OPERATION, MAINTENANCE, AND INSTALLATION MANUAL

V.I.P. Vert-I-Pack®

With VIP-LOCK®: Positive Container Lock-in Device

Solar Panel Version

Includes FL/3 and Untouchable Models

MARATHON® A DOVER COMPANY

Marathon Equipment Company
OMI Manual No. 0020-S, Revision Date: August 2010
www.marathonequipment.com

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Introduction

Thank you for purchasing a Marathon Vert-I-Pak® (VIP) Compactor.

This product is designed to give you reliable service and superior performance for years to come. To guarantee top performance from your equipment, and the safest operation, each person involved in the operation, maintenance, and installation of the equipment should read and thoroughly understand the instructions in this manual and follow ALL warnings.

Employers involved in the operation, maintenance, and installation of the equipment should also read and understand the most current version of the following applicable standards:

ANSI Standard No. Z245.2, "Stationary Compactors Safety Requirements"

A copy of this standard may be obtained from ANSI (www.ansi.org):

25 West 43rd Street
New York, NY 10036

OSHA Title 29 CFR, Part 1910.147

"The Control of Hazardous Energy (Lock-Out and Tag-Out)" (www.osha.gov)

Any service or repair instructions contained in this manual should be performed by factory authorized personnel only.

If you should need assistance with your equipment, please contact your distributor. When contacting your distributor, you will need to provide:

- Serial Number: _____
- Installation Date: _____
- Electrical Schematic Number: _____

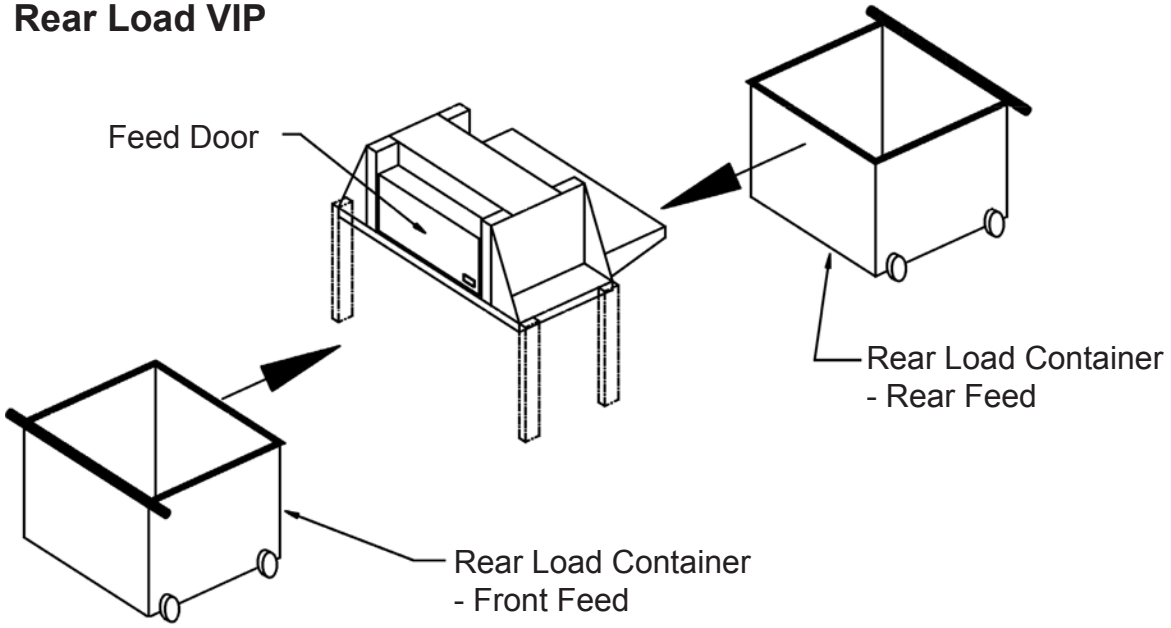
If you have any safety concerns with the equipment, or need further information, please contact us at 1-800-633-8974 or

Marathon Equipment Company
Attn: Field Service Department
P.O. Box 1798
Vernon, AL 35592-1798

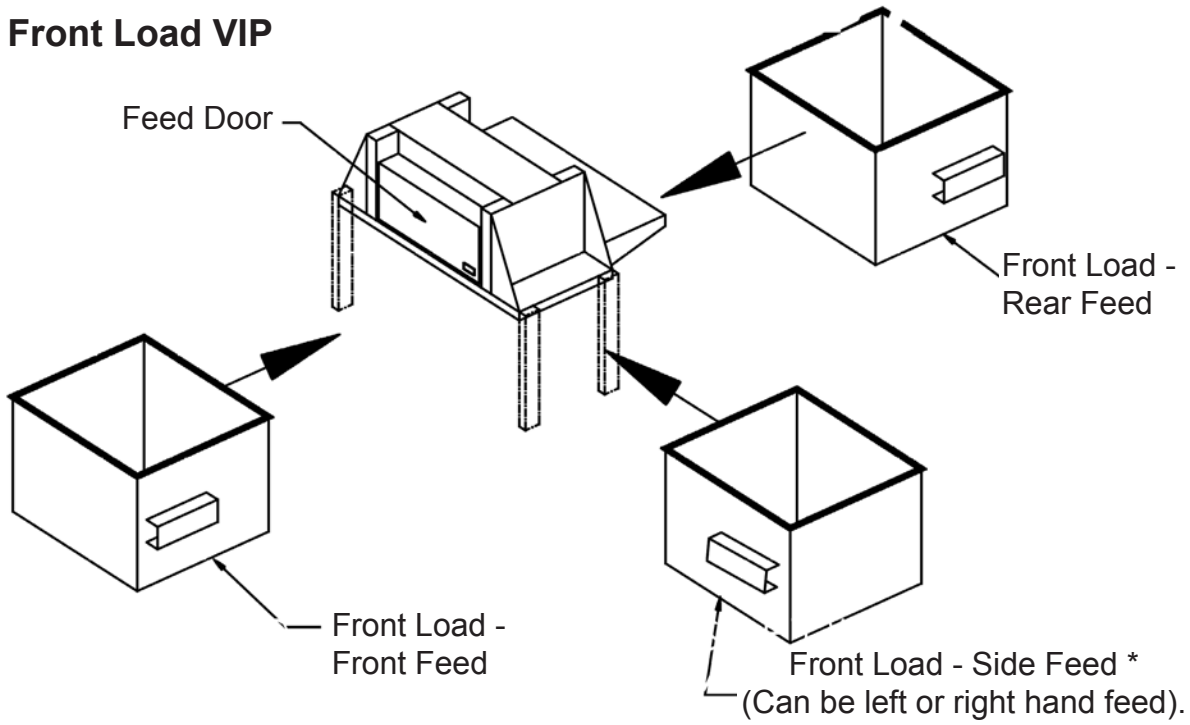
Specifications

Clear Top Opening	23.5” x 46”
Cycle Time	30 seconds
Total Normal Force	26,400 lbs.
Total Maximum Force	30,200 lbs.
Electric Motor	3/4 HP, 1 Phase
Voltage	1/60/120

Rear Load VIP



Front Load VIP



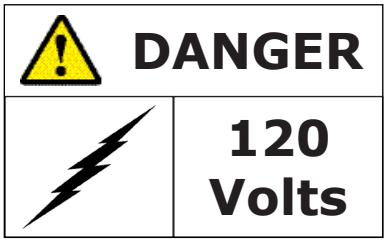
Pre-Operation Instructions

CAUTION: THIS MACHINE STARTS AUTOMATICALLY. Stay clear of all internal parts of the compactor during operation. Failure to do so could result in serious injury or death!

DANGER: DO NOT ENTER. Never enter any part of the compactor unless the disconnect switch has been locked-out and tagged-out per the "Lock-Out & Tag-Out Instructions" on page 2-1. Before starting the compactor, be sure no one is inside. Be certain that everyone is clear of all points of operation and pinch point areas before starting.

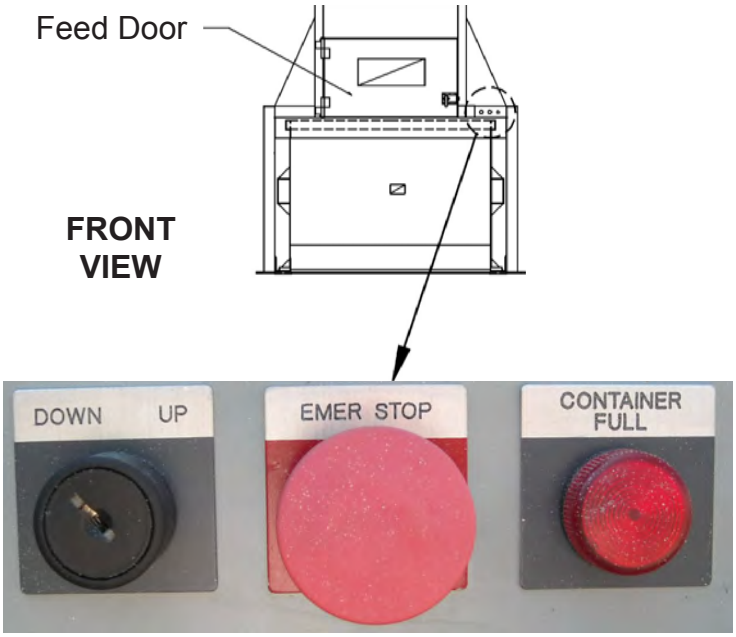
THE EMPLOYER SHOULD ALLOW ONLY AUTHORIZED AND TRAINED PERSONNEL TO OPERATE THIS COMPACTOR. This compactor is equipped with a key operated locking system. The keys should be in the possession of only authorized personnel.

DO NOT REMOVE ACCESS COVERS EXCEPT FOR SERVICING. Only authorized service personnel should be allowed inside. All access covers on the compactor body should always be secured in place when the unit is operating. See Lock-Out & Tag-Out instructions on page 2-1.



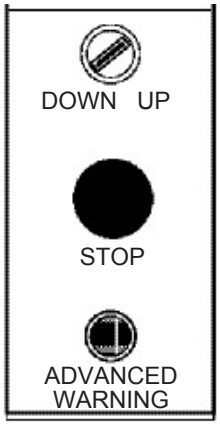
ONLY AUTHORIZED PERSONNEL SHOULD BE ALLOWED INSIDE THE PANEL BOX. The panel box contains high voltage components. See Lock-Out & Tag-Out Instructions on page 2-1.

Controls For Standard Units



1. **DOWN/UP** (Keyed Start Switch) - This spring-return switch requires a key for operation. Insert the key in the DOWN position and turn clockwise to the UP position and release. The compactor ram will travel to the up position and stop. The feed door can then be opened for loading. After the material has been loaded, close the door. The ram automatically compacts the material, returns to the mid-point position, then stops. After use, remove the key.
2. **EMERGENCY STOP** - When depressed, this big red pushbutton will stop all powered operation of the compactor.
3. **CONTAINER FULL** - Automatically lights up when the container is completely full. To reset the light, empty and replace the container.

Controls For Untouchable Units



1. **DOWN/UP** (Keyed Start Switch) - This spring-return switch requires a key for operation. Insert the key in the DOWN position and turn clockwise to the UP position and release. The compactor ram will travel to the up position and stop. The feed door can then be opened for loading. After the material has been loaded, close the door. The ram automatically compacts the material, returns to the mid-point position, then stops. After use, remove the key.

2. **STOP** (Emergency Pushbutton) - When depressed, this pushbutton will stop all powered operation of the compactor.

3. **ADVANCED WARNING** (Light) - When this automatically lights up, 200 PSI is left before the pressure switch is activated to shut the unit off and container is full.

Operating Instructions (Standard and Untouchable Units)

1. Insert the key into the key switch (DOWN position). Turn it clockwise, hold for 1 to 2 seconds, then release. The compactor ram retracts to the top position and stops.

2. Open the feed door and place the material to be discarded into the compactor.

3. Close the feed door and the ram will automatically cycle down and compact the material. The ram returns to the mid position and stops.

4. Repeat steps 1 - 3, if necessary, after the compactor has stopped.

5. When you have finished using the compactor, remove the key from the key switch.

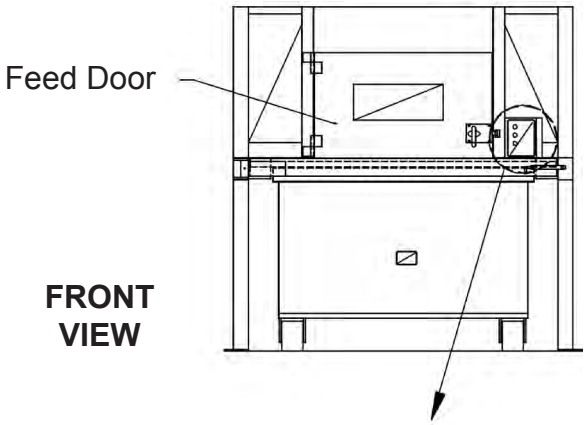
6. When the CONTAINER FULL light comes on, the container should then be emptied. Hauler Instructions are provided in "HAULER INFORMATION" on page 4-1 of this manual.

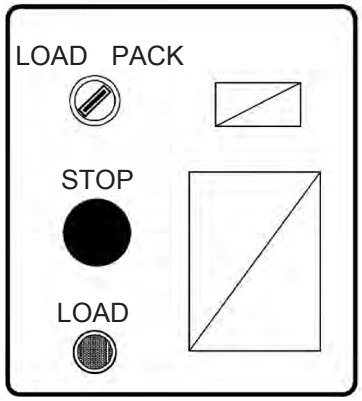
IN CASE OF EMERGENCY:
Push the large RED button to STOP

Tips For Maximum Compaction

- Place the material uniformly across the compaction area.
- Always keep the feed door closed. This assures that the ram has compacted the material and has stopped at the mid position where it holds constant pressure on the material.

Controls - 3 Cubic Yard Front Load





1. **LOAD/PACK** (Keyed Start Switch) - This two-position switch requires a key for operation. Insert the key in the PACK position and turn counter-clockwise to the LOAD position. The compactor ram will travel to the up position and stop. The LOAD light comes on, allowing the feed door to be opened for loading of material. When the material is loaded, close the door. Turn the key to the PACK position. The ram compacts the material, returns to the mid point position, and stops. After use, remove the key.

2. **STOP** (Emergency Red Pushbutton) - When depressed, this pushbutton will stop all powered operation of the compactor.

3. **LOAD** (Light) - Automatically lights up when the ram is in the up position. The compactor door can be opened and material can be loaded at that time.

Operating Instructions - 3 Cubic Yard Front Load

1. Insert the key into the key switch (PACK position). Turn it counter-clockwise to the LOAD position. The compactor ram retracts to the top position and stops. The LOAD light then comes on.

2. Open the feed door and place the material to be discarded into the compactor.

3. Close the feed door and turn the key to the PACK position. The ram cycles down and compacts the material. The ram then returns to the mid position and stops.

4. Repeat steps 1 - 3, if necessary, after the compactor has stopped.

5. When finished using the compactor, remove the key from the key switch.

IN CASE OF EMERGENCY:
Push the large RED button to STOP

Tips For Maximum Compaction

- Place material uniformly across the compaction area.
- Always compact (PACK) the material that is put into the compactor. This assures that the ram has cycled and stopped at the mid position where it holds constant pressure on the material.

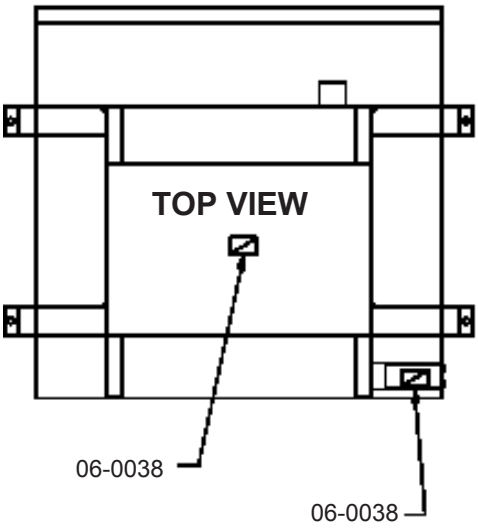
Decals

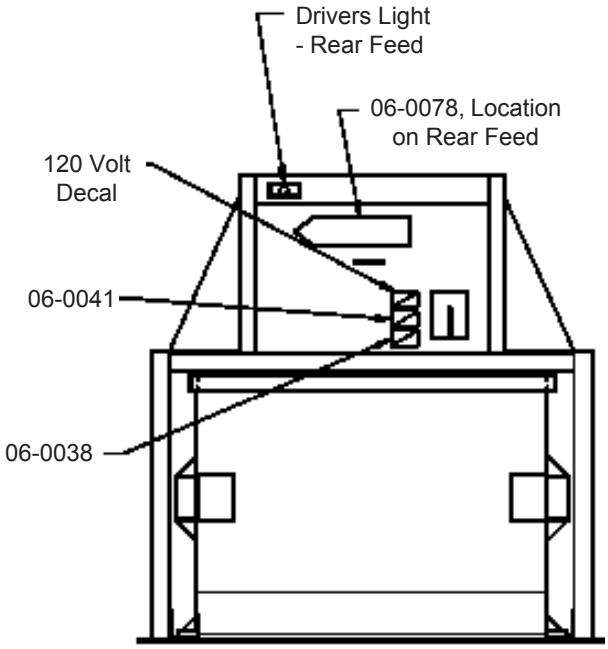
Warning Decal Requirements

When your compactor leaves the factory, the following warning decals are installed for protection. These decals are subject to wear and abuse due to the nature of the material handling operation. THESE DECALS MUST BE MAINTAINED. Additional decals may be purchased from your distributor or from Marathon Equipment Company. Refer to "Decal Placement for Standard VIP" on page 1-9.

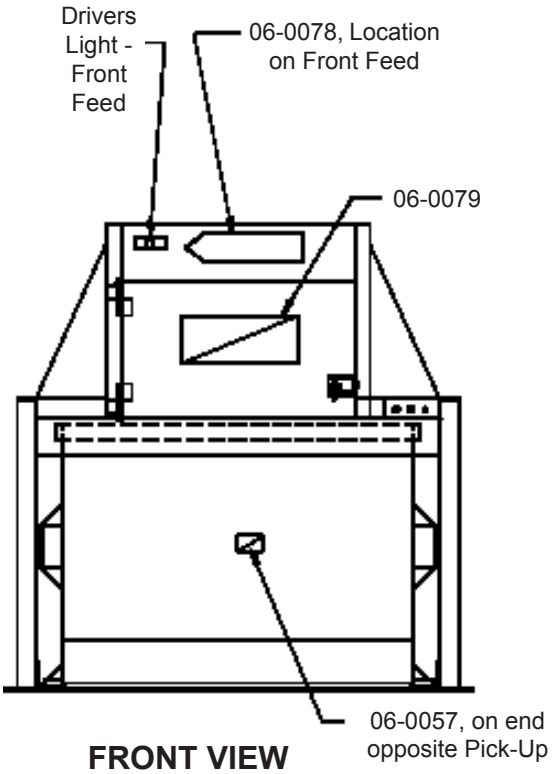
Decal #	Type
06-0038	CAUTION: Do not remove access cover except for servicing. Turn control panel key switch to off position and remove key.
06-0039	DANGER: Do not enter
06-0041	CAUTION: This compactor starts automatically.
06-0057	CAUTION: Stand clear when container is being lifted.
06-0068	Do not play in, on, around, or occupy container for any purpose.
06-0121	NOTICE: Federal regulations prohibit operation of this equipment by persons under 18 years of age.
06-0249	Lock out and tag out power before performing any maintenance, repair, adjustment, or before entering machine. (Refer to the service manual for complete lock out and tag out procedure or call 1-800-633-8974.)
06-0279	Serial Number Plate, Containers, ANSI Z245.3 - 1999 Version
06-0345	VIP (Vert - I - Pack)
06-0531	Loading Instructions: 1. To start-turn key to "UP". 2. After motor stops, open door. 3. Put material as for back as possible 4. Close door. Unit will start automatically. Container Full Light - When on, container is full. Unit will not operate until container is emptied.
06-2203	DECAL: White reflective tape
06-2394	CAUTION: Container must be placed on hard level surface. Load uniformly.
06-0078	(English/Spanish Driver Decal) Attention Driver: Remove container only when light is on. Important: Light on indicates container in proper position. V.I.P. VERT-I-PACK. Marathon Equipment Company. Patent No. 4,235,165. (See instructions in "Decal Placement" for 3 cu yd FL).
06-0092 (3 cu yd FL only)	(Operating Instruction Decal) Load/Pack, Stop, Load. 1. Insert key and turn to "load" position. 2. Wait until load light comes on. 3. Open door and load material. 4. Close door, turn key to "pack" position, and remove key.

Decal Placement for Standard VIP

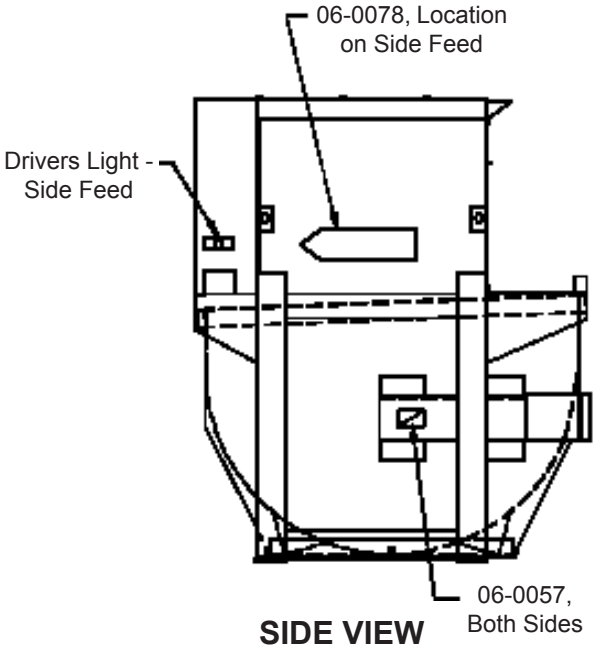




REAR VIEW

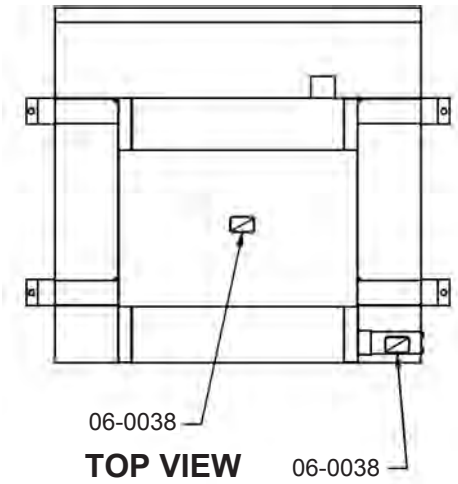


FRONT VIEW

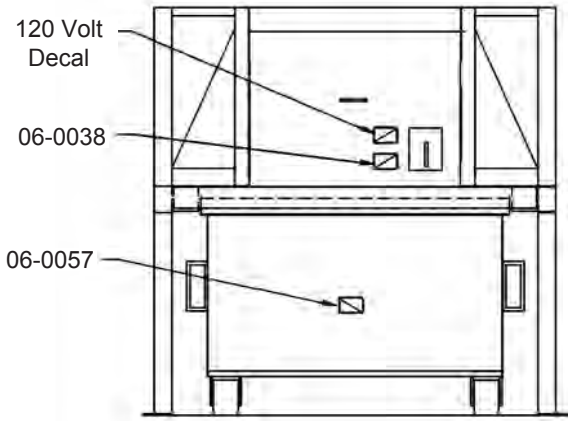


SIDE VIEW

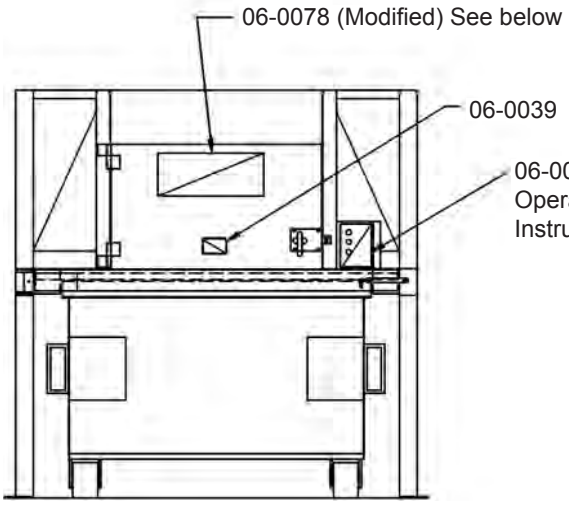
Decal Placement - 3 Cubic Yard Front Load



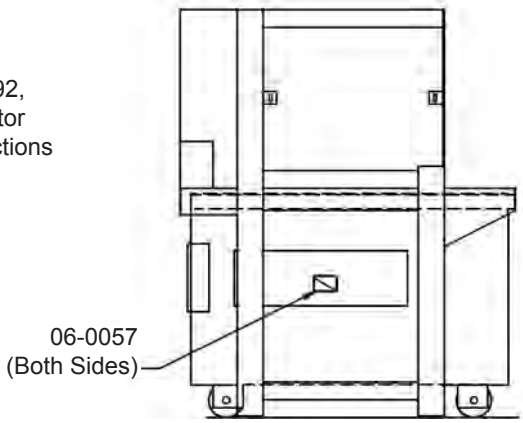
TOP VIEW



REAR VIEW

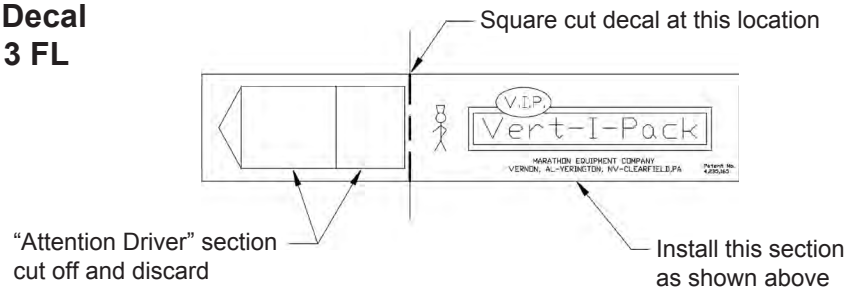


FRONT VIEW



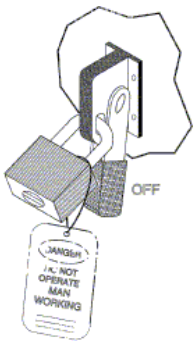
SIDE VIEW

Modification of Decal
06-0078 for VIP 3 FL



MAINTENANCE

Lock-Out & Tag-Out Instructions



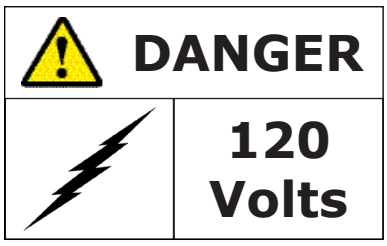
Before entering any part of the compactor, be sure that all sources of energy have been shut off, all potential hazards have been eliminated, and the compactor is locked-out and tagged-out in accordance with OSHA and ANSI requirements. If the ram is pressing against a load, move the ram upward before shutting the compactor down.

The specific lock-out and tag-out instructions may vary from company to company (such as multiple locks may be required, or other machinery may need to be locked-out and tagged-out). The following instructions are provided as minimum guidelines.

Instructions

1. Move the main disconnect lever to the OFF position.
2. Padlock the disconnect lever with a keyed padlock and take the key with you.
3. Along with the padlock, place an appropriate, highly visible, warning tag on the disconnect lever. The tag should provide a warning such as: " Danger: Do not operate equipment. Person working on equipment. Warning: Do not energize without the permission of _____."
4. After locking and tagging the compactor, try to start and operate the compactor (as outlined in the Operation section) to make sure the lock-out and tag-out is effective. If it is, remove the key from the keyswitch and take with you.

CAUTION: This machine starts automatically. The Vert-I-Pack compactor is designed to automatically cycle the ram when the feed door has been opened and closed. Do not perform any maintenance, repairs, or adjustments to the compactor until it has been locked-out and tagged-out per the instructions above.



Electrical: The panel box contains high voltage components. Only authorized service personnel should be allowed inside the box. Authorized service personnel should be allowed inside the box only after the compactor has been locked-out and tagged-out.

Hydraulic: Stored hydraulic energy must be removed from the compactor hydraulic circuit for complete lock-out and tag-out. Make sure that this energy has been relieved by manually depressing the solenoid valve pin located in the center of the coil end of the directional control valve on the power unit.

Periodic Maintenance

DANGER: Only authorized and trained personnel should perform the following procedures. Lock-Out and Tag-Out per as specified in "Lock-Out & Tag-Out Instructions" on page 2-1.

Monthly (or every 160 hours of operation)

1. Check hoses for chafing, rubbing, or other deterioration and damage.
2. Check for any obvious unsafe conditions in the compactor area.
3. Check oil level in the hydraulic reservoir. Level should be 3/4 of sight gauge.
4. Clean out debris from behind the compactor ram.
5. Check the magnetic door lock for proper operation. See "Procedure - Magnetic Door Interlock Adjustment/Testing" on page 2-7.
6. Check container gone interlock for proper operation. See "Procedure - Container Interlock Adjustment" on page 2-8.
7. Lubricate the Vert-I-Pack. See the "Lubrication Diagram" on page 2-4.

Three Months

1. Check functional operation of controls and options (such as stop button, timers, and lights).
2. Check the hydraulic cylinder and connections for leakage.

Annually

1. Lubricate the electric motor bearings annually per the manufacturers instructions.
2. Change the hydraulic fluid and suction strainer in the power unit reservoir.

Filter Maintenance

1. The hydraulic filter should be cleaned at regular yearly intervals. See the power unit diagram later in this section for location.
2. Remove the four bolts from the reservoir top plate and lift the power unit off of the reservoir. The filter can then be removed from the hydraulic pump.
3. Care should be exercised in cleaning the filter to ensure that the element is not torn. Clean the element with a soft brush and standard industrial solvent.
4. Replace the filter after cleaning and tighten the union securely. Pump noise and a "crackle" sound is most often caused by air entering the pump suction line. Tightening the suction fittings usually eliminates the problem.

Recommended Oils

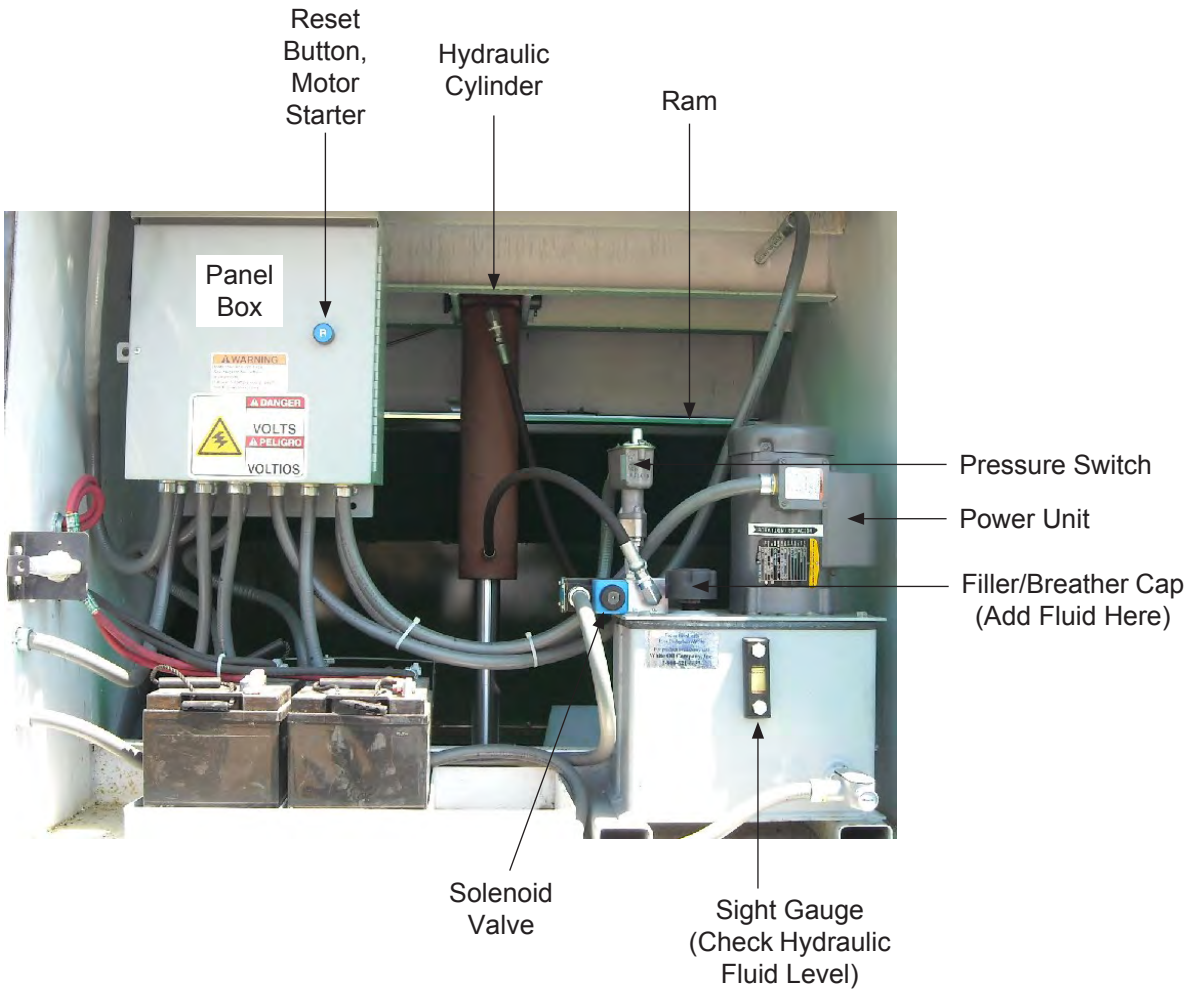
Union-UNAX-46, UNAX-AW46
Gulf-Harmony 47, Harmony 48-AW
Exxon-Teresstic 46, NUTO 46
Texaco-Rando 46
Chevron-AW 46
Shell-Turbo 46, Tellus 46
Citgo-Pacemaker 46, Tellus-AW46
Conoco-Super Hydraulic Oil 46
Quaker State-Dextron II (ATF) Automatic Transmission Fluid
Amoco-Rycon MV Cold Weather Fluid

Maintenance Map For VIP

WARNING: Never enter any part of the compactor until the unit has been locked out and tagged out per the instructions on page 2-1.

This diagram shows the location of the key components of the VIP.
Note: Untouchable models will vary in power unit placement (it is side-mounted with side access). However the components should not vary. The number of batteries may vary, though.

This section of the manual covers basic maintenance procedures.
For information not covered here, please contact the Ramjet Service Department at 1-800-633-8974.

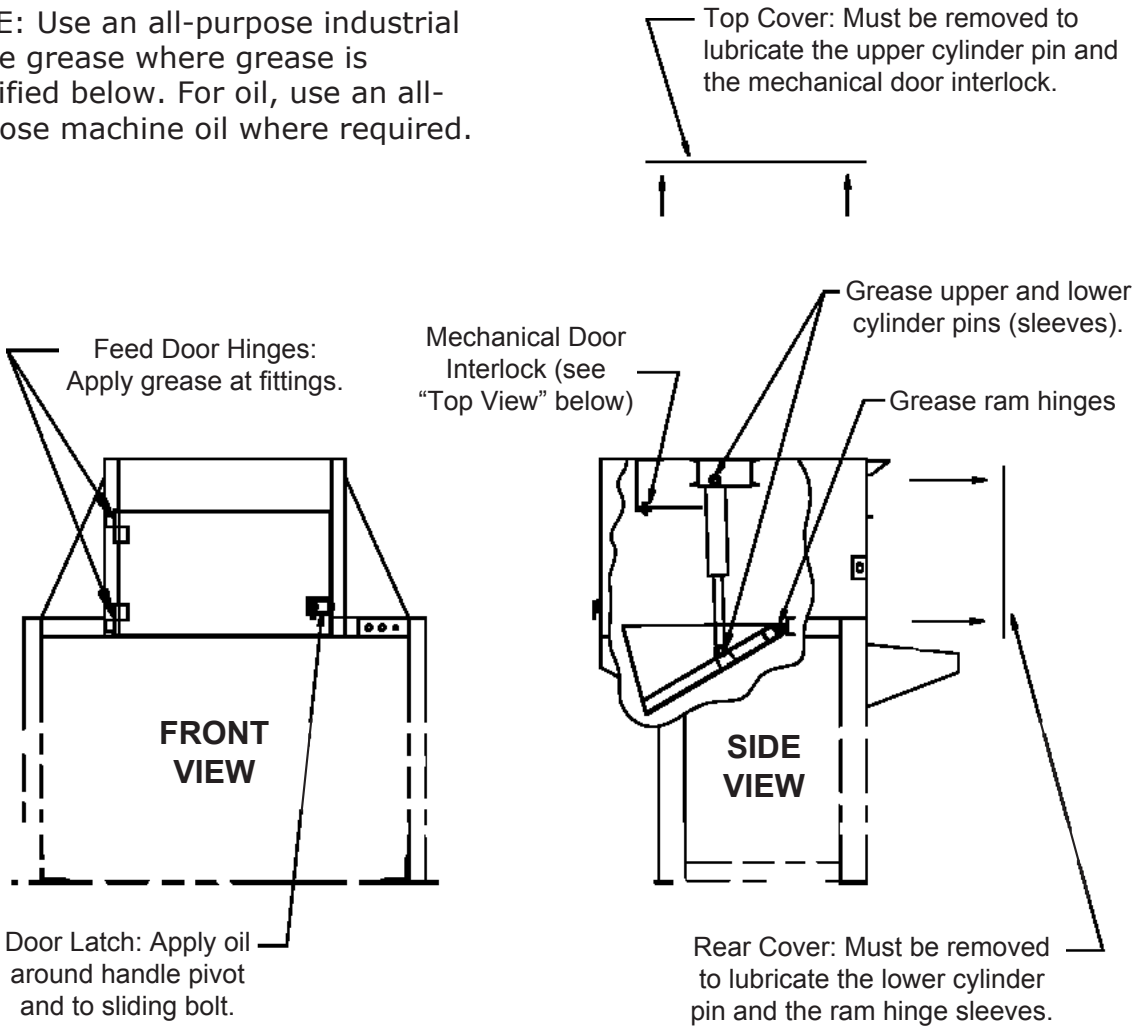


Rear View of VIP
(End opposite feed door, rear access cover removed)

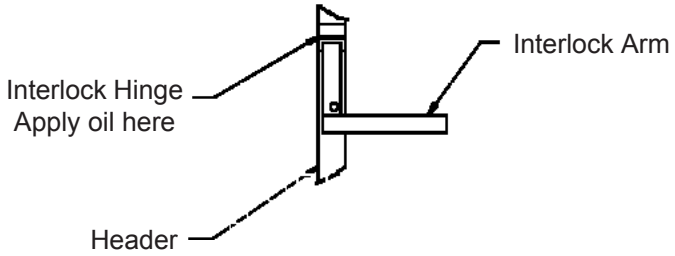
Lubrication Diagram

WARNING: Never enter any part of the compactor until the unit has been locked out and tagged out per the instructions on page 2-1.

NOTE: Use an all-purpose industrial grade grease where grease is specified below. For oil, use an all-purpose machine oil where required.



TOP VIEW
Mechanical Door Interlock



Procedure - Limit Switch Adjustment (Top)

WARNING: Never enter any part of the compactor until the unit has been locked out and tagged out per the instructions on page 2-1.

Step 1 - Locate the top position limit switch.

NOTE: The limit switch for the ram top position should be set to actuate when the cylinder is 1/2" from bottoming out.

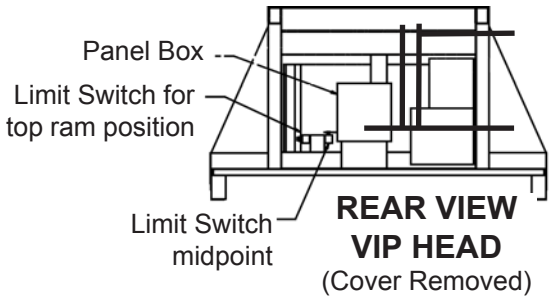
Step 2 - Loosen the limit switch arm.

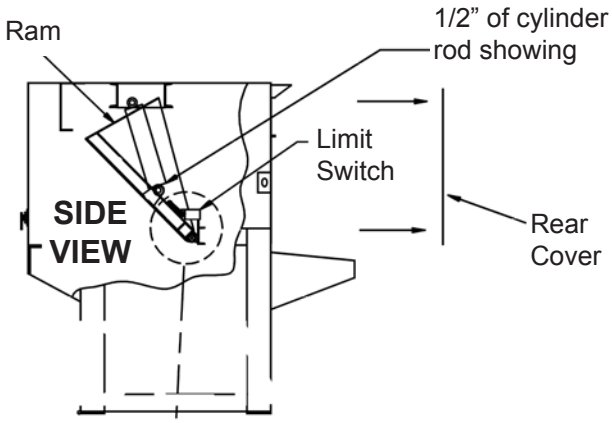
Step 3 - Make sure the compactor is clear of all personnel. Raise ram to a position where the cylinder lacks 1/2" before bottoming out.

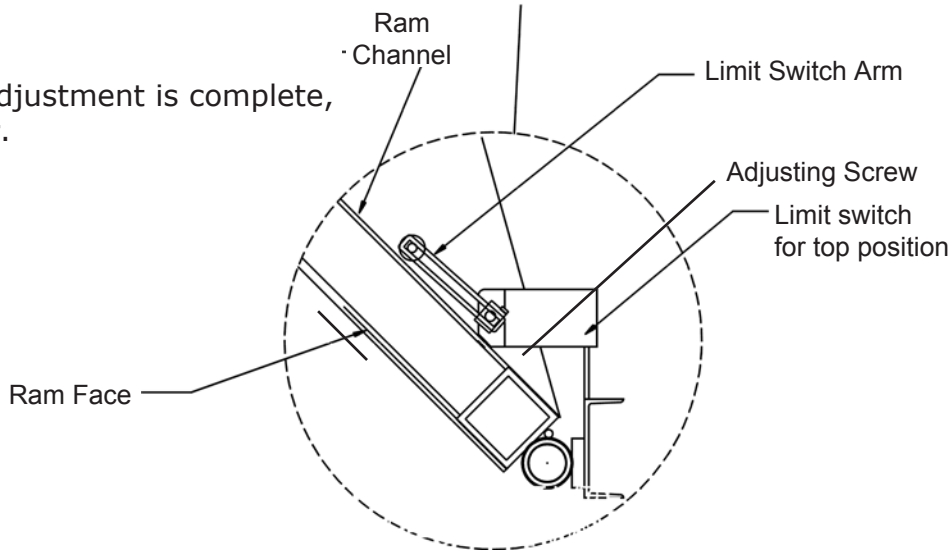
Step 4 - Position limit switch arm against ram channel and tighten the adjusting screw.

Step 5 - Make sure the compactor is clear of all personnel and test run compactor. If the cylinder bottoms out, Steps 3 and 4 need to be repeated while increasing the 1/2" measurement by 1/8".

Step 6 - When adjustment is complete, replace the cover.







Procedure - Limit Switch Adjustment (Midpoint)

WARNING: Never enter any part of the compactor until the unit has been locked out and tagged out per the instructions on page 2-1.

Step 1 - Locate the midpoint limit switch.

NOTE: The limit switch for the ram midpoint position should be set so the ram face stops 1-1/2”-2” above the bottom of the door opening.

Step 2 - Run ram to the up position and open the door. Make a 6” chalk mark horizontally located 21-1/4” above the bottom of the door opening on the inside wall of the VIP.

Step 3 - Close the door and remove the rear access cover.

Step 4 - Clear the compactor area of all people, run the ram down all the way, then push the STOP button.

Step 5 - Loosen the limit switch arm (rod) and slide out of actuator.

Step 6 - Clear the compactor area of all people and manually engage the motor starter until the top of the ram reaches the chalk mark.

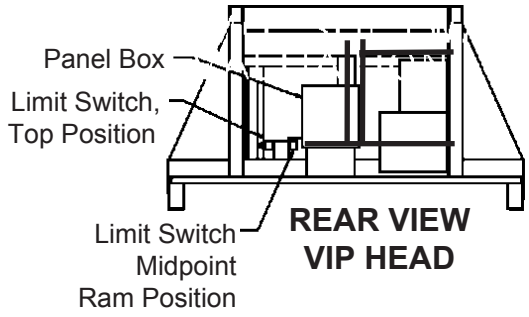
NOTE: Release the starter before the ram reaches the mark because the ram will drift into position.

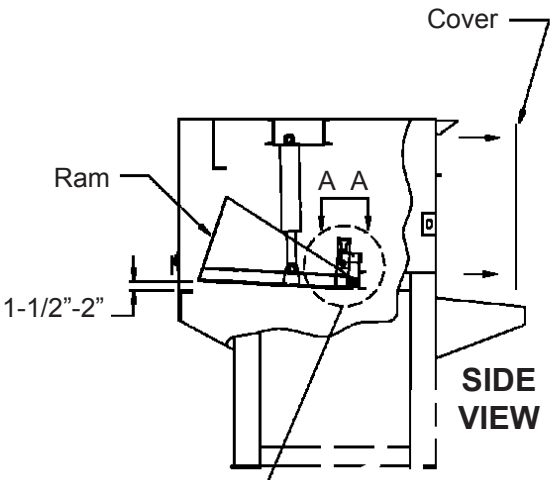
Step 7 - Extend the limit switch arm back through the actuator and position against the back of the slot in the actuator (as shown at right).

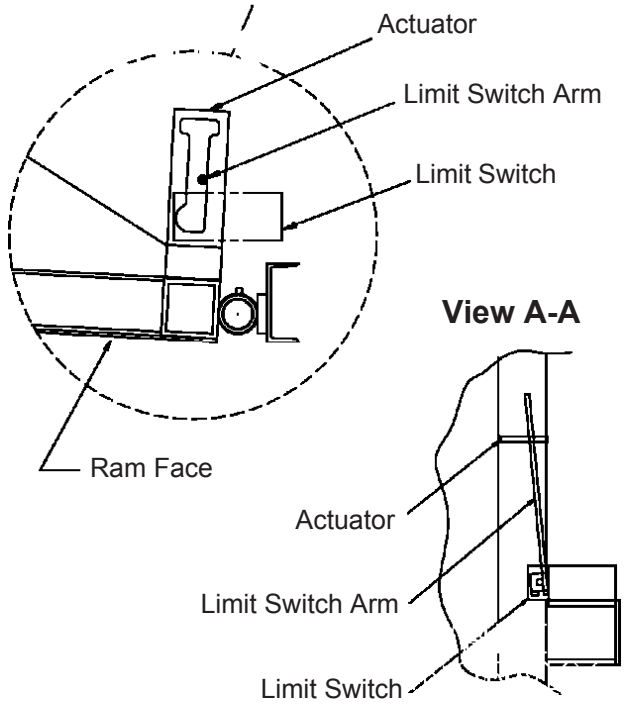
Step 8 - Tighten the Allen screws on the arm assembly.

Step 9 - Clear the compactor area of all people and run the machine to check for proper operation.

Step 10 - Replace the rear access cover.







Procedure - Magnetic Door Interlock Adjustment/Testing

WARNING: Never enter any part of the compactor until the unit has been locked out and tagged out per the instructions on page 2-1.

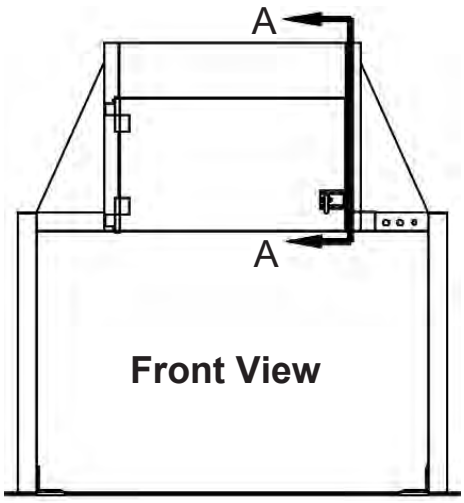
Step 1 - Lock-out and Tag-out the compactor.

Step 2 - Loosen the screws holding the interlock switch to the bracket.

Step 3 - Adjust the switch up or down until the gap between the magnet and interlock switch is 1/16”. Tighten all screws.

Step 4 - Turn the power on.

Step 5 - Operate unit to check for proper operation. If adjustment is correct and the interlock is in good condition, unit should not run with door open.



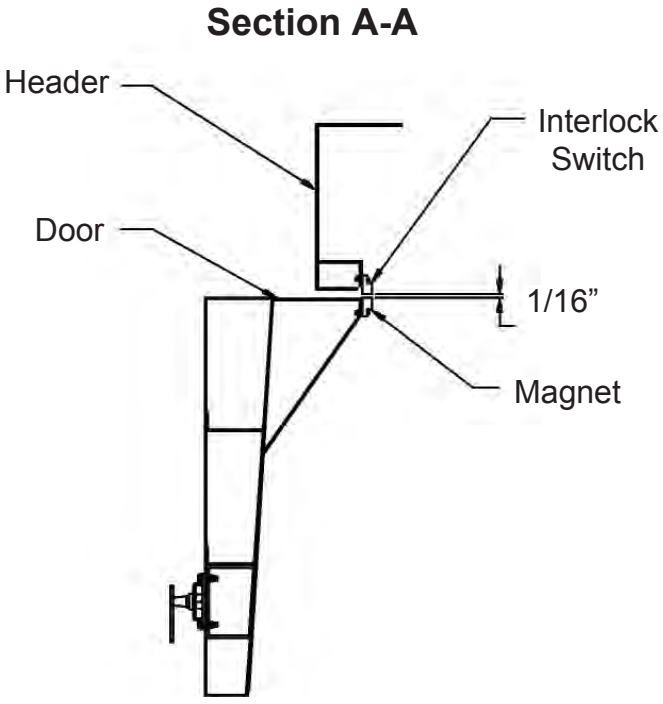
Testing

If further testing is required, a qualified and authorized electrician should make the following check:

1. With the power on the panel box, connect a volt meter (120 V) to terminals 17 and 9. The container interlock is made if the indicated voltage is 110 V.

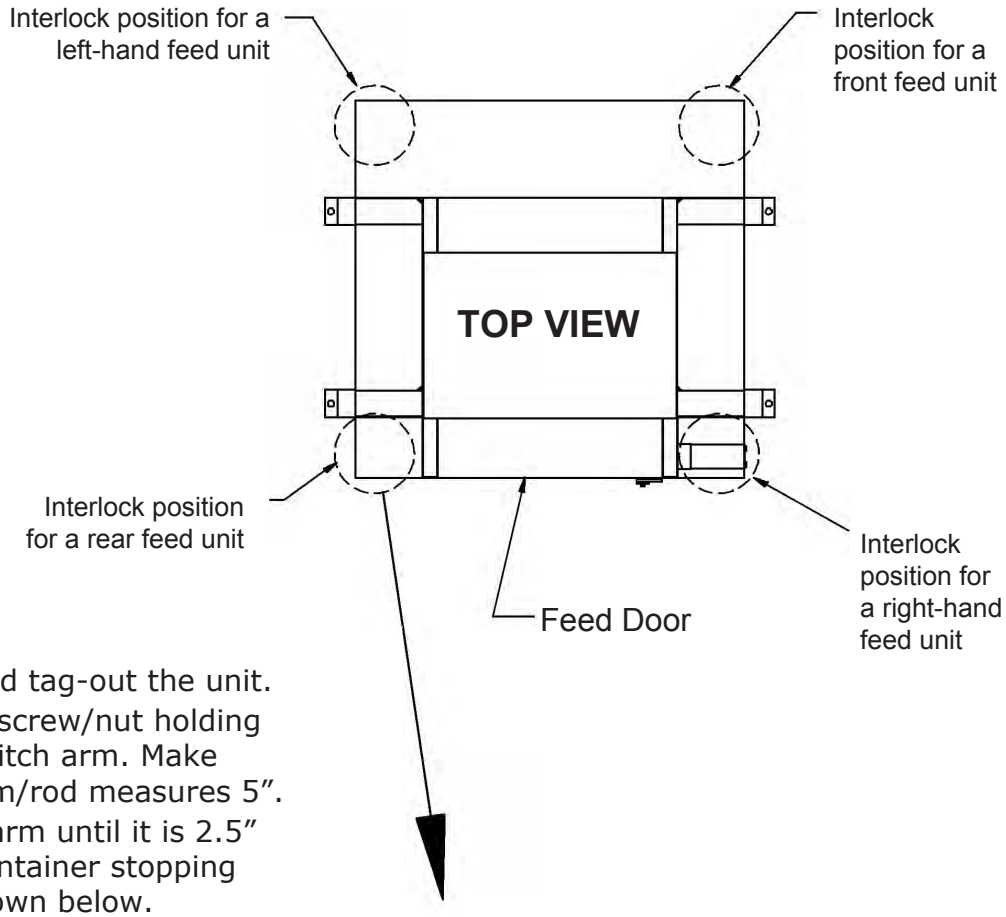
2. Connect the volt meter to terminal 17 and 2. The meter should read 110 V with the door closed.

3. While watching the volt meter, have someone open the door. The voltage should then read zero volts, indicating a good switch.



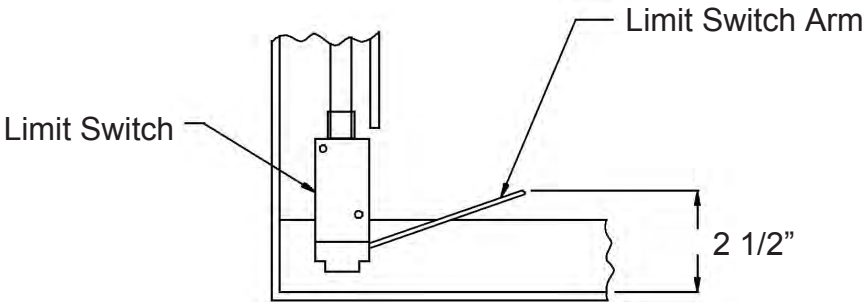
Procedure - Container Interlock Adjustment

WARNING: Never enter any part of the compactor until the unit has been locked out and tagged out per the instructions on page 2-1.



Adjustment

1. Lock-out and tag-out the unit.
2. Loosen the screw/nut holding the limit switch arm. Make sure the arm/rod measures 5".
3. Adjust the arm until it is 2.5" from the container stopping point as shown below.
4. Re-tighten the screw/nut and check measurements.



Top View of Interlock Switch
Shown in position provided with rear feed units.

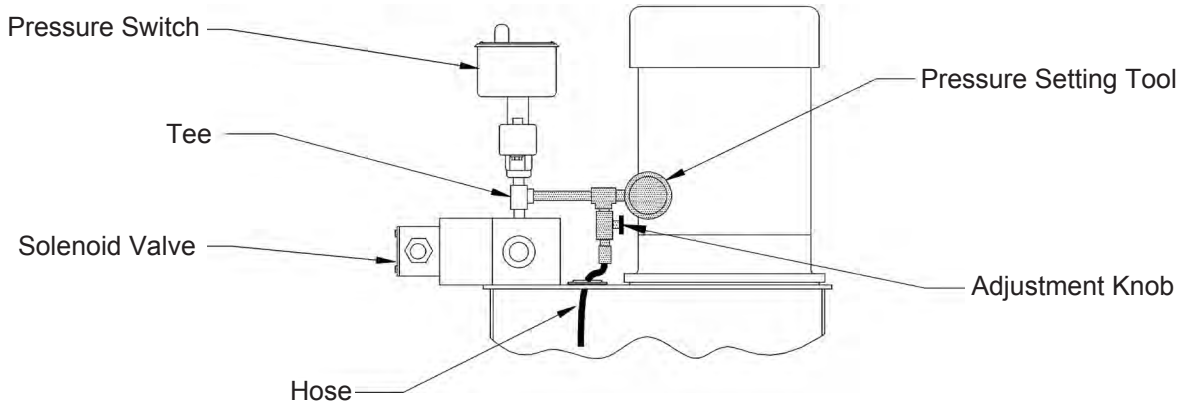
Procedure - Hydraulic System Pressure Setting

WARNING: Never enter any part of the compactor until the unit has been locked out and tagged out per the instructions on page 2-1.

WARNING: Do not begin this procedure without the special pressure setting tool available from the factory (P/N 29222).

---

1. Push in the STOP button.
2. Relieve the pressure by manually depressing the solenoid valve pin (spool) in the end of the valve.
3. Remove the 1/4” pipe plug from the tee below the pressure switch and install the pressure setting tool in the tee (threaded pipe section of the tool screws into the tee). Remove the filler/breather cap from the power unit tank and insert the hose from the tool. Make sure hose is inserted completely.
4. Remove the silver cap on top of the pressure switch and turn the adjustment screw counter-clockwise 3 or 4 turns to deactivate the pressure switch.
5. Start the compactor. Adjust the pressure setting, using the adjustment knob on the tool, to 2100 psi and turn the adjustment screw on the pressure switch clockwise until the ram reverses.
6. Reseal the pressure switch, and manually relieve the pressure on the solenoid. Remove the pressure setting tool and replace the 1/4” pipe plug.
7. System pressure is now set.
8. Relief pressure is 2400 psi. The relief valve is located internal to the pump and should not be adjusted.



Partial Side View - Power Unit

Procedure - Cylinder Replacement

WARNING: Never enter any part of the compactor until the unit has been locked out and tagged out per the instructions on page 2-1.

Cylinder Replacement Instructions

1. Make sure the unit is locked-out and tagged-out.
2. Remove the access covers.
3. Positively support the ram with a fork lift and/or 4” x 4” wooden timbers.
4. Remove the hydraulic pressure by depressing the solenoid valve pin/spool.
5. Remove the hoses.
6. Remove the cylinder pins.
7. Remove the cylinders.
8. To install the cylinders, reverse the above steps.

Principles of Operation

Single Phase Hi-Lo Operation (3/4 HP, 1 Phase)

Upon startup, the key is turned to the UP position and the motor starter contacts are made, energizing the motor starter, and starting the electric motor which turns the hydraulic pump. The valve solenoid remains de-energized and the valve spool directs fluid to the rod-end of the cylinder and raises the ram. When the ram gets to the top position, Limit Switch 1 is actuated which stops the ram. At that time, T (20 second delay timer) begins timing the ram in the up position. If the feed door is not opened in 20 seconds, the ram will cycle down and stop at midpoint and the machine will shut down. The ram stops at midpoint when the midpoint limit switch is actuated causing the normally closed R3 contact to open which breaks the circuit to the motor starter.

If the ram is in the up position and the door has been opened and closed, the magnetic door interlock completes the circuit which energizes the motor starter contacts, causing the motor to turn the pump which directs fluid through the energized solenoid valve and to the base end of the cylinder. When the cylinder gets to the end of the extend stroke, the pressure switch senses shift pressure and causes the solenoid valve to de-energize which shifts the valve and starts the cylinder in the retract stroke. As the cylinder/ram retracts, the midpoint limit switch is actuated which breaks the circuit to the motor starter and shuts the machine down.

The Emergency Stop button will shut the compactor down when depressed by breaking the circuit to the motor starter.

The 3/4 HP unit uses a Hi-Low pump with two stages. The pump has a built-in check valve, relief valve, and unloading valve. The hi-low pump allows a smaller horsepower motor to turn the pump during low pressure travel at approximately the same speed as the 3 HP. During low pressure travel (0-500 psi), both sections of the pump are pumping at 3 gpm total. During the high pressure packing stroke (500-2400 psi), the low pressure pump section unloads to the tank (approximately 2.5 gpm). As a result, the cylinder/ram travel speed slows considerably during the high pressure stroke.

VIP 3 Cubic Yard Front Load (3/4 HP, 1 Phase)

Upon startup, the key is turned to the LOAD position. The motor starter contacts are made, energizing the motor starter, and starting the electric motor which turns the hydraulic pump. The valve solenoid remains de-energized and the valve spool directs fluid to the rod-end of the cylinder and raises the ram. When the ram gets to the top position, Limit Switch 1 is actuated which stops the ram, de-energizes the motor starter, and shuts the unit down. With the ram in the LOAD position, material can be put into the compactor.

After the feed door has been closed, the key is turned clockwise to the PACK position. This energizes the motor starter contacts, causing the motor to turn the pump which directs fluid through the energized solenoid valve and to the base end of the cylinder. This causes the ram to travel down and compact the material. When the cylinder gets to the end of the extend stroke, the pressure switch senses shift pressure and causes the solenoid valve to de-energize, which shifts the valve and starts the cylinder in the retract stroke. As the cylinder/ram retracts, midpoint Limit Switch 2 is actuated, which breaks the circuit to the motor starter and shuts the machine down.

The Emergency Stop button will shut the compactor down when depressed by breaking the circuit to the motor starter.

Electrical Charts

Fuses and Circuit Breakers

Motor Size	VAC	Full Load Amp	Dual Element Fuse Max Size	Circuit Breaker Max Size	Service Disconnect Amp
3/4 HP, 1 PH	120	10.6	20	20	30

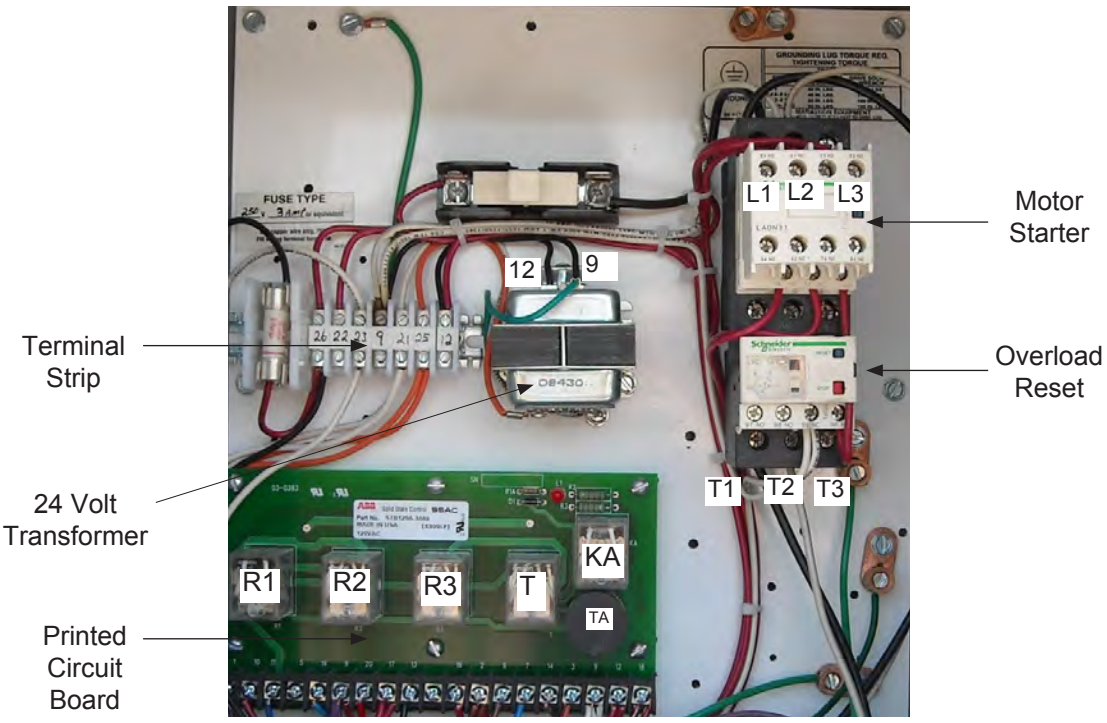
Wire Sizes

THW Copper, 75° C/165° F (for wall power on hybrid units)

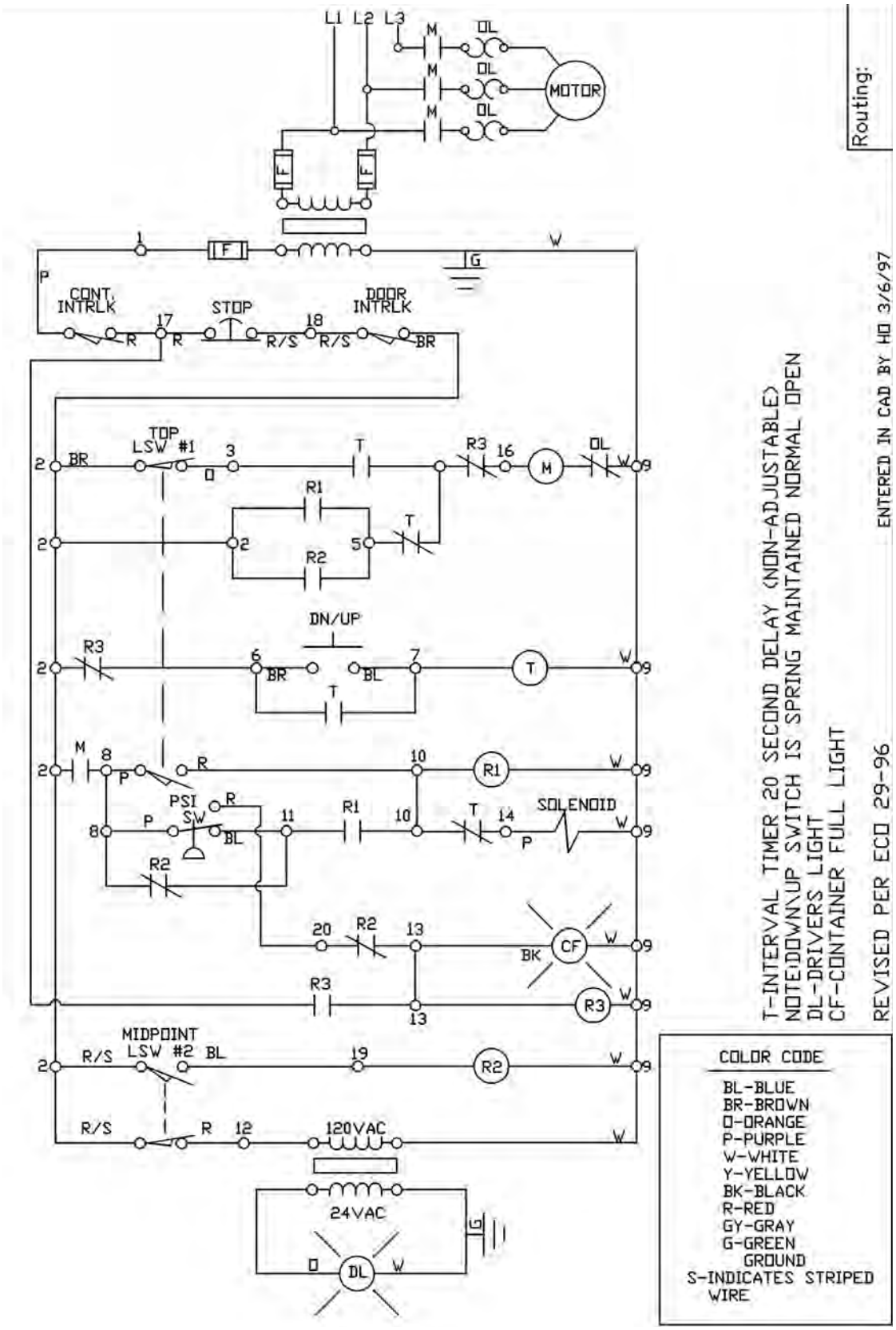
Motor Size	VAC	Length To 100’	Length To 200’	Length To 300’
3/4 HP, 1 PH	120	12	8	6

Panel Box - Standard

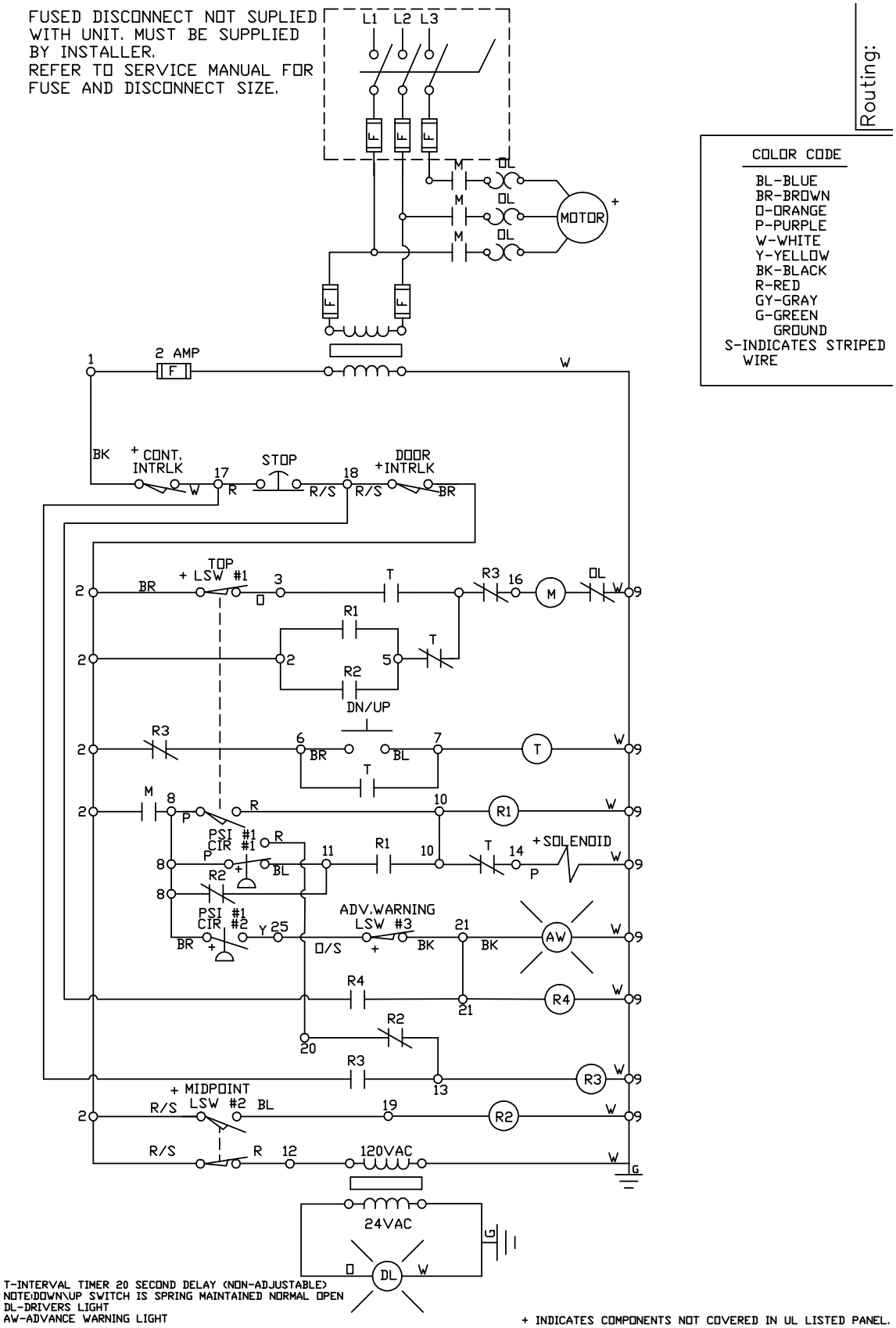
Front View - Panel Box



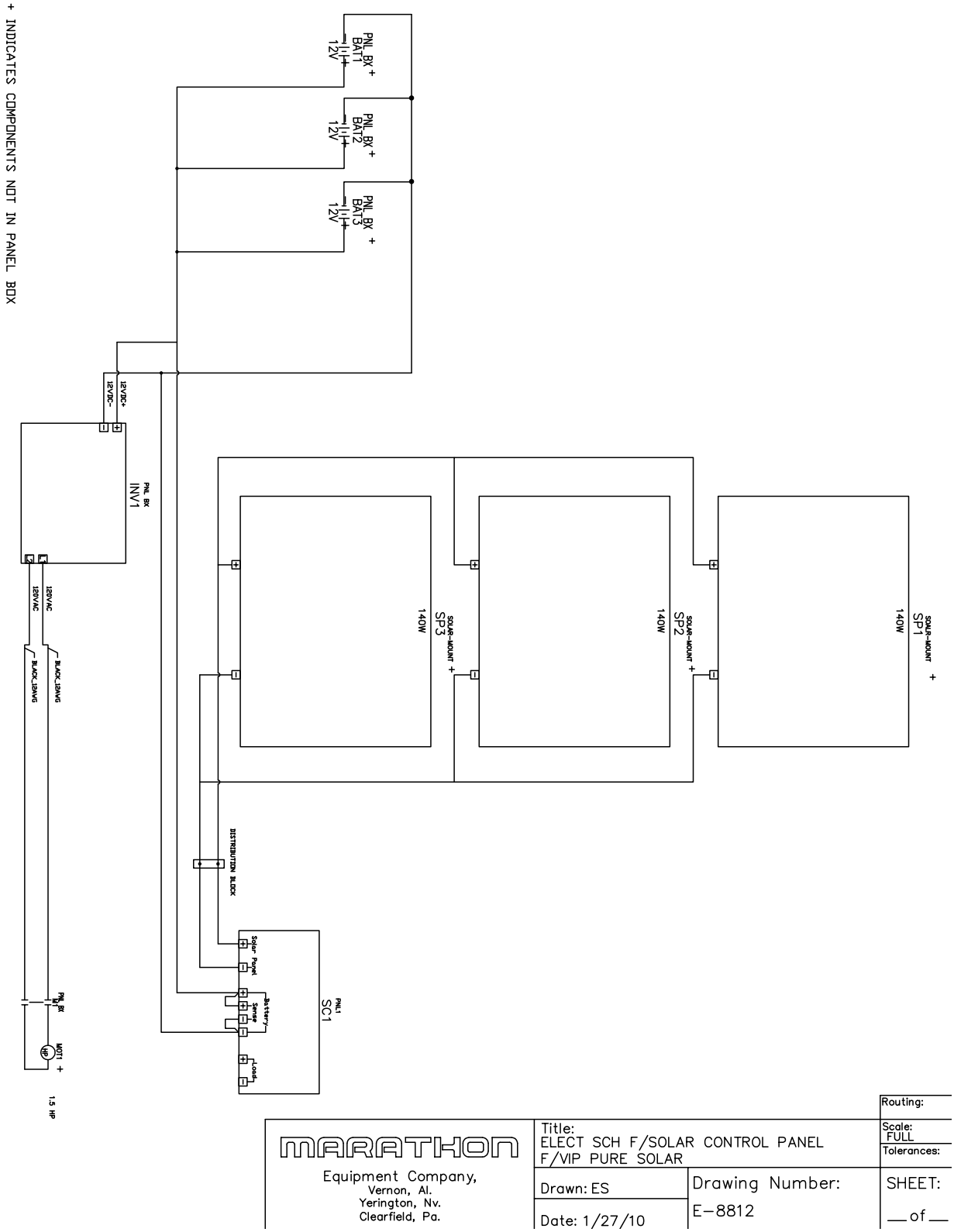
Electrical Schematic - Standard Models



Electrical Schematic - Untouchable Models

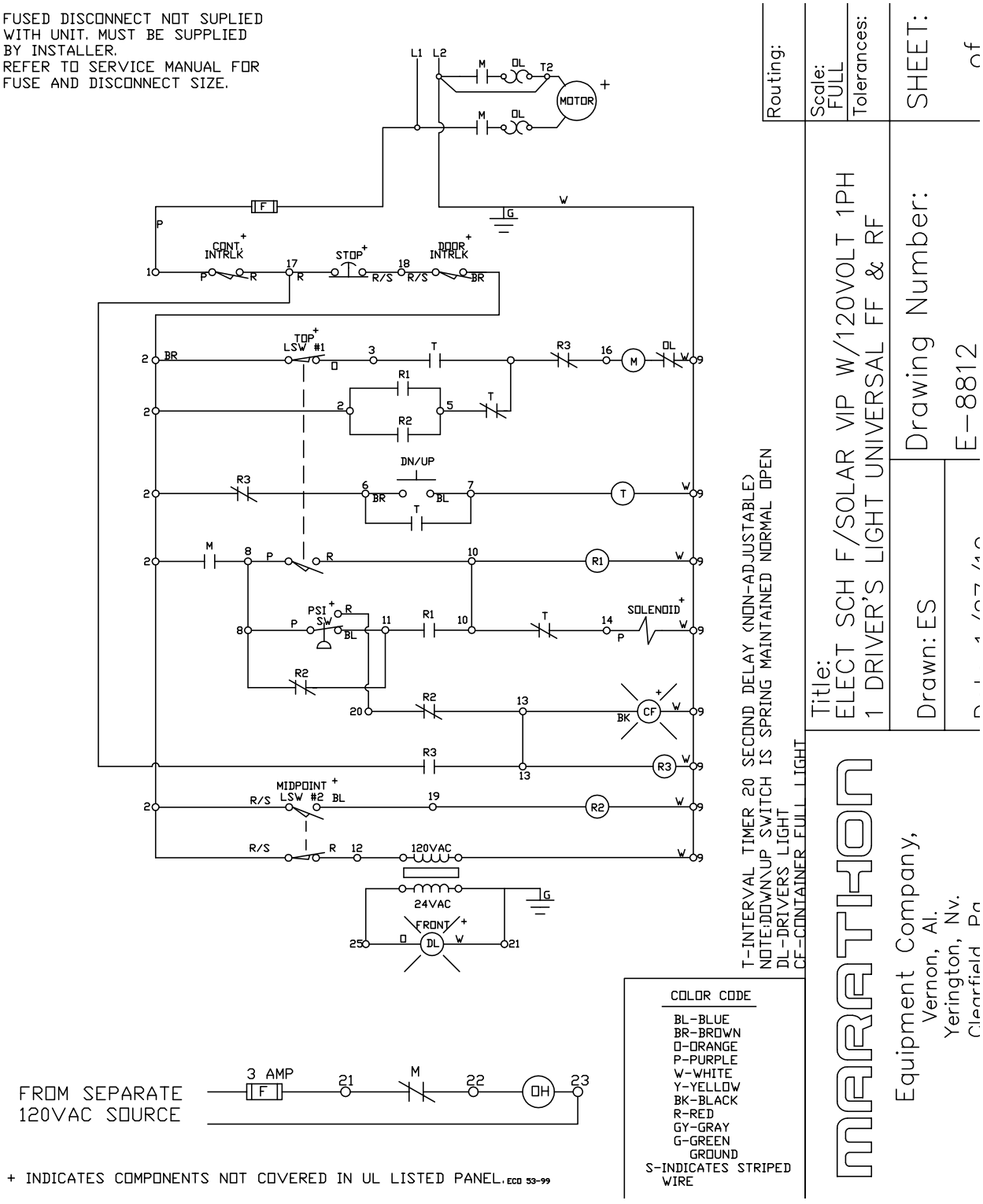


Electrical Schematic - Pure Solar Control Panel

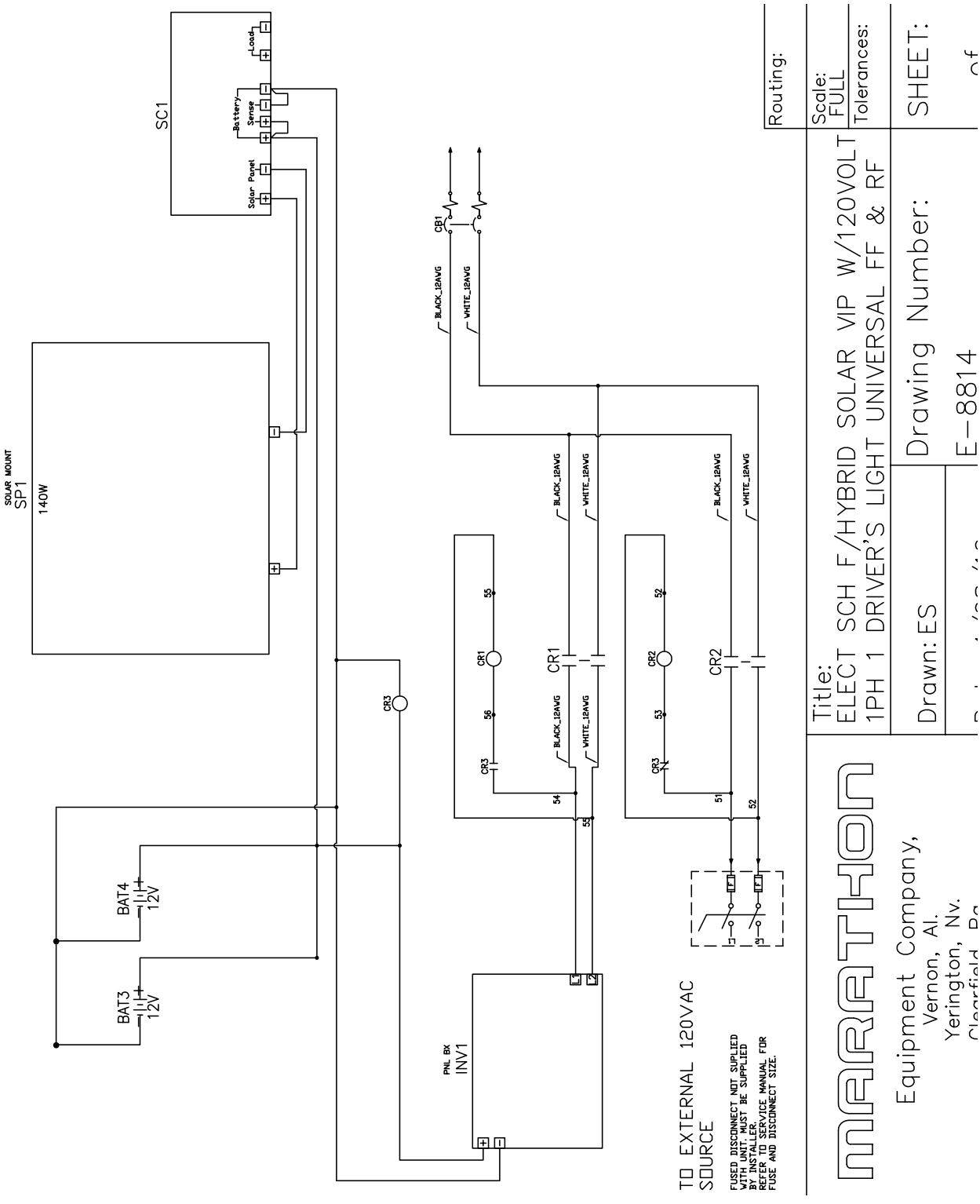


MARATHON Equipment Company, Vernon, Al. Yerington, Nv. Clearfield, Pa.	Title: ELECT SCH F/SOLAR CONTROL PANEL F/VIP PURE SOLAR	Routing:
		Scale: FULL
		Tolerances:
	Drawn: ES	Drawing Number: E-8812
	Date: 1/27/10	SHEET: __ of __

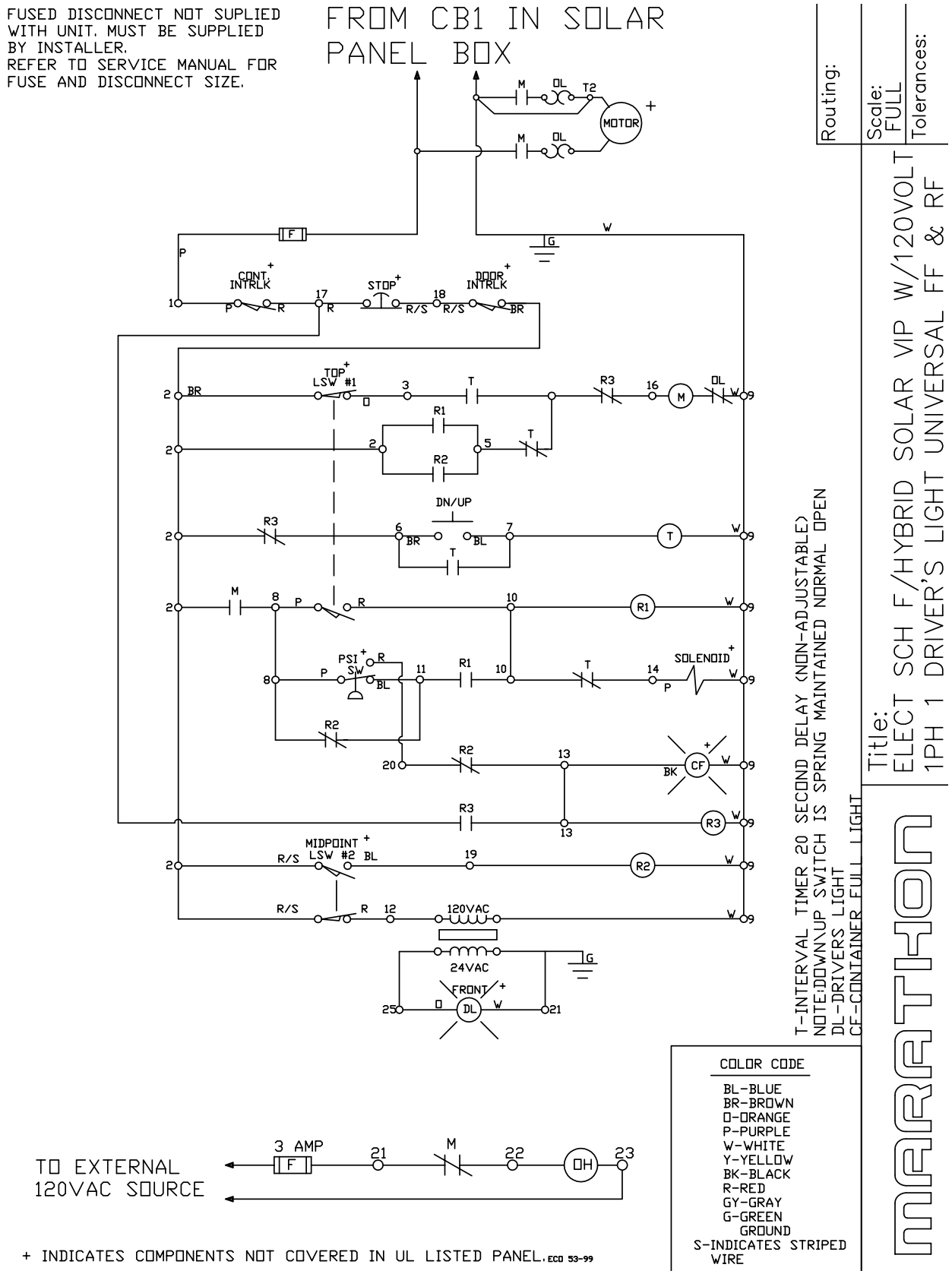
Electrical Schematic - Pure Solar VIP



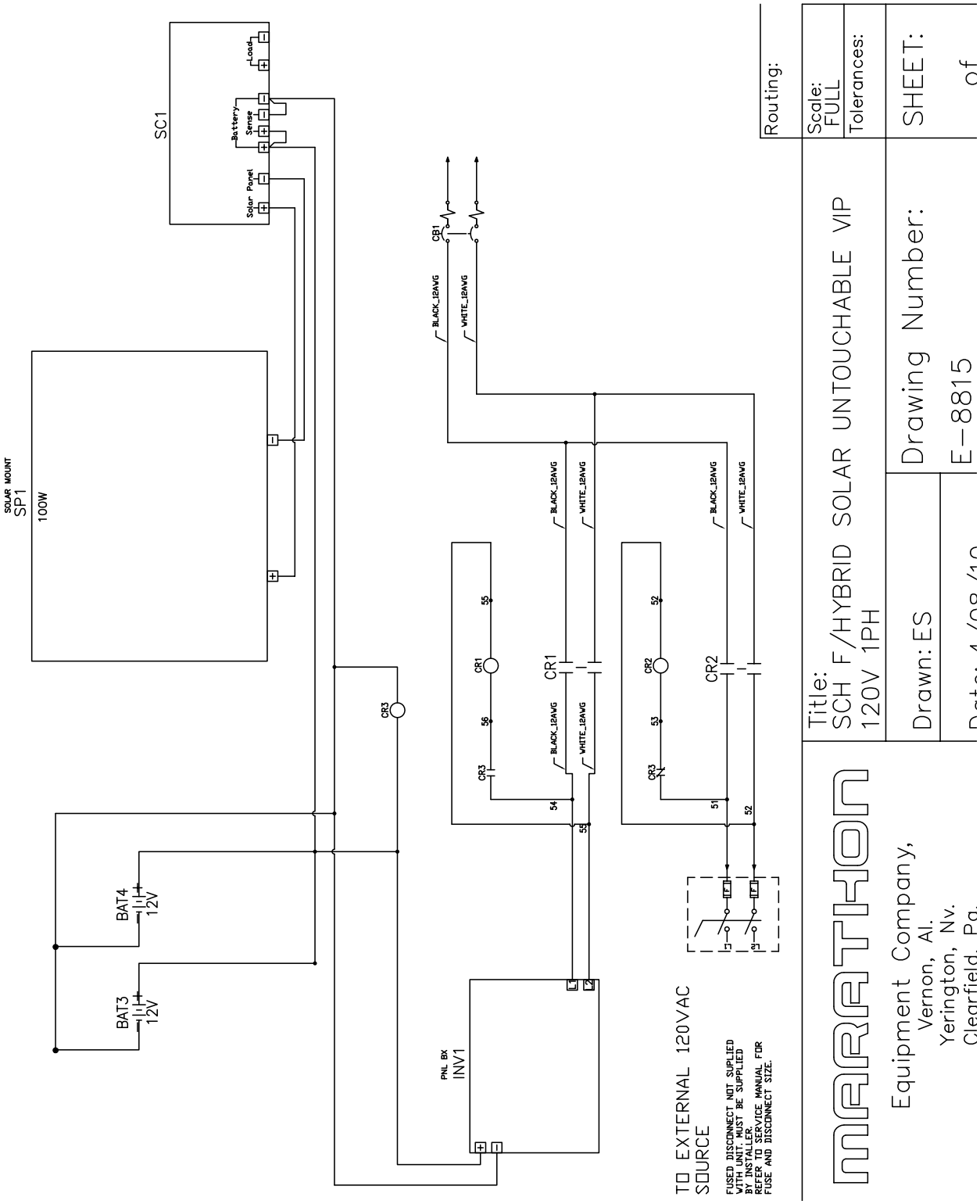
Electrical Schematic - Solar Hybrid VIP



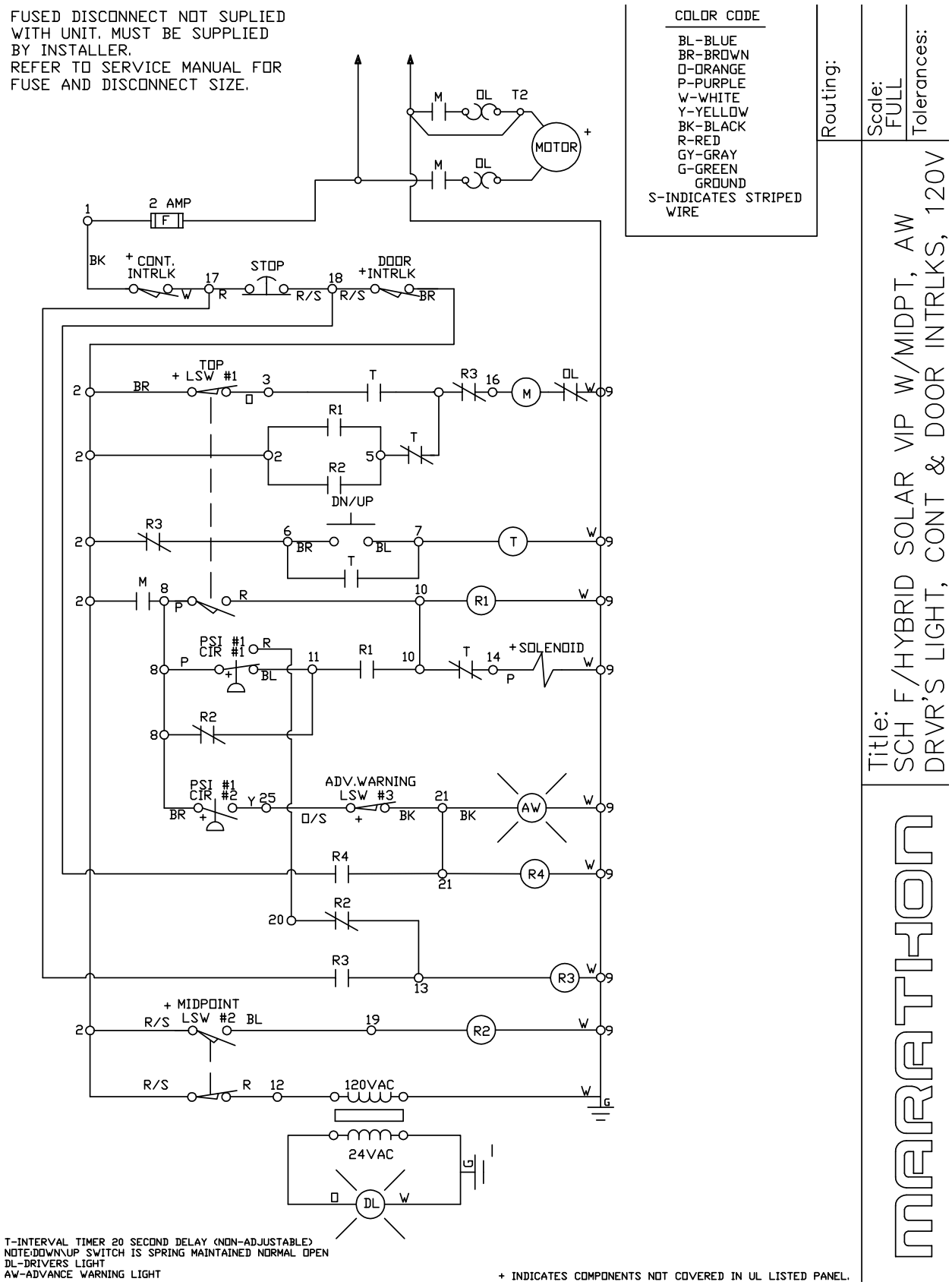
Electrical Schematic - Solar Hybrid VIP (Continued)



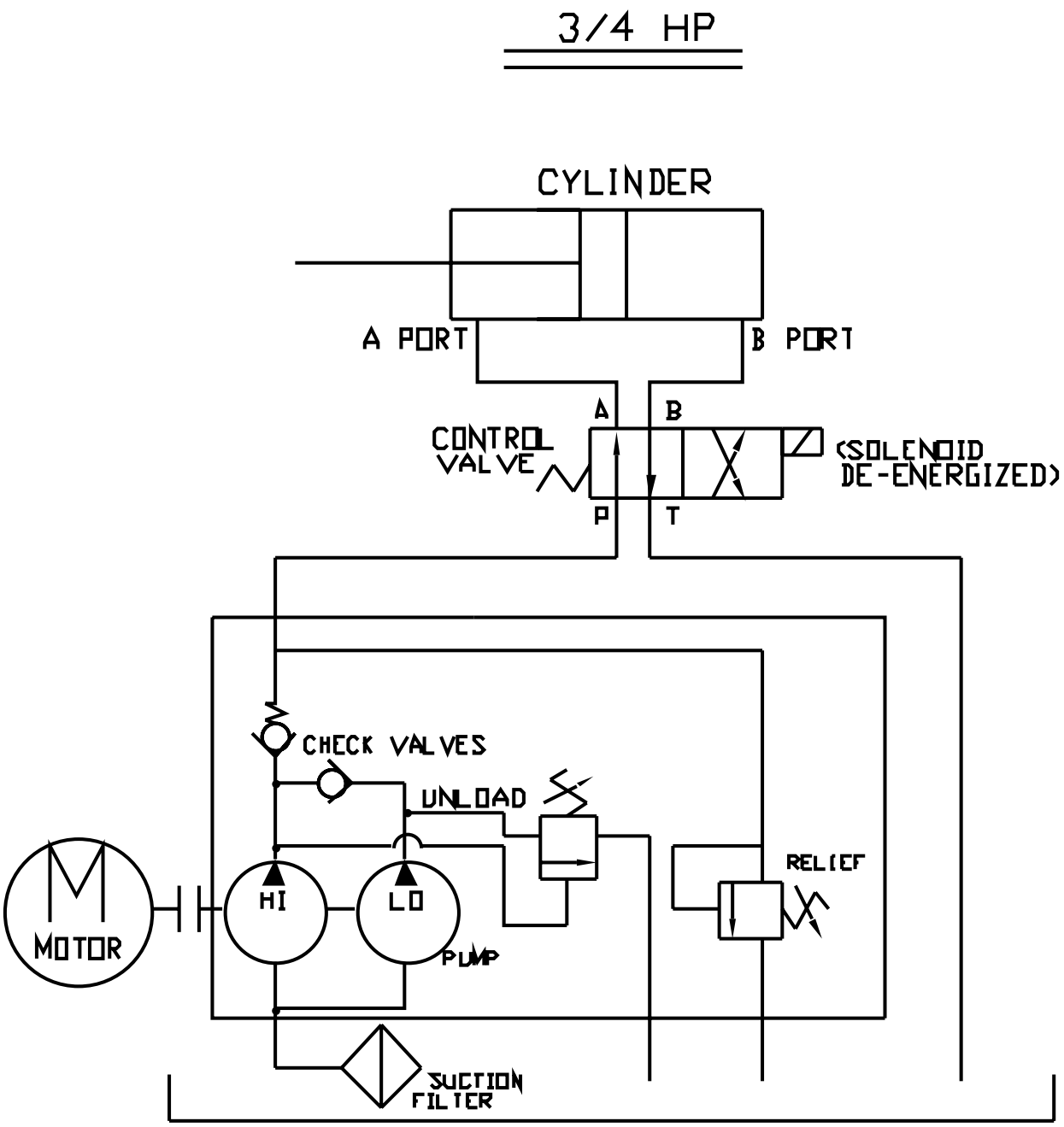
Schematic - Solar Untouchable Hybrid VIP



Schematic - Solar Hybrid VIP

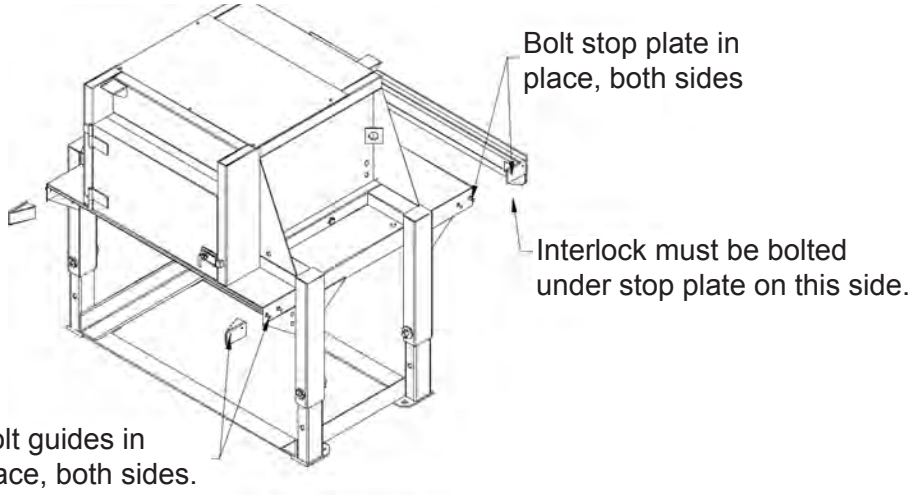


Hydraulic Schematic

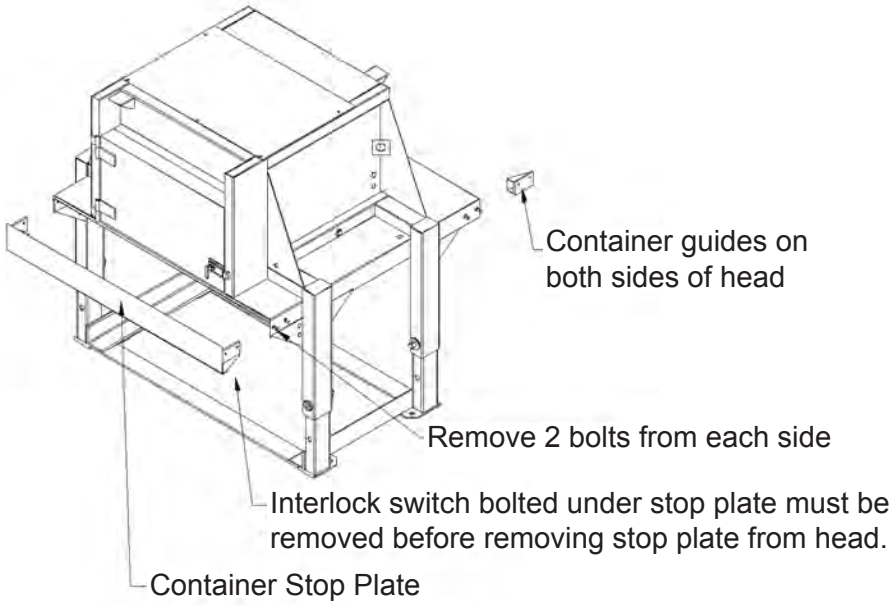


Converting To Opposite Feed

1. Lock out/tag out power before starting to convert unit to opposite feed side.
2. Remove container interlock switch from container stop plate, bolted to head.
3. Remove the bolts from the container stop plate.
4. Remove the bolts from the container guides.
5. Switch sides with container stop and guides and bolt back in place.
6. Disconnect the interlock from cable and re-route cable to the opposite end of VIP head.
7. Reconnect interlock to cable and bolt interlock switch to container stop plate.



VIP Adjustable / Reversible Front Feed Shown



VIP Adjustable / Reversible Rear Feed Configuration Shown

Troubleshooting

(Except for the 3 Cubic Yard Front Load)

WARNING: Do not perform any inspection, maintenance, adjustment, or repair without first locking-out and tagging-out the compactor per the instructions on page 2-1. Only authorized and trained personnel should perform any inspection, maintenance, adjustment, or repair.

This section of the manual is provided to help you check your compactor, find the problem, and repair it in the shortest possible time.

Basic Tools For Troubleshooting:

1. Continuity Light
2. Two Screwdrivers - 1 medium common, 1 small Phillips
3. Adjustable Wrench
4. Set of Allen Wrenches
5. Flashlight
6. Electrical Schematic
7. Voltage and Amp Tester
8. Pressure Setting Kit No. 29222

Problem	Possible Cause	Solution
Excessive void in container	1) Improper loading of unit.	1a) When loading, throw wastes as far to the rear as possible.
	2) Unit not being cycled when loaded.	2a) Cycle after each load. 2b) Keep door closed.
Charge box area always full of material. (Unit not packing properly).	1) Ram being left in "UP" position.	1a) When not in use, ram should be in midpoint position. Close door.
	2) Unit not being cycled when loaded.	2a) Cycle after each load.
	3) Loss of pressure.	3a) See Pressure Setting instructions in Maintenance section.
	4) Scheduled removal of container not allowing Container Full Light To come on.	4a) Pack until Container Full Light comes on.
	5) Improper installation.	5a) Check clearance between head and container (max. 1/8").
Unit will not start	1) No electrical power to unit.	1a) Turn main disconnect ON. 1b) Replace fuses, reset breakers.
	2) No electrical power to control circuits.	2a) Check primary and secondary sides of transformer.
	3) No electrical power to control circuits.	3a) Check fuses in control box. 3b)Check STOP button. Pull.
	4) No electrical power to motor.	4a) Check heater resets. Depress motor starter reset.

Unit will not start (continued)	5) Interlock switches not closed. (Check also to be sure door is closed, and that container is fully under VIP).	5a) Check stop button contact. It should be closed with STOP button pulled out. 5b) Container Gone Interlock should be closed. If not, make sure container is completely inserted under head. 5c) Check door interlock adjustment.
	6) UP/DOWN switch inoperative.	6a) Check UP/DOWN contact. It should be closed with the key in the UP position or with timer activated. To correct, replace UP/ DOWN switch. 6b) Check for moisture in UP/ DOWN switch. To correct, dry all parts completely, including interior of actuator head.
	7) Motor starter is inoperative.	7a) Check motor starter coil and wiring.
	8) Motor starter contacts are inoperative.	8a) Check motor starter contacts and wiring.
Container full light activates prematurely	1) Midpoint limit switch out of adjustment.	1a) Adjust midpoint limit switch.
	2) Building pressure on upstroke.	2a) Check pressure required to retract ram from full extension to midpoint. It should be no more than 400 psi. 2b) Ram binding. Check welds. Check for warping. 2c) Cylinder binding. Check upper and lower pinning locations. Cylinder should be perpendicular to ram. 2d) Solenoid valve malfunction. Replace valve.
Unit will not shut down at top position.	1) Limit switch 1 inoperative.	1a) Check limit switch. 1b) Check limit switch arm for proper operation.
	2) Keyswitch not being turned to its full UP position.	2a) Turn switch all the way to UP and release.
Motor runs but ram will not move normally.	1) Insufficient hydraulic fluid in the reservoir.	1a) Fill reservoir with hydraulic fluid.
	2) Low relief pressure.	2a) Clean orifice in relief valve (on pump) and reset pressure.
	3) Oil leakage in cylinder.	3a) Replace seal kit.
	4) Defective pump.	4a) Replace all hydraulic fluid in system and pump.

(continued)	5) Loose pump connection. 6) Oil leakage from hose. 7) Pump rotating in wrong direction.	5a) Tighten connection. 6a) Replace hose. 6b) Check plumbing inside reservoir for leaks and tighten or replace as necessary. 7a) Stop immediately to prevent pump seizure. Reverse any two incoming power leads.
Unit does not reverse	1) Pressure switch is inoperative. 2) Solenoid inoperable. 3) Insufficient hydraulic pressure to activate pressure switch. 4) Pump failure.	1a) Check pressure switch. 2a) Manually shift solenoid valve to determine whether it will function and is not binding due to contaminated fluid. Flush out solenoid valve. If it then moves freely, flush out entire hydraulic system and replace with new fluid. If valve binds after cleaning, replace valve. 2b) Check coil wiring for loose wire. 3a) Check pressure with pressure setting kit and reset pressure switch if necessary. Pressure switch is set to activate at 2100 psi. 4a) Replace all hydraulic fluid in system and pump if it will not hold 2400 psi steady for 3 - 5 seconds. **WARNING:** If pump runs relief for more than 15 seconds, damage to pump may occur.
Unit will not shut down at container-sealing position (midpoint).	1) Limit switch 2 inoperative.	1a) Check limit switch.
Unit shuts down after ram has entered container.	1) Container interlock malfunction. 2) Container moving off of container interlock (walking). 3) Improper installation. 4) Midpoint limit switch improperly adjusted.	1a) Check adjustment. 2a) Insert container fully. 2b) Pad not level. Level pad. 3a) Check clearance between head and container (max. 1/8”). 4a) Adjust midpoint.
Pump pressure decreases	1) Contaminated hydraulic fluid. 2) Internal hose or fitting leaking. 3) Drop in relief pressure. 4) Fluid bypassing inside cylinder. 5) Cavitation due to lack of hydraulic fluid.	1a) Replace fluid in entire system. 2a) Inspect and replace as necessary. 3a) Clean relief valve. If it will still not build pressure, replace pump. 4a) Replace fluid in entire system and replace cylinder. 5a) Add hydraulic fluid.

Pump makes noise, sounds like gravel	1) Partially clogged suction strainer or suction pipe.	1a) Pump must receive fluid freely or cavitation will result. Flush system, clean suction pipe and clean or replace suction strainer. Add clean fluid.
	2) Low fluid level.	2a) Add fluid to the correct level.
	3) Defective bearing.	3a) Replace pump.
Rapid wear, often indicated by repeated pump failure and/or malfunctioning solenoid valve	1) Contaminated fluid.	1a) Flush hydraulic system and replace with clean fluid.
Unusual spillage during removal of container.	1) Ram not in midpoint position.	1a) Ram should remain in midpoint position at all times except when feeding.
Unit shuts down; no Hauler's Light	1) Bulb for Haulers light burned out.	1a) Replace bulb.
	2) Transformer for Haulers Light burned out.	2a) Replace transformer.
Unit shuts down; Haulers Light on; will not start.	1) Unit is packed out; Container Full Light on.	1a) Empty container to reset light.
	2) Container Full system activated but Container Full light is out.	2a) Light is burned out. Replace. Turn disconnect switch off and back on to reset light. Cycle unit and check light.
	3) Container Full system activated, but unit not packed out.	3a) Check pressure required to return cylinder from full "extend" to midpoint. If pressure is greater than 400 psi, cylinder and/or ram may be binding or solenoid valve may not be shifting properly. Repair or replace as required. Check fluid for contamination and replace as required.
	4) Overloads may be tripped out.	4a) Reset overloads on motor starter and check for cause.
Motor overheating; running as if under constant load or constantly tripping out overloads.	1) Low voltage or loss or phase.	1a) Check incoming voltage at top of motor starter. Check for balanced incoming voltage (line to ground all incoming lines).
		1b) Check wire connections from top of motor starter to motor taps.
Container full light will not illuminate.	1) Ram is not at midpoint position.	1a) Check midpoint limit switch adjustment.
	2) Light is burned out.	2a) Replace light.

INSTALLATION

General Requirements

Caution: Review this manual before starting the installation. Study the job site and installation requirements carefully to be certain all necessary safeguards and/or safety devices are provided to protect all personnel and equipment during the installation and as a completed system. Special attention is directed to the extract from American National Standards Institute Z245.2 shipped with your compactor.

Marathon Equipment Co. does not assume responsibility for the installation procedures of this equipment. Conformance to applicable local, state, and federal laws concerning installation rests with the customer.

General

The Vert-I-Pack is designed to be anchored to concrete or asphalt. **The concrete or asphalt pad must be level for the VIP to function properly.** The following descriptions give the requirements for a concrete pad or an asphalt pad. See the next page for the Anchoring Requirements Diagram for each material.

Concrete Pad

1. Concrete should be minimum 3,000 PSI, steel reinforced, 6” thick. It is preferred that the concrete pad be flush with the surrounding ground level.
2. To provide accessibility, the concrete pad should be positioned to allow adequate space for the container handling vehicle. If applicable, allow proper clearances for a through-the-wall chute.

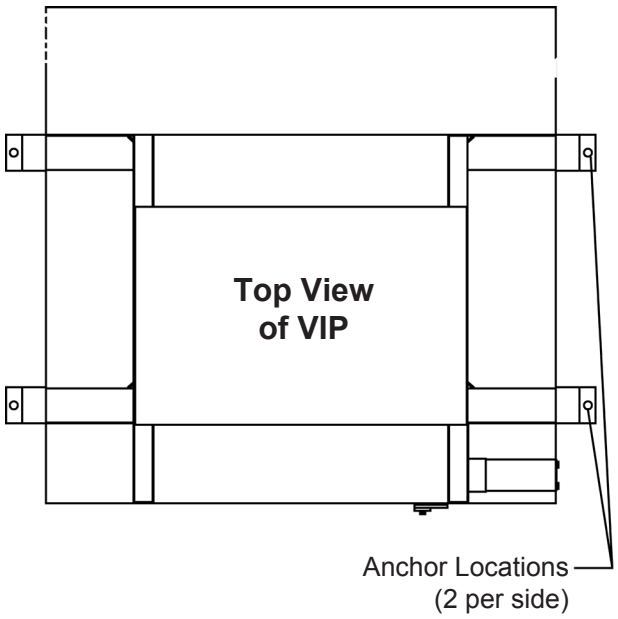
Asphalt Pad

1. If asphalt is used, it should be of construction grade material and standard parking lot thickness (approximately 4”).
2. To provide accessibility, the asphalt pad should be positioned to allow adequate space for the container handling vehicle. If applicable, allow proper clearances for a through-the-wall chute.

Decals

Be certain that the appropriate decals are in their proper locations at all times on the machine. For decal locations, see “Decals” starting on page 1-8. If your VIP is missing decals or if any decals on the VIP become damaged, contact Marathon Equipment Company or your distributor for additional decals.

Anchoring Requirements Diagram

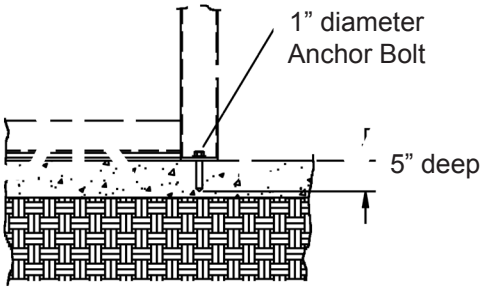


For Concrete:

The compactor should be anchored to a concrete pad using a minimum of four 1″ x 6″ long anchor bolts (Red Head-type recommended).

It is best if the holes are drilled in the concrete after pre-locating the compactor to its desired location. Holes in the leg plates are 1-5/16″ diameter to permit the use of a 1-1/8″ diameter concrete bit. The holes in the concrete should be approximately 5″ deep.

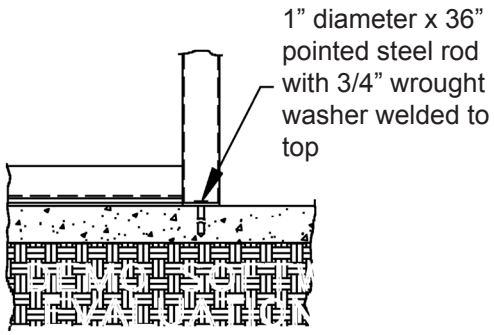
When the compactor has been permanently located, shimmed to compensate for unevenness, and anchor bolts set, tighten all nuts securely.



CONCRETE

For Asphalt:

For asphalt applications, use four 1″ diameter x 36″ pointed steel rods with 3/4″ wrought steel washers welded to the top end. Drive the headed rod though the anchor plate and asphalt and into the ground at each location.



ASPHALT

Through-the-Wall Chute Installation - Rear Feed

For "Rear Feed" through-the-wall installations, use the appropriate kit available from Marathon Equipment Company. The kit requires bolting to the interior wall, welding to the VIP body, and caulking at the exterior joint on the chute assembly. The following diagram shows a typical rear feed through-the-wall installation.

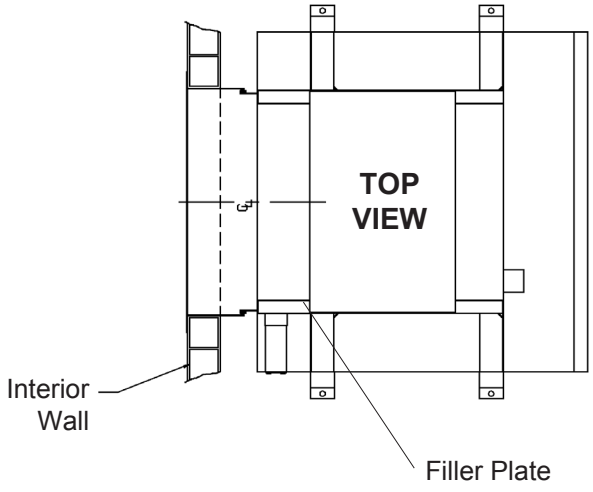
**Consult with factory for proper location of wall opening.

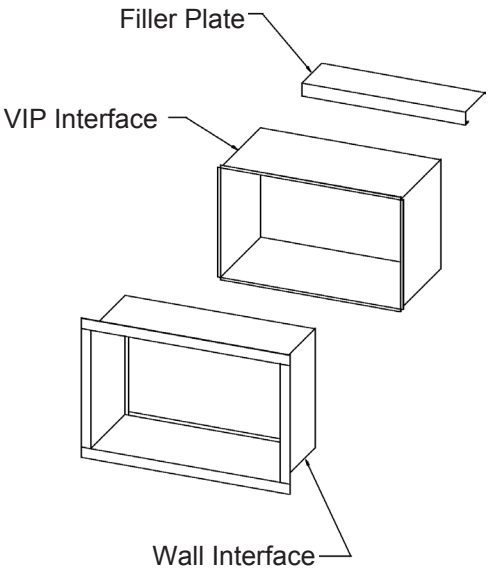
** Dimension: Ground to bottom of wall opening.

Model	"A"
4 YD FL RF	40"
6 YD FL RF	51-3/4"
8 YD FL RF	69-3/4"

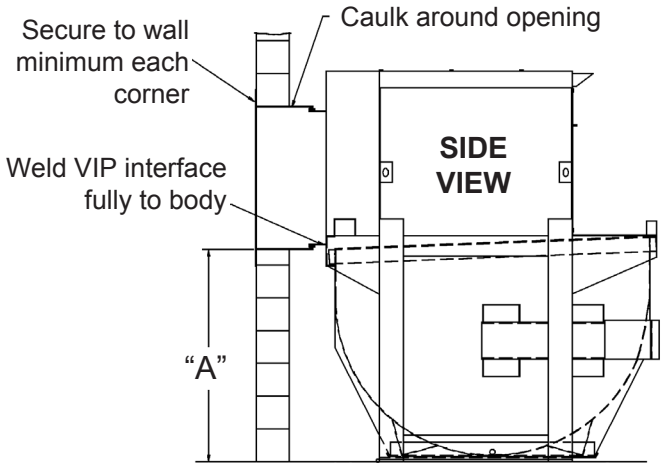
** Wall opening to be 35" high x 56" wide. Chute fits walls up to 14" thick.

NOTE: Install wall interface first, then insert VIP interface through the wall interface and weld to VIP body.





CHUTE ASSEMBLY



Through-the-Wall Chute Installation - Side Feed

For "Side Feed" through-the-wall installations, use the appropriate kit available from Marathon Equipment Company. The kit requires bolting to the interior wall, welding to the VIP body, and caulking at the exterior joint on the chute assembly. The following diagram shows a typical rear feed through-the-wall installation.

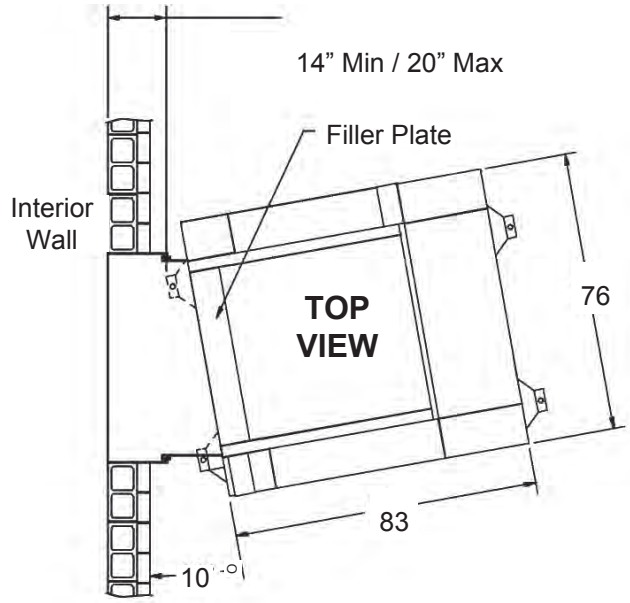
** Consult with factory for proper location of wall opening.

** Dimension: Ground to bottom of wall opening.

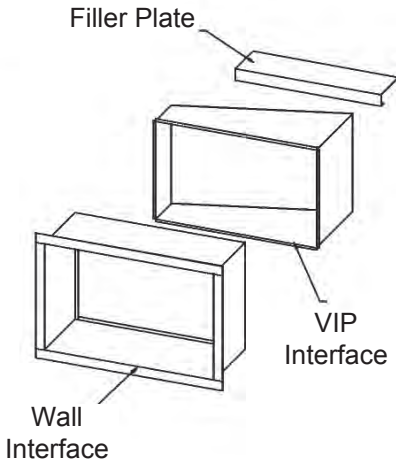
Model	"A"
4 YD FL RF	40"
6 YD FL RF	58"
8 YD FL RF	76"

**Wall opening to be 35" high x 56" wide. Chute fits walls up to 14" thick.

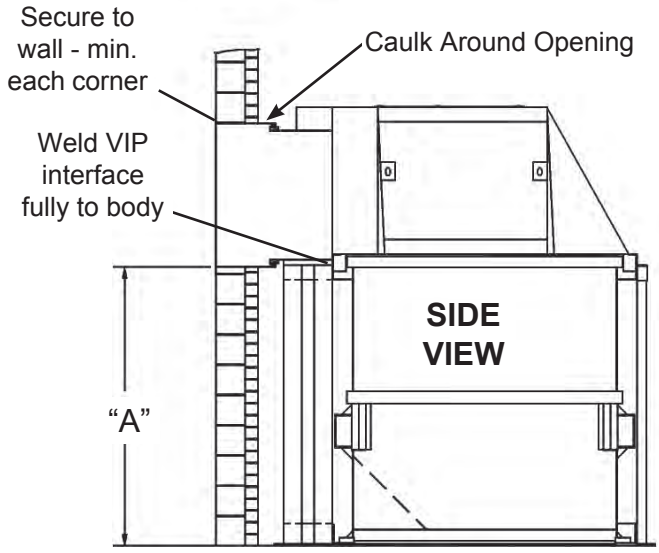
Note: Install wall interface first, then insert VIP interface through the wall interface and weld to VIP body.



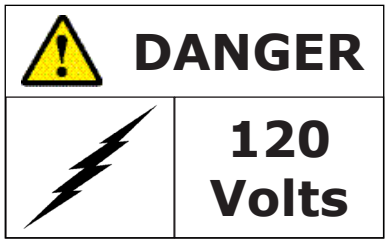
Note: The 10° angle between the feed door of the VIP and the wall will accommodate most trucks. Check your particular truck and site details before installing chute.



CHUTE ASSEMBLY



Electrical and Hydraulic Installation



The panel box contains high voltage components. Only authorized service personnel should be allowed inside. See Lock-Out & Tag-Out instructions in the maintenance section.

A lockable fused disconnect switch (customer furnished) must be installed and be within sight of the compactor's electrical panel box location, not to exceed 50' from the compactor. This fused disconnect switch should be sized in accordance with the compactor (see "Electrical Charts" on page 2-12).

Caution: All equipment should be grounded per National Electric Code.

Grounding Instructions: This appliance must be connected to a grounded, metal, permanent wiring system or an equipment grounding conductor must be run with the circuit conductors and connected to the equipment grounding terminal or lead on the appliance.

If there is any doubt whether the equipment is properly grounded, a qualified electrician should be consulted.

Pushbutton Control Station

If a remote push button station is furnished, it will be factory wired using Sealtite. If it is necessary to disconnect it from the wires (to install the pushbutton station inside a building), exercise care that these wires are reconnected as originally furnished. (Check local codes to be certain that Sealtite is acceptable.)

Caution: Controls must be located so that the red Emergency Stop button is readily accessible to the operator and within 3 feet of the charging chamber access. If installation requires this pushbutton control station to be located in a more remote area, a second Emergency Stop button should be added and installed in the manner described above.

Electrical Connections

1. Run power lines between the fused disconnect switch (customer furnished) and the compactor's electrical panel box, in accordance with local electrical codes, using knock-outs in the bottom of the panel box. See "Fuse and Circuit Breakers" and "Wire Sizes" in "Electrical Charts" on page 2-12, to determine the proper service disconnect amperage rating and the proper wire size.
2. Check voltage at the fused disconnect switch to be certain it is the same as is shown on the compactor or the remote power pack.

Start-Up Instructions

1. Container must be positioned all the way under the VIP head for the unit to operate.

2. The feed door must be closed for the unit to operate. Ensure that the door opens and closes properly. If the door binds against the top or bottom of the door opening, the unit is not level. **The unit must be level for proper operation**.

3. With the ram fully retracted (UP position), check to be sure the oil reservoir is full to the 3/4 level on the sight gauge (refer to "Periodic Maintenance" on page 2-2 for hydraulic oil recommendations). The hydraulic system pressure has been factory set and the entire unit has been operated prior to shipment.
   Caution: Make sure people and material are clear of the charge box area and all other areas of the compactor.

4. Put the fused disconnect switch in the "ON" position when ready to start the machine. Manually depress the motor starter for 1-2 seconds. If the ram does not move, this indicates that the motor and pump are rotating backwards.
   Caution: The pump will be damaged if it is operated in reverse even for short periods. Reverse any two incoming power lines to change the motor/pump rotation.

5. Run the VIP for a few cycles to make sure it is operating properly. If the ram scrubs the side of the charge chamber during operation, the unit is not level. Unit must be level for proper operation.

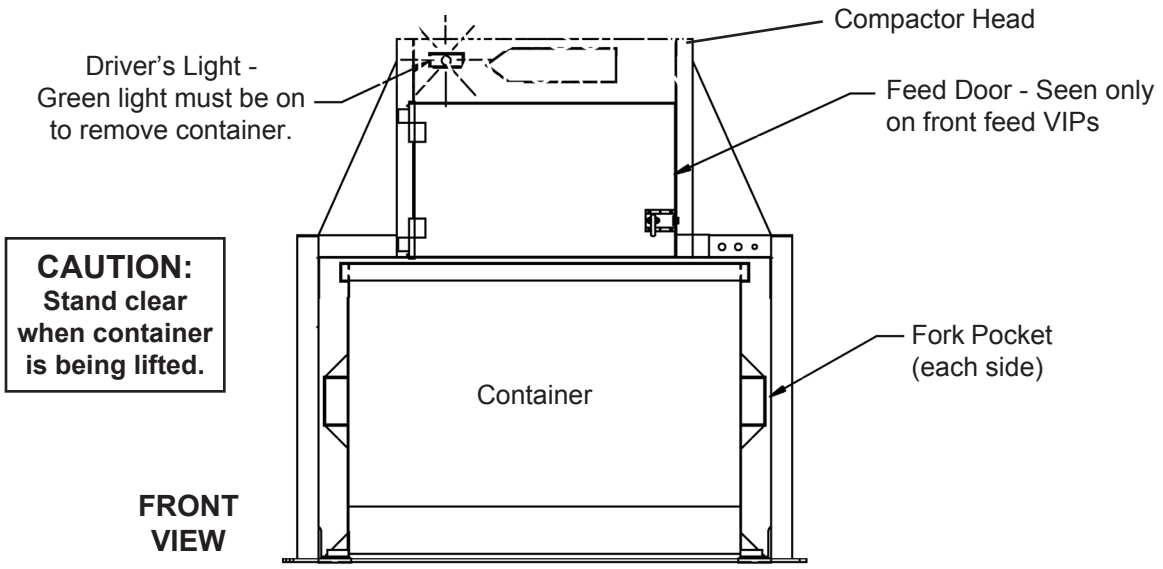
   Make sure that operators are trained in the proper use of this equipment.

HAULER INFORMATION

Front Load VIP

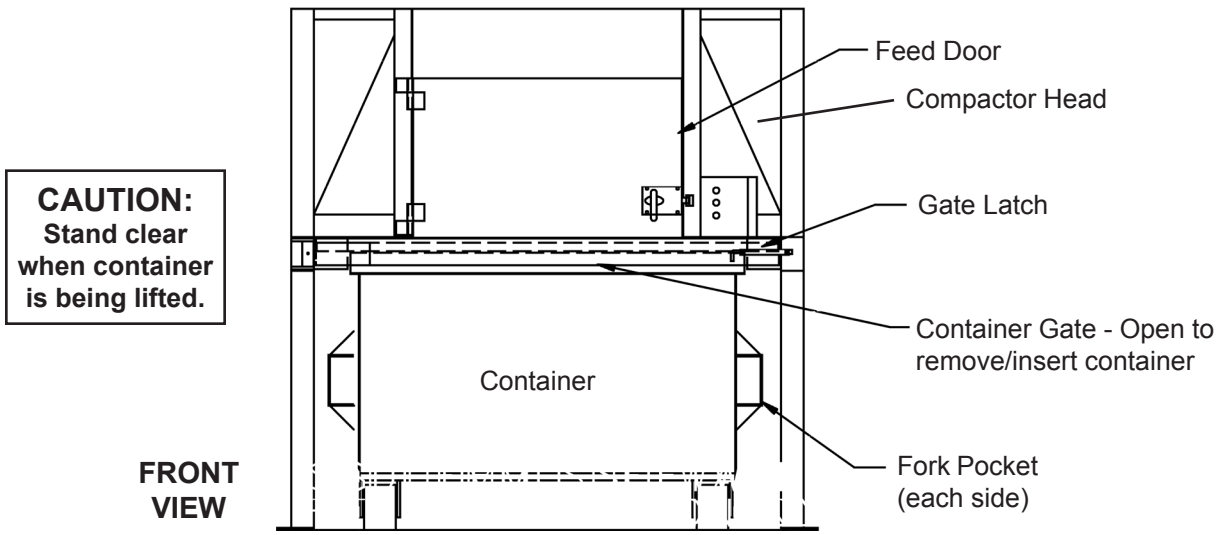
Front Load, Front Feed VIP shown
(side feed and rear feed containers handle similarly)

Instructions: Make sure the green Driver's Light is illuminated. Remove and empty the container. (Note that the container must be slightly raised to remove). Insert the emptied container completely under the compactor head.



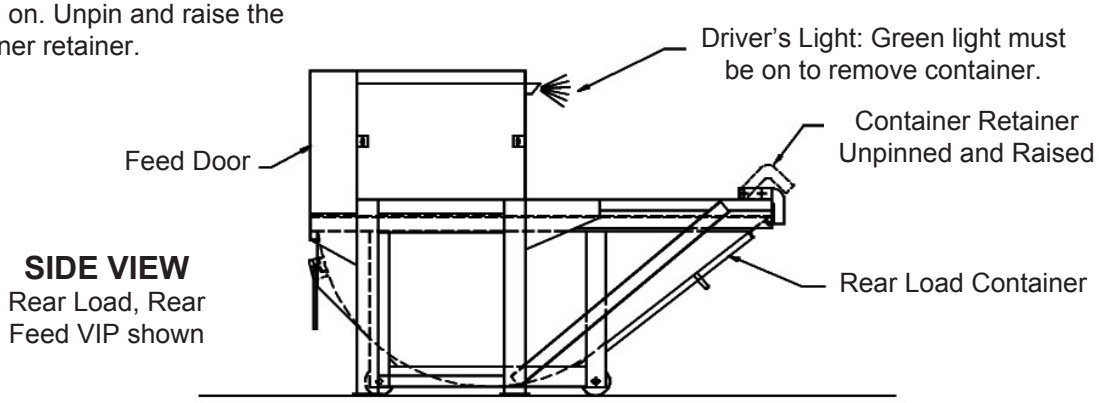
Front Load, Front Feed, 3 Cubic Yard VIP

Instructions: Unlatch and completely open the container gate. Remove and empty the container. Insert the emptied container completely under the compactor head. Close the container gate and latch completely.

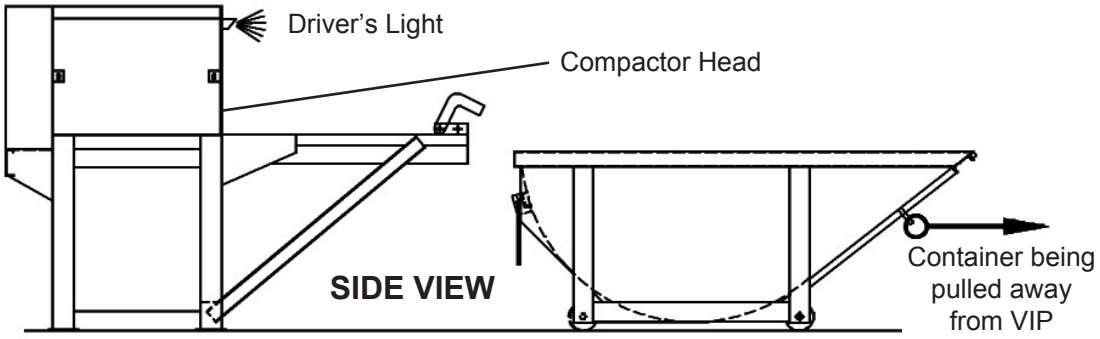


Rear Load VIP

Step 1: Make sure the driver's light is on. Unpin and raise the container retainer.

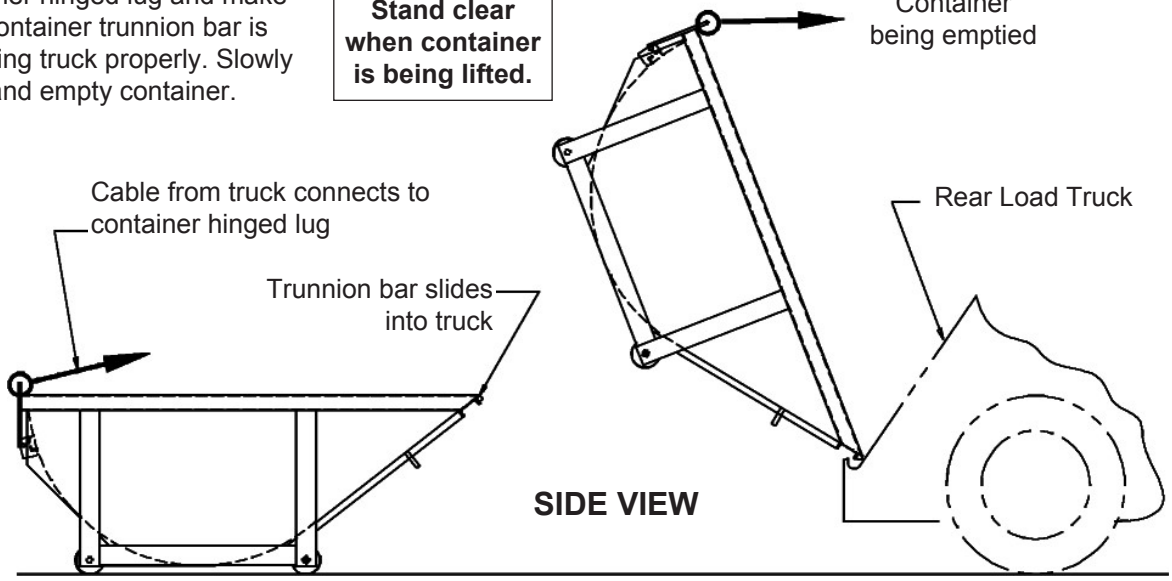


Step 2: Pull the container out from under the compactor head.



Step 3: Connect truck cable to container hinged lug and make sure container trunnion bar is engaging truck properly. Slowly raise and empty container.

CAUTION:
Stand clear when container is being lifted.



Step 4: Insert emptied container under head and close and pin container retainer.

SOLAR POWER UNIT

Solar Power Unit - Specifications

Compactor Model	VIP Quantity
Motor - 120 VAC, 3/4 HP, 3 GPM HiLo motor/pump combination	1
Batteries - sealed AGM deep-cycle lead acid 12 volt, 110 amp hours	2 Hybrid 3 Total Solar
100 Watt Solar Panel	1 3 Total Solar

Solar Power Unit - Parts List

Part #	Description	Qty
PANEL BOX		
03-5656 & 03-5657	Panel Box	1
03-5658	Inverter	1
03-5631	Reversing Contactor (Hybrid only)	1
03-0191	Fuse 2 Amp	1
03-5634	Voltage Relay (Hybrid only)	1
03-5633	Solar Controller	1
03-4748	Motor Starter	
03-4753	Overload	
PPK (Power Unit)		
02-0250	Suction Filter	1
03-1178	Motor 3/4 HP	1
02-0369	Pump 3 GPM	1
02-0202	Sub-plate	1
02-0297	Valve	1
03-0013	Pressure Switch	1
SOLAR PANEL		
03-5247	Battery	2 Hybrid or 3 Total Solar
03-5635	Battery Disconnect	1
03-5399	Red Battery Cable	Varies
03-5400	Black Battery Cable	Varies
03-5632	Solar Panel	1 Hybrid or 3 Total Solar

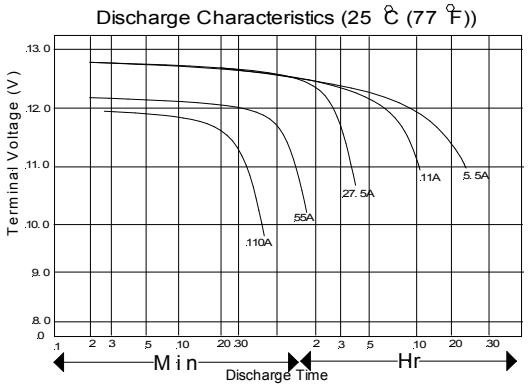
Please call our Parts Department at **1-800-633-8974** for other part numbers.

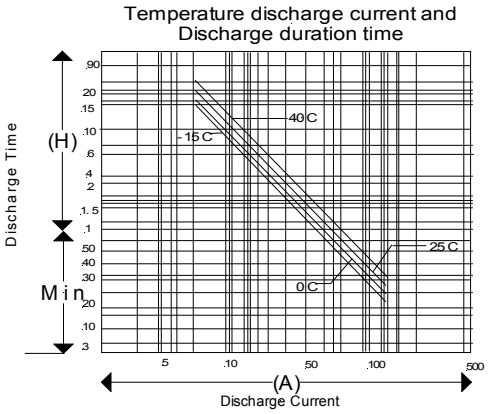
Battery Specifications

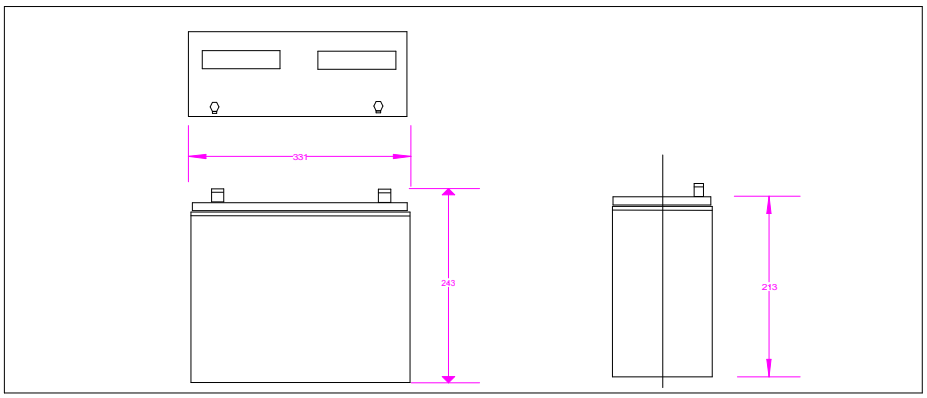
Specifications & Characteristics

Nominal Voltage		12V
Rated Capacity		110 Ah/20HR
Dimensions	L	331 mm
	W	173 mm
	Total H.	243 mm
Weight		Approx. 33 kg(72.75lbs)
Capacity 20ºC (68ºF)	20 HR 5.5 A	110 Ah
	10 HR 10.0A	100 Ah
	5 HR 18 A	90 Ah
	4 HR	87.7 Ah
	1 HR 80 A	80 Ah
Internal resistance		Approx. 4 milliohms
Terminal		Flag
Charging (Constant-Voltage)	Cycle	Initial charging current less than 40A Voltage 14.40 – 15.0V
	Float	Voltage 13.50 – 13.80
Capacity affected by Temp (20 HR)		40 ºC => 102% 25 ºC => 100% 0 ºC => 95% -15 ºC => 65%
Self Discharge (25 ºC)		Capacity after 3 mth. storage 91% Capacity after 6 mth. storage 82% Capacity after 12 mth. Storage 64%

The Plate material: Pb-Ca-Sn alloy and oxide of Pb (activity material)	
Construction: Positive plate and negative plate, battery case – ABS, AGM separator, H_2SO_4 and valve.	
Electrolyte concentration: 1.32	
Watts per cell @ 4 hour = 44	
Run time @ 25 A = 4 hours 16 min	
CCA	720A
Discharge rate @ 4 hours = 22A	







Solar Power Unit - Wire Sizes

100 Watts (1 x 100 Watt Panel)

Distance (Feet)	Wire Size (Gauge)	Wire Diameter (Inches)	Conduit Size (Inches)
20	10	< 3/16	1/2
25	10	< 3/16	1/2
30	10	< 3/16	1/2
35	8	< 1/4	1/2
40	8	< 1/4	1/2
45	8	< 1/4	1/2
50	6	1/4	3/4
60	6	1/4	3/4
70	6	1/4	3/4
80	4	> 5/16	1
90	4	> 5/16	1
100	4	> 5/16	1
125	3	> 3/8	1
150	3	> 3/8	1
200	1	>7/16	1-1/4

300 Watts (3 x 100 Watt Panel)

Distance (Feet)	Wire Size (Gauge)	Wire Diameter (Inches)	Conduit Size (Inches)
20	3	< 3/8	1
25	2	> 3/8	1
30	1	> 7/16	1-1/4
35	1	> 7/16	1-1/4
40	1/0	< 1/2	1-1/4
45	2/0	> 1/2	1-1/2
50	2/0	> 1/2	1-1/2
60	3/0	> 9/16	1-1/2
70	3/0	> 9/16	1-1/2
80	4/0	> 5/8	2
90	250 kcmil	< 3/4	2
100	250 kcmil	< 3/4	2
125	300 kcmil	< 13/16	2-1/2
150	400 kcmil	< 15/16	2-1/2
200	500 kcmil	< 1	3

Solar Power Unit - Periodic Maintenance

WARNING: Never perform maintenance on the Solar Power Unit without first following the "Lock-Out & Tag-Out Instructions" on page 2-1.

Follow all Periodic Maintenance procedures in the OMI Manual that is specific to your compactor, as well as the following:

Monthly

1. Check the solar panel for dust or residue (especially in a heavily particulate or urban environment) and clean as necessary. Usually a hose stream or wiping it off with a clean, damp cloth is sufficient. Avoid using harsh chemicals or cleaning the panel while it is hot.

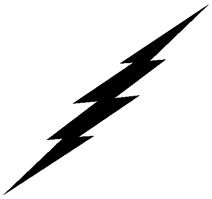
2. Check the battery cables, connections, and terminals for wear and/or corrosion.

Recommended Oil

- BioHydran AW 46

General Installation Requirements

CAUTION: The panel box contains high voltage components. Only authorized service personnel should be allowed inside. See "Lock-Out & Tag-Out Instructions" on page 2-1.



Electrical Connections

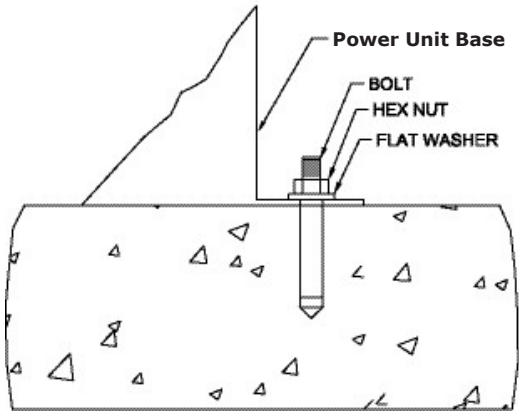
A dedicated 120 Volt, 15 Amp (minimum) outlet is required to plug in the battery charger. If the power unit is supplied with an oil heater, it needs to be plugged into the outlet as well.

Anchoring

The power unit should be anchored to the concrete pad using a minimum of four 1/2" x 6" long anchor bolts. These bolts can be secured to the concrete pad using "Porok" or special concrete anchors.

It is recommended to drill these holes into the concrete after pre-locating the power unit to its desired location. When the power unit has been permanently located, shimmed to compensate for unevenness, and the anchor bolts set, then tighten all nuts securely.

NOTE: Ensure that anchor bolts are not allowed to torque or twist the power unit when tightened.



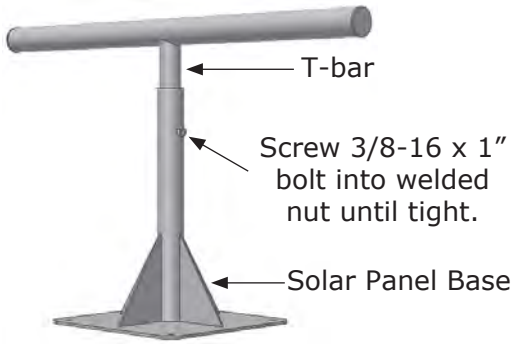
Minimum of 3000 PSI Concrete, 6" Thick

Assembling the Solar Panel Stand

The following instructions describe the assembly process for the standard solar panel stand, which can then be mounted on top of the power unit, roof, or other applicable horizontal surface. The components and assembly process for pole-mounted or wall-mounted stands may vary. See the next page for details on mounting options.

STEP 1

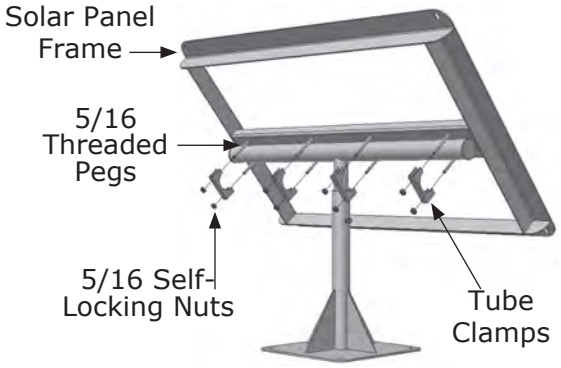
Slide the T-bar neck into the solar panel base as shown in the diagram on the right. Screw the 3/8-16 x 1" bolt into the lock nut welded to the neck of the solar panel base until tightened.



STEP 2

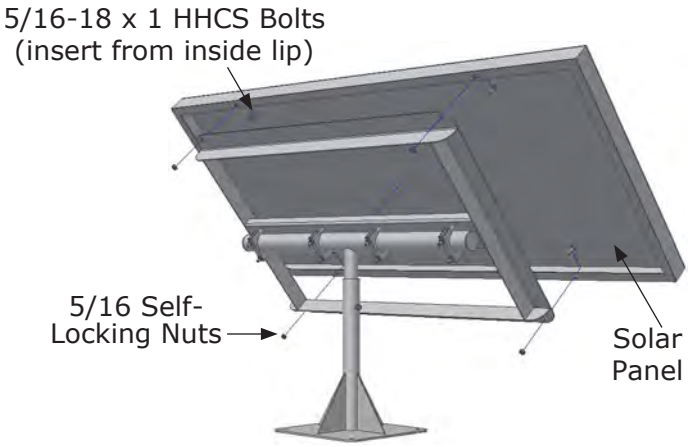
Locate the solar panel frame over the T-bar as shown in the diagram. Slide the 4 tube clamps into each pair of 5/16 threaded pegs and fasten using the provided 5/16 hex self-locking nuts.

Ensure that the frame is centered with the T-bar and base assembly. Tighten the tube clamps sufficiently to prevent slippage of the frame angle chosen for optimum insolation (See "Connecting and Orienting the Solar Panel" on page 5-8).



STEP 3

Attach the solar panel to the frame using four 5/16-18 x 1 HHCS bolts and four self-locking nuts as shown in the diagram.

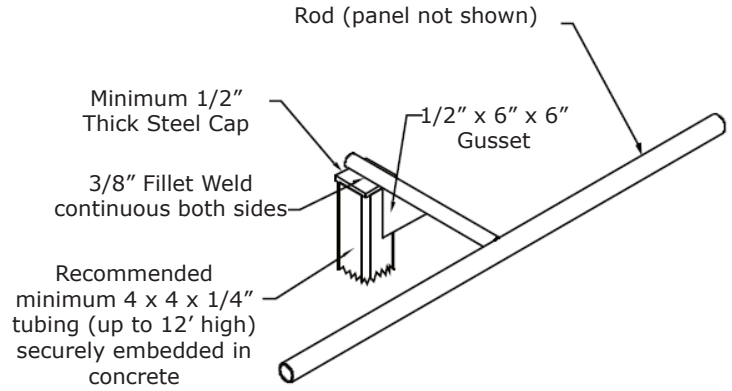


Mounting the Solar Panel Stand

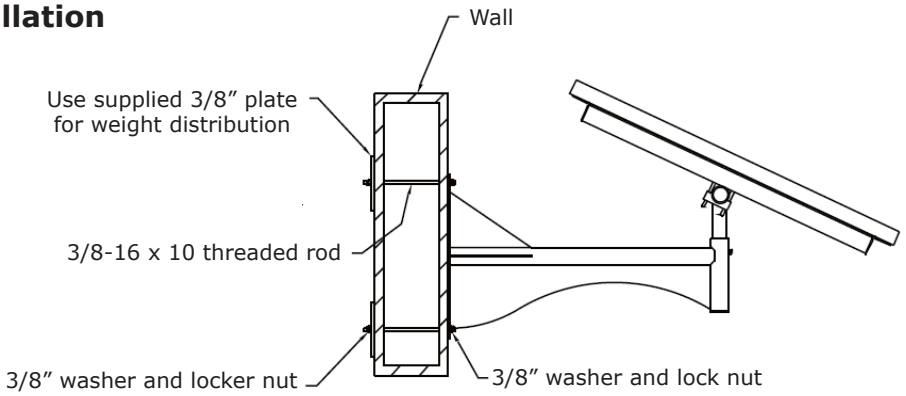
NOTE: Before choosing where to mount the solar panel stand, read the "Orientation of the Solar Panel" recommendations on the next page. The solar panel and stand can be mounted on either the top of the power unit, a wall, roof, or on a pole located within 100 feet of the power unit and connected to the solar charger controller with an S.O. cord or 12 gauge wiring in conduit or Sealtite.

The required bolts for mounting the panel will vary depending on the chosen installation. There are four 1/2" holes on the mounting bracket, all 10" apart from the centers of the adjacent holes. These match the top of the power unit holes. For wall, roof, or pole installations, use the proper anchor bolts rated for the specific composition and reference the following diagrams as installation guidelines.

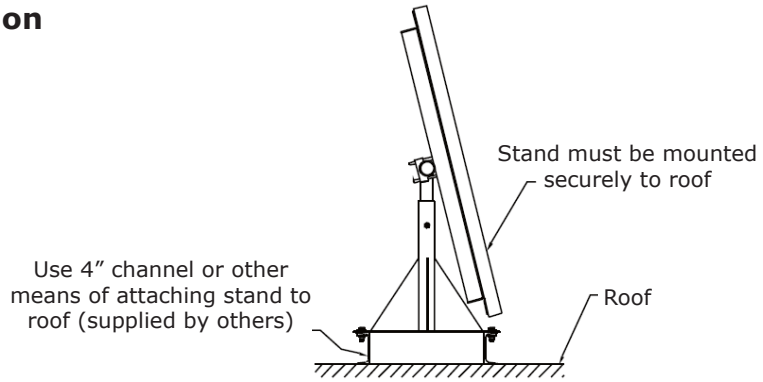
Pole Mount Installation



Wall Mount Installation



Roof Mount Installation



Connecting and Orienting the Solar Panel

After mounting the solar panel, connect the cord to the plug in on the power unit.

Orientation of the Solar Panel

In the northern hemisphere, it is best for the solar panels to face southward. In the southern hemisphere, it is best that they face northward. The best angle from the horizontal position will vary by season, but the following equation is given as a general example for winter tilt, which is about 10 degrees steeper than normal recommendations:

```
Site Latitude x 0.9 + 29 degrees
```

Example: Houston is at about 30° latitude, so 30 x 0.9 + 29 = 56. Therefore, the winter tilt for Houston is calculated to be 56°.

The best angle for optimum insolation should be determined on site. Some factors that prohibit optimum insolation are clouds, haze, trees, or any opaque object obstructing sunlight to the solar panel. These factors are just as important in determining the best position and angle for the solar panel.

Latitude	Angle	Percent of Optimum
25° (Key West, Taipei)	51.5°	85%
30° (Houston, Cairo)	56°	86%
35° (Albuquerque, Tokyo)	60.5°	88%
40° (Denver, Madrid)	65°	89%
45° (Minneapolis, Milano)	69.5°	89%
50° (Winnipeg, Prague)	74°	93%

It is recommended that you independently research and assess your site for the best placement.

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