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## TL-100-F Electric-Hydraulic Trailer Lock Instruction Manual



**Receiving instructions:**

After delivery, remove the packaging from the product. Inspect the product closely to determine whether it sustained damage during transport. If damage is discovered, record a complete description of it on the bill of lading. If the product is undamaged, discard the packaging.

**NOTE:**

The end-user is solely responsible for confirming that product design, installation, use, and maintenance comply with laws, regulations, codes, and mandatory standards applied where the product is used.

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## INSTALLATION INSTRUCTIONS – MODEL TL-100-F (-5)

*Review this entire page and the accompanying layout drawing before installing the trailer restraint.  
Consult the factory in the event there are any questions or problems at the time of installation.*

**Caution:** Before installation, block access to the dock approach in which the restraint is to be installed.

- The installation must be made so that it complies with all the regulations applicable to the machine and its location. The end-user must verify that the supplied equipment is installed so it will be suited to the environment in which it will be used.
- Installation must be performed by suitably trained personnel with access to the appropriate equipment. The electrical aspects of the installation should be performed by an electrician.

For installation you will need the following:

1. A minimum 4" thick concrete approach slab or an adequate foundation into which the restraint can be anchored. Consult the building architect or facility engineer to ensure there is an adequate foundation for anchoring, and to determine the best size and type of hardware with which to anchor the restraint.
2. A fork truck or hoisting means to set the restraint in place.
3. For mounting the restraint: lag bolts, a masonry drill, a masonry bit, and a wrench to fit the lag bolt nuts. It is recommended that you use a  $\frac{3}{4}$ " concrete anchor with a minimum length of  $4\frac{1}{4}$ " in concrete having a strength factor of 4,000 psi. Consult the building's architect or facility engineer to determine the strength of the concrete into which the restraint will be mounted, and to determine the best type of hardware with which to anchor the chassis into the concrete.  
For mounting the control enclosure, lights, and power unit: a drill, appropriate fasteners for the installation method chosen, and nut drivers or a ratchet set.
4. A power supply circuit matching the motor voltage and current requirements. Refer to the labels on the control enclosure and to the electrical section in this manual for more information. The end-user is responsible for supplying the branch circuit's required overcurrent and short-circuit protection.

### Restraint installation:

1. Set the restraint in its appropriate position in front of the dock face. The back of the restraint should be centered horizontally against the dock face if the dock leveler has standard 4" - 5" bumpers, or spaced away from the dock face as necessary for thicker bumpers or for a truck approach grade greater than 5%.
2. Anchor the restraint chassis to the concrete dock approach or foundation.

### Power unit installation:

3. Mount the power unit either underneath the dock leveler or on a wall inside the building, near the dock.
- Note: It is highly recommended that the power unit be mounted inside the building adjacent to the dock door at which the restraint is installed. This will allow access for troubleshooting purposes, and to facilitate lowering the restraint by means of a manual valve in the event of a power outage.

### Control enclosure, lights', and signs' installation:

4. Mount the control enclosure on the inside wall on the left side of the dock door. The bottom of the enclosure should be approximately 48" +/- 6" above the floor.
5. Mount the outside light unit on the truck driver's side of the door (on the right side of the dock door opening when viewing from outside). The top of the light unit should be 96" above the dock approach.
6. Using appropriate wiring methods, make the required control and power connections between the restraint and the power unit, between the outside light and the control enclosure, and between the power unit and the control enclosure.
7. Make permanent connection to the power supply wiring, using an appropriate wiring method.
8. Operate the restraint through several full up/down cycles. Verify that the upper travel limit switch (mounted in the frame) and the toe guard switches (around the perimeter of the platform) function properly.
9. Check the hydraulic oil level. It should be filled to within 1" to 1½" of the reservoir's fill hole. If oil is needed, use an anti-wear hydraulic oil with a viscosity grade of 150 SUS at 100°F (ISO 32 at 40°C) or a non-synthetic automatic transmission fluid.
10. Clean up any debris or spilled oil, and verify that all of the warning and safety labels are intact.

The installation must be done such that it complies with all the regulations applicable to the equipment and its location.

Fusing and a disconnect are to be provided by the end-user per the NEC (NFPA 70). Ground per Article 250 of the NEC.

Four (4) wires (including a grounding wire), 14 gauge minimum, will be needed between the control enclosure and the outside light assembly. Two (2) 120V, 60W incandescent bulbs are required but not furnished for the aluminum light assembly. The plastic light assembly includes bulbs.

Six (6) wires, 18 gauge minimum, and either three (3) or four (4) wires, 14 gauge minimum, (including a grounding wire and depending on the motor supply voltage), will be needed between the control enclosure and the junction box at the power unit.

The installer is responsible for obtaining the necessary hardware for mounting the supplied components.

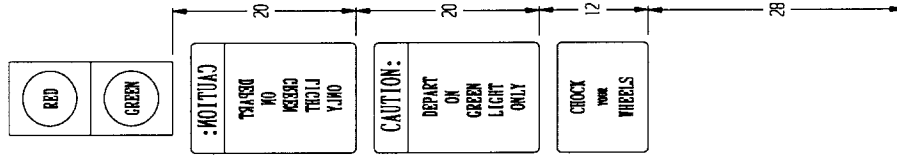
Mount the light fixture and the outside signs for enough from the door seal's or shelter's edge to allow them to be visible when the widest trailer is docked.

\*\* The power unit is commonly located inside the dock leveler as shown, but it is recommended that it be mounted inside the building adjacent to the dock door, either on the floor or on support brackets above the control enclosure. The power unit's base measures 15 1/2" wide x 24" long x 12 1/2" high, with 9/16" mounting holes on approximately 14" x 20" centers.

All dimensions shown are approximate: adjust as necessary to fit the application.

\*\* SEE NOTE ABOVE

Four (4) wires (including a grounding wire), 18 gauge minimum, will be needed between the power unit and the trailer restraint chassis. Hoses also connect here.



INSIDE WALL  
LEFT SIDE OF  
OVERHEAD DOOR

### OUTSIDE VIEW

### INSIDE VIEW

## OPERATION INSTRUCTIONS – TL-100-F (-5)

- ⚡ OSHA Section 1910.178(k)(1) and 1910.178(m)(7) requires that a truck's / trailer's brakes must be set and wheel blocks must be in place to prevent their movement while being loaded or unloaded.
- ⚡ Ensure that all employees involved in the operation of this restraint understand and follow these instructions when it is in service!
- ◆ This trailer restraint will service trucks / trailers with ICC bars having a height range of 11" to 30".

### NORMAL OPERATION:

On start-up the panel displays the following:

\*\*\* VESTIL MFG \*\*\*

After a one second delay, the display will change to:

Press ( 1 ): RESET

Pressing the "1" button turns off the warning beeper and outside red light.  
The display shows:

OPERATING MODE : >

After a two second delay, the following will appear.

Press ( 2 ): AUTO >

You can press the right arrow ( ⇒ ) button to go to "Lights" mode.

Press ( 3 ): LIGHTS <

- Use "Lights" mode if the restraint cannot engage an ICC bar or in the event that a malfunction prevents the restraint from operating properly.

Pressing the #3 button to enter "Lights" mode will change the  
lights to green inside and red outside. The display shows:

CHOCK TRAILER >

Pressing the right arrow ( ⇒ ) button allows you to once again choose "Auto" mode.

Press left arrow ( ⇐ ) to return to "Auto" mode.

- ◆ The inside and outside lights won't turn on at all until the restraint is in a normal operating mode. Any fault or reset condition must be corrected before both inside and outside lights will show.
- ◆ Pressing a button on the touchpad will result in an action only if that button's command shows on the display.
- ◆ When an arrow shows on the right side of the display, you can press the right ( ⇒ ) or left ( ⇐ ) arrow buttons to move to the next option.

Press the #2 button on the interface to select automatic operation.

If the unit is fully retracted, the following  
display will appear for about three seconds:

LOCK IS LOWERED

Followed by:

TRUCK MODE: >

and:

Press ( 4 ): LOCK >

If the unit is not fully retracted, the following will appear on the display:

LOCK IS NOT LOWERED

Press ( 5 ): UNLOCK <

- ◆ The restraint must be in the lowered position before the unit will go into the "waiting for truck" mode.

Pressing the #4 button will raise the restraint and display the following:

LOCK IS RAISING

When the trailer is properly captured, the display will show:

LOCK IS RAISED

To release a trailer, press the #5 button on the interface. The display shows:

LOCK IS LOWERING

When the trolley is completely lowered the display shows:

LOCK IS LOWERED

TRUCK MODE: >

Press ( 4 ): LOCK

- ◆ The status of the restraint's trolley is always displayed when it is in motion.
- ⚡ Pressing the +/- button resets the controls and allows you to choose again between "Auto" and "Lights" modes.

MANUAL OPERATION:

- ◆ Pressing the #8 button raises the trolley as long as the button is held down.
- ◆ Pressing the #9 button lowers the trolley as long as the button is held down

Note: MANUAL mode is intended for troubleshooting and maintenance purposes only.

Caution: Do not use MANUAL mode to engage the trolley to a truck or trailer!

*RELEASING A TRUCK OR TRAILER MANUALLY:*

- ⚡ *Caution:* Manual release of the restraint could require a person to be under the rear end of the truck or trailer. Use extreme care and verify that the truck driver and dock attendant(s) are aware of this situation!
- In the event of a power outage or if the controls become inoperable for any reason, the restraint’s trolley can be manually lowered to allow the truck or trailer to be pulled away from the dock.
  - To lower the trolley manually, locate the knurled knob of the manual valve on the side of the hydraulic manifold. Use a 7/16” wrench to loosen the locking nut, then turn the knob fully counterclockwise.
  - Note: It might be necessary to apply some force to the top of the trolley to help it to begin lowering, especially in cold weather or if the trolley roller channels haven’t been greased recently.
- If the restraint cannot be lowered by means of the manual valve, the trolley hook’s shear pin can be pulled to allow the truck or trailer to pull away without damaging its ICC bar or the restraint trolley.

ERRORS WHILE THE RESTRAINT IS IN USE:

There are three sensors which determine the status of the restraint. Proximity sensors inside the trolley communicate with the controller when the trolley is in contact with the ICC bar and when the trolley is fully lowered. A hydraulic pressure switch communicates that adequate pressure is being applied by the trolley after it has engaged the ICC bar. If the controller does not see the appropriate input by a sensor within a preset time period during operation, the warning beeper will sound and both the inside and the outside red lights will be lit.

- ◆ Whenever the restraint fails to connect to the ICC bar or build adequate pressure, the display will indicate the reason for the fault condition and the lights will show red inside and none outside.

For example, if in an attempt to capture the ICC bar the trolley can’t initially make contact with the ICC bar, or if the system can’t build adequate pressure: the alarm will sound, there will be no outside light,

and the display will show

ER: UP/ICC &PRES>

and then indicate that the unit is lowering.

ER: LOWERING...>

Press right arrow (⇒). The display shows:

E: PRESS(1)RESET<

Press the “1” button. The display shows:

ER: UNIT LOWERED>

Press right arrow (⇒) and the display shows:

OPERATING MODE : >

Refer to paragraph three of NORMAL OPERATION for what follows.

- ◆ In any fault mode, follow the arrow prompts to reset the unit and return to a normal operating mode.

## **Routine Maintenance & Safety Checks – TL-100-F**

- *Warning: Care should be taken to identify all potential hazards and comply with applicable safety procedures before beginning work.*
- *Warning: Do not attempt to adjust the limit switches with the unit in “auto” mode, due to the possibility that the trolley could lower unexpectedly.*
- *Only qualified individuals trained to understand mechanical devices and their associated electrical and hydraulic circuits should attempt troubleshooting and repair of this equipment*

### (A) Inspect weekly for the following:

- 1.) Frayed electrical cables.
- 2.) Oil leaks.
- 3.) Pinched or chafed hoses.
- 4.) Damage or structural deformation to the frame or the trolley.
- 5.) Unusual noise or binding, or evidence thereof.
- 6.) Accumulation of debris in or on the restraint.

### (B) Inspect monthly for:

- 1.) The oil level. Oil should be 1” to 1½” below the reservoir’s fill hole with the restraint in the fully lowered position. See below for oil specification.
- 2.) Worn or damaged hydraulic hoses and electrical wires and cables.
- 3.) Trolley rollers’ looseness or wear, or damage to the roller channels.  
\*Grease the roller channels monthly to prevent binding.
- 4.) Damage to the trolley hook’s shear pin.
- 5.) The integrity of the chassis anchor bolts, and for cracks in the concrete around them.
- 6.) Unusual noises or movement during operation.
- 7.) All the information, safety, and warning labels being in place and in good condition.
- 8.) The need to clean off dirt and debris.

### (C) Yearly inspection

The oil should be changed if the oil darkens, becomes gritty, or turns a milky color (indicating the presence of water). Replace with an anti-wear hydraulic oil with a viscosity grade of 150 SUS at 100°F, (ISO 32 at 40°C). Ex: AW 32 or HO 150 hydraulic oil, or a non-synthetic transmission fluid. You may use a low-temperature synthetic transmission fluid if you flush the system with the synthetic fluid before filling the reservoir.

## THE POWER UNIT'S OPERATION – TL-100-F (-5)

The electric / hydraulic trailer restraint utilizes an electric motor directly coupled to a gear-type hydraulic pump to produce the needed fluid pressure and flow to allow the unit to restrain a truck or semi-trailer.

A hydraulic manifold houses the hydraulic control components, and is bolted directly onto the gear pump.

The power unit's hydraulic components are all rated for 2,500 psi or higher working pressure.

☞ Important parts of the power unit include:

- The electric motor, available for operation on single- or three-phase AC supplies. All are dual-voltage.
- The gear pump. Its shaft is coupled directly to the shaft of the electric motor.
- The check valve. Its purpose is to prevent the backflow of fluid through the pump.
- The pilot-operated check valve. Its purpose is to prevent fluid from returning from the blind end of the cylinder to the reservoir unless the pump builds pressure on the rod end to lower the trolley. In this way it allows the restraint to hold a trailer indefinitely.
- The pressure relief valve. Its job is to open a path for fluid to flow back to the reservoir in the event that the fluid pressure built up by the pump exceeds 750 psi.
- The directional solenoid valve. This is an electrically-operated cartridge valve that controls the direction of the trolley motion. In its energized state it allows the cylinder to extend (the trolley will raise).
- The manual lowering valve. Allows fluid to move from the blind end of the cylinder to the reservoir to allow the trolley to be lowered in the event of a malfunction or power outage so that the truck or trailer can pull away from the dock. Turn the knurled knob counterclockwise to allow the restraint to lower. (Might require some force to be applied to the top of the trolley to begin lowering.)
- The fluid accumulator. Acts as a hydraulic shock absorber. Allows for some movement of the trolley as a truck or trailer is being loaded or unloaded.
- The hydraulic lift cylinder. This is a double-acting cylinder.
- The hydraulic fluid. The system uses HO150 hydraulic fluid. Any anti-wear hydraulic fluid with a viscosity grade of 150 SUS at 100°F (ISO 32 at 40°C) such as AW 32 or a non-synthetic transmission fluid is acceptable.

☞ Normal operation sequence:

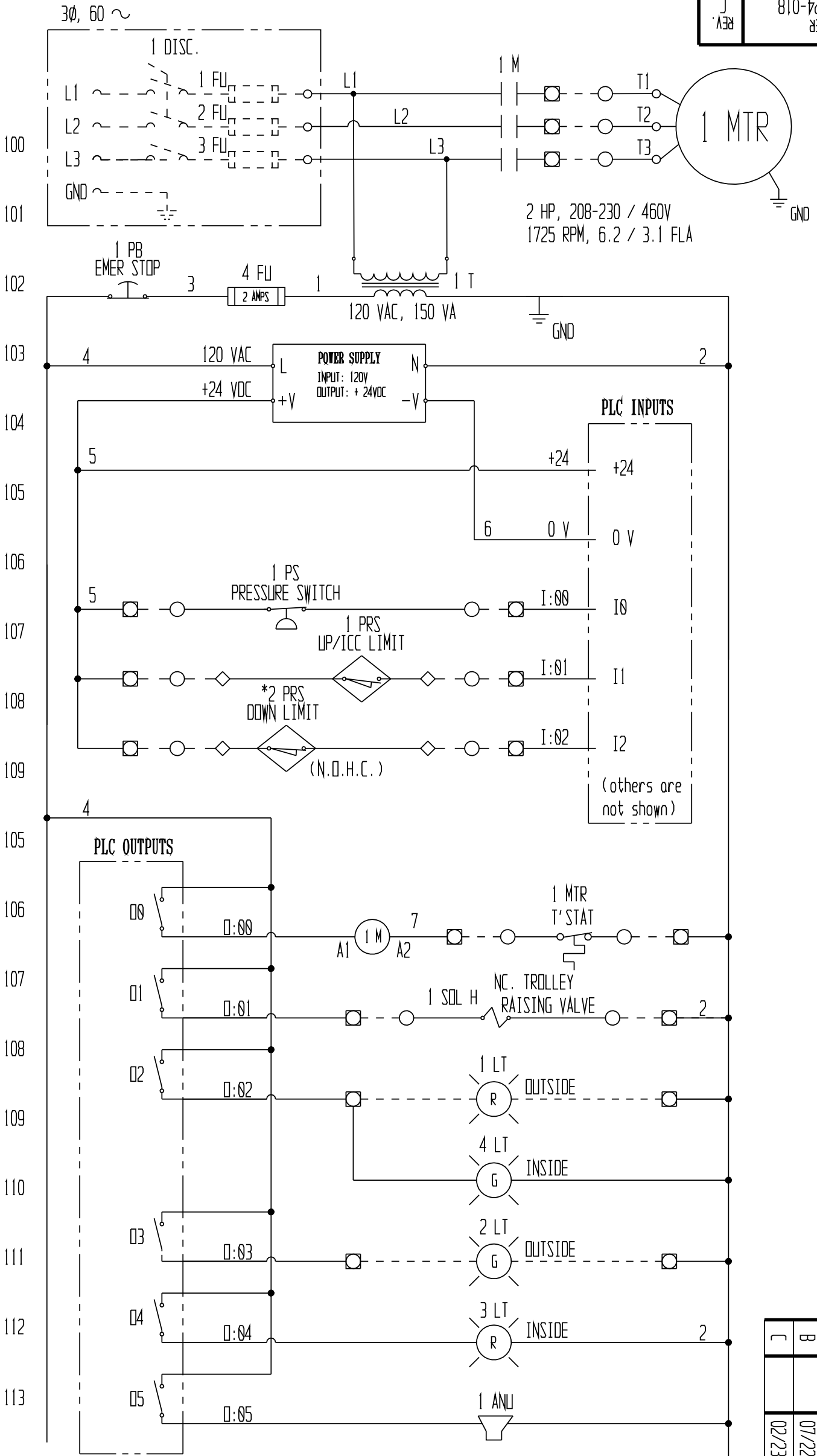
When the trolley is to be raised to engage a truck or trailer, press the "LOCK" pushbutton on the interface. (See the operation instructions in this manual.) The motor turns, and in turning it spins the hydraulic gear pump. Fluid is drawn from the reservoir through the suction filter and into the pump. The pump pushes the then-pressurized fluid through the check valve, the energized directional valve, and the pilot-operated check valve to the blind end of the cylinder. As the cylinder raises the trolley, fluid from rod end of the cylinder returns to the reservoir.

When the trolley is to be lowered to release a truck, press the "UNLOCK" pushbutton on the interface. Again the motor turns and the pump pushes pressurized hydraulic fluid through the check valve. When lowering, however, the directional valve does not operate. When a slight pressure builds on the rod end of the cylinder, the pilot-operated check valve opens. Fluid enters the rod end of the cylinder and the fluid in the blind end returns back to the reservoir.

☞ It might at some time be necessary *to remove one or more valves for inspection and cleaning*, as follows:

- ◆ Lower the trolley all the way down.
- ◆ For the directional valve, remove the nut holding the solenoid coil on the valve stem, remove the coil, and then unscrew the valve from the manifold. For all other valves, simply unscrew them from the manifold.
- ◆ Inspect the valve for contaminants, and the valve's o-rings and back-up washers for cuts, tears, or other damage.
- ◆ With the valve immersed in mineral spirits or kerosene, use a thin tool such as a small screwdriver or a small hex wrench to push the poppet in and out several times from the bottom end of the valve. (Might not apply to all valve types.) The valve should move freely, about 1/16" from closed to open position. If it sticks in, the valve stem could be bent and will need to be replaced if it doesn't free up after cleaning. Blow the valve off with a compressed-air gun while again pushing the poppet in and out.
- ◆ Inspect the bottom of the manifold's valve cavity for contaminants.
- ◆ Reinstall the valves into the manifold, tightening the valve with approximately 20 lb-ft of torque.

OVERCURRENT & SHORT-CIRCUIT PROTECTION, AND DISCONNECT ARE TO BE PROVIDED BY THE END-USER PER THE NEC (NFPA 70) AND LOCAL CODES.



| REV. | DATE     | DESCRIPTION                   | INITIAL |
|------|----------|-------------------------------|---------|
| A    | 11/17/04 | DESIGN CHGD W/ UNITRONICS PLC | B.L.    |
| B    | 07/22/05 | UPDATE                        | TG      |
| C    | 02/23/12 | CCR SOLENOID DESCRIPTOR       | DRB     |

| INPUTS | DESCRIPTION            |
|--------|------------------------|
| I0     | 1 PS : PRESSURE SWITCH |
| I1     | 1 PRS : UP/LIC LIMIT   |
| I2     | 2 PRS : LOWERED LIMIT  |

| OUTPUTS | DESCRIPTION                  |
|---------|------------------------------|
| O0      | 1 M : MOTOR CONTACTOR        |
| O1      | 1 SOL H : NC. LOWERING VALVE |
| O2      | 1 LT : OUTSIDE RED           |
| O3      | 4 LT : INSIDE GREEN          |
| O4      | 2 LT : OUTSIDE GREEN         |
| O5      | 3 LT : INSIDE RED            |
| O5      | 1 ANU : BEEPER               |

- TERMINALS IN CONTROL ENCLOSURE
- TERMINALS IN MOTOR JUNCTION BOX
- ◇ CONNECTION AT TRAILER RESTRAINT CHASSIS

\* ALL COMPONENTS ARE REPRESENTED AS THEY WOULD BE WITH THE UNIT IN ITS "HOME", OR RESTING, POSITION. HOME POSITION IS DETERMINED TO BE WHEN THE CARTRIDGE IS FULLY LOWERED AND ALL POWER IS REMOVED.



NOTE:

- Indicates wire and/or components supplied by others
- Maintain proper grounding of the PLC and the operator interface at all times.
- Effective suppression of all PLC outputs must be maintained to prevent PLC failures.
- Separate input wiring from output wiring.

**BE SURE ALL POWER IS OFF BEFORE ATTEMPTING TO WORK ON THIS EQUIPMENT!**  
CAUTION: SERVICE WORK SHOULD BE PERFORMED ONLY BY TRAINED & QUALIFIED PERSONNEL.

T & S EQUIPMENT COMPANY

SCALE: N/A      DRAWN BY: B.L. GQH

DATE: 5/15/03      SIZE: B

DIAG., ELEC., 3Ø, TL-100-F & TL-100-F-5

MATERIAL: N/A      DRAWING NUMBER: 17-124-018





**BE SURE ALL POWER IS OFF BEFORE ATTEMPTING TO WORK ON THIS EQUIPMENT!**  
**CAUTION: SERVICE WORK SHOULD BE PERFORMED ONLY BY TRAINED & QUALIFIED PERSONNEL.**

- Effective suppression of all RL outputs must be maintained to prevent RL failures.
- Separate input wiring from output wiring.
- Maintain proper grounding of the RL and the operator interface at all times.

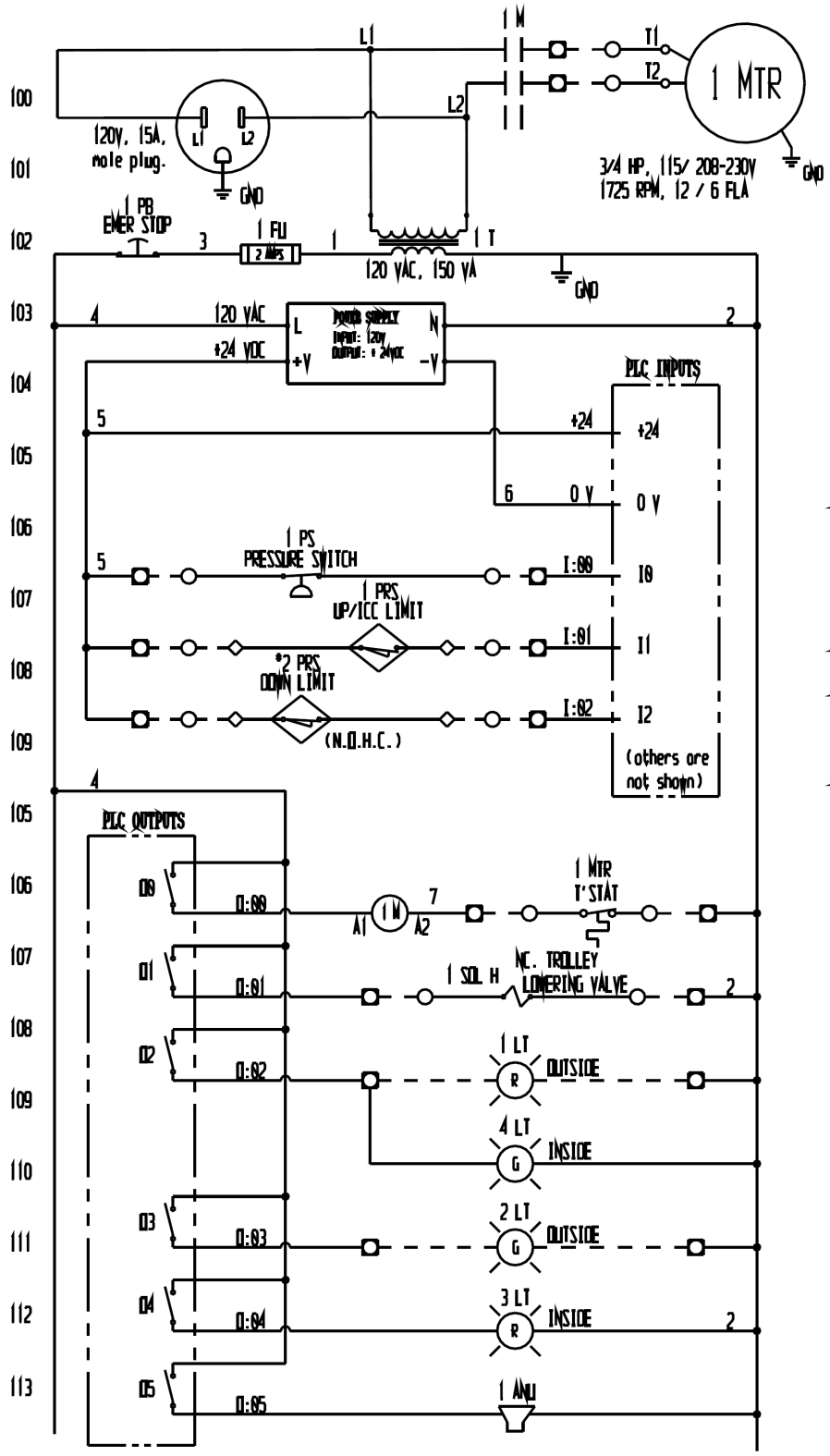
**DIAG., ELEC., 115V, 1Ø, TL-100-F & TL-100-F-5**

DATE: 17-124-013 0

\* ALL COMPONENTS AND WIRING SHOULD BE CHECKED FOR CORRECTNESS AT THE TIME OF TESTING, REPAIRING, AND RESETTING. THE OPERATOR SHOULD BE ADVISED THAT THE CIRCUIT IS NOT TO BE RE-ARMED UNTIL THE POWER IS RESTORED.



NOTE:



OVERCURRENT & SHORT-CIRCUIT PROTECTION ARE TO BE PROVIDED BY THE END-USER PER THE NEC (NFPA 70) AND LOCAL CODES.

- terminals in common enclosure
- terminals in motor junction box
- ◇ connection at terminal receptacle consists

| OUTPUTS | DESCRIPTION                  |
|---------|------------------------------|
| O0      | 1 M : MOTOR CONTACTOR        |
| O1      | 1 SOL H : NC. LOWERING VALVE |
| O2      | 1 LT : OUTSIDE RED           |
| O3      | 4 LT : INSIDE GREEN          |
| O4      | 2 LT : OUTSIDE GREEN         |
| O5      | 3 LT : INSIDE RED            |
| O6      | 1 ALM : BEEPER               |

| INPUTS | DESCRIPTION            |
|--------|------------------------|
| I0     | 1 PS : PRESSURE SWITCH |
| I1     | 1 PRS : UP/ICC LIMIT   |
| I2     | 2 PRS : LOWERED LIMIT  |

**ELECTRICAL BILL OF MATERIALS**

WORK ORDER #: TL-100-F new design

MODEL #: TL-100-F

DATE: 10/20/03

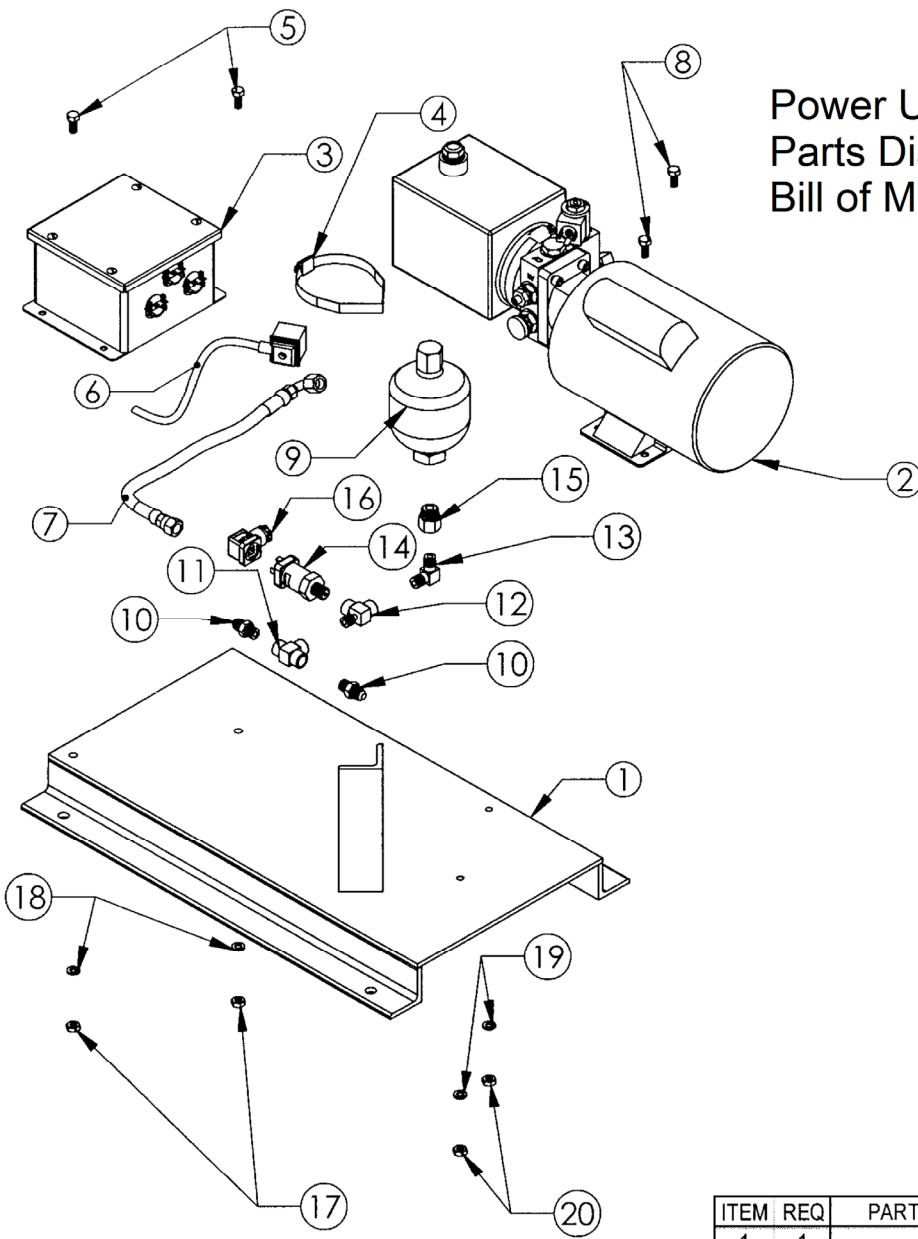
PREPARED BY: D.R. BOOHER

FILE NAME: TL100-F B1.WK4

PAGE 1 OF 1

| ITEM #   | ITEM QTY. | VENDOR           | PART #         | PART DESCRIPTION  | PART DESIGN. |
|--|-----------|------------------|----------------|---|--------------|
| <b>Parts used on all TRAILER RESTRAINT units</b>       |           |                  |                |   |              |
| 1  | 1         | VARIAS           | 99-135-003     | MOTOR, ELECTRIC, .75 HP, 1725 RPM, 115/208-230 VAC  | 1 MTR        |
| 2  | 1         | JUWA             | LC1-D1810-120V | RELAY, CONTACTOR, MOTOR, 3 POLE, 20A, 115V COIL   | 1 M          |
| 3  | 1         | BUSSMAN          | AGC2           | FUSE, 1/4" x 1/4", 2 AMP  | 1 FU         |
| 4  | 1         | BUSSMAN          | HRK            | FUSE HOLDER, IN-LINE  | 1 FU         |
| 5  | 2         | AUTOMATION DIREC | AK1-A0-3A      | SENSOR, PROXIMITY, INDUCTIVE, DC, SINK/SOURCE   | 1 - 2 PRS    |
| 6  | 1         | JUWA             | ZB2BT4C        | SWITCH, OPERATOR, STOP, MUSHROOM, NC/NO CONTACT BLOC  | 1 PB         |
| 7  |           | JUWA             | ZB2BZ102       | CONTACT BLOCK, N.C.   | 1 PB         |
| 8  | 1         | UNITRONICS       | M90-B-19-B1A   | PLC, 10 DC INPUTS, 6 RELAY OUTPUTS, 24 VDC INPUT, ONE LINE OF 16 CHARACTERS, 15 MEMBRANE KEYS | 1 PLC        |
| 9  | 1         | FLOYD BELL INC.  | MW09201Q       | BEEPER, WARBLE TONE, 120VAC   | 1 ANU        |
| 10   | 1         | ITI              | A-402DSC       | ENCL., CTRL, W/ SCREW COVER, 4" x 2" x 2"   | 3 ENCL       |
| 11   | 1         | ITI              | 01-029-006     | ENCL, CTRL, SCREW-COVER, 6" x 6" x 4"   | 2 ENLC       |
| 12   | 1         | VYNCKIER         | RVJ1210HW      | ENCL., CTRL, W/ SCREW HINGE LID, PLASTIC, 12" x 10"   | 1 ENCL       |
| 13   | 1         | ALLEN BRADLEY    | 1492-N16       | END BARRIER, TERMINAL BLOCK   | 1 TB         |
| 14   | 2         | ALLEN BRADLEY    | 1492-N23       | END ANCHOR, TERMINAL BLOCK  | 1 TB         |
| 15   | 3         | ALLEN BRADLEY    | 1492-CA1       | TERMINAL BLOCK  | 1 TB         |
| 16   | 1         | DELTRON          | 99-034-009     | COIL W/ DIN CONNECTOR, SIZE 8, 120 VAC  | 1 SOL H      |
| 17   | 1         | PDI              | PDAH-4-4M-C-HC | SWITCH, PRESSURE, 3000 PSI, ADJUSTABLE  | 1 PS         |
| 18   | 1         | ASTRODYNE        | DR-4524        | POWER SUPPLY, 24 VDC, 2 A   |              |
| 19   | 1         | CUTLER HAMMER    | E22H2          | LENS, PILOT, RED  | 3 LT         |
| 20   | 1         | CUTLER HAMMER    | E22H3          | LENS, PILOT, GREEN  | 4 LT         |
| 21   | 2         | CUTLER HAMMER    | E22D           | MODULE, LIGHT, WITHOUT LAMP   | 3 - 4 LT     |
| 22   | 2         | BULBTRONICS      | BT120MB        | WHITE, MINI BAYONET, WHITE  | 3 - 4 LT     |
| <b>Additional parts used on Model: TL-100-F only</b>   |           |                  |                |   |              |
| 23   | 1         | GENERAL HIGHWAY  | EA201Y202PRG8  | LIGHT, TRAFFIC, ALUM., 2 SECTION, W/ VISORS   | 1 - 2 LT     |
| 24   | 3         | PHOENIX          | 30 03 51 2     | END BARRIER, TERMINAL BLOCK   | 2, 3 TB      |
| 25   | 2         | ALLEN-BRADLEY    | 1492-EA35      | END ANCHOR, TERMINAL BLOCK  | 2, 3 TB      |
| 26   | 26        | PHOENIX          | 30 03 50 9     | TERMINAL BLOCK  | 2, 3 TB      |
| 27   | 2         | ANY              | VARIOUS        | LAMP, A21 (HOUSEHOLD) LAMP (NOT INCLUDED)   | 1 - 2 LT     |
| <b>Additional parts used on Model: TL-100-F-5 only</b> |           |                  |                |   |              |
| 28   | 1         | TRI-LITE         | SG10-115RG     | LUMINAIRE, RED & GREEN, 120VAC  | 1 - 2 LT     |
| 29   | 1         | SSAC             | FS126RC        | FLASHER, MODULE, 120VAC   | FLASHER      |
| 30   | 3         | PHOENIX          | 30 03 51 2     | END BARRIER, TERMINAL BLOCK   | 2, 3 TB      |
| 31   | 4         | ALLEN-BRADLEY    | 1492-EA35      | END ANCHOR, TERMINAL BLOCK  | 2, 3 TB      |
| 32   | 28        | PHOENIX          | 30 03 50 9     | TERMINAL BLOCK  | 2, 3 TB      |
| 33   | 2         | ANY              | 25T8DC         | LAMP, T8 CLEAR APPLIANCE, 25 WATT (INCLUDED)  | 1 - 2 LT     |

# Power Unit Exploded Parts Diagram and Bill of Materials

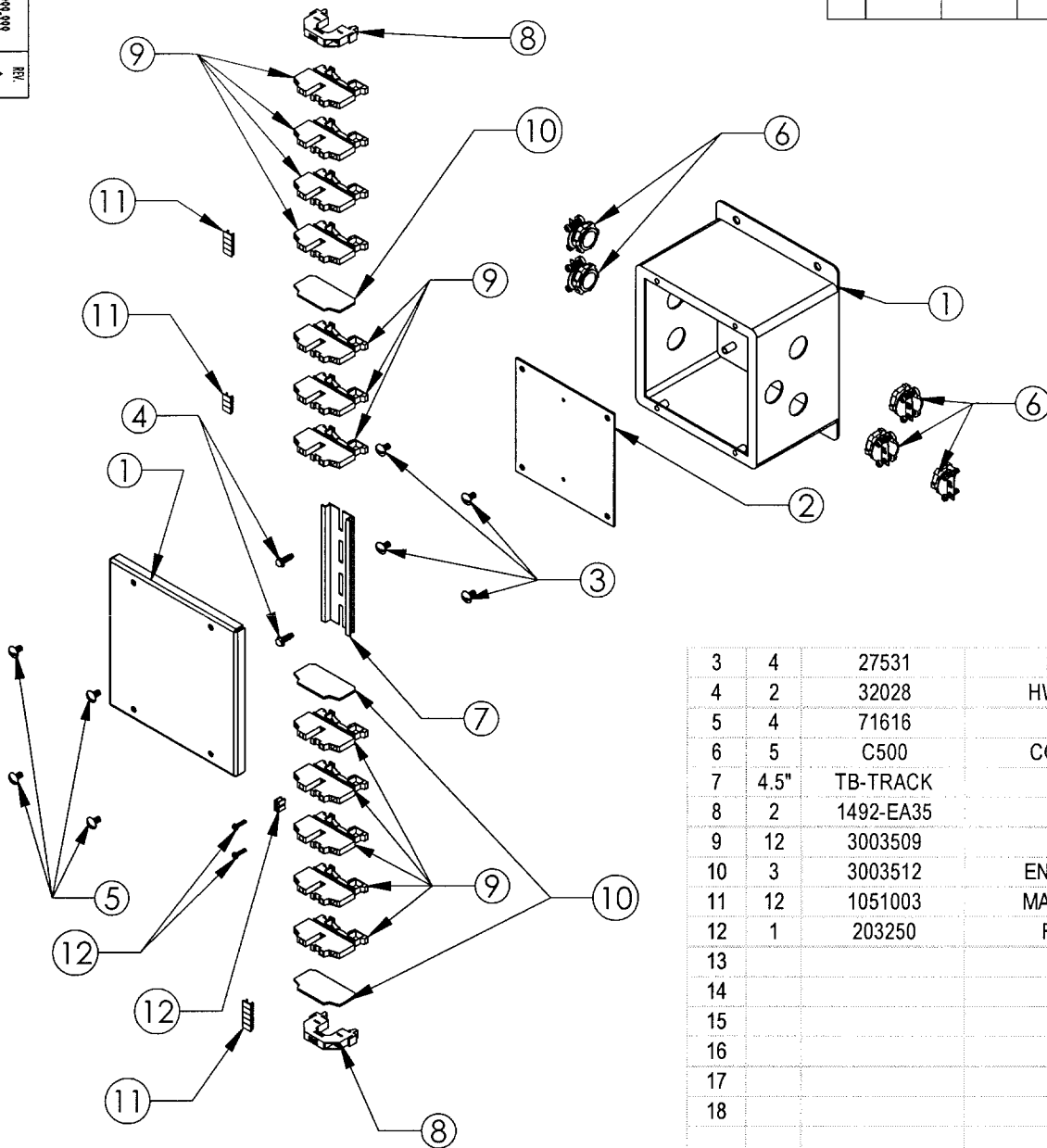


| ITEM | REQ | PART NO.      | DESCRIPTION                   |
|------|-----|---------------|-------------------------------|
| 1    | 1   |               | BASE PLATE WELDMENT           |
| 2    | 1   |               | POWER UNIT, TRAILER RESTRAINT |
| 3    | 1   |               | JUNCTION BOX ASSY.            |
| 4    | 1   | HS64          | CLAMP, WORM GEAR              |
| 5    | 2   | 11005         | HHCS Z PLATED                 |
| 6    | 1   | 01-33-011     | COIL CONECTOR 90 DEGREE       |
| 7    | 1   |               | HOSE ASSEMBLY                 |
| 8    | 2   | 11055         | HHCS Z PLATED                 |
| 9    | 1   | 377316        | ACCUMULATOR                   |
| 10   | 2   | 240-04-04     | MJ-MP STRAIGHT                |
| 11   | 1   | 5605-04-04-04 | MP-FP-FP TEE                  |
| 12   | 1   | 5602-04-04-04 | MP-MP-FP STREET TEE           |
| 13   | 1   | 5500-04-04    | MP-MP 90 DEGREE PIPE          |
| 14   | 1   | 99-022-005    | SWITCH, PRESSURE              |
| 15   | 1   | 6405-08-04-0  | MORB-FP STRAIGHT              |
| 16   | 1   | A1B1213A      | DIN CONNECTOR                 |
| 17   | 2   | 36102         | HEX NUT Z PLATED              |
| 18   | 2   | 33618         | LOCKWASHER Z PLATED           |
| 19   | 2   | 33620         | LOCKWASHER Z PLATED           |
| 20   | 2   | 36104         | HEX NUT Z PLATED              |

DRAWING NUMBER 91-399-099

REV

| REV. | OWG P. | REV. | ECR # | DATE | REVISIONS | INITIAL |
|------|--------|------|-------|------|-----------|---------|
|      |        |      |       |      |           |         |
|      |        |      |       |      |           |         |
|      |        |      |       |      |           |         |



|    |      |           |                     |
|----|------|-----------|---------------------|
| 3  | 4    | 27531     | PHSMS, Z PLATED     |
| 4  | 2    | 32028     | HWH TEK DRILL & TAP |
| 5  | 4    | 71616     | TSHMS, SS           |
| 6  | 5    | C500      | CONNECTOR, ROMEX    |
| 7  | 4.5" | TB-TRACK  | DIR RAIL            |
| 8  | 2    | 1492-EA35 | END ANCHOR          |
| 9  | 12   | 3003509   | TERMINAL BLOCK      |
| 10 | 3    | 3003512   | END COVER ANCHORS   |
| 11 | 12   | 1051003   | MARKERS, UNPRINTED  |
| 12 | 1    | 203250    | FIXED BAR BRIDGE    |
| 13 |      |           |                     |
| 14 |      |           |                     |
| 15 |      |           |                     |
| 16 |      |           |                     |
| 17 |      |           |                     |
| 18 |      |           |                     |
| 11 | 1    | DRILL     |                     |
|    | 1    | DRILL     |                     |

| REMOVE ALL BURRS AND SHARP EDGES |   |           |
|----------------------------------|---|-----------|
| CONCENTRIC                       | .006 TIR  | .060 TIR  |
| ANGLES                           | +/- 0° 30'                                      | +/- 1° 0' |
| DECIMALS                         | x.xxx +/- .005<br>x.xx +/- .010<br>x.x +/- .025 | +/- .015  |
| FRACTIONS                        | +/- 1/32  | +/- 1/16  |
| TOLERANCE                        | MACHINE   | WELDMENT  |

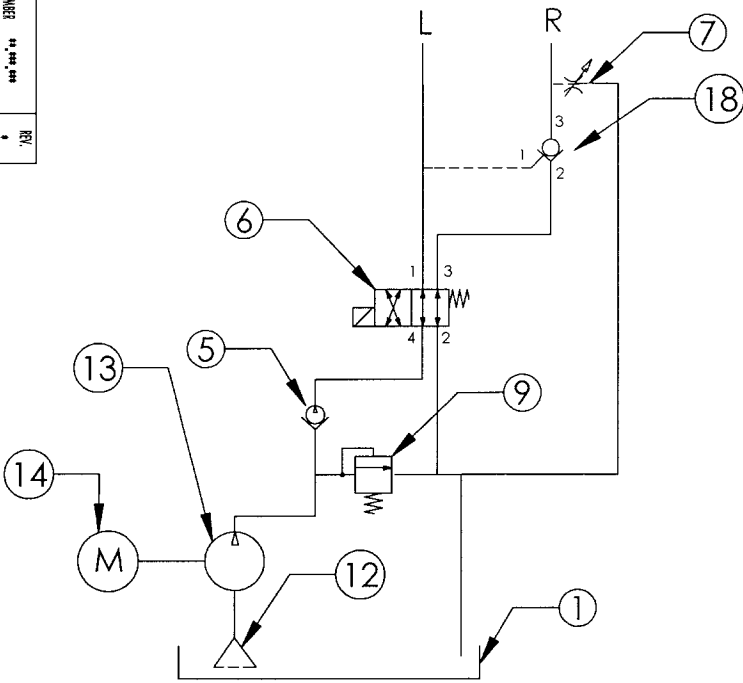
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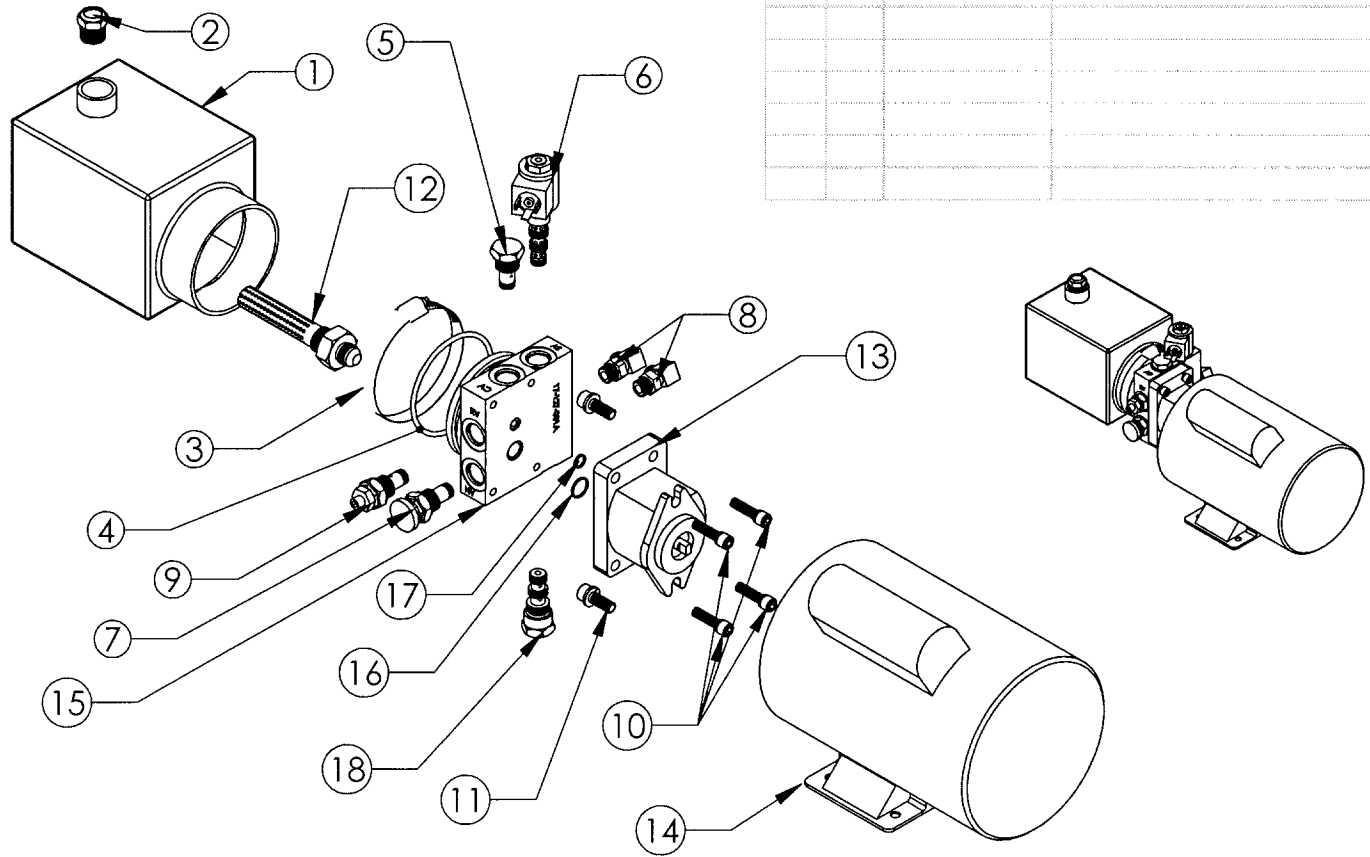
|            |                 |                    |
|------------|-----------------|--------------------|
| SCALE: NTS | APPROVED BY:    | DRAWN BY: J. YOUNG |
| DATE:      |                 | SIZE: A            |
| MATERIAL:  | DRAWING NUMBER: | REV:               |

DRAWING NUMBER  
REV

| REV. | DWG F.<br>**_***_*** | REV. | ECR # | DATE | REVISIONS | INITIAL |
|------|----------------------|------|-------|------|-----------|---------|
|      |                      |      |       |      |           |         |
|      |                      |      |       |      |           |         |
|      |                      |      |       |      |           |         |



| ITEM | REQ | PART NO.       | DESCRIPTION          |
|------|-----|----------------|----------------------|
| 1    | 1   | 06-023-001     | RESERVIOR            |
| 2    | 1   | BV-38          | BREATHER             |
| 3    | 1   | HS-64          | CLAMP                |
| 4    | 1   | 568-340        | ORING                |
| 5    | 1   | 99-153-011     | CHECK VALVE          |
| 6    | 1   | 99-153-008     | 4-WAY SOLENOID VALVE |
|      |     | 99-034-008     | 24 VAC COIL          |
| 7    | 1   | 99-153-045     | NEEDLE VALVE         |
| 8    | 2   | 6801-06-06N-WO | FITTING              |
| 9    | 1   | 99-153-004     | RELIEF VALVE         |
| 10   | 4   | 5/16-18 X 1    | SHCS WHCLW           |
| 11   | 2   | 3/8-16x1       | SHCS WHCLW & FW      |
| 12   | 1   | 01-031-005     | STRAINER             |
| 13   | 1   | 01-143-905     | PUMP                 |
| 14   | 1   | 99-135-003     | ELECTRIC MOTOR       |
| 15   | 1   | 17-127-001     | MANIFOLD             |
| 16   | 1   | 568-015-BN70   | ORING                |
| 17   | 1   | 568-011-BN70   | ORING                |
| 18   | 1   | 99-153-027     | PILOT OP CHECK VALVE |



| REMOVE ALL BURRS AND SHARP EDGES |   |           |
|----------------------------------|---|-----------|
| CONCENTRIC                       | .006 TIR  | .060 TIR  |
| ANGLES                           | +/- 0° 30'                                      | +/- 1° 0' |
| DECIMALS                         | x.xxx +/- .005<br>x.xx +/- .010<br>x.x +/- .025 | +/- .015  |
| FRACTIONS                        | +/- 1/32  | +/- 1/16  |
| TOLERANCE                        | MACHINE   | WELDMENT  |

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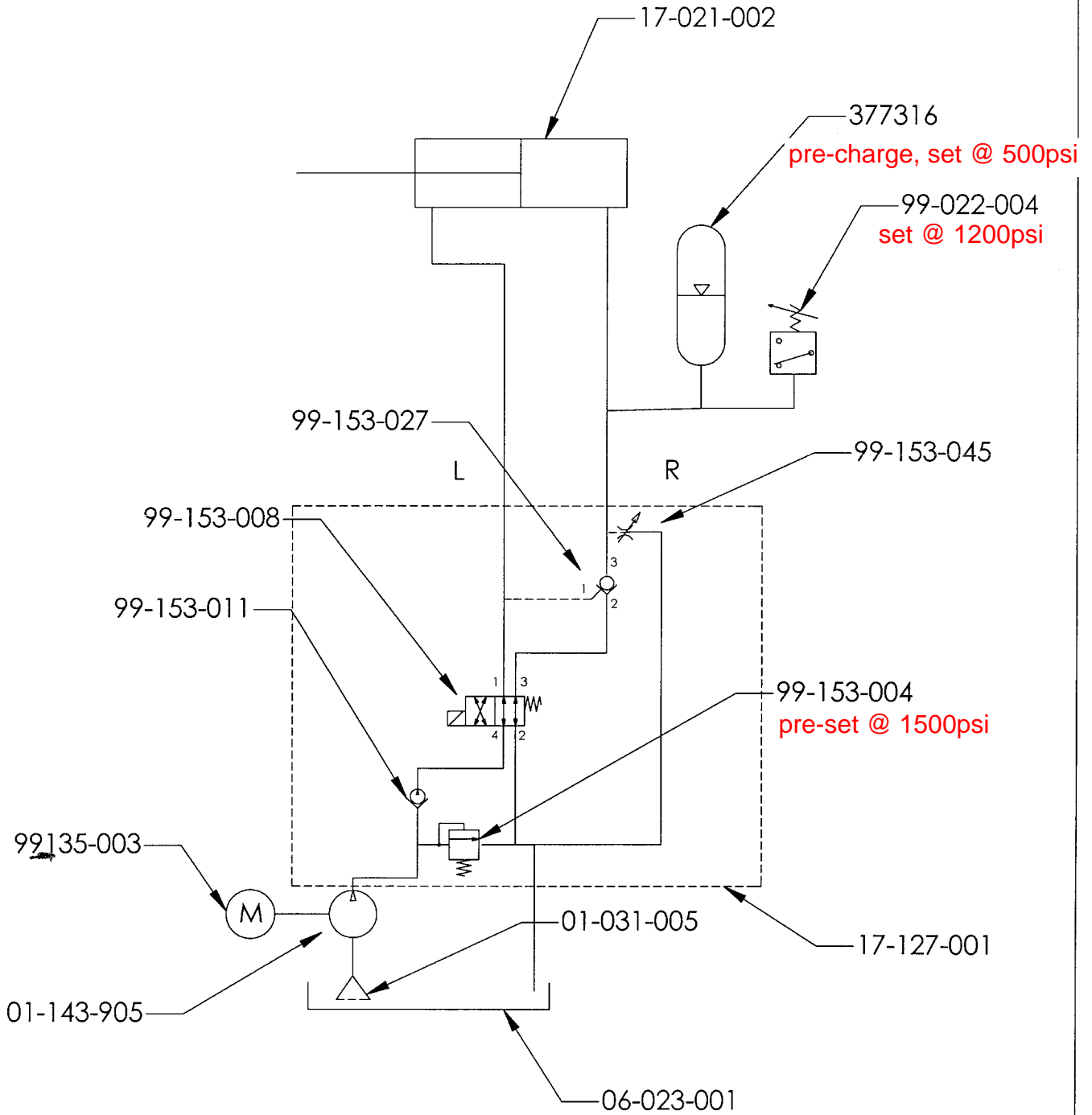
|                                     |                               |                   |
|-------------------------------------|-------------------------------|-------------------|
| SCALE: NTS                          | APPROVED BY:                  | DRAWN BY: J.YOUNG |
| DATE: 10/18/02                      | SITE: A                       |                   |
| <b>TRAILER RESTRAINT POWER UNIT</b> |                               |                   |
| MATERIAL:                           | DRAWING NUMBER:<br>**_***_*** | REV:              |

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DRAWING NUMBER 99-999-999

REV.

| REV. | DWG # | REV. | ECR # | DATE | REVISIONS | INITIAL |
|------|-------|------|-------|------|-----------|---------|
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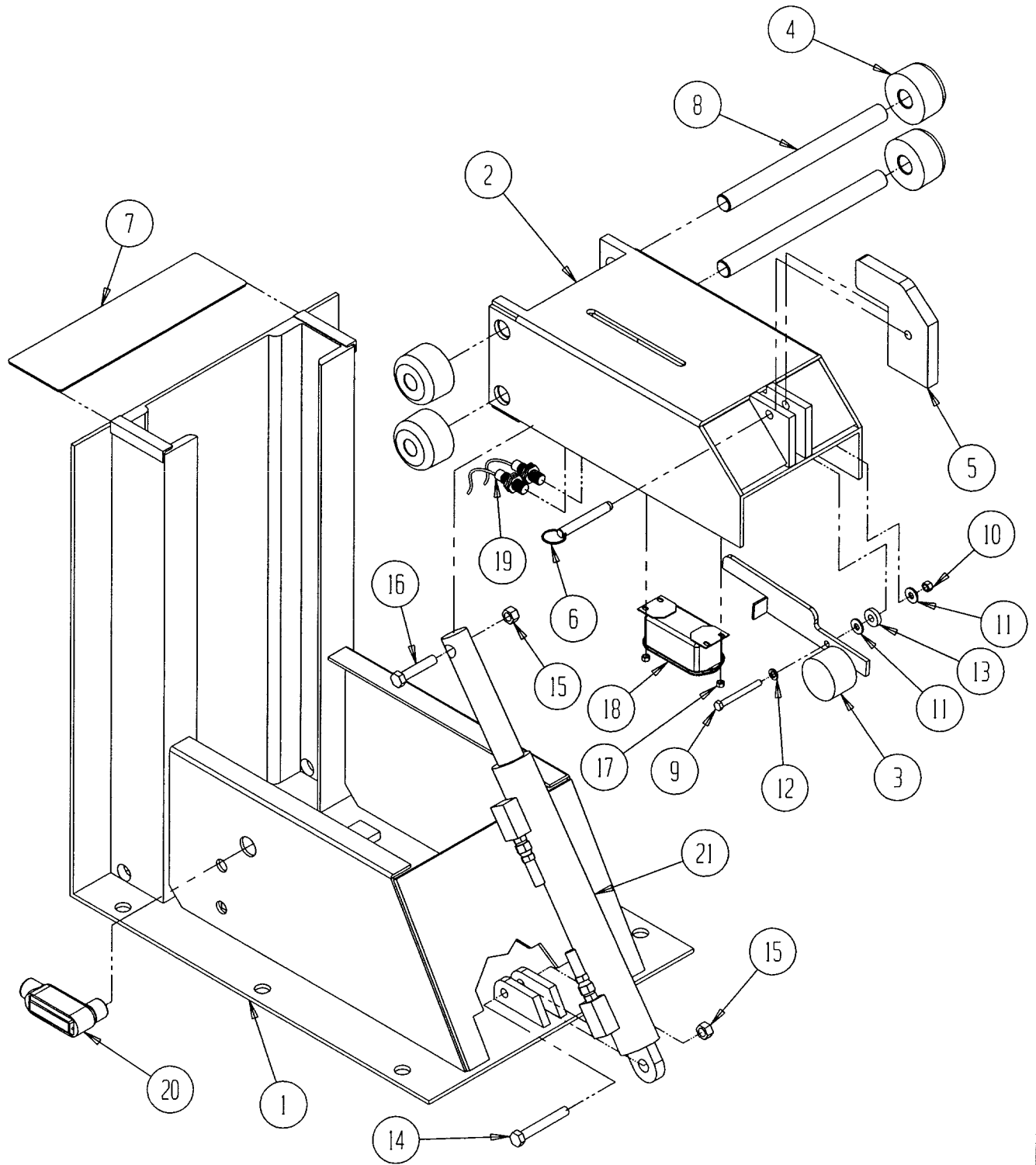


| REMOVE ALL BURRS AND SHARP EDGES |   |           |
|----------------------------------|---|-----------|
| CONCENTRIC                       | .006 TIR  | .060 TIR  |
| ANGLES                           | +/- 0° 30'                                      | +/- 1° 0' |
| DECIMALS                         | x.xxx +/- .005<br>x.xx +/- .010<br>x.x +/- .025 | +/- .015  |
| FRACTIONS                        | +/- 1/32  | +/- 1/16  |
| TOLERANCE                        | MACHINE   | WELDMENT  |

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|   |                 |                   |
|---|-----------------|-------------------|
| SCALE: NTS                                  | APPROVED BY:    | DRAWN BY: J.YOUNG |
| DATE:                                       |                 | SIZE: A           |
| <b>TRAILER RESTRAINT POWER UNIT SHEET 4</b> |                 |                   |
| MATERIAL:                                   | DRAWING NUMBER: | REV:              |

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DESCRIPTION: ASSEMBLY, 3D, EXPLODED TL-100-F

SCALE: 1:8

DATE: 7/27/04

DRAWING NUMBER:

REV:

DRAWN BY: K. YOUNG

KY-0727-02

|          |             |   |      |
|----------|-------------|---|------|
| 21       | 17-021-002  | CYLINDER, 1 1/2" x 14" STROKE           | 1    |
| 20       | N/A         | 1/2" LB                                 | 1    |
| 19       | N/A         | INDUCTIVE PROXIMITY SWITCH              | 2    |
| 18       | N/A         | 2 x 4 JUNCTION BOX                      | 1    |
| 17       | N/A         | NUT, HEX HEAD, $\phi$ 1/4 -20 UNC       | 2    |
| 16       | N/A         | BOLT, $\phi$ 1/2 - 13 UNC X 2 1/2 LG.   | 1    |
| 15       | N/A         | NUT, NYLOCK, $\phi$ 1/2 - 13 UNC        | 2    |
| 14       | N/A         | BOLT, $\phi$ 1/2 - 13 UNC X 3 1/2 LG.   | 1    |
| 13       | N/A         | SPACER, 1/4 X 13/32 I.D. X 1 D.D.       | 1    |
| 12       | N/A         | FLAT WASHER, 3/32 X 3/8 I.D. X 5/8 O.D. | 1    |
| 11       | N/A         | FLAT WASHER, 3/32 X 3/8 I.D. X 7/8 O.D. | 2    |
| 10       | N/A         | NUT, NYLOCK, $\phi$ 5/16 - 18 UNC       | 1    |
| 9        | N/A         | BOLT, $\phi$ 5/16 - 18 UNC X 3 LG.      | 1    |
| 8        | 17-112-008  | PIN, ROLLER, $\phi$ 1 X 12 3/4 LG.      | 2    |
| 7        | 17-014-047  | FRAME, GUARD/SHROUD                     | 1    |
| 6        | 99-112-004  | PIN, SHEAR, $\phi$ 1/2 X 3 3/4 LG.      | 1    |
| 5        | 17-037-002  | FRAME, LOCK TIP                         | 1    |
| 4        | TL-PLASROLL | ROLLER                                  | 4    |
| 3        | 17-514-015  | FRAME, WELDMENT, SENSOR TRIP            | 1    |
| 2        | 17-514-014  | FRAME, WELDMENT, TROLLEY                | 1    |
| 1        | 17-514-013  | FRAME, WELDMENT, BASE                   | 1    |
| ITEM NO. | PART NO.    | DESCRIPTION                             | QTY. |



## TROUBLESHOOTING GUIDE – TL-100-F (-5)

- *WARNING: Care should be taken to identify all potential hazards and comply with all applicable safety procedures before beginning troubleshooting or repairs. The dock approach should be blocked to traffic. Never work under a dock leveler without first installing its safety maintenance prop.*
- *CAUTION: Disconnect power before performing any troubleshooting or repairs. Place a solid structural prop under the raised trolley if work is to be performed inside the restraint itself.*
- *Only qualified individuals trained to understand mechanical devices and their associated electrical and hydraulic circuits, along with the hazards that could result from them, should attempt troubleshooting and repair of this equipment.*

### TROUBLESHOOTING GUIDE:

| MESSAGE DISPLAYED  | POSSIBLE CAUSES  | ACTION TO DIAGNOSE   |
|--|--|--|
| <b>CONDITION: UNSUCCESSFUL LOCK OPERATION</b>  |  |  |
| The controller enters error mode if the restraint doesn't engage and pressurize within 25 seconds of pressing the LOCK button ( button 4). |  |  |
| <b>ER: CHECK PRESSURE SW &gt;</b>  | <ul style="list-style-type: none"> <li>• The manual lowering valve is open.</li> <li>• A defective valve seal.</li> <li>• The directional solenoid valve is stuck in the actuated position.</li> <li>• The pump is defective.</li> <br/> <li>• The pressure switch is defective.</li> <br/> <li>• A short in the switch circuit wiring.</li> </ul>   | <ul style="list-style-type: none"> <li>• Verify that the knob is turned in completely.</li> <li>• Pull each valve and inspect.</li> <li>• Remove the valve; inspect and clean per instructions herein.</li> <li>• Install a pressure gauge in the lift circuit. The system pressure should build to at least ??? psi.</li> <li>• Check continuity of the pressure switch with a meter when system pressure is above ??? psi.</li> <li>• Check the wiring to the pressure switch for damage. Check the wire terminals for shorting.</li> </ul>  |
| <b>ER: CHECK UP/ICC &gt;</b>   | <ul style="list-style-type: none"> <li>• The trolley did not reach the ICC bar.</li> <br/> <li>• The ICC bar is too high or out of place for the trolley to engage it.</li> <li>• The power unit's hydraulic reservoir fluid level is low.</li> <br/> <li>• The ICC bar proximity switch circuit is open or the proximity switch is defective.</li> <br/> <li>• The directional solenoid valve is stuck or its coil is defective (open).</li> <li>• The motor isn't turning on.</li> <br/> <li>• The ICC bar proximity switch is out of adjustment.</li> </ul> | <ul style="list-style-type: none"> <li>• Check for an obstruction or damage that could prevent the trolley from raising.</li> <li>• Evaluate the condition and placement of the ICC bar.</li> <li>• The reservoir should be filled to within 1" - 1½" of the fill hole. Check for oil leaks.</li> <li>• Check that the LED on the innermost proximity switch lights (only) when a metal object is placed in front of it.</li> <li>• Remove the valve; inspect and clean per instructions herein. Check the coil's continuity.</li> <li>• Check the continuity of the motor relay's coil, and check for 24 VDC at the relay's coil.</li> <li>• Raise the trolley in manual mode and physically move the ICC bar sensor actuator down. The LED will light if the switch is adjusted properly.</li> </ul> |
| <b>ER: UP/ICC &amp; PRES &gt;</b>  | <ul style="list-style-type: none"> <li>• Review the list shown above.</li> </ul>   | <ul style="list-style-type: none"> <li>• Review the list shown above.</li> </ul>   |
| <b>CONDITION: UNSUCCESSFUL UNLOCK OPERATION</b>  |  |  |
| The controller enters error mode if the restraint isn't completely lowered within 15 seconds of pressing the UNLOCK button (button 5).     |  |  |
| <b>ER: LOWER LIMIT &gt;</b>  | <ul style="list-style-type: none"> <li>• The lower limit proximity switch circuit is open or the proximity switch is defective.</li> <li>• The trolley is not fully lowered.</li> </ul>  | <ul style="list-style-type: none"> <li>• Check that the LED on the outermost proximity switch lights when a metal object is placed in front of it.</li> <li>• Check for an obstruction or damage that could prevent the trolley from raising.</li> </ul>   |
| <b>ER: CHECK UP/ICC &gt;</b>   | <ul style="list-style-type: none"> <li>• Defective upper limit proximity switch.</li> <li>• The ICC bar proximity switch is out of adjustment.</li> </ul>  | <ul style="list-style-type: none"> <li>• Check that the LED on the innermost proximity switch lights only when a metal object is placed in front of it.</li> <li>• Raise the trolley in manual mode. The proximity switch's LED should not light when the ICC bar sensor is popped up.</li> </ul>  |

USING THE “INFORMATION” MODE:

To enter information mode, at any time, press and hold the **i** key for at least three (3) seconds. This will allow you to troubleshoot problems by reviewing the status of the restraint’s inputs and outputs. See the chart below.

The display will show: **INPUTS / OUTPUTS**

Press the “enter” ( ) button to show: **INPUTS**

Press “enter” ( ) again to review the status of the control system’s inputs, or use the right arrow ( => ) button and “enter” ( ) to choose and view the control system’s outputs’ status.

Press the **i** key to back out of a given option and to exit to “run” mode.

000-007: ■ \_ \_ \_ ■ \_ \_ \_ Each line represents an input or an output (I / O).

In the above example, if the OUTPUTS menu has been selected, outputs 00 and 05 are showing as ON. Any position with a darkened cursor indicates an active input or output.

⚡ In the event that the restraint does not respond to commands properly, enter the information menu to check the status of each input and output (I/O) at the time the error appears. Writing down the I/O status and the position of the trolley at the time of the error will provide symptoms by which the problem can be diagnosed.

Use the following chart to determine which I/O should be on at any given point in the restraint’s operation.

**CONTROLLER INPUTS & OUTPUTS THAT ARE “ON” IN NORMAL OPERATING MODES:**

| RESTRAINT’S POSITION:                | INPUT NUMBER / DESCRIPTION:   |   | RESTRAINT’S STATUS:   |
|--------------------------------------|-------------------------------|---|---|
| FULLY LOWERED                        | 0                             | PRESSURE SWITCH                         | AUTO MODE, “WAITING FOR TRUCK”  |
|                                      | 2                             | LOWER LIMIT PROXY                       |   |
| WHILE RAISING                        | 0                             | PRESSURE SWITCH                         | IN MOTION   |
| ICC BAR ENGAGED & SYSTEM PRESSURIZED | 3                             | OUTSIDE GREEN LIGHT                     | LOCKED AGAINST AN ICC BAR   |
|                                      | 4                             | INSIDE RED LIGHT                        |   |
| WHILE LOWERING                       | 0                             | MOTOR RELAY                             | THE RESTRAINT IS LOWERING   |
|                                      | 4                             | INSIDE RED LIGHT                        |   |
| NOT APPLICABLE                       | DEPENDANT ON TROLLEY POSITION |   | MANUAL LIGHTS MODE  |
| RESTRAINT’S MODE:                    | OUTPUT NUMBER / DESCRIPTION:  |   | RESTRAINT’S STATUS:   |
| RESET                                | 5                             | WARNING BEEPER                          | CONTROLS ARE WAITING FOR RESET  |
|                                      | 4                             | INSIDE RED LIGHT                        |   |
| WAITING FOR TRUCK                    | 3                             | OUTSIDE GREEN LIGHT                     | THE RESTRAINT IS READY FOR A TRUCK                                    |
|                                      | 4                             | INSIDE RED LIGHT                        |   |
| LOCKING                              | 0                             | MOTOR RELAY                             | THE RESTRAINT IS RAISING  |
|                                      | 1                             | SOLENOID VALVE                          |   |
|                                      | 4                             | INSIDE RED LIGHT                        |   |
| LOCKED                               | 2                             | OUTSIDE RED LIGHT<br>INSIDE GREEN LIGHT | THE RESTRAINT IS COMPLETELY RAISED                                    |
| UNLOCKING                            | 0                             | MOTOR RELAY                             | THE RESTRAINT IS LOWERING   |
|                                      | 4                             | INSIDE RED LIGHT                        |   |
| UNLOCKED                             | 3                             | OUTSIDE GREEN LIGHT                     | THE RESTRAINT IS COMPLETELY LOWERED                                   |
|                                      | 4                             | INSIDE RED LIGHT                        |   |
| MAINTAINING CONTACT WITH THE ICC BAR | 0                             | MOTOR RELAY                             | THE RESTRAINT IS REPRESSURIZING TO MAINTAIN CONTACT WITH THE TRAILER. |
|                                      | 1                             | SOLENOID VALVE                          |   |
|                                      | 4                             | INSIDE RED LIGHT                        |   |
| MANUAL LIGHTS                        | 2                             | OUTSIDE RED LIGHT<br>INSIDE GREEN LIGHT | MANUAL LIGHTS   |
| MANUAL LOCK                          | 0                             | MOTOR RELAY                             | THE RESTRAINT IS BEING RAISED MANUALLY                                |
|                                      | 1                             | SOLENOID VALVE                          |   |
| MANUAL UNLOCK                        | 0                             | MOTOR RELAY                             | THE RESTRAINT IS BEING LOWERED MANUALLY                               |
|                                      | 4                             | INSIDE RED LIGHT                        |   |

## LIMITED WARRANTY

Vestil Manufacturing Corporation (“Vestil”) warrants this product to be free of defects in material and workmanship during the warranty period. *Our warranty obligation is to provide a replacement for a defective original part if the part is covered by the warranty, after we receive a proper request from the warrantee (you) for warranty service.*

### Who may request service?

Only a warrantee may request service. *You are a warrantee if* you purchased the product from Vestil or from an authorized distributor AND Vestil has been fully paid.

### What is an “original part”?

An original part is a part used to make the product as shipped to the warrantee.

### What is a “proper request”?

A request for warranty service is proper if Vestil receives: 1) a photocopy of the Customer Invoice that displays the shipping date; AND 2) a written request for warranty service including your name and phone number. Send requests by any of the following methods:

|   |  |                  |
|---|--|------------------|
| <u>Mail</u>   | <u>Fax</u>                                       | <u>Email</u>     |
| Vestil Manufacturing Corporation<br>2999 North Wayne Street, PO Box 507<br>Angola, IN 46703 | (260) 665-1339<br><u>Phone</u><br>(260) 665-7586 | sales@vestil.com |

In the written request, list the parts believed to be defective and include the address where replacements should be delivered.

### What is covered under the warranty?

After Vestil receives your request for warranty service, an authorized representative will contact you to determine whether your claim is covered by the warranty. Before providing warranty service, Vestil may require you to send the entire product, or just the defective part or parts, to its facility in Angola, IN. The warranty covers defects in the following *original* dynamic components: motors, hydraulic pumps, electronic controllers, switches and cylinders. It also covers defects in *original* parts that wear under normal usage conditions (“wearing parts”), such as bearings, hoses, wheels, seals, brushes, and batteries.

### How long is the warranty period?

The warranty period for original dynamic components is 1 year. For wearing parts, the warranty period is 90 days. The warranty periods begin on the date when Vestil ships the product to the warrantee. If the product was purchased from an authorized distributor, the periods begin when the distributor ships the product. Vestil may, at its sole discretion, extend the warranty periods for products shipped from authorized distributors by *up to* 30 days to account for shipping time.

### If a defective part is covered by the warranty, what will Vestil do to correct the problem?

Vestil will provide an appropriate replacement for any *covered* part. An authorized representative of Vestil will contact you to discuss your claim.

### What is not covered by the warranty?

1. Labor;
2. Freight;
3. Occurrence of any of the following, which automatically voids the warranty:
  - Product misuse;
  - Negligent operation or repair;
  - Corrosion or use in corrosive environments;
  - Inadequate or improper maintenance;
  - Damage sustained during shipping;
  - Collisions or other incidental contacts causing damage to the product;
  - Unauthorized modifications: DO NOT modify the product IN ANY WAY without first receiving written authorization from Vestil. Modification(s) might make the product unsafe to use or might cause excessive and/or abnormal wear.

### Do any other warranties apply to the product?

Vestil Manufacturing Corp. makes no other express warranties. All implied warranties are disclaimed to the extent allowed by law. Any implied warranty not disclaimed is limited in scope to the terms of this Limited Warranty.

