



# Low Profile ONBOARD™

## Installation Manual

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# NORAC Low Profile ONBOARD Installation Manual

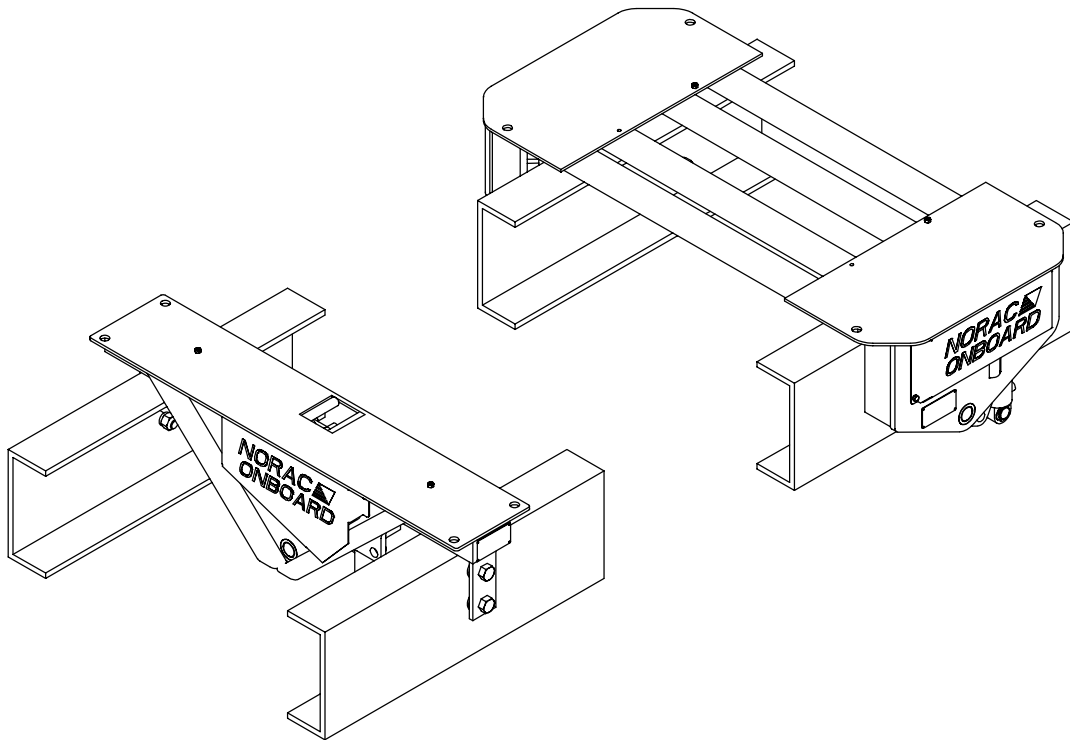
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## Introduction

Congratulations on your purchase of a *NORAC* Low Profile ONBOARD™ Weighing System. This system is manufactured with top quality components and is engineered using the latest technology to provide operating features and reliability unmatched for years to come.

Please take the time to read this manual completely through before attempting to use the system. Although the ONBOARD™ system has been designed for easy set up and use, a thorough understanding of this manual will ensure that you receive the maximum benefit from the system.



If you have any questions or comments please contact NORAC:

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## Overview

The *NORAC* LOW PROFILE ONBOARD™ System is a patented, legal for trade, NTEP and Measurement Canada approved, mobile weighing device.

The LOW PROFILE ONBOARD System has a height profile of only 2-3/8". This allows the center of gravity of a truck to remain practically unchanged. The entire package is designed so that it is almost unnoticeable so as not to detract from the appearance of the unit. The scale modules come preassembled for ease of installation.

Features and benefits of the *NORAC* ONBOARD Weighing System include:

1. Quick transition between weigh and transport position (about 3 seconds)
2. Off level operation. The ONBOARD system can be used in very hilly terrain since it can operate up to six degrees out of level in any direction.
3. The measurement received from the scale is shown to you directly in lbs. or kg, so conversion from gallons or liters is not necessary.
4. The entire system is temperature compensated so it can be used at any time of the year in any weather condition.

## Important Installation Notes

Following are some notes (repeated later in the manual) which must be followed when installing the Low Profile system.

1. Do not weld to any part of the scale system. Electrical currents required for welding can damage the load cells.
2. Clearance of at least 2" must be allowed between anything that is a part of the scale (lift plates, container) and anything that is NOT part of the scale (scale bases, truck frame, bumper, axles and wheels, truck cab, etc.)

## Vehicle and Container Selection

Vehicle selection is an important part of the installation process. When mounting the *NORAC* ONBOARD™ Low Profile system on a truck frame, care must be taken in selecting a truck that will carry the load and be balanced properly.

The container used to transport product must also be suitable for use with the *NORAC* ONBOARD™ Low Profile system. The container (tanks, body, etc.) must be capable of supporting its own weight plus the total weight of product at two locations along its length. If this is not practicable, a frame must be built to support the container in the weigh position.

### **Vehicle requirements**

1. Truck frame width (outside to outside) must be between 33½” and 35”.
2. Truck frame behind the cab must be as long as the container plus 6 to 12”.
3. There must be enough axle capacity for the container, product, and scale components.
4. Truck must have a bumper attached to truck frame.
5. Fenders must be attached to the truck frame. (Fenders should not be attached to the container body).

### **Hydraulic Requirements**

Truck requires a hydraulic pump with the following specifications

1. Maximum pressure capability of 3000psi (pressure is usually set to approximately 1800 to 2000 psi).
2. Minimum flow of 5 GPM (lower flow is acceptable, but will increase the time to raise and lower the scale into and out of weighing mode).
3. If used with NORAC supplied control valves, the pump must be open center (constant volume).
4. If used with other hydraulic control valves, pump must match the control valve (i.e. open center pump with open center valve).

### **Scale Selection**

The capacity of the scale selected must be able to carry the empty weight of the container / delivery body (tare weight) plus the maximum product that can be carried by the container (maximum net weight). The following chart can be used to select the proper scale capacity.

|                            | Number of Assemblies Required by Part Number |            |            |            |            |            |            |
|----------------------------|----------------------------------------------|------------|------------|------------|------------|------------|------------|
| Capacity Required          | OB5-SGL5                                     | OB10-DBL10 | OB10-SGL10 | OB20-DBL10 | OB15-SGL15 | OB30-DBL15 | OB30-TAN30 |
| 15,000 lbs.<br>(7000 kg)   | 1                                            | 1          |            |            |            |            |            |
| 20,000 lbs.<br>(9,000 kg)  |                                              | 2          |            |            |            |            |            |
| 30,000 lbs.<br>(13,500 kg) |                                              |            | 1          | 1          |            |            |            |
| 40,000 lbs.<br>(18,000 kg) |                                              |            |            | 2          |            |            |            |
| 45,000 lbs.<br>(20,000 kg) |                                              |            |            |            | 1          | 1          |            |
| 60,000 lbs.<br>(27,000 kg) |                                              |            |            |            |            | 2          |            |
| 60,000 lbs.<br>(27,000 kg) |                                              |            |            |            |            | 1          | 1          |

## Weight and Balance

The objective of the weight and balance calculation is to determine the truck's resulting axle weights when the system is installed. It is important that the allowable axle weight limits of the truck and allowable road limits are not exceeded.

A worksheet outlining the calculation is shown on the following page.

1. Measure the **wheelbase** of the truck. This is the distance from the front axle to the center of the rear axle group.
2. Obtain the **initial axle weights** of the truck without the container (delivery body).
3. Allow a **minimum** clearance of 2" from any part of the scale (scale frame, tanks, etc.) to any fixed obstruction on the truck (cab, exhaust stacks, etc.). This is **required** for proper scale operation.
4. Estimate the center of gravity of the container or delivery body. The center of gravity can usually be estimated as the center of the container.
5. Select a starting position for the body or container on the truck frame. The container center of gravity **must** be ahead of the rear axle group.
6. Assuming the starting position as previously described determine the **forward distance (FD)** from the center of the rear axle group ahead to the body's center of gravity. This dimension can be calculated or measured with a tape measure.
7. Determine the **total weight of components** being installed on the truck.
8. Determine **final axle weights** using the equations below the worksheet.

**If one of the axle weights is greater than the allowable limit for the truck or roads. Shift the body forward (to lower the rear axle weight) or backward (to lower the front axle weight), keeping in mind points 3, 5 and 6 above.**

9. Extend the truck frame if required. If the weigh module hangs past the end of the truck frame, the truck frame must be extended. The truck frame must be at least even with the end of the weigh module. It is recommended that the truck frame extend a minimum of 1" past the weigh module.
10. It is preferred that the rear bumper be mounted directly to the truck frame.

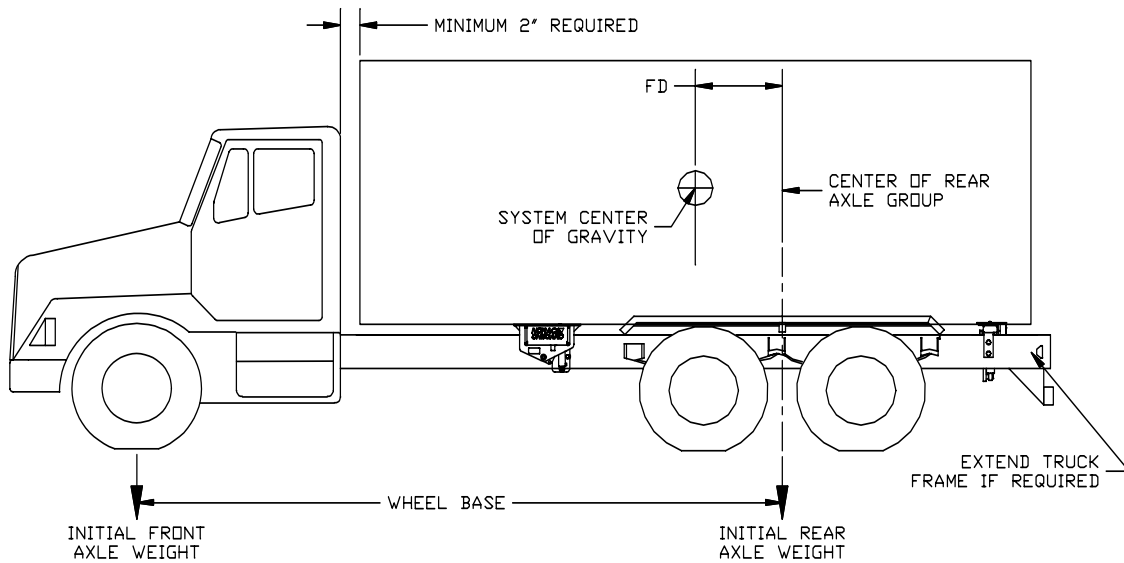


**Figure 1 - Weight and Balance**

**Weight of Installed Components Calculation**

|                                   | Approximate Weight of Components (lbs.) |         |         |         |
|-----------------------------------|-----------------------------------------|---------|---------|---------|
|                                   | 5K* or 10K*                             |         | 15K*    |         |
|                                   | 3 point                                 | 4 point | 3 point | 4 point |
| Container(s) Tare (empty) Weight  |                                         |         |         |         |
| Maximum Product Weight            |                                         |         |         |         |
| Scale Parts (approx.)             | 450                                     | 550     | 575     | 720     |
| <b>Total Weight of Components</b> |                                         |         |         |         |

\*5K → OB5-SGL5 and OB10-DBL5

\*10K → OB10-SGL10 and OB20-DBL10

\*15K → OB15-SGL15 and OB30-DBL15

**Weight and Balance Calculation**

|                                            | Workspace | Example  |
|--------------------------------------------|-----------|----------|
| Wheel base                                 |           | 216"     |
| Initial Front Axle Weight                  |           | 6800 lb  |
| Initial Rear Axle Weight                   |           | 6600 lb  |
| Total Weight of Components (see above)     |           | 27600 lb |
| Forward Distance (FD)                      |           | 28"      |
| <b>Final Front Axle Weight</b> (see below) |           | 10378 lb |
| <b>Final Rear Axle Weight</b> (see below)  |           | 30622 lb |

$$\text{Final Front Axle Weight} = \text{Initial Front Axle Weight} + \left( \frac{\text{FD}}{\text{Wheelbase}} \times \text{System Weight} \right)$$

$$\text{Final Rear Axle Weight} = \text{Initial Rear Axle Weight} + \left( \frac{\text{Wheelbase} - \text{FD}}{\text{Wheelbase}} \times \text{System Weight} \right)$$

## **Truck Preparation**

Before you mount your *NORAC ONBOARD™* Weighing System onto your truck, make sure there are no protrusion or mechanical parts on the truck that may interfere with the scale operation. Remove any parts that protrude above the C-channel of the truck frame.

### ***Fenders***

Fenders are required over the rear wheels of the truck. This prevents mud/dirt to accumulate on the scale that can cause erroneous weight indications. The truck fenders must be mounted on the truck frame, **NOT ON THE CONTAINER BODY**. Allow for a minimum 3" clearance between the fenders and any part of the scale.

## **Scale Positioning**

The scale must be positioned correctly in relation to the container's center of gravity to ensure proper distribution of weight to the load cells. The following diagrams outline the proper scale positioning for three point and four point scales. For three point systems, NORAC recommends positioning the single cell in the rear to avoid the truck's driveshaft. There is no front or back to the modules, they can be attached either direction. Some factors to consider when positioning the modules are:

1. Accessibility for service.
2. Space for attachment of test weights to the lift plates of the scale system.
3. Avoidance of bolt heads on the truck frame.
4. Avoidance of other protruding components on the truck frame.
5. Ease of hydraulic plumbing and wire routing.

It is important to position the scale far enough away from axles and tires such that weight hangars and test weights can be attached to the lift plates for balancing, calibration, and approval. The test weights, when attached to the scale, must clear all obstructions at all operative angles (6 degrees in all directions). See the following figures for details.

### Three Cell System

(One single and one double mount assembly)

*The distance from the container's center of gravity to the single load cell assembly must be double the distance from the container's center of gravity to the double load cell assembly.*

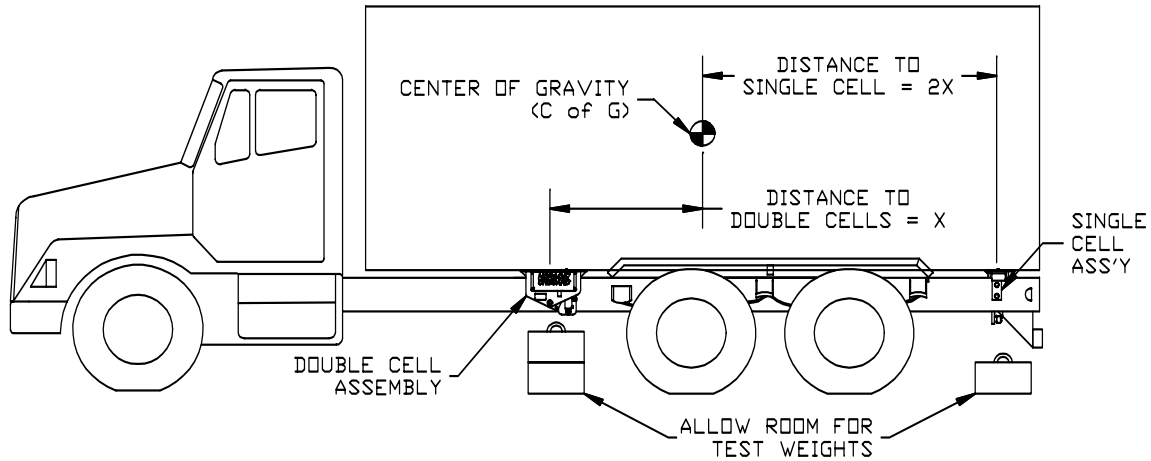


**Figure 2 – Double / Single Scale Positioning**

### Four Cell Systems

(Two double mount assemblies OR one double and one tandem assembly)

*The distance from the container's center of gravity to the front load cell assembly must be equal to the distance from the container's center of gravity to the rear load cell assembly.*

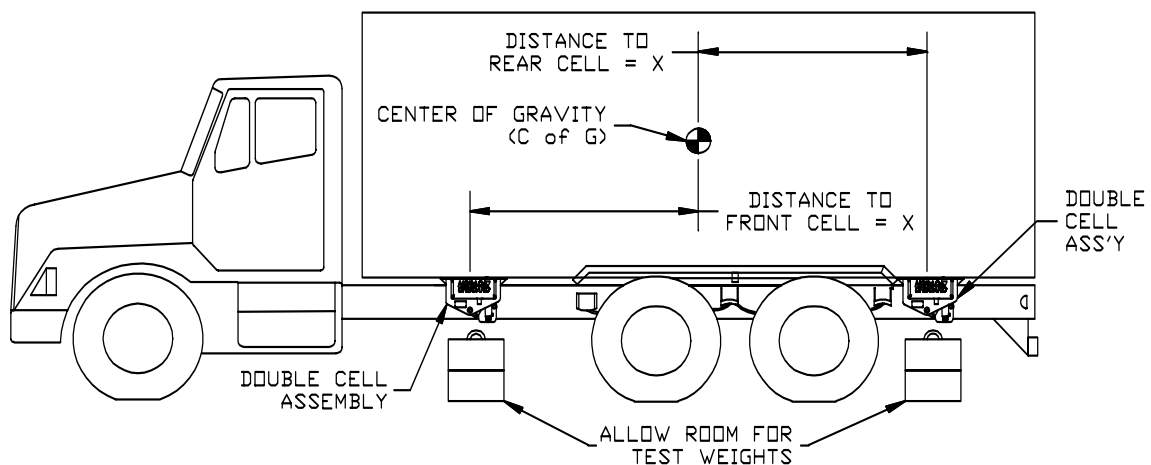


**Figure 3 – Double / Double Scale Positioning**

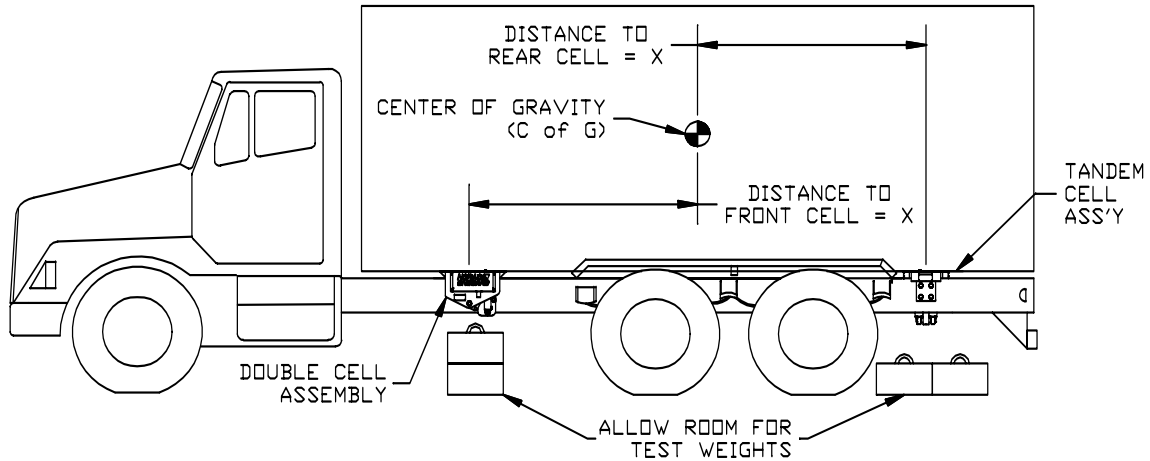


**Figure 4 – Double / Tandem Positioning**

## Attachment of Scale to Truck

Position the scale modules on the truck frame as per the previous section. Mark the location of the bolt holes to be drilled through the truck frame, and move the scale away. Drill 7/8" holes through the channel of the truck frame. Reposition the scale aligning the holes. Insert shims (flat washers) between the truck frame and the scale (equal amount on both sides). Bolt the scale to the truck frame using the 3/4"x2 1/2" grade 8 bolts, 3/4" nuts, and 3/4" lock washers supplied. Torque the 3/4" bolts to between 90-110 ft-lbs.

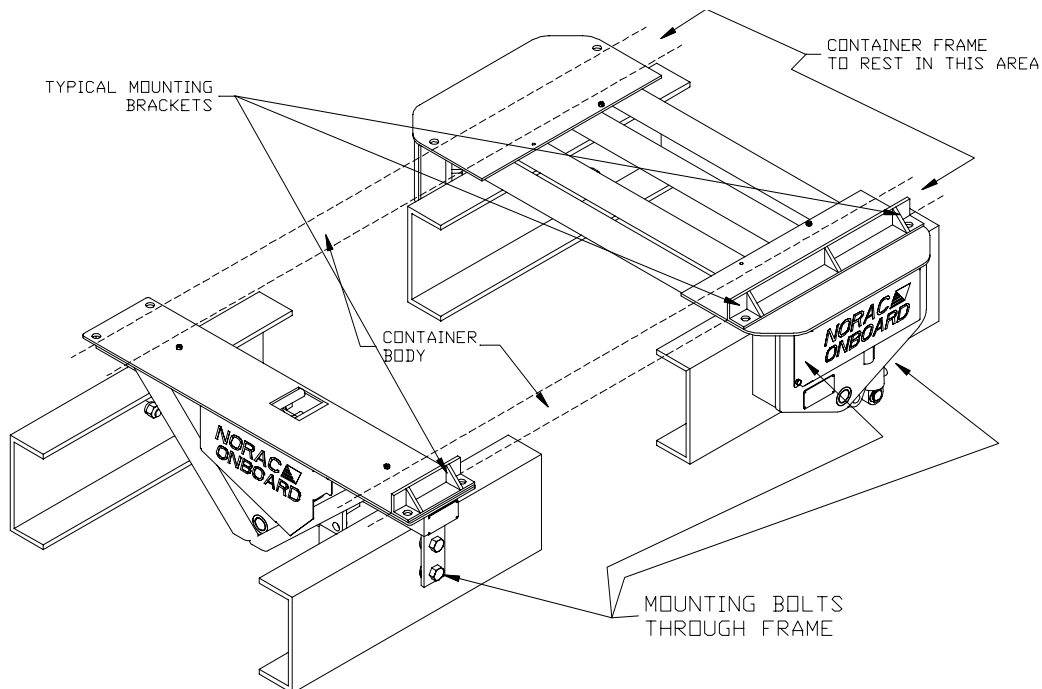


**Figure 5 - Attachment of Scale to Truck Frame**

## Attachment of Container to Scale

Once the scale modules are attached to the truck frame, the container can be attached to the scale.

Mounting brackets must be attached to the container to bolt the container to the scale. Mounting hole dimensions are shown in the following figures. NORAC recommends the following bolt sizes for attaching the container to the scale.

| System Size | Hole Drill Size | Bolt Size    | Torque Spec (ft-lbs.) |
|-------------|-----------------|--------------|-----------------------|
| 5K or 10K   | 3/4"            | 5/8" Grade 8 | 70 – 90               |
| 15K         | 7/8"            | 3/4" Grade 8 | 90 – 110              |

Measure distance D from module to module to determine distances between mounting brackets on the container. All hole dimensions must be  $\pm 1/16"$ .

**IMPORTANT: Bolts shown below are used for shipping and keeping the load cell assemblies aligned during installation. They must be removed as soon as the container is attached to the scale and before testing hydraulics.**

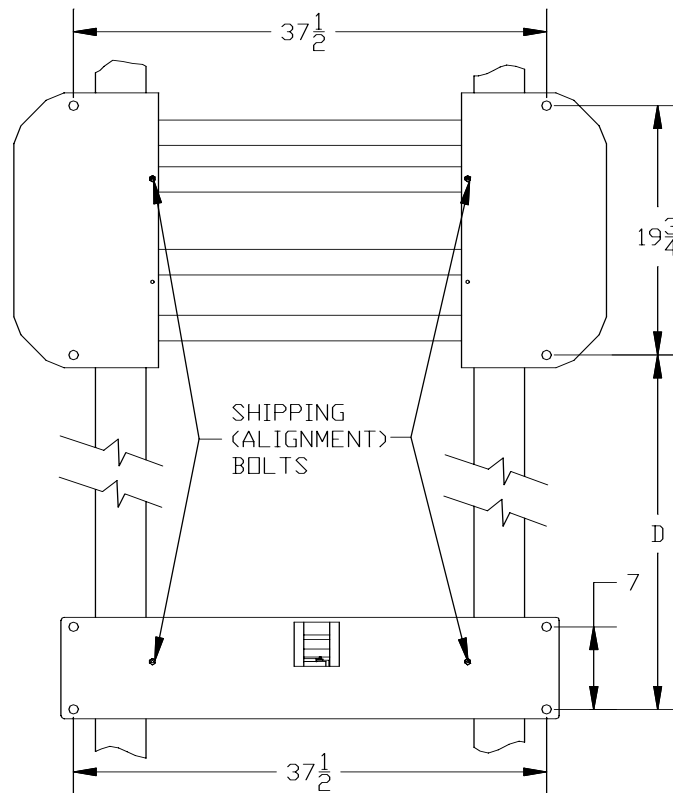


**Figure 6 - Mounting Hole Dimensions**

## **Control Box Mounting**

A suitable location must be found for the ONBOARD control box. *NORAC* recommends mounting the control box near the front driver's side corner of the container. However, the location for the control box is application specific and is dependent on the end user's needs.

**IMPORTANT: The control box must be mounted level with the scale.** The control box contains a mercury level switch that detects the degree to which the scale is off level. Therefore, the control box must be mounted level with respect to the scale.

### ***42300 Standard Control Box***

The 42300 control box comes standard with vibration mounts to protect the indicator. A bracket (plate with holes) is required. Ensure the bracket is attached level with the scale (see above).

**IMPORTANT:** The red light on the side of the control box must be viewable through the driver's rear view mirror.

NOTE: Control box mounting brackets are available from *NORAC*.

### ***42301 Compact Control Box***

The 42301 control box is mounted inside the cab of the truck. Included with the control box is a junction box (42302) that contains the mercury level switch. This junction box must be mounted on the scale (level with the scale – see above).

## Hydraulic Assembly

Included with each scale module is hydraulic plumbing from the cylinders to the line locks. Control valves and hose kits are available from *NORAC*.

### Cylinders to Line Locks

A diagram of the hydraulic assembly from the cylinders to the line locks is shown in Figure 7.

1. Attach the line locks to the truck frame, using the bolts, nuts, and washers provided. Position the line locks such that there is some slack in the hoses to allow for cylinder motion (see below).
2. Thread orifices into the lower ports of the cylinders. This is an ORB (SAE) o-ring fitting. Ensure the o-ring is on the fitting.
3. Thread fittings into the upper port of the cylinders. These fittings are DO NOT have an orifice. Ensure the o-ring is on the fitting.
4. Thread hoses into the line locks.
5. Thread hoses into the fittings on the cylinders.

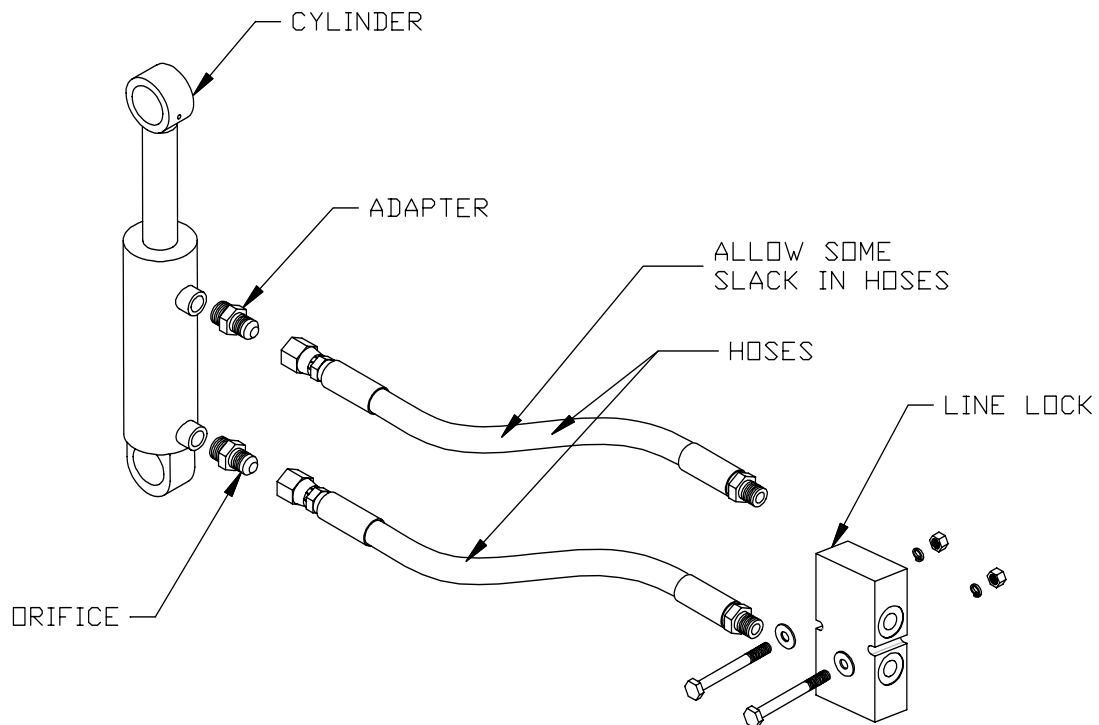


**Figure 7 – Assembly of Hydraulic Components**

### ***Line Locks to Valve***

The system must be plumbed to a hydraulic source (pump) on the truck through a valve. Optional packages are available which include a manual spool valve, hydraulic components, and hoses to plumb the valve to the line locks.

Hydraulic schematics of the ONBOARD systems are shown in Figure 8 and Figure 9.

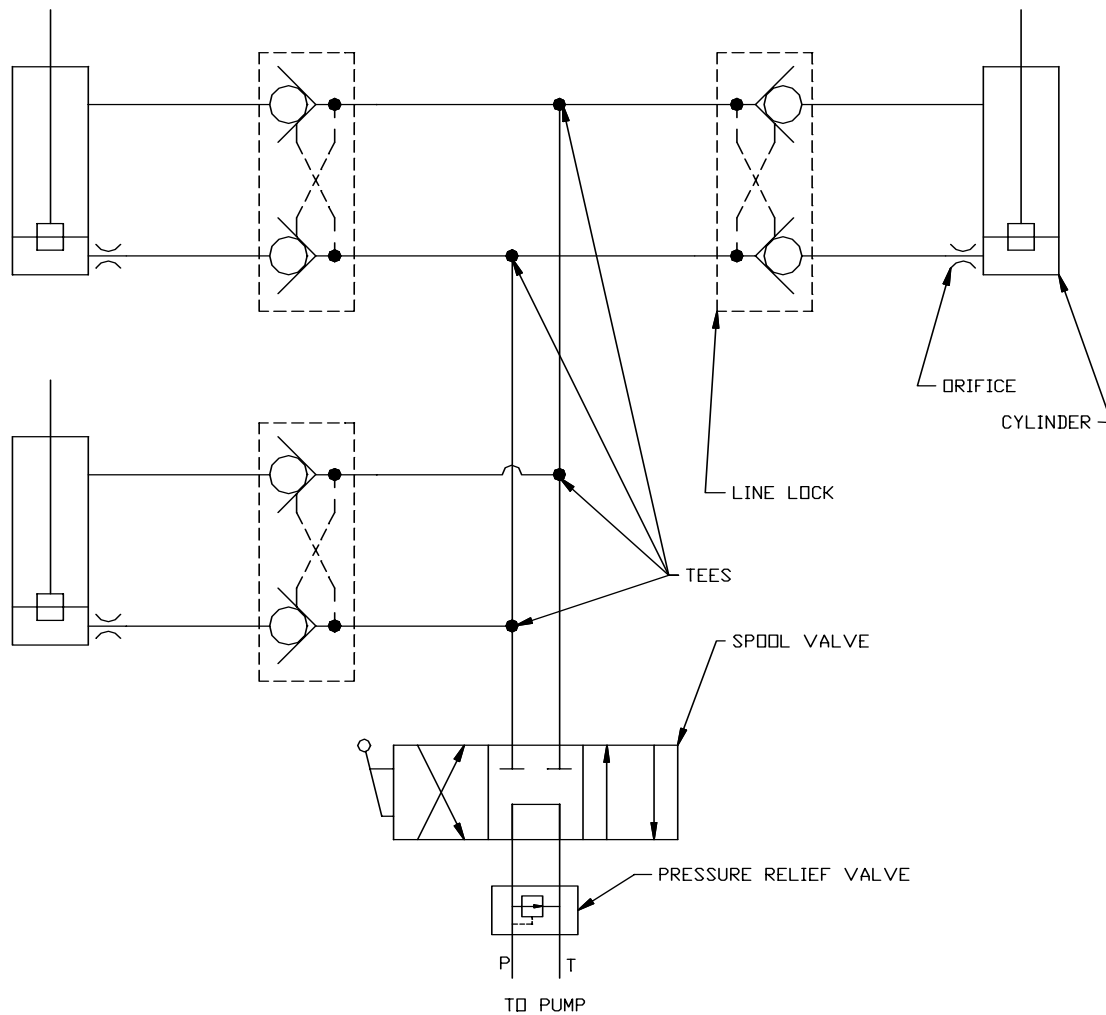


**Figure 8 - Hydraulic Schematic for 3 Cell System**

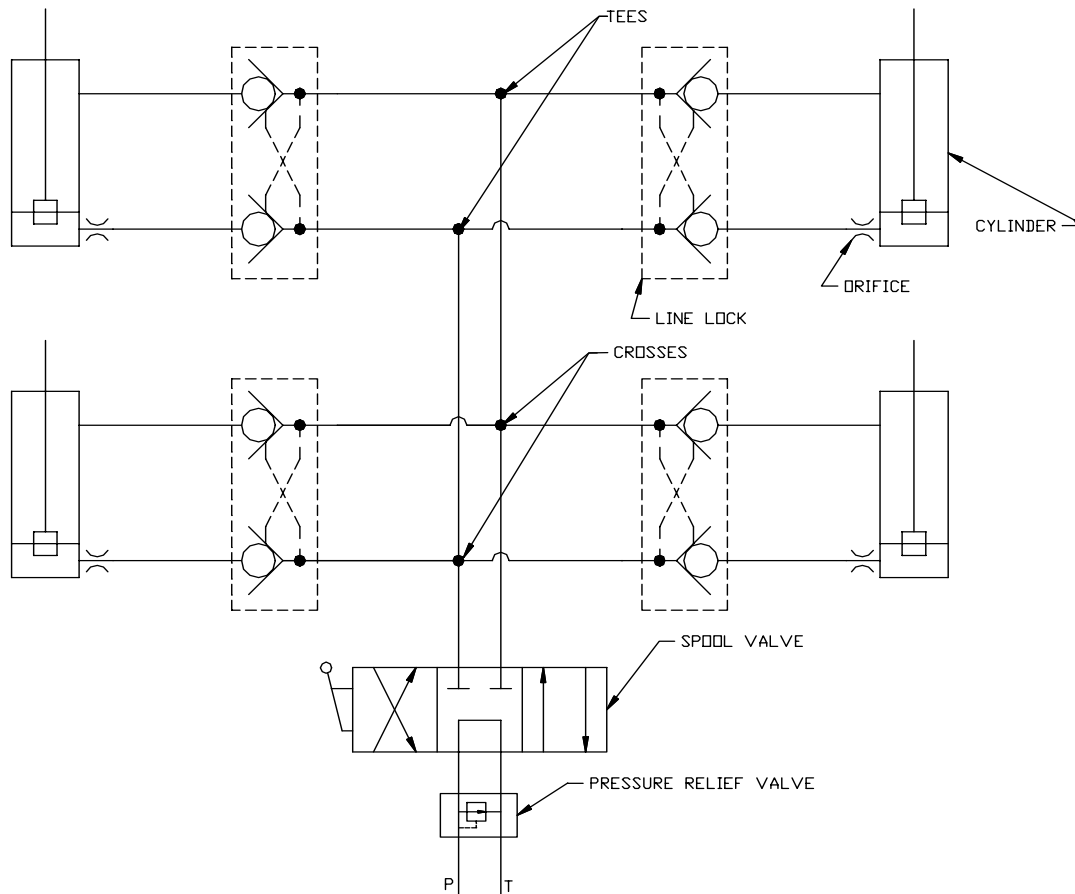


**Figure 9 – Hydraulic Schematic for 4 Cell System**

### ***Valve to Pump***

The hydraulic pump on the truck can be plumbed to the control valve. Simply plumb pressure from the pump to the pressure port on the valve, and plumb the tank port of the pump to the tank port on the valve.

**WARNING: Control valves supplied by NORAC contain a pressure relief valve. This ensures the pump is protected from over pressurization. This pressure setting may require adjustment depending on the application (consult factory).**

### ***Air Removal (Bleed-off) Procedure***

**IMPORTANT:** Before raising the scale, ensure shipping bolts are removed.

During the bleed-off procedure, which removes air from the hydraulic system, some oil will be lost. **Do not allow the hydraulic pump to run dry. Serious damage and failure of the hydraulic pump can occur.**

1. Plumb the valve to a hydraulic power source and hydraulic reservoir.  
This can be the hydraulic source on the truck or a portable power pack.
2. With the cylinders down, loosen the top fitting of one of the cylinders.  
Place a pail or can under the fitting to catch oil.
3. Raise and lower the scale. Continue raising and lowering until the oil coming out of the top fitting is clear (not bubbly or creamy).
4. Tighten the top fitting.
5. Repeat steps 2 through 4 for all other cylinders.
6. Repeat steps 2 through 5 for the bottom fittings of all cylinders.

### **Lock Down Bolt Adjustment**

The lock down bolt is adjusted at the factory. However, to ensure proper lock down of the container, check the lock down bolt height adjustment.

The lockdown bolt should be adjusted so that the hydraulic cylinder is extended minimum 1/8" to maximum 1/4" when locked down – see **Figure 10**. As well, the load cell should be loose in the lock down position.

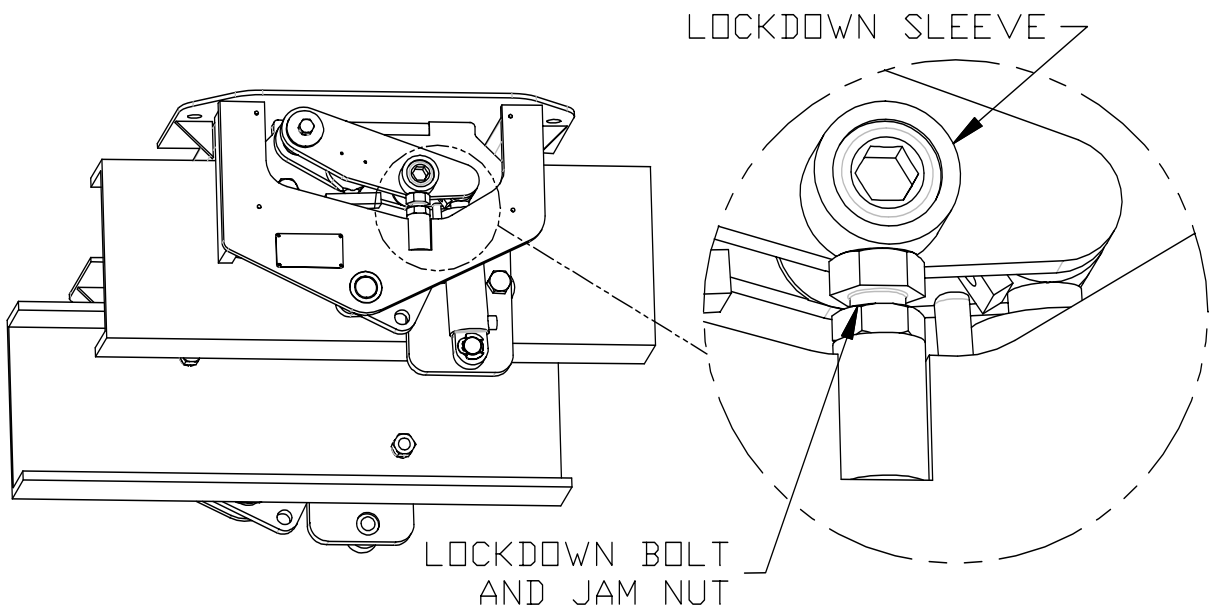


**Figure 10 – Lock Down Adjustment**

## Cell Covers

The final step in the mechanical installation is attachment of the load cell covers. Bolt the covers in position as shown in Figure 11 with ¼" bolts and lock washers.

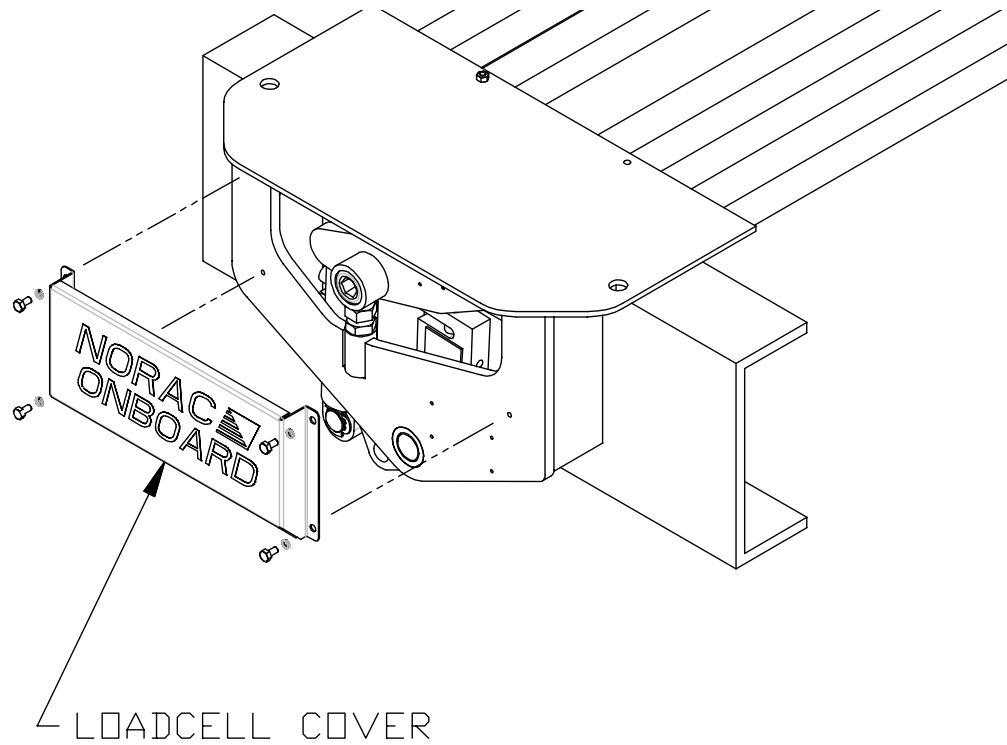


**Figure 11 - Load Cell Cover**

## Electrical System

### Control Box Mounting

The control box must be mounted on the scale. If needed, use the control box mounting bracket included with the ONBOARD kit. The control box should be easily accessible to the operator and be visible to anyone wishing to see the display.

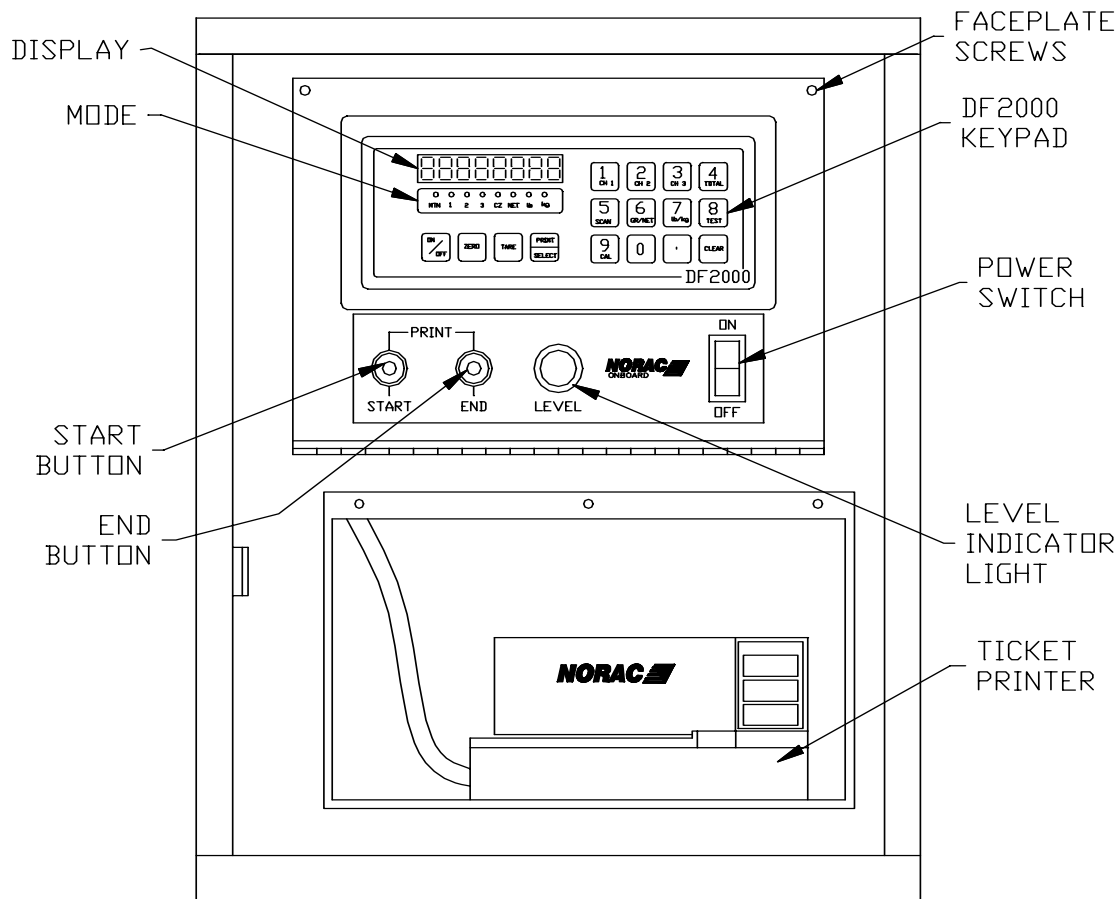


Figure 12 - Control Box

**The control box must be level with the scale.** The control box contains a mercury level switch that detects the degree to which the scale is off level. Therefore, the control box must be attached to the scale so that it is level with respect to the scale.

## **Conduit Connections**

Follow Figure 13 for assembly of sealtite conduit connectors.

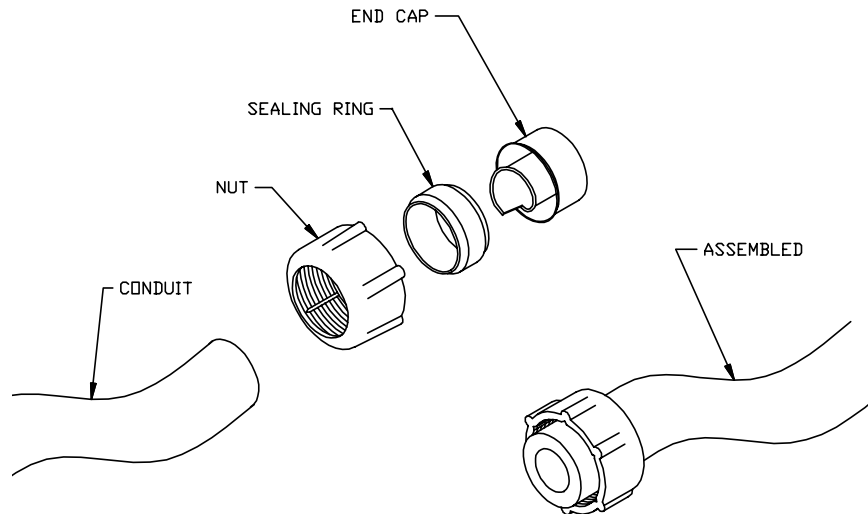


**Figure 13 – Sealtite Conduit Connectors**

The following wires are run in the flexible conduit:

1. All load cell cables
2. Power (Truck) Cable

The only wire not run in conduit is the Reed Switch (Hardware Alarm).

### **Power (Truck) Cable**

Included with the control box is a 3-conductor 14-gauge cable referred to as the truck cable, this fused cable supplies power to the instrument box and controls the "weigh position" cab alarm. The truck cable has the following wiring color code:

**BLACK - GROUND**

**GREEN - +12 V DC (switched and fused)**

**WHITE - CAB ALARM**

1. Measure a length of conduit to feed the power cable through. The conduit must reach from the strain relief on the control box to the nearest switched 12V source plus 1 to 2 feet. The extra length required is to provide a gradual loop so that the cable is not tight. Assemble sealtite conduit connectors on the conduit.
2. Feed the power cable through the conduit.

3. Wire the power cable to the truck (see Figure 15). The fused power (green) wire should be wired to a switched 12V source. This ensures that power to the control box is on only when the ignition key of the truck is on.
4. Feed the cable through the strain relief closest to the cab.
5. Cut the power cable to length. Ensure there is enough cable to plug the connector into the corresponding connector on the board. (See Figure 14)
6. Strip back the outer (black) insulation of the cable so there is approximated  $\frac{1}{2}$ " to 1" extending past the strain relief into the control box.
7. (Re) wire the plug onto the end of the power cable. (See Figure 14). Wire the white and green wires leading from the red (alarm) light on the side of the control box into this plug as well (See Figure 14).
8. Connect the power cable to the circuit board in the control box by plugging the connector of the power cable into the matching connector on the board (see Figure 14).
9. Turn the ignition key on and ensure the Power LED on the circuit board illuminates. (See Figure 14)
10. After checking for power, tighten all strain relief fittings.

### ***Cab Alarm (Optional)***

The cab alarm provides a visual and audible signal to the operator when the scale is in the weigh position. The cab alarm functions when the control box power switch is on (software controlled) and when it is off (hardware controlled).

1. Mount the cab alarm/buzzer assembly in a convenient location in the cab of the truck.
2. Wire the cab alarm cable to the power cable as shown in Figure 15.

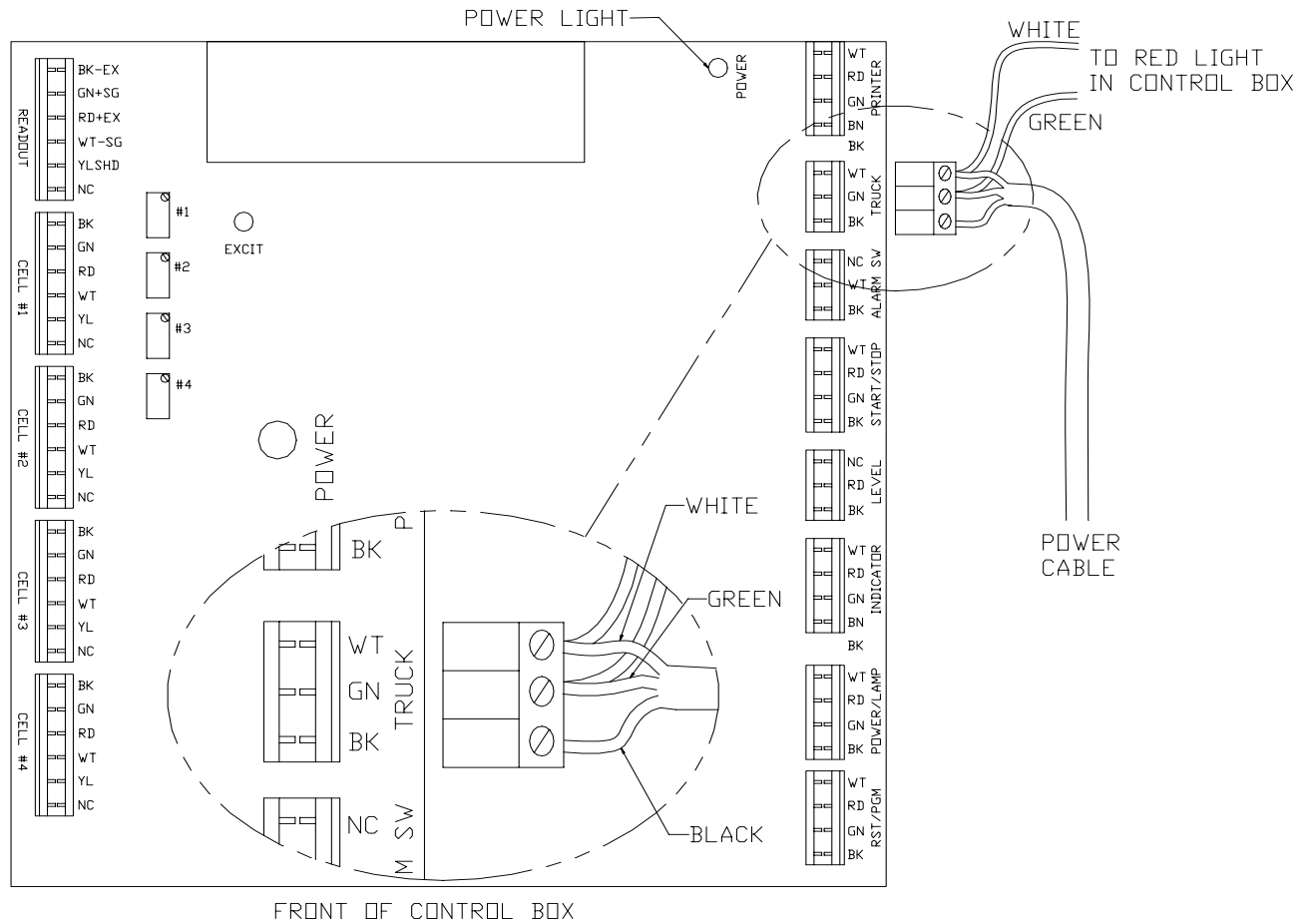


**Figure 14 – Truck Power Cable Wiring**

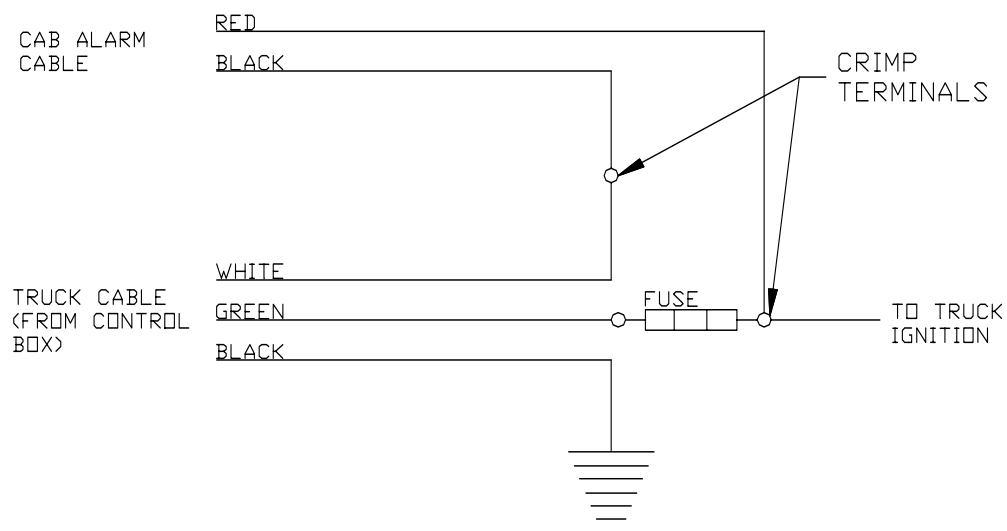


**Figure 15 – Power Cable and Cab Alarm Wiring**

### **Reed Switch (Hardware Alarm)**

The NORAC ONBOARD system is equipped with a "weigh position" alarm system. When the M2000 indicator is on, the system software automatically monitors the weight on the scale and alerts the operator if the scale is in the weigh position via the cab alarm or control box. As a backup to the software alarm, a hardware alarm, consisting of a reed switch and a magnet, is included which operates when the M2000 is off. The reed switch and magnet are physically mounted at the factory, but must be electrically connected at installation. The reed switch and magnet are mounted on the double load cell module of a three-point system and on one of the modules in a four-point system.

1. Bring wire into the control box.
2. Wire to the "ALARM SW" position of the circuit board (see Figure 17).
3. Test the alarm by raising the scale. When the scale is in the weigh position the alarm is activated. Lower the scale into the transport position the alarm should turn off.

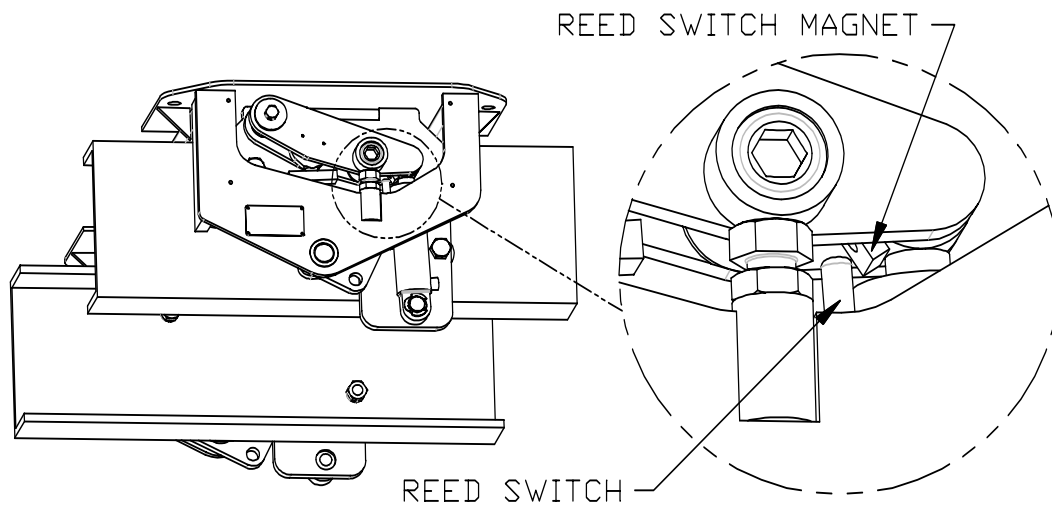


**Figure 16 – Reed Switch and Magnet Location**

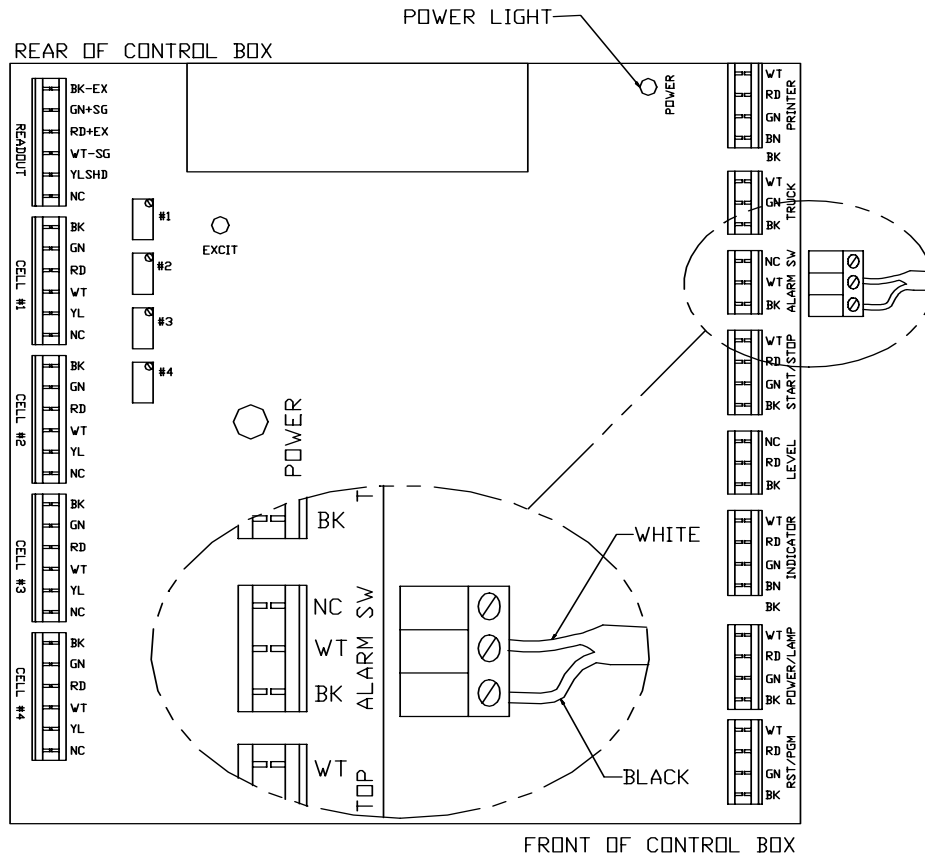


**Figure 17 – Hardware Alarm (Reed Switch) Wiring**

### ***Load Cell Numbering***

#### **Systems balanced at the factory:**

Systems that are balanced at the factory have load cell numbers already assigned. Connect numbered load cell wires to the corresponding connector on the circuit board.

#### **Systems balanced at installation:**

Systems that have not been balanced at the factory, but are to be balanced at installation, should follow the load cell number convention shown below (see Figure 18 and Figure 19).

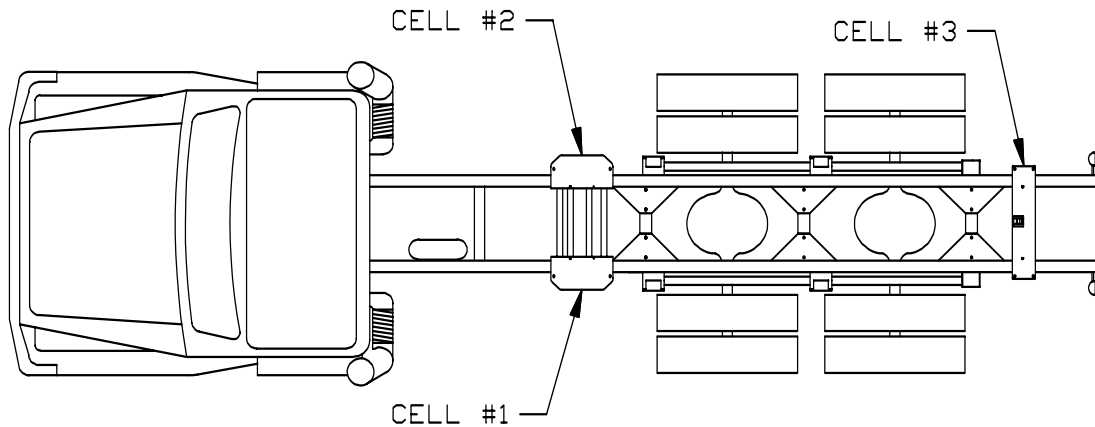


**Figure 18 – Load Cell Numbering for 3 Point System**

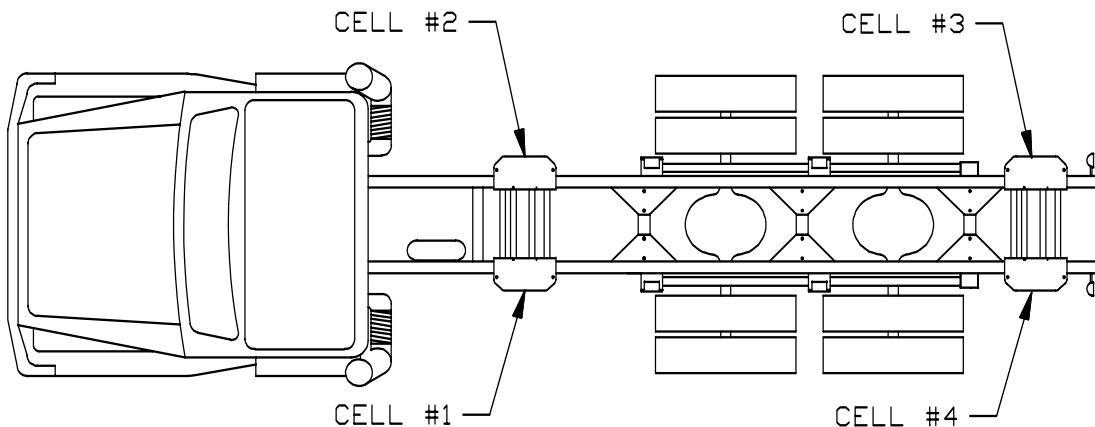


**Figure 19 – Load Cell Numbering for 4 Point System**

### ***Load Cell Connections***

1. Measure lengths of conduit to pass the load cell wires through. The conduit must reach from the strain relief fitting near the load cell to the compression fitting on the control box. Install seal-tite connectors on conduit ends.
2. Feed load cell wires through conduit. The load cell wires must have a small amount of wire loose between the conduit and the Load Cell. The load cell wire must be loose to allow the scale to swing freely.
3. Wire load cell wires to the circuit board in the control box. Load cell wires may be cut to reduce the amount of wire looped inside the control box. **Load cell wires must not be cut closer than 6 feet away from the load cell (i.e. at least 6 feet of wire must be left attached to the load cell).** The scale must be balanced and calibrated **AFTER**

**cutting load cell wires.** See Figure 20 for where to wire the load cells to the circuit board.

4. For each load cell remove the connector from the board and attach to the load cell cable according to Figure 20. The wiring color code for the load cells is also shown.

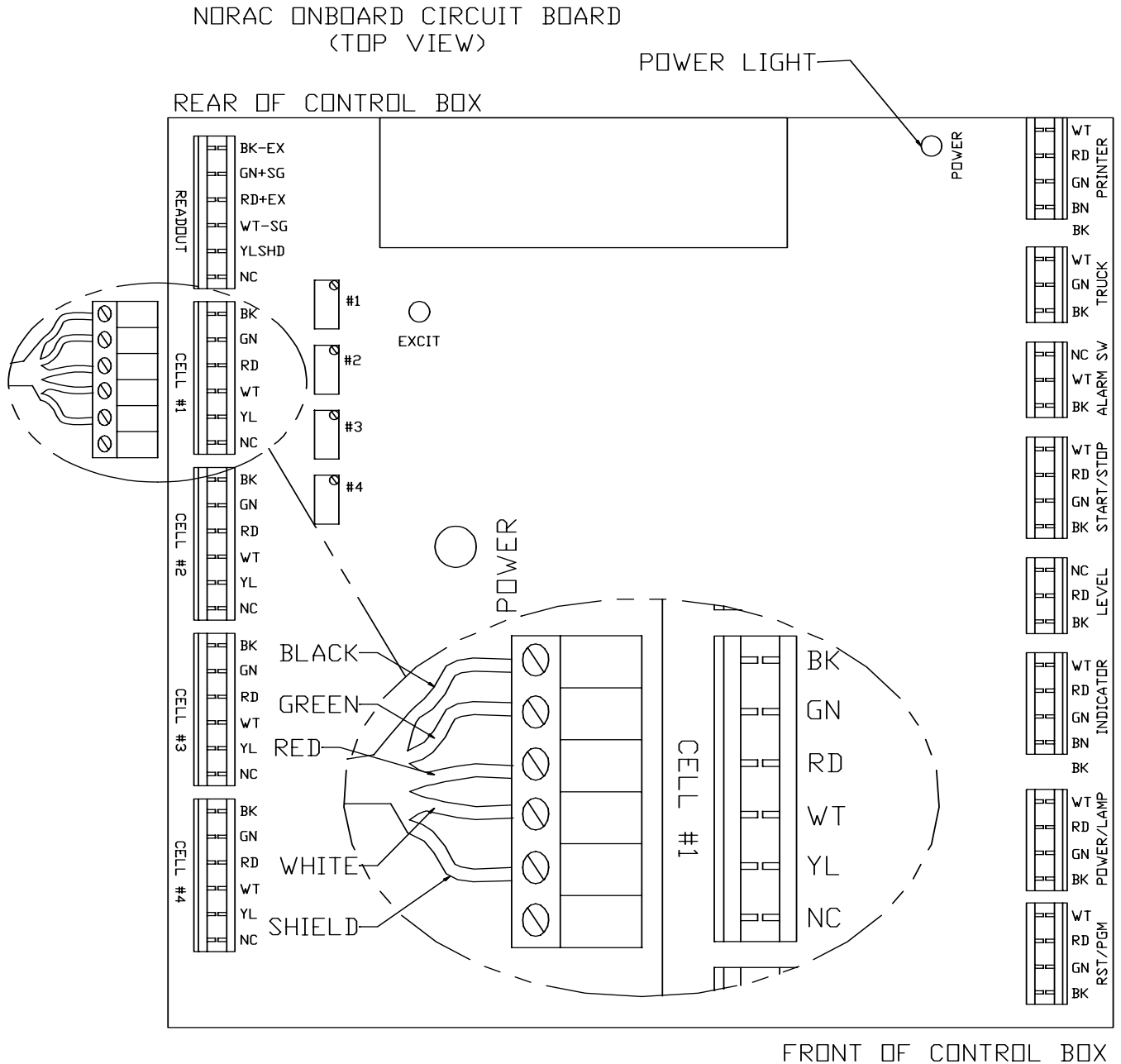


**Figure 20 – Circuit Board, Load Cell Connections & Trimmer Locations**

## Dip Switches

A small bank of DIP switches is located on the front left corner of the circuit board. The position of these switches determines how your system operates, as described below. As shown in the diagram below, the side of the dip switch that is down determines if the switch is in the open or closed position.

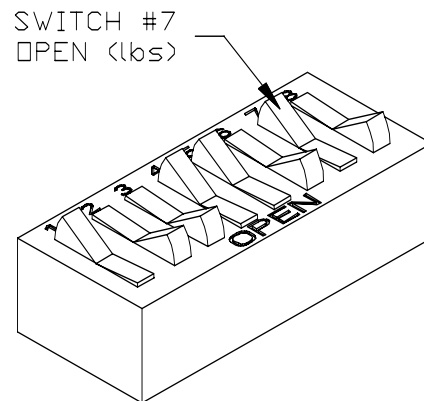
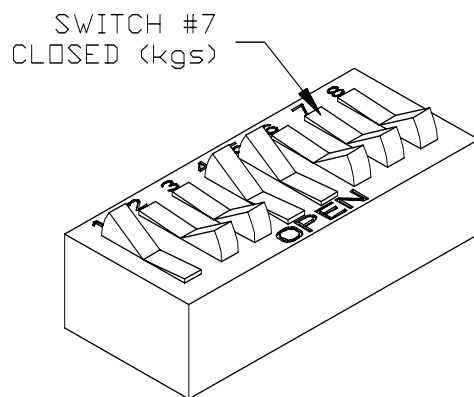
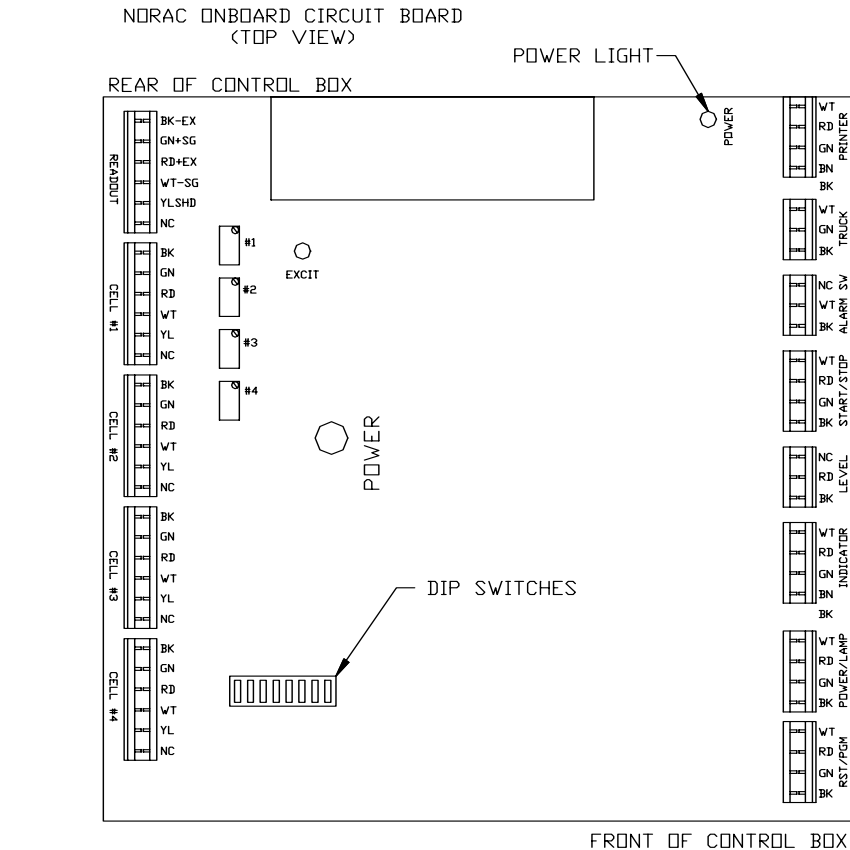


**Figure 21 – Dip Switches**

## Units

The units can be set in kilograms (KGS) or pounds (LBS). To change this setting find **switch #7** and set appropriately.

Closed = kilograms (kg)

Open = pounds (lbs)

## ID Number

The ID number for your system is factory programmed. If you wish to change this ID number, follow the instructions below:

- a) Change **switch #3** to “open”.
- b) Type the following sequence on the M2000

[2][0] [SELECT] [x][x][x][x][x] [SELECT]

xxxxxx is the new ID number

- c) Push [START] and hold until your keystrokes start to repeat on the M2000, about 3 - 5 seconds.
- d) Move switch #3 back to “closed” and close the front panel.

## Standard Switch Settings

The standard DIPswitch settings on the main circuit board should be set as follows:

| Switch # | Position             | Description                           |
|----------|----------------------|---------------------------------------|
| 1        | Open                 | DO NOT CHANGE                         |
| 2        | Closed               | DO NOT CHANGE                         |
| 3        | Closed               | System ID number                      |
| 4        | Open                 | DO NOT CHANGE                         |
| 5        | Open                 | DO NOT CHANGE                         |
| 6        | Closed               | DO NOT CHANGE                         |
| 7        | a) Closed<br>b) Open | a) Kilograms (KGS)<br>b) Pounds (LBS) |
| 8        | Closed               | DO NOT CHANGE                         |

## Set-up and Calibration

The M2000 weigh indicator (integral in the control box) is set-up with all required parameters when it is shipped with the *NORAC ONBOARD™* System. Common parameters to all ONBOARD systems are shown in Table 1. The appropriate parameter values for popular net capacities are listed in Table 2 and Table 3. Double check that the parameters are set appropriately for your system. To check the parameters:

1. Enter the calibration mode channel 1 on the M2000 by keying in:

**19 <SELECT>**

The display will be showing a blinking "PASS" message. This prompts you to enter a 4 digit password. The factory default password is "1111". This password can be changed, but it is recommended that the factory default password be kept. You are now in calibration mode. You will see a "C" flash on the left side of the display while in calibration mode.

2. Access the individual parameters by typing the parameter number followed by the SELECT key.

Example: **4 <SELECT>**

3. To change a value, while displaying the parameter value type in the desired number followed by the TARE key.

Example: **31500 <TARE>**

4. When finished exit calibration mode by typing 99 and pressing SELECT.

**99 <SELECT>**

For more information, refer to the M2000 manual included along with this manual.

| Parameter | Value | Parameter | Value | Parameter | Value |
|-----------|-------|-----------|-------|-----------|-------|
| 2         | 0     | 21        | 2     | 38        | 0     |
| 5         | 2     | 22        | 0     | 40        | 0     |
| 8         | 0     | 23        | 15    | 41        | 100   |
| 9         | 0     | 24        | 16    | 42        | 12    |
| 10        | 1     | 30        | 3*    | 43        | 8     |
| 11        | 3     | 31        | 0     | 44        | 0     |
| 19        | 1     | 34        | 3     | 50        | 1     |

**Table 1 – Common Parameters**

| Parameter Number | Net Capacity x Divisions |               |               |
|------------------|--------------------------|---------------|---------------|
|                  | 8000 x 2 kg              | 12,000 x 2 kg | 15,000 x 5 kg |
| 3                | 2                        | 2             | 5             |
| 4**              | 8400                     | 12600         | 15750         |
| 6                | 1                        | 1             | 1             |

**Table 2 - Parameter Settings (Metric units)**

| Parameter Number | Net Capacity  |               |                |
|------------------|---------------|---------------|----------------|
|                  | 10,000 x 2 lb | 20,000 x 5 lb | 60,000 x 10 lb |
| 3                | 2             | 5             | 10             |
| 4**              | 10500         | 21000         | 63000          |
| 6                | 0             | 0             | 0              |

**Table 3 - Parameter Settings (US units)**

Notes:

\* Set parameter 30 to 3 for ticket printers. Set parameter 30 to 6 for roll printers.

\*\* Values listed are maximum settings. Parameter 4 may be set anywhere from net capacity plus one division up to the maximum setting.

## Balancing Procedure

When loading test weights on the scale (for balancing or calibration), it is important to position the weights correctly. Imagine lines connecting the load cell positions (see Figure 22). Keep the weights inside the area defined by the lines connecting the load cell positions.

**Note:** Temporary racks may be required on the container to place the weights on during testing. All modules have provisions for hanging test weights below the truck frame.

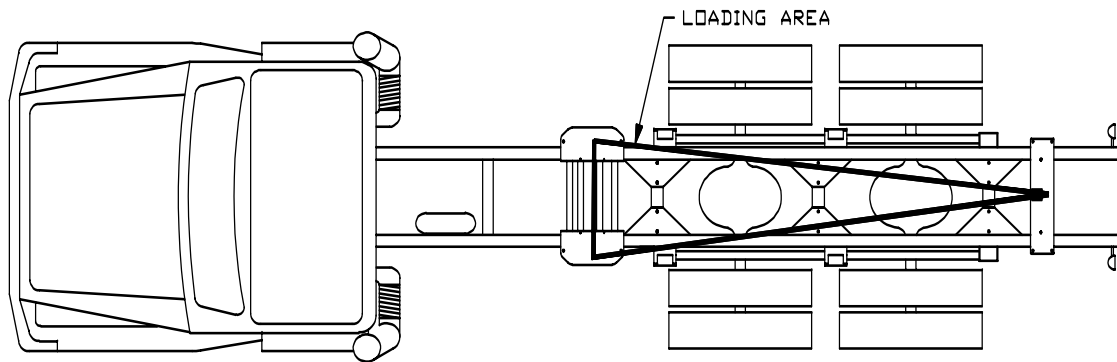


**Figure 22 - Loading Area**

Before the scale can be calibrated, all load cells must be balanced and responding to loading equally by adjusting the balance trimmers. The balance trimmers are located on the main circuit board, inside the control panel (see Figure 20). They are initially set to 2-Ohm resistance. Use the following procedure to balance the load cells.

1. Use the following balancing weights to ensure proper balancing. Use a minimum of  $\frac{1}{4}$  of the net capacity of the scale for balancing. I.e. for a 10,000-lb net capacity, use at least 2500 lbs. for balancing.
2. Ensure the load cells are all loose when in the transport mode. The lockdown bolts may have to be adjusted if the load cell is binding. Raise and lower the scale several times to ensure the scale is hanging free.
3. Raise the scale. "Dead load" the test rack by following the Calibration Procedure page 32. Load weights on the rack to the full capacity of the scale: then, unload all the weights. This process "exercises" the load cells.
4. Press the zero key to obtain a good center of zero. Load one cell by placing the balancing weights on that corner of the tank (inside the triangle noted above). Keep the weights as close to the cell as possible directly above the

cell being preferred. Record the weight on the M2000. The weight reading should be close to the actual weight applied at this point in the procedure, however it does not need to be exact.

5. Repeat step 4 for the other cells with the same procedure (remembering to press the zero key to obtain a good center of zero). All the readings should be within approximately one percent (1%) of each other. If the readings are significantly farther apart, you may not be able to balance your system. Contact NORAC for technical assistance.
6. Pick the lowest reading and adjust the other cells down to this value with the trimmers inside the control box (see Figure 20). To adjust a cell use the following procedure:
  - a) With no test weights on the scale, press the zero key to obtain a good center of zero
  - b) Load the balancing weight over the cell to be adjusted.
  - c) If you have to adjust the cell by one or two graduations, simply turn the trimmer clockwise to reduce the displayed reading to the desired reading.
  - d) If you have to adjust the cell by more than one or two graduations, the system may undergo a zero shift during the adjustment. Adjust the cell (by turning the trimmer clockwise) to one graduation LOWER than the desired value. Remove the weights and check the zero. Re-zero the scale and repeat the process until the desired reading is obtained.
7. Test the final balance by loading each cell again and recording the M2000 readings. The cells must read within one graduation of each other for an acceptable final balance. However, it is more desirable that there be no difference in the readings (zero balance error).
8. The system can now be calibrated.

**EXAMPLE: OB30L-F3 System**

Balancing Weights

English = 5000 lb.

Metric = 2000 KG

Graduations

English = 5 lb.

Metric = 2 KG

**First Loading**

| English Units (lbs.) |        |          | Load Cell | Metric Units (kg) |        |          |
|----------------------|--------|----------|-----------|-------------------|--------|----------|
| M2000 Reading        |        |          |           | M2000 Reading     |        |          |
| Start                | Loaded | Unloaded |           | Start             | Loaded | Unloaded |
| 0                    | 4995   | 0        | 1         | 0                 | 1998   | 0        |
| 0                    | 4990   | 0        | 2         | 0                 | 1996   | 0        |
| 0                    | 5005   | 0        | 3         | 0                 | 2002   | 0        |

From the above results, it can be seen that cells 1 and 3 must be adjusted down to read 4990 lbs. (1996 kg in the metric example). First, the trimmer for cell 1 is turned clockwise to bring the reading down (step 6(c)).

**Second Loading**

| English Units (lbs.) |        |          | Load Cell | Metric Units (kg) |        |          |
|----------------------|--------|----------|-----------|-------------------|--------|----------|
| M2000 Reading        |        |          |           | M2000 Reading     |        |          |
| Start                | Loaded | Unloaded |           | Start             | Loaded | Unloaded |
| 0                    | 4990   | 0        | 1         | 0                 | 1996   | 0        |
|                      |        |          | 2         |                   |        |          |
|                      |        |          | 3         |                   |        |          |

Next, the trimmer for cell 3 is turned clockwise to bring its reading down. Because this cell is being adjusted by three graduations, the procedure in 6(d) should be followed, adjust cell 3 down to 4985 lbs. (1994 kg in the metric example) and check for a zero shift.

**Third Loading**

| English Units (lbs.) |        |          | Load Cell | Metric Units (kg) |        |          |
|----------------------|--------|----------|-----------|-------------------|--------|----------|
| M2000 Reading        |        |          |           | M2000 Reading     |        |          |
| Start                | Loaded | Unloaded |           | Start             | Loaded | Unloaded |
|                      |        |          | 1         |                   |        |          |
|                      |        |          | 2         |                   |        |          |
| 0                    | 4985   | -5       | 3         | 0                 | 1994   | -2       |

The unloaded reading is found to be -5 lb (-2 kg), indicating a zero shift. The scale must therefore be re-zeroed, and cell 3 checked again.

#### **Fourth Loading**

| English Units (lbs.) |        |          | Load<br>Cell | Metric Units (kg) |        |          |
|----------------------|--------|----------|--------------|-------------------|--------|----------|
| M2000 Reading        |        |          |              | M2000 Reading     |        |          |
| Start                | Loaded | Unloaded |              | Start             | Loaded | Unloaded |
| 0                    | 4990   | 0        | 1            | 0                 | 1996   | 0        |
| 0                    | 4990   | 0        | 2            | 0                 | 1996   | 0        |
| 0                    | 4990   | 0        | 3            | 0                 | 1996   | 0        |

**THE CELLS ARE NOW BALANCED WITHIN THE TOLERANCE OF ONE GRADUATION.**

## **Calibration Procedure**

(Refer to the M2000 manual for further details)

1. Enter the calibration mode channel 1 on the M2000 by keying in:

**19 <SELECT>**

The display will be showing a blinking "PASS" message. This prompts you to enter a 4 digit password. The factory default password is "1111". This password can be changed, but it is recommended that the factory default password be kept. You are now in calibration mode. You will see a "C" flash on the left side of the display while in calibration mode.

2. With the container or tanks empty, you must now **dead load** the scale. If temporary racks are used to place test weights on the scale, dead load the scale with the racks on. Ensure no product is in the container and key in:

**12 <SELECT>**

**1 <TARE>**

You will see a flashing "d" on the display while the indicator is automatically dead loading the scale. When it has completed the display will be at or near zero.

3. Now you must set the **span** of the system. Place a known amount of weight on the scale. Key in the following:

**13 <SELECT>**

Now enter the correct value of the weight followed by the TARE key. As an example if you have 15000 lbs. of weight on the scale (the display will read an improper value at this point) you would key in:

**15000 <TARE>**

The display will now change to read 15000.

4. Remove the weight.
5. Repeat step 3 and 4 if necessary.
6. If temporary racks were used to load the scale, remove the racks and dead load the scale once more.
7. The scale is now calibrated. Exit the calibration mode by entering:

**99 <SELECT>**

### ***Legal for Trade Inspection***

The exact inspection procedures may vary slightly from those described below in your region. The following is the basic inspection procedure:

1. Balance test (as described on page 16).
2. Increasing/Decreasing load test.
3. Out-of-Level Increasing/Decreasing load test.
4. Twist Condition Increasing/Decreasing load test.
5. Out-of-Level shut off test.
6. Printing of Ticket.

### **Final Installation Check List**

- |                                                                                                                                                                                                             |                          |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|
| Ensure a good consistent +12V DC power source.                                                                                                                                                              | <input type="checkbox"/> |
| Check proper operation of the Hardware Alarm.                                                                                                                                                               | <input type="checkbox"/> |
| Level Switch check. Turn on the indicator and move the truck onto a slope larger then 6 Degrees, the indicator will turn off. Do this in all four directions front high, front low, left high and left low. | <input type="checkbox"/> |
| Check to ensure the scale swings freely at all angles (does not contact anything off the scale)                                                                                                             | <input type="checkbox"/> |
| After calibration is completed, check the lockdown adjustment. (See page 14)                                                                                                                                | <input type="checkbox"/> |
| Check all hoses, wiring and any other components to ensure they do not interfere with the operation of the scale.                                                                                           | <input type="checkbox"/> |
| Ensure all mounting bolts are tight.                                                                                                                                                                        | <input type="checkbox"/> |
| Check that fenders are mounted to the truck frame (not the scale)                                                                                                                                           | <input type="checkbox"/> |
| Make certain all personnel using the scale have a full understanding of the operation and any safety precautions.                                                                                           | <input type="checkbox"/> |

---

**Name**

---

**Date**

## Linkage Disassembly and Assembly

To perform service on any of the scale parts (i.e. load cell, bushings), the linkage assembly must be disassembled. The following procedure must be followed when disassembling any linkage. See parts lists for item numbers.

### Tools required:

7/16" wrench or socket

3/4" wrench or socket

3/4" hex Allen key (ratchet preferred)

1/4" roll pin punch

Hammer

Large flat head screwdriver

11/16" wrench (required for hydraulics only)

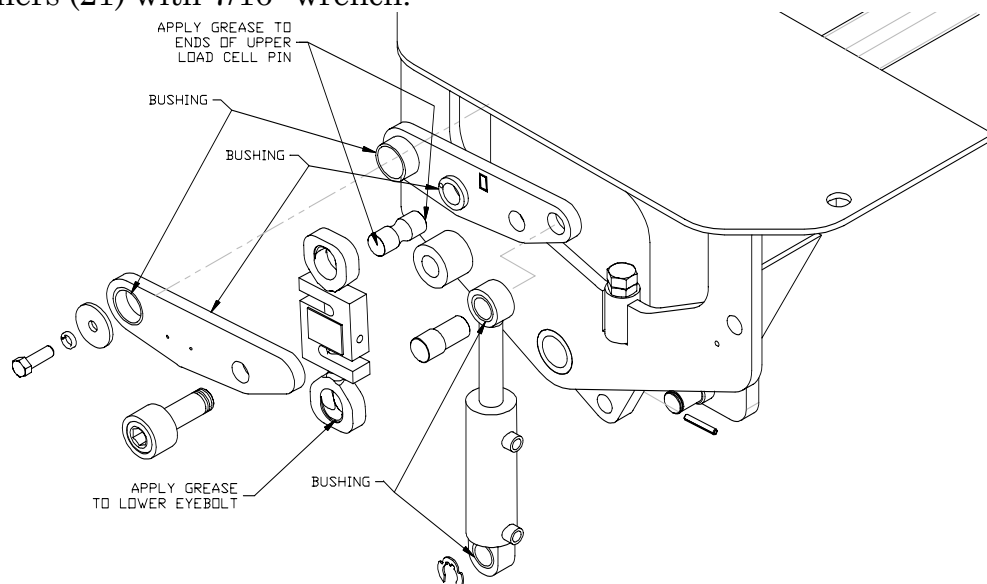
5/8" wrench (required for hydraulics only)

### Disassembly Procedure (refer to parts drawing page 36)

1. Remove load cell cover bolts (20) and lock washers (21) with 7/16" wrench and remove load cell cover (37 or 44).
2. Remove retaining ring from lower cylinder pin (3) with flat head screwdriver.
3. There are two roll pins (17) inserted through the lower load cell pin (34). Remove the roll pin at the end of the lower load cell pin that prevents the load cell assembly from jumping off the pin.
4. Loosen jam nut (19) on lockdown bolt (18) and turn lockdown bolt in with 3/4" wrench.
5. Loosen socket head cap screw (10 and 11) with 3/4" Allen key. Note: the cap screw and sleeve are pressed together and should not be separated. Sleeve will come out with cap screw.
6. Remove pivot pin bolt (13), washer (15), and lock washer (14) with 3/4" wrench.
7. Remove socket head cap screw (10 and 11) and lift arm spacer (9).
8. Remove outer lift arm (5 or 7).
9. Remove upper load cell pin (31) and load cell assembly (32 and 33).
10. Remove upper cylinder pin (8) and hydraulic cylinder (1).
11. Remove inner lift arm (4 or 6).
12. Remove lower load cell pin (34) if required by removing the second roll pin (17) with roll pin punch and hammer.
13. Remove hydraulic fittings (55,56,57) if required with 11/16" and 5/8" wrenches.

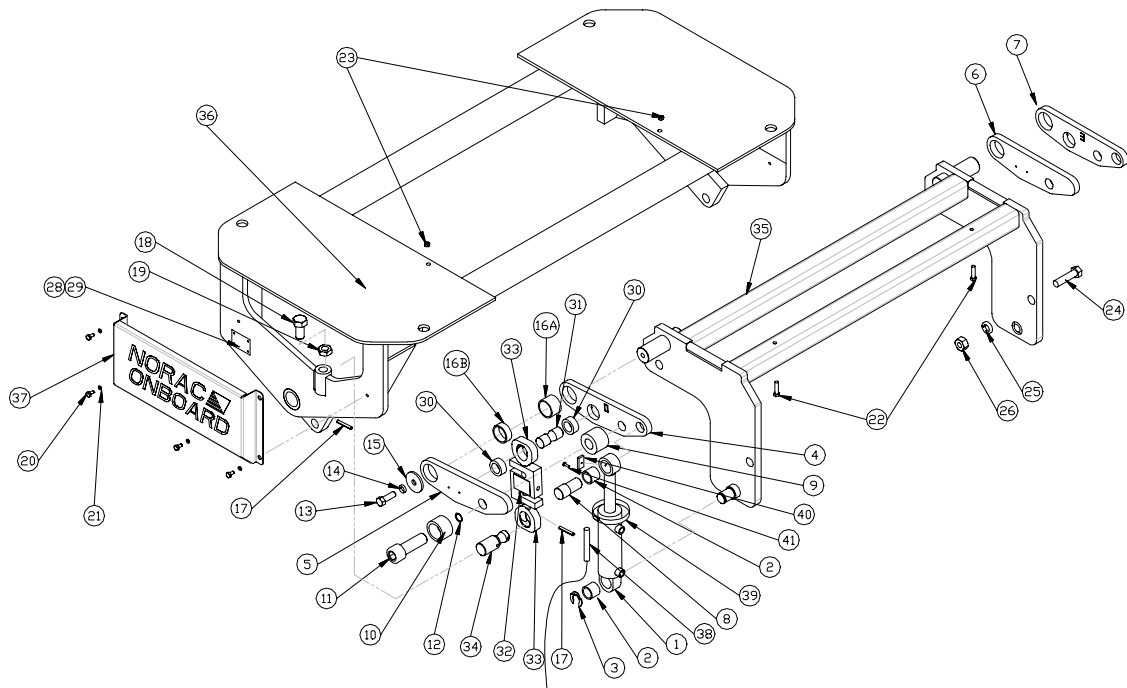
Assembly Procedure (refer to parts drawings pages 35 and 36)

1. Insert lower load cell pin (34) into lift plate (36 or 43) insert roll pin to hold the pin in place with roll pin punch and hammer.
2. Assemble inner lift arm (4 or 6) onto pivot pin on base (35 or 42).
3. Assemble hydraulic cylinder (1) onto lower cylinder pin on base (35 or 42).
4. Insert upper cylinder pin (8) through cylinder (1) into inner lift arm (4 or 6).
5. Assemble load cell assembly (32,33) onto lower load cell pin (34).
6. Apply a thin film of grease onto ends of upper load cell pin (31).
7. Insert upper load cell pin (31) through upper eyebolt (33) into inner lift arm (4 or 6).
8. Assemble outer lift arm (5 or 7) loosely onto the three pins (pivot, upper load cell, and upper cylinder).
9. Place lift arm spacer (9) between two lift arm plates and press outer lift arm fully onto the pins.
10. Insert cap screw (10,11) and start threads, *do not tighten*, with 3/4" Allen key.
11. Insert pivot bolt (13), washer (15) and lock washer (14) into pivot pin and tighten with 3/4" wrench.
12. Tighten cap screw (10,11) with 3/4" Allen key.
13. Turn out the lock down bolt (18) until cylinder is extended between 1/8" and 1/4" with 3/4" wrench. Tighten the jam nut (19).
14. Insert roll pin (17) through the lower load cell pin (34) to prevent the load cell assembly from jumping off the pin with roll pin punch and hammer.
15. Insert retaining ring (3) on lower cylinder pin with a hammer.
16. Assemble hydraulic fittings (55,56,57), if required, with 11/16" and 5/8" wrenches.
17. Attach load cell cover (37 or 44) with load cell cover bolts (20) and lock washers (21) with 7/16" wrench.

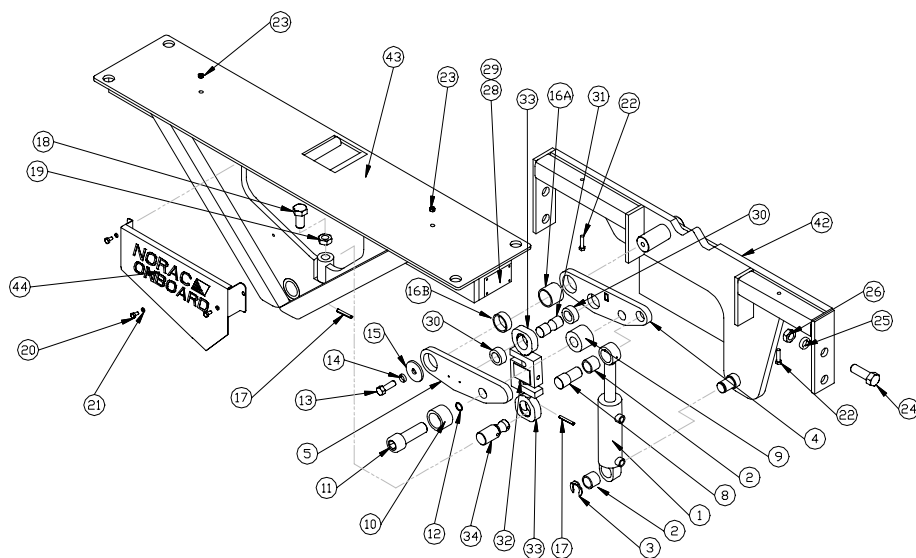


## Parts Lists

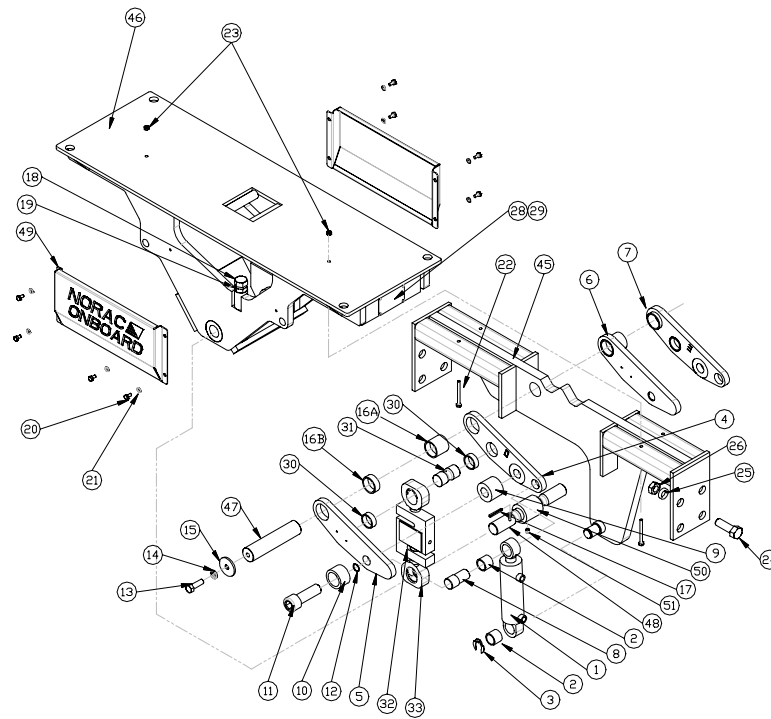
### Double Assembly



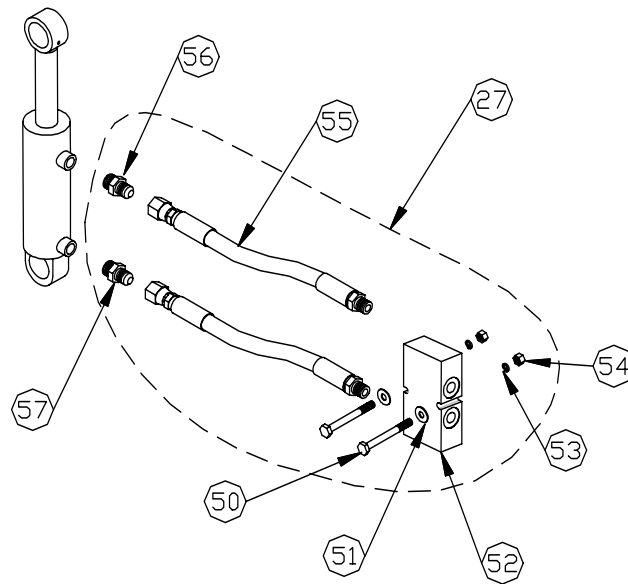
### Single Assembly



## Tandem Assembly



## Hydraulic Parts



## Common Parts

| Item #                            | Description                                     | Part # |
|-----------------------------------|-------------------------------------------------|--------|
| 1                                 | Hydraulic Cylinder                              | 104575 |
| 2                                 | Bushing Oil-lite 1¼x1x1                         | 104638 |
| 1,2                               | Hydraulic Cylinder w/ bushings                  | 42661  |
| 3                                 | Retaining Ring External 1" Heavy                | 104397 |
| 4                                 | Lift Arm Low Prof CCW Inner (includes bushings) | 42600  |
| 5                                 | Lift Arm Low Prof CCW Outer (includes bushings) | 42601  |
| 6                                 | Lift Arm Low Prof CW Inner (includes bushings)  | 42602  |
| 7                                 | Lift Arm Low Prof CW Outer (includes bushings)  | 42603  |
| 8                                 | Pin Upper Cylinder Low Profile                  | 42605  |
| 9                                 | Lift Arm Spacer Low Profile                     | 42604  |
| 10                                | Lift Arm Lockdown Sleeve Low Profile            | 42618  |
| 11                                | Bolt Socket Head Cap Screw                      | 42631  |
| 12                                | O-ring 1-1/8" OD, 1" ID                         | 104902 |
| 13                                | Bolt Gr5 ½"x1"                                  | 100594 |
| 14                                | Lock Washer ½"                                  | 100948 |
| 15                                | Washer Pivot Pin Low Profile                    | 42619  |
| 16a                               | Bushing Oil-lite 1¼"x1½"x2"                     | 104639 |
| 16b                               | Bushing Oil-lite 1¼"x1½"x3/4"                   | 42668  |
| 17                                | Spring Pin Slotted ¼"x1¾"                       | 100967 |
| 18                                | Bolt Gr8 ¾"x2"                                  | 100700 |
| 19                                | Jam Nut ¾"                                      | 104473 |
| 20                                | Bolt Gr5 ¼"x ½"                                 | 100667 |
| 21                                | Lock Washer ¼"                                  | 100945 |
| 22 <sup>1</sup>                   | Bolt Gr5 ¼" x 2½"                               | 102416 |
| 23 <sup>1</sup>                   | Nut ¼"                                          | 100853 |
| 24                                | Bolt Gr8 ¾"x2½"                                 | 100699 |
| 25                                | Lock Washer ¾"                                  | 102134 |
| 26                                | Nut ¾"                                          | 100858 |
| 27                                | Hydraulic Line Lock Kit                         | 42175  |
| Each 42175 contains the following |                                                 |        |
| 50                                | Bolt ¼ x 2-1/4"                                 | 103015 |
| 51                                | Flat Washer ¼"                                  | 100937 |
| 52                                | Hydraulic Line Lock 6 ORB Ports                 | 103623 |
| 53                                | Lock Washer ¼"                                  | 100945 |
| 54                                | Nut ¼"                                          | 100853 |
| 55                                | Hydraulic Line – Line Lock to Cylinder          | 42221  |
| 56                                | Coupling 6MB-6MJ                                | 103312 |
| 57                                | 6MB-6MJ Orifice                                 | 42997  |
| 28                                | Serial Plate                                    | 100147 |
| 29                                | Pop Rivet 1/8"                                  | 100974 |

Notes: 1. Items 22 and 23 to be removed after installation.

### Capacity Dependent Parts

| Item # | Description                      | Part #                |                          |                          |
|--------|----------------------------------|-----------------------|--------------------------|--------------------------|
|        |                                  | OB10-DBL5<br>OB5-SGL5 | OB20-DBL10<br>OB10-SGL10 | OB30-DBL15<br>OB15-SGL15 |
| 30     | Bushing Oil-lite 1½"x1¼"x1/2"    | 104876                | 104876                   | 104876                   |
| 31     | Pin Upper Load Cell Low Profile  | 42606                 | 42606                    | 42607                    |
| 32     | Load Cell S-Type                 | 82855                 | 82856                    | 82858                    |
| 33     | Eyebolt                          | 42256                 | 42256                    | 42513                    |
| 32,33  | Load Cell Assembly (w/ eyebolts) | 42583                 | 42660                    | 42540                    |
| 34     | Pin Lower Load Cell Low Profile  | 42608                 | 42608                    | 42609                    |

### Double Assembly Parts

| Item # | Description                   | Part #   |            |            |
|--------|-------------------------------|----------|------------|------------|
|        |                               | OB5-DBL5 | OB10-DBL10 | OB15-DBL15 |
| 35     | Base Double Low Profile       | 42612    | 42612      | 42612      |
| 36     | Lift Plate Double Low Profile | 42614    | 42614      | 42615      |
| 37     | Cell Cover Double Low Profile | 42620    | 42620      | 42620      |
| 38     | OBW Alarm Sensor Assembly     | 42377    | 42377      | 42377      |
| 39     | Hose Clamp 2½"                | 104059   | 104059     | 104059     |
| 40     | Magnet for OBW Reed Switch    | 42375    | 42375      | 42375      |
| 41     | Screw 10-32x½"                | 100763   | 100763     | 100763     |

### Single Assembly Parts

| Item # | Description                   | Part #   |            |            |
|--------|-------------------------------|----------|------------|------------|
|        |                               | OB5-SGL5 | OB10-SGL10 | OB15-SGL15 |
| 42     | Base Single Low Profile       | 42613    | 42613      | 42613      |
| 43     | Lift Plate Single Low Profile | 42616    | 42616      | 42617      |
| 44     | Cell Cover Single Low Profile | 42621    | 42621      | 42621      |

### Tandem Assembly Parts

| Item # | Description                   | Part #    |            |            |
|--------|-------------------------------|-----------|------------|------------|
|        |                               | OB10-TAN5 | OB20-TAN10 | OB30-TAN15 |
| 45     | Base Tandem Low Profile       | n/a       | n/a        | 42636      |
| 46     | Lift Plate Tandem Low Profile | n/a       | n/a        | 42637      |
| 47     | Pin Pivot Tandem Low Profile  | n/a       | n/a        | 42638      |
| 48     | Pin Lower Load Cell Tandem LP | n/a       | n/a        | 42640      |
| 49     | Cell Cover Tandem Low Profile | n/a       | n/a        | 42641      |
| 50     | Spacer Lower Load Cell Tandem | n/a       | n/a        | 42642      |
| 51     | Set screw 3/8x3/8             | n/a       | n/a        | 100802     |

## **NORAC Statement of Limited Warranty**

All *NORAC* scale products are warranted against defects due to faulty material or workmanship for a period of one (1) year. *NORAC Systems International Inc.* extends this warranty only to the original purchaser or original user.

In the event a defect develops during the warranty period, *NORAC* will repair or replace the unit with a new or reconditioned model of equivalent quality. In order to obtain performance of any obligation of *NORAC Systems International Inc.* under the warranty, the original purchaser or original user must return the defective unit, with a written description of the complaint, freight prepaid to the manufacturer or a designated service depot. In the event of replacement with a new or reconditioned model, the replacement unit will continue the warranty period of the original unit.

*NORAC Systems International* shall not be liable for loss of use of the unit or the incidental or consequential damages, expenses, or economic loss, or for any claim or claims for such damage, expenses or economic loss.

Any questions with respect to the warranty should be taken up with *NORAC Systems International Inc.* 306-664-6711.