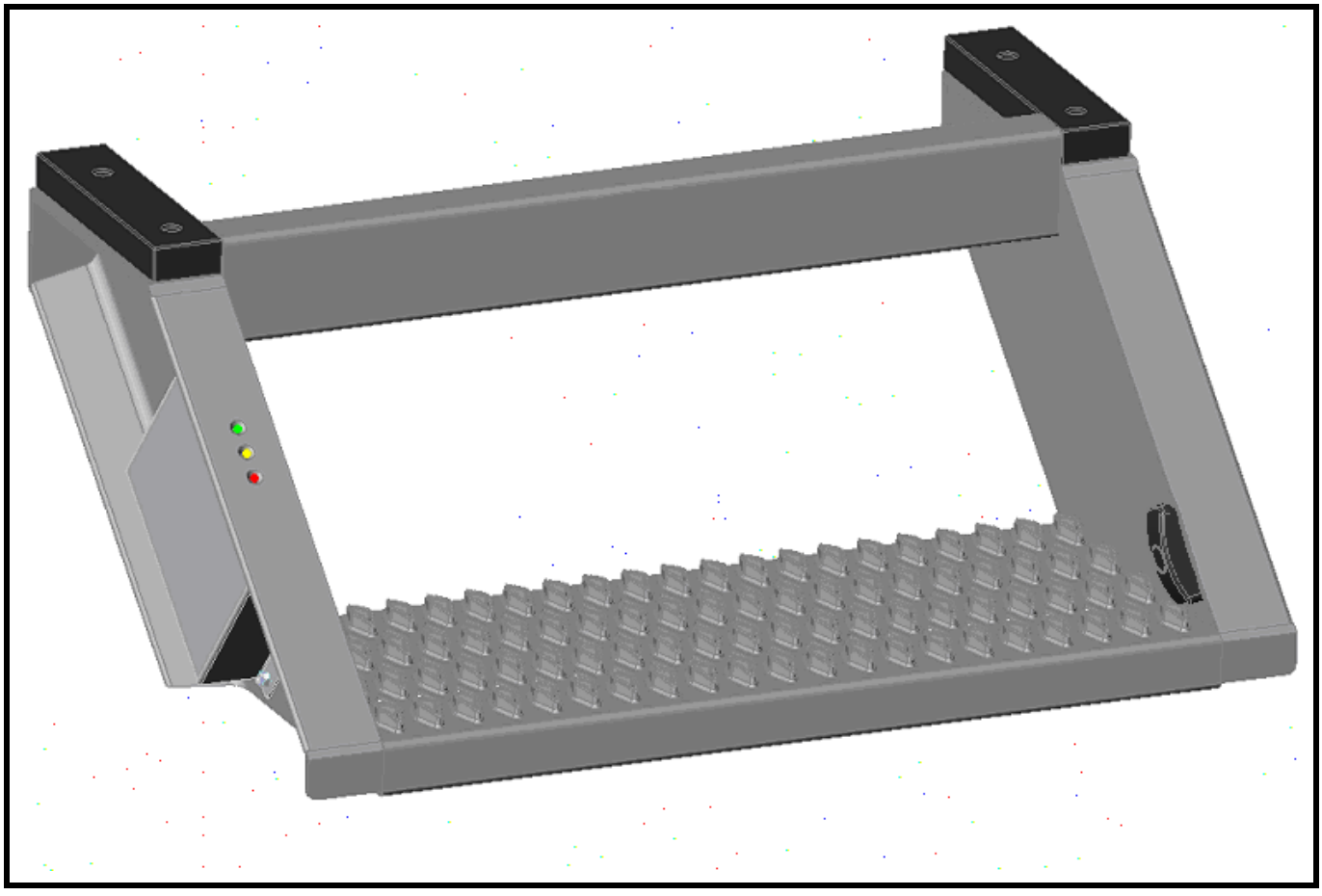
MARLEX ENGINEERING INC.
Engineering Management & Product Development Services
323 Wilson Street, Lower Level Phone: (905) 304-6208 E-mail: info@marlexeng.com
Ancaster, Ontario, Canada L9G 4A8 Fax: (905) 304-6209 Web: www.marlexeng.com

MODEL PSS-24 PRESENCE SENSING STEP



REV 2.0 2007-06-26

Index

Limited Warranty

MARLEX Engineering Inc. (“MARLEX”), by providing you with a safety enhanced side collection step to augment the operation of your refuse collection vehicle, is not offering any guarantee or insuring against any accidents and/or injuries. The safe operation of a refuse collection vehicle is the responsibility of the operator. The PSS-24 Presence Sensing Step is designed to complement the operator’s normal safe practices by stopping the operation of the forward compacting function of the refuse collection vehicle whenever the potentially dangerous situation of an operator standing on the side collection step is detected. The PSS-24 Presence Sensing Step by itself will not prevent possible accidents and/or injuries.

MARLEX WARRANTS TO THE ORIGINAL PURCHASER THAT THE PRODUCT WILL BE FREE FROM DEFECTS IN MATERIAL AND WORKMANSHIP FOR A PERIOD OF ONE YEAR FROM THE DATE OF ORIGINAL PURCHASE. MARLEX HEREBY DISCLAIMS ALL OTHER WARRANTIES EXPRESSED OR IMPLIED INCLUDING BUT NOT LIMITED TO ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

If the product does not conform to the prior paragraph, MARLEX’s entire liability and the purchaser’s sole and exclusive remedy shall be, at MARLEX’s option, either to (a) repair the defective product, (b) replace the defective product, or (c) return for the purchase price therefore. IN NO EVENT SHALL MARLEX BE LIABLE FOR ANY CONSEQUENTIAL, SPECIAL, INCIDENTAL OR INDIRECT DAMAGES OF ANY KIND ARISING OUT OF THE PERFORMANCE, NONPERFORMANCE OR USE OF THE PRODUCT, EVEN IF MARLEX HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

This warranty does not cover any labor costs for the removal and reinstallation of the unit for repair or replacement whether performed by the purchaser or any other third party.

This warranty shall not apply to any defect, malfunction or failure caused by or resulting from improper or unauthorized installation, service, maintenance, repair, or use that is not within the working specifications for which the product was designed, or from abuse, neglect, tampering with or opening the unit, accident or any other cause beyond the control of the manufacturer.

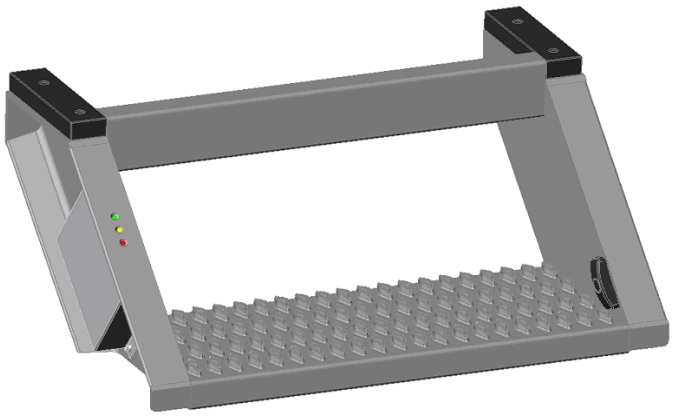
SOME JURISDICTIONS DO NOT ALLOW THE EXCLUSION OF IMPLIED WARRANTIES OR LIMITATIONS OF HOW LONG AN IMPLIED WARRANTY MAY LAST, OR THE EXCLUSION OR LIMITATION OF INCIDENTAL DAMAGES, THEREFORE THE ABOVE LIMITATIONS AND/OR EXCLUSIONS MAY NOT APPLY TO YOU. THIS WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS WHICH MAY VARY FROM JURISDICTION TO JURISDICTION.

Product returned to the location from which it was purchased must be complete; that is, the entire product as received must be returned, not just the suspected defective part, and must be accompanied by a copy of the purchase receipt. In the absence of such purchase receipt the warranty period shall be one (1) year from the date of manufacture. The returned parts must also be accompanied with a Return Material Authorization (“RMA”) number which can be obtained by calling MARLEX at (905) 304-6208.

If the product is returned by mail/freight for warranty service, it must be returned postage/freight prepaid to MARLEX. MARLEX assumes no responsibility for any damage, loss or claims by the purchaser or any third party that may arise through the use of this product.

Features

Designed to operate with Labrie Expert 2000 Packer Control Module
Fully Assembled, Bolt-On One-Piece Construction with Mounting Bars
Patented 40 kHz Wide Beam Angle Ultrasonic Sensor [1]
Up to 50 Sensor Updates per Second
Plug-in Electrical Connection (no soldering)
Visual (LED) Operation Status
Performs self diagnostics with sensor failure detection
Wide Operating Temperature (-40ºC to +75ºC)
Rugged Design - Fully Encapsulated Electronics
Wide Operating Voltage (10.0VDC to 14.5VDC with 17V peak)



LABRIE EXPERT 2000 INSTALLATION

1 US patent No. 6,114,950

Specifications

Mechanical Specifications

Maximum Load (Static)[2]: 227kg (500lb)

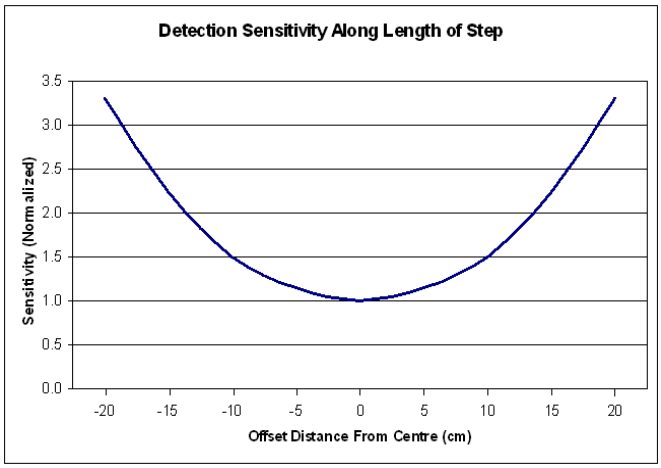
Electrical Specifications

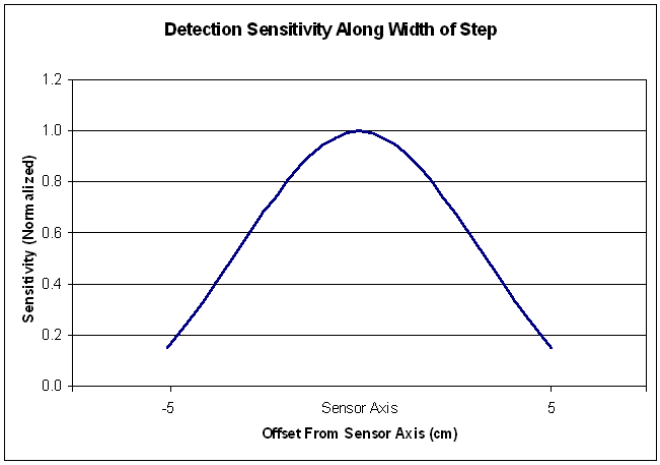
Maximum Response Time: 0.1 seconds
Operating Temperature: -40ºC to +75ºC (-40ºF to 167ºF)
Operating Environment: Indoor/Outdoor
Sensor Operating Frequency: 40.0 kHz
Operating Voltage: 10.0VDC to 14.5VDC (17V peak repetitive voltage; 17VDC < 10 minutes)
Operating Current:

Voltage (VDC)	Detection	Operating Current (mA)
14.5	YES	30
14.5	NO	250
12	YES	30
12	NO	215
10	YES	30
10	NO	180

Contact Rating: 100,000 Operations at 28VDC, 20A, Resistive Load

Operating Performance





Minimum object sensitivity: 70 mm (2.75 in) diameter x 1000 mm (39.4 in) pole
Nominal Update Interval: 0.02 seconds
Status: Power ON – GREEN LED Active
Sensor Disconnect / Fault – RED LED Flashing 1Hz
Obstacle Detected – RED LED Active
Sensor Interference – AMBER LED Active

2 When mounted in accordance with the installation instructions.

Warning

The PSS-24 Presence Sensing Step (referred to as the system) is intended to aid the operator from entering a potentially dangerous situation. The operator is responsible for maintaining safe operating practices.

CAUTION: PLEASE NOTE THAT, EVEN WHEN PROPERLY INSTALLED, THE PSS-24 PRESENCE SENSING STEP COULD ENCOUNTER SITUATIONS IN WHICH PRESENCE SENSING IS INHIBITED OR HAMPERED, SUCH AS SHORT DURATIONS OF STRAY ULTRASONIC NOISE FROM HYDRAULIC AND PNEUMATIC LINES, NOR IS THE UNIT INTENDED TO DO RELIABLE PRESENCE SENSING FOR SHORT PERIODS OF TIME AT THE START OF SUCH NOISE. THE SYSTEM IS NOT A SUBSTITUTE FOR ATTENTIVE OPERATION.

Self Check and Diagnosis

The interlock relay allowing forward motion of the packer unit is immediately de-energizing in any detected failure mode, preventing forward motion of the packer. If the unit is in the Main electrical configuration, the operator must wait 5 seconds before power is restored to the packer allowing motion. Otherwise if the unit is in the Alternate electrical configuration, the packer must be manually retracted to its fully retracted position before the interlock relay is re-energized allowing forward motion.

The software in this safeguarding device is protected using a watchdog timer that will re-initialize the output port in case of software failure, driving the interlock relay to its de-energized state.

The software also contains self-checking routines that check for a failed and/or disconnected sensor once per detection cycle (every 20 milliseconds). The red detection LED will flash during this condition. On sensor failure and/or disconnect detection, the software will set the output port to de-energize the interlock relay.

Stray ultrasonic noise from external sources (such as an air hose, compressed air leakage, air brake exhaust) can be measured on the sensor and may render the protective device incapable of detection. Such a condition is monitored by the software once per detection cycle. A yellow warning LED is activated during this condition to provide a visual indication to the operator that some external signal is causing interference with the presence sensing capabilities of this device.

Operating Instructions

The PSS-24 Presence Sensing Step monitors the presence of objects (most importantly the operator's foot) on the side collection step and disables the forward motion of the compactor's hydraulic ram via the de-energizing of an interlock relay. Once tripped, the interlock relay can only be re-energized by clearing the step of the object being detected and waiting 5 seconds (Main Configuration), or by clearing the object and retracting the hydraulic ram to its fully retracted position (Alternate Configuration).

Once installed, the unit is continuously powered and the green LED should be on. If it is not then there is a problem with the unit.

When detecting the presence of an object on the side collection step, the red LED lights up, the interlock relay is de-energized, and the hydraulic ram can not be moved. To re-enable forward motion of the ram, the object must be cleared from the step and the operator must wait a time delay of 5 seconds. This will re-energize the interlock relay and allow normal operation of the ram.

In certain instances there may be ultrasonic noise created that interferes with the operation of the step sensor. This may be caused by such things as pneumatic and hydraulic valves being operated or the sound of air brakes being applied. In such instances the yellow LED will light for the duration of the interference, and the unit may have difficulty detecting the presence of objects on the step.

NOTE: DURING THE TIME THAT STRAY ULTRASONIC NOISE IS DETECTED, THE UNIT CAN NOT DETECT OBJECTS ON THE STEP BUT ALLOWS THE RAM TO OPERATE NORMALLY WHILE ACTIVATING THE YELLOW WARNING LED. IT IS THE OPERATOR'S RESPONSIBILITY TO ALWAYS USE SAFE OPERATING PRACTICES.

If the unit detects a fault condition, the red LED will blink. In this case the interlock relay is de-energized and cannot be re-energized until the fault condition is corrected.

The following table summarizes the operation of the presence sensing step (--- indicates don't care):

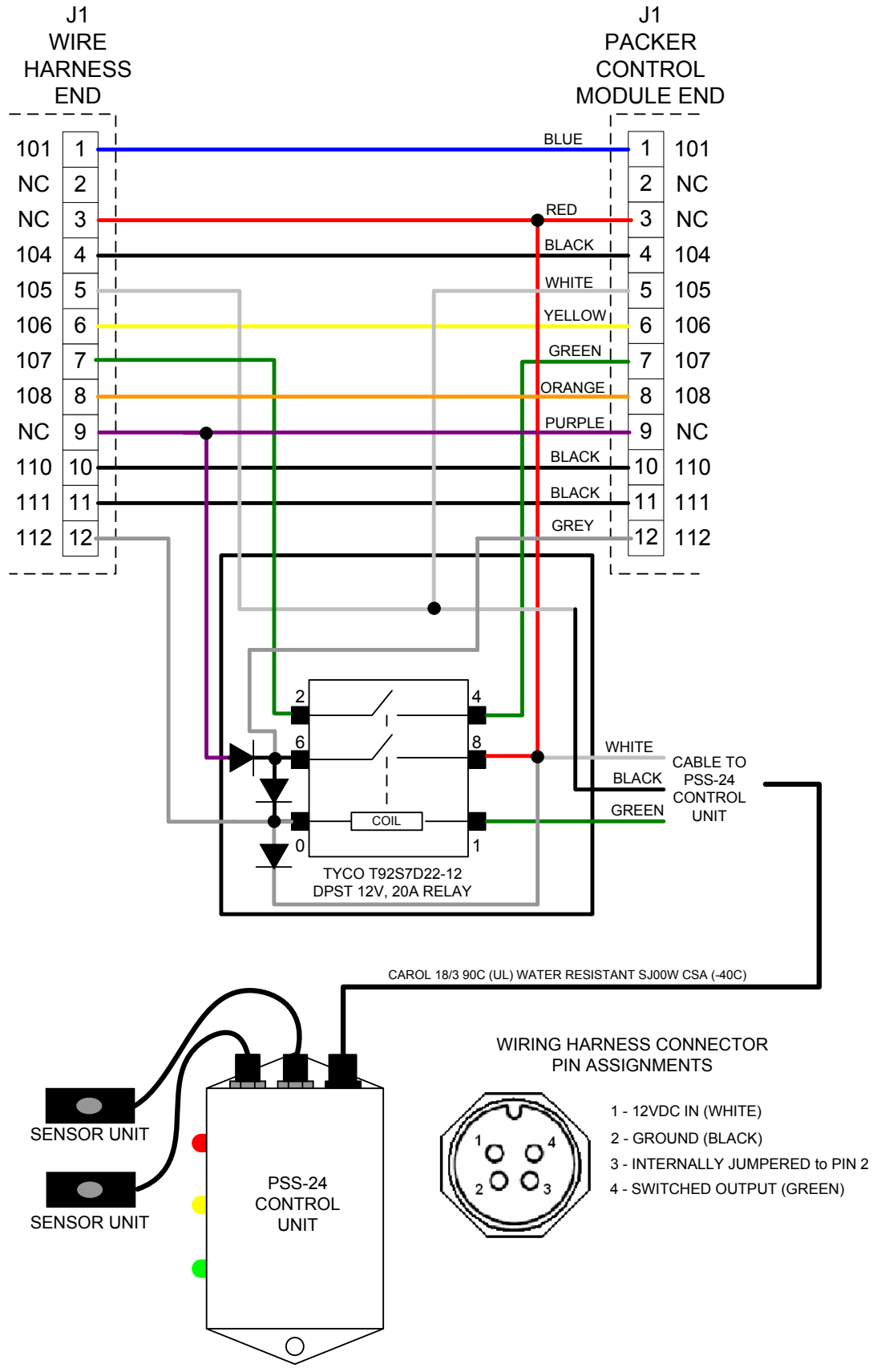
Green	Yellow	Red	Condition	Action
OFF	OFF	OFF	Unit not powered.	If the vehicle battery is connected and charged, check for incorrect installation of the unit or broken wires. If no fault can be found with the installation then the unit may require servicing.
ON	OFF	OFF	Unit powered up and functioning properly.	Operate refuse collection vehicle as normal.
OFF	OFF	ON	Unit is detecting object on step and has de-energized interlock relay.	Clear object from step area and move ram to fully retracted position.
OFF	ON	OFF	Unit is detecting ultrasonic noise.	Use caution since the step may not be able to detect objects under this condition. Continue to operate refuse collection vehicle as normal.
OFF	---	Blinking	Unit has detected a fault and has de-energized the interlock relay.	Fix fault, clear objects from step area, and move ram to fully retracted position. If fault condition cannot be determined, unit may require servicing.

Electrical Configurations

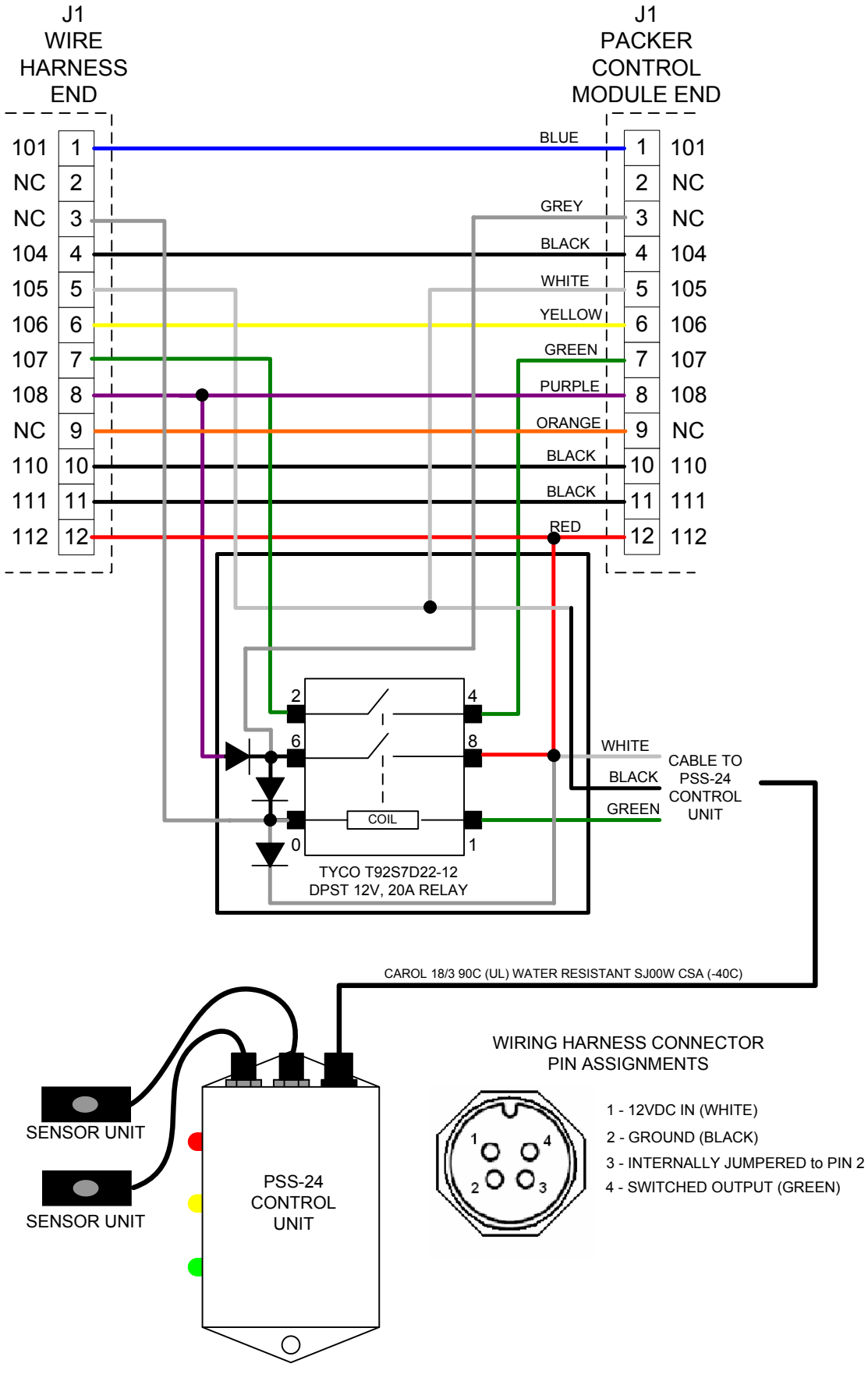
The PSS-24 Presence Sensing Step has two possible electrical connections. The Main Configuration (default) is designed to disconnect the power to the Packer hydraulics. The Alternate Configuration is designed to disconnect the power to the Forward Solenoid Valve. To change the Main Configuration to the Alternate Configuration, simply swap the orange wire and purple wire, and the red wire and grey wire at each end of the J1 connector. To go from the Alternate Configuration to the Main Configuration, simply follow the instructions in the reverse order.

Installation Instructions

Electrical Connection Diagram
Main Configuration: Hydraulic Power (RED STOP Button Circuit Interrupt)



Electrical Connection Diagram
Alternate Configuration: Packer Forward Motion Interrupt



Installation:

STEP 1: Mounting Bar Attachment (Skip to Step 2 for Retrofit Installations)

Weld the two step mounting bars onto the bottom of the packer chamber, as shown in Figure 1. Note that the mounting bar end with the threaded hole closest to the end should be pointed outward. The mounting bar should be located so that the edge of the bar end is flush with the beginning of the round on the edge of the packer chamber body. The mounting bars are to be spaced 66cm (26”) apart and should be located so that the step is centered below the red/white striped panic bar. Figure 2 shows a typical dimension to the right side of the right mounting bar that will provide an adequately centered step. The mounting bars are supplied unpainted in order to facilitate welding. Once welded, the mounting bars should be painted with a rust-inhibiting paint.

Installation Hint: The step is shipped with the mounting bars fastened to the step. Use the step as a template for marking the spacing between the bars before removing the bars and individually welding them to the bottom of the packer chamber.

Figure 1: Welded Mounting Bars

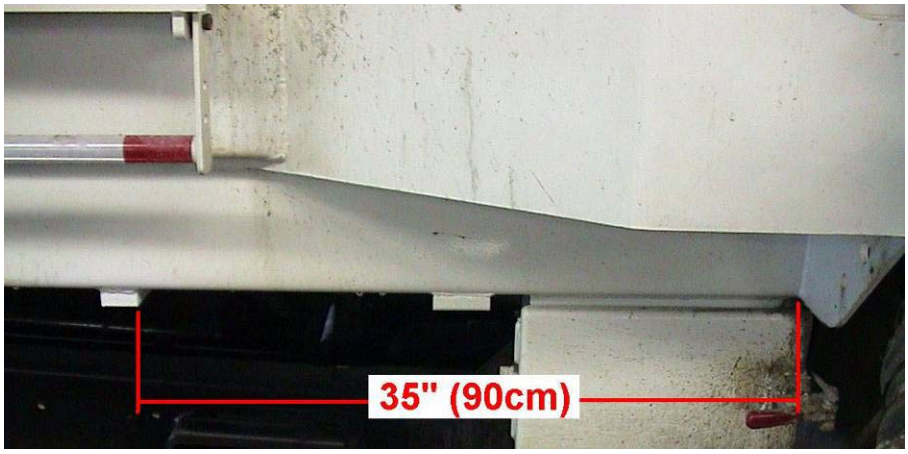


Figure 2: Suggested Right Hand Side Mounting Bar Location

STEP 2: Presence Sensing Step Attachment to Mounting Bars

Attach the Presence Sensing Step to the mounting bars using the supplied mounting hardware (1/2"-13 x 1.25" UNC HEX CAP SCREWS, ZINC CHROMATE PLATED, SAE GRADE 5 (ASME/ANSI B18.2.1) MIN YIELD STRENGTH 120,000 PSI SPAENAUR #HC-74 OR EQUIVALENT).

Torque to 34 Nm (25 ft-lbs) on all 4 screws.

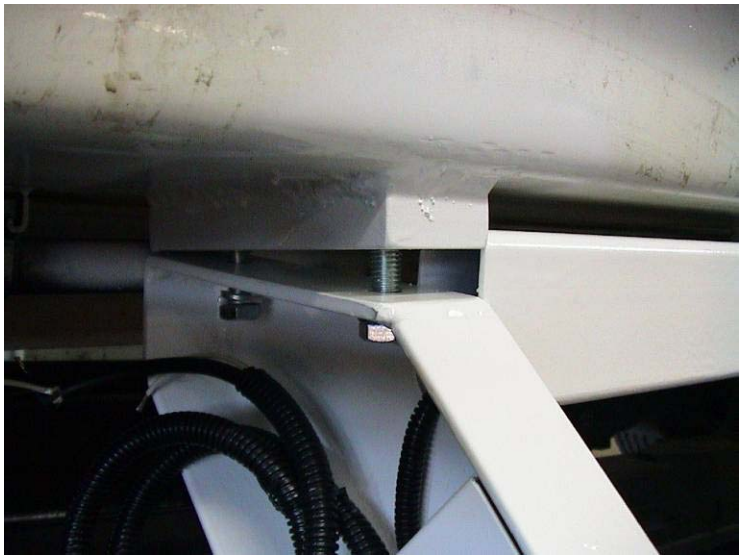


Figure 3: New Installation Step Attachment

Figure 4: Retrofit Installation Step Attachment

STEP 3: Wiring Harness Removal from Presence Sensing Step.

Remove the PSS-24 Control Module shield located on the left side of the step. Carefully disconnect the wiring harness connector attached to the control module by first rotating the locking ring counterclockwise and then pulling the connector away from the receptacle.

Installation Hint: It may be difficult to turn the locking ring, once locked. You may have to gently use pliers to turn the locking ring counter clockwise past its 'locking' point.

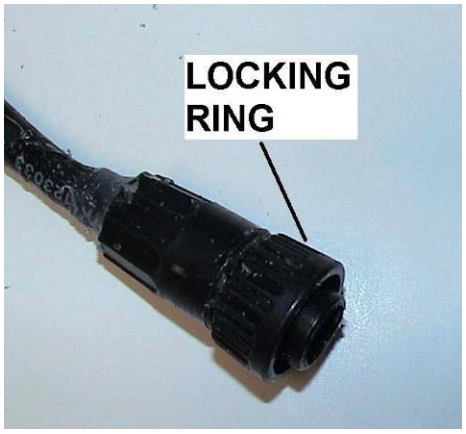


Figure 5: Weathertight Wiring Harness Connector with Locking Ring

Remove the Wiring Harness from the Presence Sensing Step.

STEP 4: Access Panel Removal

Open both the left hand side and right hand side access panels to gain access to the crusher panel pivot pipe. See Figures 6 and 7. The crusher panel pivot pipe is also used as an electrical conduit.

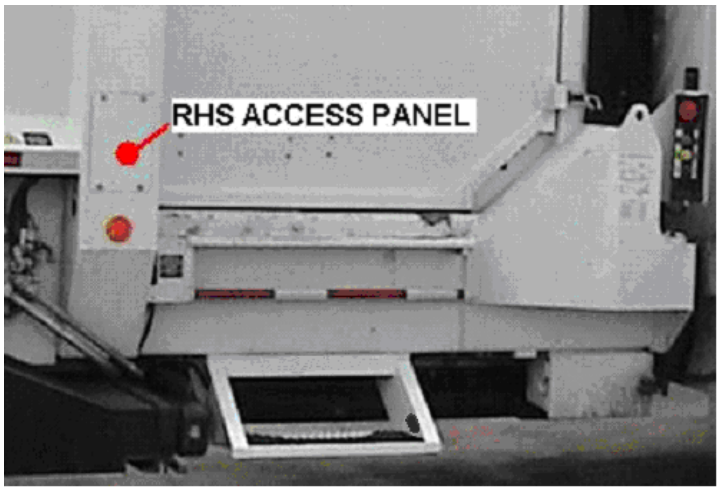


Figure 6: RHS Access Panel

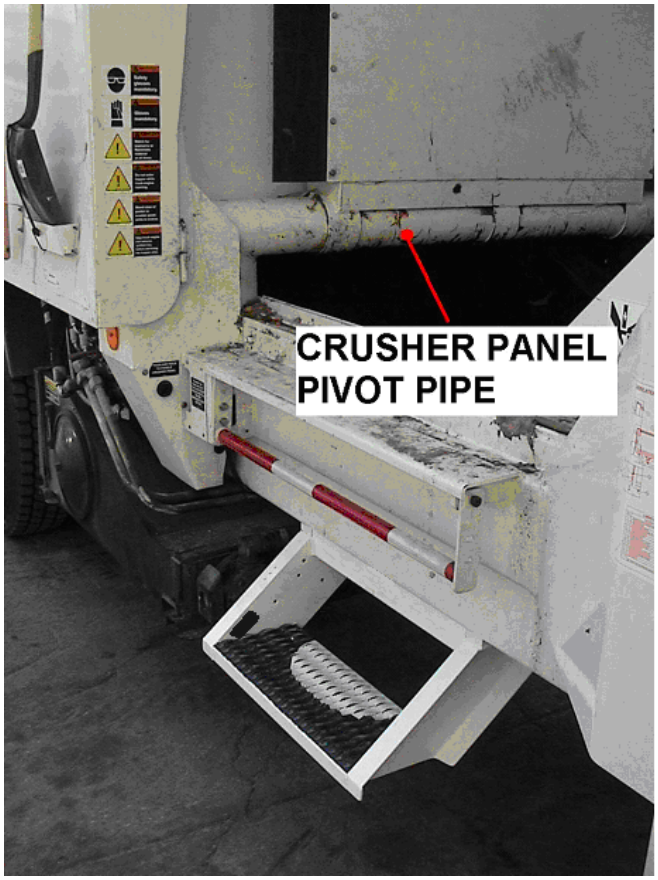


Figure 7: Crusher Panel Pivot Pipe used as an Electrical Conduit

Remove the LHS Packer Module Access Panels as shown in Figure 8.

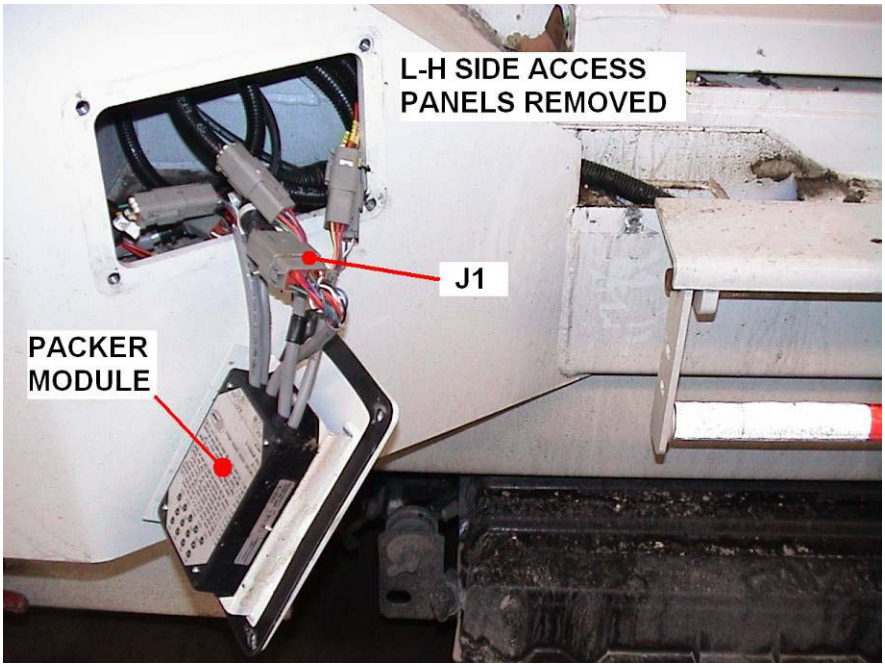


Figure 8: LHS Packer Module Access Panel

STEP 5: Wire Harness Connection to Packer Control Module

Disconnect the 12-pin connector J1, and connect the PSS-24 Wiring Harness in-line with the existing 12-pin connector J1. (see Figures 9 and 10).

Figure 9: PSS-24 Wiring Harness End to Connect In-Line with Existing 12-Pin Packer Control Module Connector J1

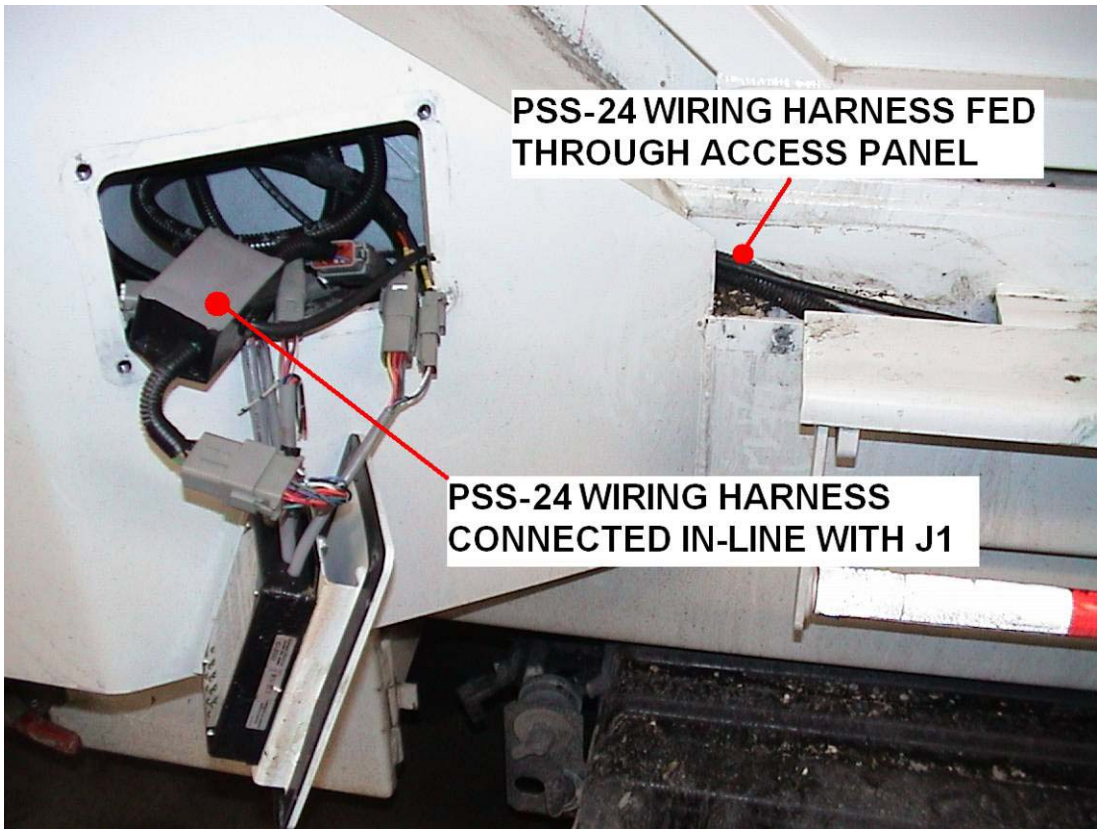


Figure 10: PSS-24 Wiring Harness Connection to Packer Control Module

STEP 6: Wire Harness Connection to PSS-24 Control Unit

Fish the wiring harness connector end to the PSS-24 Control Unit using the access panels and the Crusher Panel Pivot Pipe.

Run the cable end with the protective split-loom down through the RHS Access Panel body, along the outermost hydraulic line, and back to the Control Unit of the PSS-24 Presence Sensing Step. Secure the wire harness cable to the hydraulic line using heavy duty, weatherproof tie-wraps.

Figure 11: Wire Harness Cable Return to Step

Connect the Wiring Harness Connector to the PSS-24 Control Unit, making sure that the locking ring is turned fully clockwise into the locking position (you should feel it 'click' in).

Re-attach the PSS-24 Control Unit Shield, making sure that the grommet on the wiring harness is positioned in the U-shaped cut-out in the shield. Make sure that the cable to the sensor is positioned to be underneath the wiring harness.

STEP 7: Verification of the Detection Zone

This procedure should be performed after installation and during periodic servicing.

Start the Truck and make sure that the hydraulics are active.

The Presence Sensing Step is tailored in order to achieve foot detection as the operator steps onto the step. The Presence Sensing Step detects objects placed directly in between the two sensors at either end. Experimentally verify the detection area by placing a 70 mm diameter by 1000 mm long reference pole onto the step and viewing the response of the red 'detection' LED. (Both a simulated leg and an actual leg, covered with a pant leg made of standard 'blue' coverall material, were determined to provide a stronger reflection back to the sensor and were thus easier to detect than the reference pole.)

Please note that the sensor sensitivity has been pre-set so as to achieve detection when a foot or boot is placed between both sensors. Proper in-service verification should be performed with the packer stopped and by carefully stepping onto the step and confirming that the red 'detection' LED has turned on when the boot is between the sensors.

STEP 8: Verification of the Packer Interrupt

This procedure should be performed after installation and at the start of each shift/collection run.

Once the Detection Zone has been verified, the interruption of the Packer can be verified by pressing the Green button to initiate a packing cycle. Once the packer is moving forward, a 70 mm diameter by 1000 mm long reference pole (or a work boot) should be placed directly in between the sensors. At the first instance of detection, the red 'detection' LED will turn on and if the electrical connection is in the Main Configuration, the power to the hydraulics will be disconnected for 5 seconds stopping the Packer's current motion. After 5 seconds the power will be reconnected and the operator may now continue the packing cycle by pressing the Green button. If the electrical connection is in the Alternate Configuration, the electrical circuit to the Forward Air Solenoid Valve (Line 107) will be disconnected. The electrical circuit to the Forward Air Solenoid Valve (Line 107) will remain disconnected for 5 seconds and until the Yellow Retract Button is pressed and the Packer is fully retracted. Once fully retracted, the operator may once again initiate a packing cycle by pressing the Green button.

STEP 9: Excess Cable Fastening and Access Panel Closure

Gather and securely fasten the excess cable from the wiring harness using heavy duty weatherproof tie-wraps.

Re-insert the Packer Control Module and re-attach all of the Access Panel covers that were removed in Step 4.

ADHERENCE TO GUARDING PROVISIONS AND STANDARDS FOR THE PRESENCE SENSING STEP MODEL # PSS-24

June 5, 2007

MARLEX Engineering Inc. has completed a thorough review of the Guarding Provisions and Standards listed on Page 9 of the April 2001 Ministry of Labour Publication “Guidelines for Pre-Start Health and Safety Reviews: How to Apply Section 7 of the Regulation for Industrial Establishments”. An applicability review was conducted to determine which Guarding Provisions and Standards were pertinent to the application of a Presence Sensing Step to Side Loading Compacting Equipment. The pertinent standards and guidelines were purchased and reviewed in detail.

As a result of its review of the Guarding Provisions and Standards, MARLEX Engineering Inc. has determined that the Presence Sensing Step Model # PSS-24, along with its supporting documentation, and when installed according to the instructions provided in this manual, meets the requirements set forth in the following publications:

MOBILE COMPACTING EQUIPMENT SAFETY GUIDELINE (MOL: MAY 2004)

SAFEGUARDING OF MACHINERY (CSA: Z432-04, MARCH 2004)

PERFORMANCE CRITERIA FOR SAFEGUARDING (ANSI B11.19-2003)

MOBILE WASTES AND RECYCLABLE MATERIALS COLLECTION, TRANSPORTATION, AND COMPACTION EQUIPMENT SAFETY REQUIREMENTS
(ANSI Z245.1-1999)