Models: TBX & TBI (0280)
Flow-rate: 280gpm
Impeller Trim: 6.88
Motor HP: 5hp
Pump part number: 132177
Pump Repair Kit number: 118206
Models: TBX & TBI (0400)
Flow-rate: 400gpm
Impeller Trim: 7.63
Motor HP: 7 1/2hp
Pump part number: 115068
Pump Repair Kit number: 118207

IRON - 1750 RPM - 8.0" IMPELLER - JP FRAME - 7.5-15 HP

PUMP NO. 103, 104, 105

KEY NO. PART
1. CASE
2. IMPELLER
3. MOTOR
4. SHAFT SLEEVE, BRONZE
5. SHAFT SLEEVE, STAINLESS
6. NUT, BRONZE
7. NUT, STAINLESS
8. WEAR RING, BRONZE
9. WEAR RING, STEEL
10. STUB
11. NUT
12. SLIPFIT
13. ADAPTER, IRON - JP216250
14. GASKET, CASE
15. SEAL, 1 3/4" 

PUMP NO. PUMP NO. PUMP NO.
103 104 105

ENCLOSED IMPELLERS SPECIFY DIAMETER

PUMP NO. SIZE DISCH IRON
103 2 3 130.000.410
104 5 3 130.000.310X
105 5 4 130.000.311X

1/4" KEYED DESIGN

PUMP NO. CONSTRUCTION NO.
100 IRON 137.000.026
Brass 137.000.027

*Steel IMA 105 pump with wear ring, replace supply "W" with "WT".
Models: TBX & TBI (0525)
Flow-rate: 525 gpm
Impeller Trim: 8.00
Motor HP: 15 hp
Pump part number: 114875
Pump Repair Kit number: 118207

### Pump Diagram

---

**Iron - 1750 RPM - 8.0" Impeller - JP Frame - 7.5-15 HP**

---

**Key to Parts List**

<table>
<thead>
<tr>
<th>No.</th>
<th>Part Name</th>
<th>Pump No.</th>
<th>Pump No.</th>
<th>Pump No.</th>
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<tr>
<td>1</td>
<td>Case</td>
<td>114</td>
<td>115</td>
<td>116</td>
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<td>2</td>
<td>Impeller</td>
<td>See Chart</td>
<td>See Chart</td>
<td>See Chart</td>
</tr>
<tr>
<td>4</td>
<td>Motor, JP</td>
<td>See Chart</td>
<td>See Chart</td>
<td>See Chart</td>
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<tr>
<td>14n</td>
<td>Shaft Sleeve, Bronze</td>
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<tr>
<td>15h</td>
<td>Nut, Bronze</td>
<td>110,000.364</td>
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<tr>
<td>19h</td>
<td>Nut, Stainless</td>
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<tr>
<td>20h</td>
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<tr>
<td>26h</td>
<td>Stud</td>
<td>105,000.365</td>
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<tr>
<td>27h</td>
<td>Key</td>
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<tr>
<td>39h</td>
<td>O-Ring, Shaft</td>
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<tr>
<td>60h</td>
<td>Flange</td>
<td>105,000.209</td>
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<tr>
<td>71h</td>
<td>Adapter, Iron - JP2/125</td>
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<tr>
<td>73h</td>
<td>Gasket, Case</td>
<td>110,000.276</td>
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</tr>
<tr>
<td>75h</td>
<td>Seal, 2.24&quot;</td>
<td>See Chart</td>
<td>See Chart</td>
<td>See Chart</td>
</tr>
</tbody>
</table>

---

**Repair Kits**

- **B-ICM Seal:** 110,000.410
- **VCM Seal:** 110,000.410
- **VCM Seal, 100,000.412**
- **VCM Seal, 110,000.412**
- **VCM Seal, 110,000.412**

**Enclosed Impellers**

- **Case:**
  - 105
  - 104
  - 103

**Enclosed Impeller Diameter**

- **14mm:**
  - 105: 0.508
  - 104: 0.508
  - 103: 0.508

**Enclosed Impeller Construction**

- **No:**
  - 105: 105
  - 104: 104
  - 103: 103

---

*All repair kits include the bronze shaft sleeve except the VCM seal, which is stainless.*

---

*Includes bronze wear ring for steel.*

*105 pump with wear ring, replace supply "A" with "B."*
Models: TBX & TBI (0825)
Flow-rate: 825gpm
Impeller Trim: 8.50
Motor HP: 20hp
Pump part number: 123138
Pump Repair Kit number: 118208

Models: TBX & TBI (1100)
Flow-rate: 1100gpm
Impeller Trim: 8.63
Motor HP: 20hp
Pump part number: 111541
Pump Repair Kit number: 118208
VIII. STANDARD PUMP CONTROL PANEL WIRING DIAGRAMS

A. The following control panel wiring schematics represent our LAKOS standard control panels for the TC and TB system packages. All control panels supplied by LAKOS are provided with NEMA-4X enclosures and are UL Listed. If the system you purchased has a different voltage or phase than those shown on the drawings, please request the correct control panel wiring schematic for your model from LAKOS.

B. There are three sizes of control panels sized on the horsepower of the pump for each system. Please refer to the title block on the drawings and select the panel which represents your package. Pump horsepower ratings can be found on each page of the pump curve data supplied in this manual.
IX. SPARE PARTS FOR TC & TB SYSTEMS

SRV replacement bags (set of 10):
- CBX-1610-25 (25 micron) LAKOS P/N 104181
- CBX-1610-50 (50 micron) LAKOS P/N 104182

TC/TB Pump Repair Kits**:
- Pump repair kits to be selected based on pump model. Please refer to the pump curve and parts breakdown pages in this manual and select the kit based on your system. The LAKOS Pump Repair Kit part number is listed for each pump on the corresponding page.

**ALL KITS INCLUDE (1) SHAFT SLEEVE, (1) IMPELLER RETAINER, (1) IMPELLER KEY, (1) SHAFT O-RING, (1) FLINGER, (1) CASE GASKET, (1) MECHANICAL SEAL ASSEMBLY

SRV Parts:
- AUTO VENT LAKOS P/N 111016
- GASKET FOR LID (NITRILE) LAKOS P/N 106213
- STAINLESS STEEL BASKET LAKOS P/N 105355
- O-RING FOR BASKET (BUNA-N) LAKOS P/N 106807

SRI Parts:
- DIFFERENTIAL PRESSURE INDICATOR LAKOS P/N 101849
- SIGHT GLASS LAKOS P/N 106276
- FLOW CONTROL ORIFICE (10 GPM) LAKOS P/N 115183
- MANUAL ISOLATION BALL VALVE (3/4”) LAKOS P/N 108034
X. STANDARD PUMP I&O MANUAL, MECHANICAL SEAL I&O MANUAL

A. LAKOS supplies Scot Pumps and American Marsh Pumps on our standard TC and TB system packages. The following manuals are for reference when servicing or repairing a Scot Pump and American Marsh Pump. Please review these manuals before attempting any disassembly of the pump. LAKOS would highly recommend that any pump repairs be done by a certified pump repair service technician. A pump identification guide page is included (prior to manuals) to help you identify the Scot Pump supplied with your system. **LAKOS recommends that the SPECIFICATION NUMBER, SALES ORDER NUMBER, and DATE CODE be documented and kept with the records for the system. These codes will be requested by LAKOS for any type of warranty issues that may arise with the pump and motor.**

B. If your pump is other than a Scot or American Marsh pump, please contact LAKOS and request the supplied pump manufacturer's I&O manuals.

C. There are multiple Scot Pump I&O manuals based on the size of the pumps. The manuals are arranged in the following order:

- I&O Manual for C56 & JM Frames
  - Scot Pump models #16, #17, #19, #54, #55, #56F, #57, #59

- I&O Manual for TCZ & JP Frames
  - Scot Pump models #96, #102, #103, #104

- I&O Manual for Mechanical Seal (Type 21)
  - Supplied in all Scot Pump models listed above

D. The American Marsh Pump I&O manual is 24012 Series 300 & 310 – REF, REC, & REI END SUCTION. LAKOS uses the REC model only on the standard TC/TB systems.
TOWER-CLEAN/SIDESTREAM-CLEAN SYSTEMS

START-UP FORM

DATE OF START-UP: ____________________
COMPANY NAME: _________________________________________
ADDRESS: _________________________________________
_____________________________________________________________________
PROJECT NAME/DESCRIPTION: _________________________________________

CONTACT PERSON(S): _________________________________________
(Please include titles)
DESCRIPTION OF LIQUID & SOLIDS (type, size, etc.): ____________

TEMPERATURE OF SYSTEM FLUID: ________________

COOLING TOWER BASIN SIZE: ________________
NUMBER OF COOLING TOWER CELLS SERVICED: ____________
DOES SYSTEM USE HYDROBOOSTERS IN THE TOWER BASIN:
θ Yes θ No    Number of Hydroboosters per Cell: ____________

Prior to start-up, please record this data:
PUMP SERIAL NUMBER: ____________________
MOTOR MAKE AND FULL LOAD AMPS: _________/___________
TC PACKAGE SERIAL NUMBER: ____________________

For start-up, please record this data:
MOTOR AMPS: _________/_________/_______
MOTOR VOLTAGE: ________
PRESSURE TO INLET OF SEPARATOR: ____________
PRESSURE AT OUTLET OF SEPARATOR: ____________
ADDITIONAL OBSERVATIONS/REMARKS: ____________________
_____________________________________________________________________

Please complete this form and send a copy to LAKOS; keep a copy for your records.

1365 North Clovis Avenue ~ Fresno, California 93727 USA
Telephone:(559) 255-1601 • Fax:(559) 255-8093 • E-Mail: info@lakos.com
Toll-Free: (800) 344-7205 (USA, Canada & Mexico)