American Forklift Scales are designed to measure the load weight when the load has been picked up.

Hydraulic Forklift Weighing Systems
by
American Forklift Scale LLC
4804 Granite Dr. #160
Bldg. F-3 Suite 293
Rocklin, CA 95677
Tel: 888-640-2725 FAX: 916-660-0679
sales@americanforkliftscale.com

Installation - Calibration - Operation - Troubleshooting
Call Tech Support 24-7C
(Cell) 805-236-7406
tech@americanforkliftscale.com

Last Revision 27 April, 2015
AMERICAN FORKLIFT SCALES
Accurate and Affordable Industrial Truck Scales

Model LTWS-1 Patriot
Economy Model Static Weighing Hydraulic Lift Truck Scale.

System Technical Specifications

<table>
<thead>
<tr>
<th>General Features</th>
<th>Technical Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>✔ Most user-friendly system available with built-in troubleshooting diagnostics and our 24-7 technical support line.</td>
<td>Input Power - Voltage: 9 - 12Vdc +/-5%</td>
</tr>
<tr>
<td>✔ Load Sensors made from ISO9000 17.4 Stainless Steel using only temperature compensated strain gage technology.</td>
<td>Input Power - Current/Amps: Maximum: 500mA</td>
</tr>
<tr>
<td>✔ System is designed to work dependably and accurately in the harshest environments,</td>
<td>Input Power - Current/Amps: Nominal: 100mA + 30mA per 350 Ohm transducer</td>
</tr>
<tr>
<td>✔ Accumulation feature allows operators to either count up for total or display single load weight.</td>
<td>Excitation Voltage: 5Vdc</td>
</tr>
<tr>
<td>✔ Accurate and requires on average only 2 hours for installation.</td>
<td>Maximum Transducers: Four (4) X 350 Ohm</td>
</tr>
<tr>
<td>✔ RS232 Printer accessory available providing date, time and accumulated, loaded weight.</td>
<td>Operating Temperature: 14F to 104F (10C to 40C)</td>
</tr>
<tr>
<td>✔ Two Setpoints with Isolated 300mA 50V Outputs</td>
<td>Control Panel Key Functions: Power, ZERO, Tare, Net/Gross, Print, Function</td>
</tr>
<tr>
<td>✔ Internal Clock/Calendar</td>
<td>Serial Port: Full Duplex RS-232 format</td>
</tr>
<tr>
<td></td>
<td>Display Technology: 6 digit LCD 3/4” height</td>
</tr>
<tr>
<td></td>
<td>Housing Material: Grey ABS</td>
</tr>
<tr>
<td></td>
<td>Weight: 1 lb. 6oz.</td>
</tr>
<tr>
<td></td>
<td>Shipping Weight: 2 lb. 4oz.</td>
</tr>
</tbody>
</table>

Hydraulic Transducer: Typically 5000psi 03 mV/V, 4-Wire, Temperature Compensated

Options and Accessories:

- Impact Receipt Printer
- Remote Switch for Accumulator Function
- 12Vdc Battery Line Conditioner
- Voltage-Converter for 24Volt to 48Volt systems

- The American Forklift Scales onboard hydraulic weighing system determines the load weight by sensing the hydraulic pressure needed to extend the lift cylinder for raising or holding the forks.
- The heavier the load, the greater the pressure in the hydraulic line. Pressure = Weight
- This signal is transmitted to the In-Cab meter, which displays the weight on the forks.
- Accuracy and Repeatability are affected by consistency of operation and condition of lift system
Rinstrum R320 Scale Indicator Face View

Side View

Front View

Rinstrum R320 Scale Indicator Rear View

Side View with Boot

Rear View

To suit M4 Screw
Hydraulic Transducer Installation

This weighing system depends upon a direct connection to the active lifting and holding pressure used by the primary lifting cylinders.

The ideal sensor "Tee" location is at the high-pressure feed port to one of the primary lift cylinders. However, any unrestricted free-flow point will probably work fine.

Avoid filters, check valves, flow restrictors or valving between the cylinder and the transducer.

Electrical Installation

Rinstrum R320 Scale Indicator Power: 9Vdc to 18Vdc from Truck Electrical.

Connect power via Key Switch or directly to Battery Power.

Recommended in-line fuse for truck electrical protection: 2.0A Minimum.

For 24, 26, 48Vdc truck electrical systems, contact Sales for Power Converter recommendations.
Operator Briefing

Weighing Methods

Model LTWS-1 with Rinstrum Indicator
Hydraulic Weighing System

Prepared by Technical Support 10 March, 2015

Examples of different weighing procedures which have produced desired weight consistency and accuracy:

"Tilt, Lift and Weigh" method:
This method is a basic process, if it can be utilized safely. In theory, when the mechanism is tilted back or tucked in, we eliminate errors caused by different tilt or tuck positions.

- Position the lift under the load or load the lift.
- Lower the lift mechanism to the ground
- Make the forks flat to the ground or adjust your lift for an equivalent, easily repeatable position relative to the ground.

*It may be useful to press the carriage down/slack the chains to provide a repeatable starting pressure. Note the (-) weight for future reference.*

- Tilt the mast back or tuck the lift in.
- Lift the load about a foot and stop.
- Allow the scale to calculate and display the weight of the load.

Simple "Lift and Weigh" method:

- Load the forks or lift
- Lower the lift mechanism to the ground
- Make the forks flat to the ground or adjust your lift for an equivalent, easily repeatable position relative to the ground.

*It may be useful to press the carriage down/slack the chains to provide a repeatable starting pressure. Note the (-) weight for future reference.*

- Lift the load about a foot and stop
- Allow the scale to calculate and display the weight of the load.

In the "AUTO" Mode, American Forklift Scales Model LTWS-1 hydraulic weighing firmware "Freezes" the display, once the lift has been made. The display becomes "un-frozen" when the weight is removed from the machine for a second or two and the system will accept a new weight. When lifting objects which require that the object be loaded after the forks are lifted, it is necessary to relieve the pressure (similar to putting the forks on the ground) before lifting to weigh.
Fork weighing method for spools and other similar loads

- Place the forks or spear in the core of the spool
- Lower the lift mechanism to rest on the lower portion of the core
- Make the forks flat inside the core provided that this does not endanger the operator or make the load unstable

*It may be useful to press the carriage down/sack the chains to provide a repeatable starting pressure. Note the (-) weight for future reference.*
- Lift the load about a foot and stop
- Allow the scale to calculate and display the weight of the load.

Weighing dangling and hanging loads:

- Dangling and hanging loads in the normal AUTO weighing mode can be difficult to weigh on some machines. This is because the scale ZERO calibration is based upon the weight of the entire lifting assembly. First, try the standard weighing processes. One might work for your application.

  If you are unable to achieve acceptable weights in the AUTO weighing mode, you may try the "KEY" (manual) weighing mode. In KEY, the display does not freeze and bleed-off will be observed.

- For hanging loads, establishing a reliable empty-lift pressure may not be easily achieved because the forks or lift cannot be settled while the cargo is loaded on the lift.

  You may attempt to rest the forks or lift on the load to relieve the hydraulic lift pressure before lifting.

  If resting the forks or lift on the load is not advisable or possible, try using the KEY (manual) weighing mode.

AUTO or KEY (manual) weighing modes:

Normal weighing with the Model LTWS-1 is in the AUTO weighing mode, where all of the automated functions for determining the most accurate conversion from hydraulic pressure to equivalent weight are functional. This is a proprietary feature of the American Forklift Scale Indicator Firmware.

The fundamental Non-Automated hydraulic conversion process, KEY (manual) weighing mode can be useful, but requires additional Operator intervention and attention.

How to determine if the Indicator is in AUTO or KEY (manual) weighing mode:

- Pick up a weight. If the Indicator is in the normal AUTO mode, there should be a brief display of 
  "- - - - -", then a weight number. This number may change once or twice, but will "freeze" and not change at all until the lift is lowered and pressure removed from the lift cylinder. A small "H" under the right-hand digit indicates the display is on "HOLD", or frozen in AUTO mode.

- If the Indicator is in the manual mode (KEY), the weight number will continually change and will change immediately if the load on the lift is changed.
Set or change AUTO/KEY (manual) weighing mode:

- Press POWER and "f" buttons, hold them both until the display shows "FULL SETUP". Release the buttons. The display will then show "BUILD"
- Press the ZERO button once to go to OPTION displayed on the Indicator.
- Press the TARE button eight (8) times so go to START displayed on the Indicator.
- Press the GROSS/NET button once and either AUTO or KEY will be displayed.
- Select the desired option with the PRINT button.
- Save your selection by pressing the "f" button. START will be displayed on the Indicator.
- Press the ZERO button to go to END
- Press the TARE button to save the settings. The Indicator will display SAVING, then return to the weighing mode.

Weighing in the KEY (manual) weighing mode:

- The scale display in the KEY (manual) mode is always "live". The scale display will not "freeze" to hold the displayed "weight" during bleed-off. The scale display represents relative pressure, shown in weight terms.
- When a load is lifted, the Indicator settings will produce the best calibrated weight in the first two or three numbers displayed. Correlation of pressure to weight is valid only for a short period of time.
- The displayed number will change as the pressure on the lift cylinder changes with bleed-off or changing load.
- The weight displayed in KEY (manual) weighing mode can be accurate, IF the Operator understands and heeds the reasons behind the extreme volatility of the displayed "weight".
- Although the scale remains calibrated, the display is not "locked" to the calibration. The Indicator will only display the calibrated weight during the initial displayed number or the first following one or two displayed numbers.
- The subsequent numbers can be intelligently used as the basis for manually re-calculating the weight in consideration of other factors observed and collected by the operator, such as time, motion and other relative/interpretive factors.
- Often, a difficult load can be weighed in the KEY (manual) mode by simply lifting and holding until the displayed weight is stable. The waiting period can be many seconds.
- Depending upon the load motion and the hydraulic system bleed-off, it may take some time for the displayed weight to become stable.
- The resultant displayed weight will always be lower than the actual weight.
- Once the displayed weight becomes stable, the operator must use experience and judgment to adjust the displayed weight to a corrected, accurate weight. This process is not difficult, but it is very dependent upon the Operator's diligence, skill and experience.
In some instances, the best weighing process uses a lift and lower to weigh method, such as this example:

**Simple "Lift, Lower and Weigh" method:**

This method is capable ONLY in the **KEY** (manual) weighing mode.

In theory, when we lift above the weighing point, the errors due to varying lift pressures are reduced or eliminated when the load is slowly lowered to rest, establishing a resting/holding pressure for that particular weight.

Load the forks or lift

Lower the lift mechanism to the ground

Make the forks flat to the ground or adjust your lift for an equivalent, easily repeatable position relative to the ground.

*It may be useful to press the carriage down/slack the chains to provide a repeatable starting pressure. Note the (-) weight for future reference.*

Lift the load above the weighing height and stop.

Slowly lower the load to the weighing point and stop

Allow the scale to calculate and display the weight of the load.

This "Lift, Lower and Weigh" method may also be functional for applications where the load to be weighed is picked up at a height and must be weighed before moving or lowering.

We have noted that some forklift operators will utilize the **KEY** mode and use the forks as they would a platform scale, parking the forklift, raising the forks, then weighing items by placing them on the forks and observing the weight.

When using the fork scale as a substitute for a floor scale, we suggest that the initial scale calibration be made with the **ZERO** (unloaded) calibration be made with the forks grounded/slack chains. The **ZERO** button can then be used to **ZERO** the scale at any lift level or no lift level and the forks used as a standard floor scale with **TARE** function.

**A Note to you, the Operator** - Your operation experience is the basis for all that is written in these notes. Your feedback, comments and recommendations are very important and can aid other operators as the information is passed along, such as we have done in these notes. I hope these comments have been useful for your work. **Please feel free to call 805-236-7406** for additional assistance and to share experiences of success and not so successful. Your input will help improve these notes.
Operator Briefing
What is "Hydraulic Weighing Accuracy"?

Hydraulic Weighing System Model LTWS-1 with Rinstrum Indicator

Prepared by Technical Support 10 March, 2015

Informative Introduction:
This publication is intended to assist Operators of the LTWS-1 Hydraulic Weighing System with American Forklift Scale proprietary hydraulic weighing firmware. Many of the following comments offered may be applicable universally in weighing with hydraulic pressure installed in:

- Hydraulic lift trucks, fork trucks, forklifts and power-jacks
- Front-loaders, bucket-loaders, Bobcats and telehandlers
- Hay-squeeze, hat wagons, refuse trucks and scout trucks
- Many lifting machines utilizing hydraulic pressure as the weight sensing medium.

Early attempts to secure weight of the load by observing the hydraulic pressure required to lift or hold a load utilized a standard pressure gage and required the operator to convert PSI to weight units. Operators soon discovered that the technique required practice by the operator to find and repeat operations to provide a consistent hydraulic pressure specifically for the purpose of weighing. Modern electronic gages and scale indicators are subject to the same considerations, but can produce higher accuracy results with less dependence upon the operator. Most modern operators can produce +/-1% to 2% repeatability with most machines and weighing systems.

General Comments:

Hydraulic scales are best utilized as simple "check-weight" systems.

The primary goal of good operation is to find the proper operation which produces the best consistent results.

- Once consistent results are achieved, most hydraulic lifts can produce an accurate weighing process.
- If you cannot get consistent weights, it is futile to attempt to adjust for accuracy. Experiment to find your machine's best results.

What does the term "Accurate" mean?

"Accurate" means that the scale displays the actual weight of the load, within the specified tolerance of error and within one display graduation, whichever is larger.

What does the terms "Consistent" and "Reliable" mean?

- "Consistent" means that the weights displayed are close in value and not "scattered". We consider consistent weights to be those which vary less than a spread of 4 or 5%.
What is acceptable Weighing accuracy vs. errors?

Hydraulic weighing produces errors which may be above or below the actual weight, depending upon the many operating variations and related potential errors they induce.

- The accuracy specification of +/- 1 to 2% means that percentage of the FULL CALIBRATED RANGE, or ONE DISPLAY INCREMENT, whichever is LARGER.

- A 1,000 pound load estimated load in an ideal operation with a 20 pound display graduation may indicate as 960, 1000 or 1040 pounds to be within the specified +/- 1 to 2% error range due to display resolution.

- A 100 pound estimated load in an ideal operation with a 20 pound display graduation may indicate a 100 pound load as 60, 100 or 140 pounds to be within the specified +/- 1 to 2% error range, because the display graduation is the minimum change that can be displayed.

- The display increment is the minimum value by which the display changes the displayed weight. A 20 lb increment means that the scale will change value by 20 pound steps. In other words, 1000, 1020, 1040, 1060, etc. If the weight is 1050 pounds, it will display as either 1040 or 1060.

We have commented briefly on the various error sources when seeking predictable pressures for the load on the truck lifting mechanism. Generally, due to inherent hydraulic and mechanical frictions, leverages, warpages, binding and leakages, lift and hold pressure errors cannot be presumed to be consistent between light loads and heavy loads.

If the pressure necessary to move the lifting apparatus through a distance varies by 20 psi due to changing friction, warps in the slides, leaking seals, binding bearings, corroded chain links, etc, the variation will be minor with a 250 psi lift of a 1,000 pound load, but for a 100 pound load where the lift pressure is only 50 psi, the error is obviously greater, perhaps unacceptably so.

This characteristic is greater for small trucks and less in heavy lift trucks, due to proportionately smaller intrinsic mechanical disturbances between light and heavy loads on the larger mechanics.

A Note to you, the Operator - Your operation experience is the basis for all that is written in these notes. Your feedback, comments and recommendations are very important and can aid other operators as the information is passed along, such as we have done in these notes. I hope these comments have been useful for your work. Please feel free to call 805-236-7406 for additional assistance and to share experiences of success and not so successful. Your input will help improve these noted.
Passcodes and Operator Lock-Out (Normally NOT USED)

The instrument has two levels of passcodes to provide restrict Setup via the keypad.

**Full Setup Passcode** (For calibration and Technician Access)
Setting a passcode for Full Setup restricts any access to Full Setup.
Full Setup passcode can also be used to access Safe Setup.

**Safe Setup Passcode** (May allow limited Operator Access)
Setting a passcode for Safe Setup restricts access to Safe Setup functions.

Setup Operator Lock-Out
If an attempt is made to enter Full or Safe Setup using an incorrect passcode, the instrument will respond with the message **ENTRY DENIED** and then the user will be returned to normal operating mode.

A passcode counter has been set so that only three failed attempts can be made to access Full/Safe Setup. On the fourth attempt the user will be 'locked out' of Full/Safe setup.

Should this occur the **ENTER PASS** prompt will not display, but instead the **ENTRY DENIED** message displays and returns the user to the normal operating mode. To rectify this issue the instrument must be turned off. When the instrument is turned back on the passcode counter is reset to zero (allowing the user to enter the correct passcode).

**SAFE.PC** (Safe Passcode for Operator access.) allows partial access to Digital Setup (ie. only non calibration/trade critical settings can be changed).

For the Safe Passcode to have any effect, the **FULL.PC** passcode must also be set.

The default passcode setting is **000000** that allows free access.
Any other number will restrict access.

Range: **000000** to **999999**
Default: **000000**

**FULL.PC** (Full Passcode) can be set to restrict access to Full Digital Setup.
This passcode is used to prevent unauthorised or accidental tampering in the instrument setup.

The default passcode setting is **000000** allows free access.
Any other number will enable the passcode functions and restrict access.

Range: **000000** to **999999**
Default: **000000**

It is important to note that when restricting Full access to Setup the passcode must not be forgotten. It is only possible to circumvent the passcode at the factory.

Care must be taken when setting the Full Digital Setup Passcode to ensure that the instrument does not become permanently locked.
POWER CHECK and Troubleshooting

1. POWER SOURCE
   Check to be sure the system has primary DC power applied.
   Power should be between 8Vdc and 18Vdc if powered from truck electrical or
   greater than 6Vdc using fresh "AA" batteries if utilizing internal battery pack.

2. POWER-UP
   Press the small Power button to turn on Indicator
   The Indicator should show the Firmware version, then count down from
   9 to 0 and then display some number.

PRIMARY POWER PROBLEMS:

If the system does not turn ON or not stay ON, or of the system turns OFF unexpectedly:

1. If no characters are displayed, if no back light is seen, check the Primary Power
   wiring and connections.

   Truck power should be in the range of 11 to 13.8Vdc.

   If a Voltage Converter is installed, Primary Power to the Indicator should be
   the labeled Output Voltage +/- 20%

   Check for correct Voltage polarity at the Indicator Connection.

   Note: Use a Voltmeter, if possible, to verify that the proper Voltage and polarity
   is present at all test points.

2. If the wiring to the scale indicator is equipped with a fuse, check the fuse.

   Note: The standard LTWS-1 hydraulic weighing systems normally consume less
   than 0.200 Amperes (200 milli-Amp).

   The purpose of a in-line fuse is to protect the truck electrical from a
   catastrophic short in the weighing system electronics and electrical wiring.

   This fuse rating should be in the range of 0.5 Amperes to 10 Amperes.

3. When measuring Primary Voltage, the indicated Voltage should not vary by more
   than about 0.1 V between when the indicator is turned ON and turned OFF.

   Truck electrical systems, especially older trucks, commonly utilize the truck frame as the
   common or negative connection to the battery. It is not unusual to experience high resistance
   caused by corrosion or loose fitting of the elements of the chassis between the battery terminal
   and the primary power to the indicator.
This condition can produce an open circuit Voltmeter indication of satisfactory Voltage, because the resistance of degraded continuity is difficult to detect in an open circuit. Degraded circuit/wire/ground connections can often be detected by detecting the difference in Voltage at the load when OFF and when ON. Resistance of degraded connections will prevent full voltage when the circuit load (Indicator) is ON.

If possible, turn the Indicator ON and OFF while monitoring the primary power Voltage. Be alert for a significant drop in Voltage when the system is turned ON.

For example if the open circuit Voltage is 11.5 and drops to 10 V or 9.5 V etc. when the indicator is turned ON, this change is an indication that the system battery may need to be charged or that continuity of the conductors and connections between the battery to the indicator may have been degraded by corrosion or loosening, etc.

4. During testing, move the Indicator in its bracket while monitoring the Primary Voltage.

The Indicator should not turn OFF. Watch for any disturbance in the display (if the Power problem is intermittent).

Voltage readings and Indicator Display should show no aberrations, flicker, etc.

If movement of the Indicator affects the Primary Power, test each power connection.

If Primary Power is delivered via a plug at the side of the Indicator, check that the plug is the correct size to fit the barrel and also the center pin. Install the correct size plug, if this connection is physically sloppy or electrically intermittent.

If power is hard-wired to the internal connections of the rear panel, remove the rear cover and check the internal power wiring for connection and continuity.

The Euro connections are spring-loaded with an internal knife-edge. The insulation of the wires inserted in these terminals should have the insulation trimmed back to expose about 3/8 inch or 10mm of bare wire.

The bare wire strands would be twisted so that there are no "flying" strands and so that the twisted wire may be inserted smoothly into the Euro-Connector block connection.

Depress the loading tab, insert the twisted wire, release the loading tab. Now, give the wire a gentle tug to seat the internal clamp and assure that the wire does not slip loose.

5. Internal dry cell batteries may be discharged to below minimum Voltage required to operate.
LTWS-1 R320 Printer HookUp

From Battery Power Supply Input
7Vdc to 14Vdc

PWR (+)

PWR (-)

Black

Red

Green

White

Optional: Transducer Cable Shield
Chassis Ground (Normally Not Used)

From Printer Model OM-7212
Telephone Cable
(Typical)

Trim Wire End
3/8" - 10mm

LTWS-1 R-320 Indicator Rear Panel Wiring
with Remote Alarm Cable and Jumper

From Battery Power Supply Input
7Vdc to 14Vdc

PWR (+)

PWR (-)

Trim Wire End
3/8" - 10mm

Green

Sig (+)

White

Sig (-)

Red

Exc (+)

Black

Exc (-)

From 4-Wire Pressure Transducer

Install jumper (provided in Alarm Kit) from PWR (+) to COM
Connect Alarm Cable RED wire to OUT 1
Connect Alarm Cable BLACK Wire to GND
Check to assure spring-clips grip wire, not insulation

Power / SetUp

LTWS-1 Rinstrum Rear Panel Wiring
With Datalogger and Alarm Module

From Battery Power Supply Input
12Vdc to 14Vdc

PWR (+)

PWR (-)

From Logger Module

Trim Wire End
3/8" - 10mm

Green

Sig (+)

White

Sig (-)

Red

Exc (+)

Black

Exc (-)

From 4-Wire Pressure Transducer

Optional: Transducer Cable Shield
Chassis Ground (Normally Not Used)
Default Set-Up Settings
AFS Firmware A309 v1.00 and later Model
LTWS-1 w/Rinstrum R320 Indicator

BUILD

DP = 000000 (no decimals)
CAP = 5000
RES = 10
UNITS = lb
HI.RES = off
CABLE = 4

OPTION

USE = indust
FILTER = 2.0
MOTION = 1.0-1.0
INIT.Z = off
Z.TRAC = off
Z.RANGE = -2.0
Z.BAND = 000050
START = Auto
AC Band = 000001
AC.TIME = 00001.0
UTIME = 00000.0
AC.TO = 00009.0

CAL OPTION USE = indust

ZERO - (calibrate)
SPAN - (calibrate)
FAC.CAL - (Restores factory default settings for BUILD + OPTION + CAL ) (Not used)

PRINT

BAUD = 9600 BITS = 8
DTR = off
FORMAT = PRINT B

TEST

SCALE = "0.00000" Number related to pressure

SPEC
(Do not use)

SAFE.PC - Default setting "000000".
Requires FULL PC passcode to be set up. FULL.PC
(IMPORTANT: If you forget this code, reset at factory is required!)

FACTORY - (Restores all factory default settings except Calibration) (Not used) END
(Display will "SAVING" then Auto Power OFF to complete Set-up process.)

Tech Support 24-7 *** Call 805-236-7406

(rev. 10 March, 2015)
**Setup Menu**

**LTWS-1 Hydraulic Weighting System**

**Rinstum-R320 and Older GSE-250 Indicators.** NOTE - Setup does NOT include Calibration. See "Short Calibration Procedure Pamphlet"

---

**Initial Setup Indicator Operating Parameters:**

**Apply Power:**
Apply power to the indicator. Press the small **Power Key** on the left face of the Indicator to turn the Indicator **ON**. The Indicator should turn on automatically. The Indicator will flash **firmware codes** and then display a static Weight. If the forks are on the ground, this number may be a negative weight (-).

**Activate Setup and Calibration Mode:** **FULL, SETUP, (Codes), bUiLD**

Hold down the small **Power** and **"f"** buttons together for about two (2) Seconds to enter **SetUp/Calibrate Mode**. The indicator will display **FULL SETUP/**

The unit is now ready to adjust Setup parameters.
Set Display Decimal Point:
Press "T" (Tare) \[ \text{T} \] the display will show "dp" (Decimal Point)

Press GROSS/NET \[ \text{G} \] and the display will show "000000" (No decimals) If necessary, press Print \[ \text{P} \] to remove the Decimal Point. Decimal point setting for vehicle scales should be no decimal.

Press "f" \[ \text{f} \] to store Decimal Point Setting. The display will show "dp"

Set Scale Calibration Weighing Capacity:
Press "T" (Tare) \[ \text{T} \] The display will show "CAP" (Weighing Capacity) of the Scale

Press GROSS/NET \[ \text{G} \] The display may show "03000" (Default) or another weight.

Set the Maximum Weighing Capacity

The Capacity should be set to one of the following amounts:
- The label/safe/rated lift capacity of the machine
- Slightly above the maximum weight to be lifted in your application

Press GROSS/NET \[ \text{G} \] to select digit and PRINT \[ \text{P} \] to change the value of the selected digit. The selected digit will flash. American Forklift Scale may pre-set 005000 for most small forklift applications.

Set Scale Display Resolution: ( 1, 2, 5, 10, 20, 50, 100 )
Press "T" (Tare) \[ \text{T} \] the display will show "rES"
(Resolution) Resolution is the smallest change of weight displayed. For example, if "10", the displayed weight will show 2010, 2020, 2030, etc.

Press **GROSS/NET** to select **Resolution Units**

- Note 1. The Indicated Weight will change by steps/increments of this amount. (i.e. 500, 510, 520, 530 etc. if \( rES = 10 \))
- Note 2. Default = "1" American Forklift Scales normally sets to "10"
- Note 3. Maximum increments is 3000. CAP divided by RES should always be 3000 or less.

Press "f" to store the Display Resolution setting. The Display will show "rES"

**Set UNITS of Scale (none, g, kg, Lb, t)**

Press "T" (Tare) to select **UNITS**

Press **GROSS/NET** to select **UNITS** designation desired. Options: lb, kg, t

Press "f" to store the **UNITS** setting. The Display will show **UNITS**

**Set High Resolution Option**

Press "T" (Tare) to select "Hi.rES"

Press **GROSS/NET** to select "OFF" and is the preferred setting.
If necessary, Press PRINT to show OFF, then press "f" to store the setting.
The Display will show "Hi.rES"

Select Transducer Cable Type
Press "T" Tare = "CAbLE"
Press GROSS/NET and the display will show "4" (Default) or "6" Important - MUST be "4".
*Standard hydraulic forklift sensor is 4-wire cable.*

If "6", Press PRINT and the display will show "4"
*Standard hydraulic forklift sensor is 4-wire cable.*

Press "f" to store the CAbLE setting.
The Display will show CAbLE

Change to OPTION Menu
Press "0" (ZERO) Indicator will show "OPt iON"

Set Indicator Use Type   Industrial, NTEP, OIML
Press "T" Tare Display shows USE

Default = iNdUSt  This is the correct setting.

Press "f" to store the USE setting.
The Display will show USE

Set Filter   None, .2, .5, 1.0, 2.0, 3.0, 4.0, 5.0, 7.5
Press "T" Tare = FiLtEr (FILTER)
*American Forklift Scales setting is 2.0*
Press **GROSS/NET** **Ω** The display will show **2.0**

If other value, press **PRINT** **Ω** until Display shows **2.0**

Press "f" **f** to store the setting.

Display will show **FiLtEr (FILTER)**

**Set Motion** **OFF, 0.5-1.0, 1.0 - 1.0**

Press "T" (Tare) **T** = "**MOr tON**" (Motion)

Press **GROSS/NET** **Ω** Display will show "**1.0 - 1.0**"

If another value, press **PRINT** **Ω** until Display shows **1.0 - 1.0**

Press "f" **f** to store the **1.0 - 1.0** setting.

The Display will show "**nOt iON"**

**Set Initial Zero** **OFF, ON**

Press "T" (Tare) **T** to select "**iNit.Z**"

Press **GROSS/NET** key **Ω**

Display will show "**OFF**" If **ON**, press **PRINT** **Ω** until Display shows **OFF**

Press "f" **f** to store the **OFF** setting.

The Display will show **iNit.Z**

**Set Zero Tracking** **OFF, SLOW, FAST**

Press "T" (Tare) **T**

Display will show **Z.trAC** Press **GROSS/NET** **Ω**

Display will show **OFF**.

If **ON**, press **PRINT** **Ω** until Display shows **OFF**.
Press "f" to store the OFF setting. Display will show Z.trAC

**Set Zero Range**
FULL, -2_2, -1_3, -20_20
Press "T" (Tare) to select "Z.rANGE"

Press GROSS/NET Display will show -2_2 If another value, press PRINT until Display shows -2_2

Press "f" to store the setting. The Display will show Z.rANGE

**Set Zero Tracking Band**
Press "T" (Tare) = "Z.bANd" (Zero Band)
Default = "0"

Press GROSS/NET and the display will show 000050
If other value, adjust with GROSS/NET and PRINT until Display shows 000050

Press "f" to store the setting. The Display will show Z.bANd

**Set Auto or Manual (Key) Mode**
Press "T" (Tare) to select "StAr t"

Press GROSS/NET The display will show "AUtO" or "KEY" Operation should be in AUtO Mode
If "KEY" appears on the display, press PRINT until Display shows "AUtO"
Press "f" to store the "AUTO" setting. The Display will show Start

**Set AC Band**

Press "T" (Tare) to display "AC.bAND"

Factory default = 2 lb

Press GROSS/NET The display may show "000001"

If another value, adjust with GROSS/NET and PRINT until Display shows 000001

Press "f" to store the "000001" setting. The Display will show AC.bAND

**Set AC Time**

Press "T" (Tare) = "AC.t IME" Factory Default = "00003.0".

Press GROSS/NET the display will show "00000.5"

If another value, adjust with GROSS/NET and PRINT until Display shows 00000.5

Press "f" to store the "00000.5" setting. The Display will show AC.t IME

**Set U-Time**

Press "T" (Tare) to select "ut inE"

Press GROSS/NET The Display will show "00000.0" If other value, adjust with GROSS/NET and PRINT until Display shows 00000.0
Press "f" to store the "00000.0" setting. The Display will show "ut inE"

**Set AC Time Out**

Press "T" (Tare) to display "AC.tO"

Press GROSS/NET The Display will show "00009.0"

If other value, adjust with GROSS/NET and PRINT until Display shows shows "00009.0"

Press "f" to store the "00009.0" setting. The Display will show "AC.tO"

**Calibrate** Please complete Set-Up before proceeding to Calibration.

Press "0" (ZERO) The Display will show "CAL"

The CAL Mode will be discussed in the CALIBRATION PROCEDURE and is not discussed here.

Press "0" (ZERO) The Display will show "PriNt"

**Set BAUD** 1200, 2400, 4800, 9600, 19200

Press "T" (Tare) to select "bAUd" - Default is 9600 BAUD.

Press GROSS/NET The display will show "9600" If another value, press PRINT until Display shows shows 9600

Press "f" to store the "9600" setting. The Display will show bAUd
Set Printer Ticket Format  FMT A, FMY b, FMT C
Press "T" (Tare) to display "FOrMAt"
Options are A, b, C
Press GROSS/NET The display will show "FMt b"
If another value, adjust with GROSS/NET and PRINT until Display shows shows "FMT b"
Press "f" to store the FMT b setting. The Display will show FOrMAt

Set/De-Select DTR
Press "T" (Tare) to display "dtr"
Options are ON, OFF
Press GROSS/NET and the display will show "OFF"
If another value is displayed, press PRINT until Display shows OFF
Press "f" to store the "OFF" setting. Display will show dtr

Set Time of Day
Press "T" (Tare) to select "t inE"
Press GROSS/NET Display will show "hhmmss"
Select digit with GROSS/NET
Set number using PRINT
After TIME is entered, press to store setting.
"f" Display will show t inE

Set Day/Month/Year
Press "T" (Tare) to select "dAtE"
Press **GROSS/NET** The display will show "ddmmyy"

Select the digit with **GROSS/NET** Set the
number using **PRINT** After **DATE** is entered,
Press "f" to store the setting. The Display will show "dAtE"

Press "0" (ZERO) The display will show "PriNt"

**TEST Diagnostic:**

Press "0" (ZERO) The display will show "tESSt"

**TEST** is a diagnostic mode and has no operator settings.

Press "T" (Tare) to display "SCALE"

Press **GROSS/NET** The display will show the
adjusted mV from the Transducer Analog Converter.
This number format is +/- 0.0000

**SPEC**

Press "0" (ZERO) The display will show "SPEC"

**SPEC** is a Certified Mode setting. See Tech Notes.

**Factory Reset** - **NOT ADVISED**

Press "0" (ZERO) The display will show "FACtrY"

**Exit Programming Mode**

Press "0" (ZERO) The display will show "END"

**Save Settings, Exit and Re-Start Weighing Mode**

Press "T" (Tare) To Save and
Exit. Display will show "SAviNG"

At this point Setup is complete. Please proceed to "Calibration Procedure"
General comment:
Your **LTWS-1 Hydraulic Weighing System** can provide 98-99% or better accuracy and repeatability for most of your onboard weighing activities. To achieve these accuracies it is important to remember that virtually every hydraulic system measurement error is due to a "normal" variation in hydraulic pressure. Try to be consistent in all hydraulic weighing operations and observe safe lifting practices. Consistent pressures create good accuracy and repeatable weighing.

A good sequence for consistent fork operation is to **Tilt** the mast back, **Lift** and **Weigh**. A good alternate is to position the forks to lift, slack the chains, then lift and weigh. Buckets should be tucked in and pressure relieved from the lift cylinders, lift and weigh. Pallet Jacks should lift only 1/2 -way up.

RPM (engine/pump) and lift valving lift speed variation cause errors. Where possible, when you lift your fork or bucket do so at idle or at the most rapid, safe lift-rate.

Immediately prior to lifting the loaded forks or bucket to weigh, lower and relieve the pressure at the lift cylinder or slack the chain of your mast. Note the negative weight indication, where the weight ceases to change when in the pressed down position. This is a good indication that the pressure has stabilized prior to lifting an unknown weight. Then raise the carriage to the weighing point to acquire the Load Weight. Begin every weighing operation from the ground or slack lift chain.

You should observe a (-) weight when the lift chain is slack or the bucket is lowered. This is normal and the number represents the weight of your forks and carriage or bucket and lift arms. The number should be more consistent than your other displayed weights.

**CALIBRATION**

Two Calibration Operating modes are available which establish **ZERO** with no load on the raised lift. The **ZERO** button should not be used when weighing/operating in offset AUTO or KEY modes.

The most common mode is **AUTO**. The display reading is frozen once the Indicator automatically analyses the lift pressure. The lift pressure for weight of the carriage, forks and accessories (or the bucket and lift-arms) is established as the Indicator "**0.0**" weight display or "**ZERO**". This calibration "**ZERO**" is actually an artificial **TARE**.
A less-utilized calibration mode is the "KEY" or non-automatic mode. The Key mode function and calibration are identical to the AUTO mode, except that all weight displays are "live" and change with the real-time change of lift cylinder pressure.

Rarely used is the calibration of the complete hydraulic pressure range in a single scale, from no pressure on the lift cylinder calibrated as the "0.0"/ZERO weight. When the empty mechanism is lifted, that weight is displayed and can be manipulated as an operating TARE. The ZERO button may be used with this method.

The Calibration process is performed in three stages:

The first stage establishes ZERO - the unloaded reference pressure. We are actually weighing the empty forks by measuring the hydraulic pressure necessary to raise the carriage and fork assembly. This "offset" pressure is assigned the arbitrary value of "ZERO". Alternately, ZERO can be calibrated with the lift lowered and cylinder de-pressurized.

The second stage records the pressure necessary to lift a known weight, called the SPAN weight.

All subsequent weights are calculated using the ZERO and SPAN as reference points upon a linear vector. Often, a third stage is necessary to adjust (fine-tune) the automatic conversion of hydraulic pressure to weight.

Preliminary Tasks:

Secure a known weight test load. We recommend a weight of at least half of the maximum machine safe lifting capacity or use the maximum weight of your normal operation. Heavier is better than lighter.

Check the Setup of the Indicator according to the Set Up procedure. (Skip this step if you have just completed the Set Up.)

Activate Calibration Mode:

Simultaneously hold down the small Power Key and "f" for two to four seconds to enter Set Up/Calibrate Mode and release the buttons when the display shows FULL SETUP.

The indicator will display in automatic sequential order: FULL, SETUP, the firmware I.D., and BUILD.
The unit is now ready to calibrate ZERO.

Press "0" (ZERO) until "OPt iON" (OPTION) is displayed.

Press "T" (TARE) (8 times) until "StArt" (START) is displayed.

Press GROSS/NET key and either "kEy" (KEY) or "AUtO" (AUTO) will be displayed.

Press "PRINT" key until "AUtO" (AUTO) appears on the display if the system is to be operated in the AUTOMATIC Mode. Select "kEy" if live operation is desired.

Press "f" to store the "AUtO" or "kEy" setting.

The Display will revert to "StArt" ("START")
Press "0" (ZERO) until "CAL" (CAL) is displayed

Press "T" (Tare) to select "ZErO" (ZERO)

Press GROSS/NET key and the display will show "(some number)".

This number is "live" and related to the hydraulic pressure of the instant. (See tech notes for usefulness of this number in calibrating and trouble-shooting.)

Lift the empty forks or bucket to the weighing point (sweet-spot) and immediately press to store the "ZErO", (ZERO) setting. The Display will show "Z.in.P" momentarily, then display "0 lb" or a weight close to zero pounds.

When calibrating without the ZERO fork offset, lower the lift to relieve the lift pressure and Press "f" to set ZERO.
The Indicator Firmware deals appropriately with bleed-off when the system is in "AUTO" mode instead of manual "KEY" mode.

Press "T" (Tare) (two times) to select "SPAN" (SPAN).

Press GROSS/NET key and the display will show "(some number)". This number is "live" and related to the hydraulic pressure of the instant. (See tech notes for usefulness of this number in calibrating and trouble-shooting.)

Press GROSS/NET key again and note the number. This number is either the CAPacity setting or the last SPAN calibration weight entered with one digit flashing.

Enter your test weight value using the GROSS/NET key to select the flashing digit and change the value of that flashing number with the PRINT key.

Lift the test weight and stop at the height where you will normally weigh your loads.

Immediately press to store the "SPAN" (SPAN) setting. The Display will show "S.in.P" momentarily, then display a weight.

This is a "live" weight and will change with bleed-off. It is important to press at a consistent moment in time after stopping the lift. Later, when adjusting the displayed weight, the timing of this press affects the calibration adjustment.

Please remember that these numbers are "live" and related to the hydraulic pressure of the instant. After the lift is stopped, the number will change with bleed-off of hydraulic pressure. This is normal in a "live" measurement environment.

This first weight will reflect the previous calibration and should be noted for reference, but not considered as the calibration result. It is a good practice to lower your test weight and pick it up again without pressing buttons, to note the revised weight shown on the Display. This weight will be close to the new displayed weight in the Operate Mode, but may be significantly different from the SPAN weight that you entered.

Press "0" (ZERO) several times until "End" (END) is displayed.
Press "T" (Tare) to SAVE and Exit.

The display will show "SAvInG" and enter normal Weighing Mode.

Primary Calibration is now complete.

Testing for Repeatability and Accuracy:

It is good practice to lift your test weight several times to determine the repeatability of the machine and Scale Set Up. If convenient, lift two or three other known weights of different ranges to assure yourself that the Weighing System weighs consistently and accurately across a range of weights.

Your general results should produce weight displays which are within a 4 to 5% difference between high and low results for the same weight. This is the measure of consistency. You are looking for the spread, not accuracy of the weight at this step.

Bringing the high and low readings closer together requires your attention to the machine operation and some operator experimentation.

You should be able to produce weighing accuracies within a window of +/- 2% (4% range) and most weights within +/- 1% (2% window).

When calibrating the scales, MOVE THE MACHINE between lifting the weight for review or adjustment. For some reason, many hydraulic systems will accumulate a significant offset with each lift to examine the weight display. The only way to avoid this peculiar effect we have found, is to move the machine as if in a normal loading task, before returning to the test weight.

Discussion:

This is a "live" setting and will change with bleed-off pressure. It is important to press at a consistent moment in time after stopping the lift. When adjusting the displayed weight, the timing of this press affects the calibration adjustment.

The longer the delay between stopping the lift and pressing to store the value, the more time is given to bleed-off, which results in a lower pressure with time. When the relationship of time, bleed-off curve and pressure are understood, this factor can be used effectively when adjusting difficult to calibrate systems.
Testing for Repeatability and Adjusting for Accuracy:

It is good practice to lift your test weight several times to determine the repeatability of the machine and Scale Set Up.

If convenient, lift two or three other known weights of different ranges to assure yourself that the Weighing System weighs consistently and accurately across a range of weights.

Your general results should produce weight displays which are within a 4 to 5% difference between high and low results for the same weight. This is the measure of consistency. You are looking for the spread, not accuracy of the weight at this step.

Bringing the high and low readings closer together requires your examination of the machine operation and some experimentation.

When your machine operation provides consistent results, you can shift the center of the weight display to bring the reading to the accurate weight of the test weight by the following process:

Enter the Calibration mode

Press ZERO button to go to CAL.

Press TARE button two times to go to SPAN.

Press GROSS/NET button to enter new SPAN calibration weight. The display will show the previous SPAN calibration weight.

Use GROSS/NET and PRINT buttons to enter an adjusted SPAN calibration weight. If the scale reads high by 15%, then decrease the SPAN calibration weight by approximately the same percentage,

Lift the Test Weight and Press "f" button to store the new SPAN calibration weight.

Press ZERO button to go to END, then press the TARE button to save the new settings.
Repeat the tests for repeatability and accuracy and re-adjust the SPAN calibration weight until you are satisfied with the accuracy.

A Note for technicians and operators - A peculiar characteristic of hydraulic weighing is a phenomena which causes the indicated weight to incrementally increase or decrease with every lift if the truck is NOT MOVED between lifts. If you notice this strange error, simply move the truck between each weigh, as would be the case, if the truck were in actual loading, weighing and moving operations.

Call Tech Support if you need assistance. (805-236-7406)
Tech Support at this number is available 7 days per week, including holidays.
Tech Notes: LTWS-1 Patriot

RINSTRUM Indicator Accumulate/Totalize Function

Operator Instructions:

Initiate the Accumulate/Totalize/Store function by clearing the Accumulator Memory. Press and hold the PRINT button until the display indicates the memory is clear and displays the Total = "0".

Load must be stable:
The Indicator will Accumulate/Totalize when you press the PRINT after the weight is stable and the small "H" appears below and between the "1's" digit and the lb/kg sign.

ACQUIRE and STORE Weight:
When the PRINT/(STORE) button is pressed momentarily, the Indicator will flash “PRINT” to indicate that the Store function is successful.

The stored weight is in the accumulated load memory (TOTAL).

The Indicator will Accumulate/Totalize/(Store) only one weight per PRINT/STORE.

In order to store a new weight, the forks must be unloaded and re-loaded to calculate and add a new weight.

The Indicator will display "- - - - - - " if PRINT/STORE is attempted without acquiring a new load and weight.

PRINT Accumulated TOTAL and CLEAR TOTAL (Accumulated Weight)
The accumulated TOTAL weight will be displayed and PRINTed if the PRINT button is pressed and held.
When the Accumulated Weight is PRINTed, the TOTAL Weight Memory is erased.
The accumulated TOTAL weight may be viewed when the "f" button is pressed and held. Viewing the accumulated TOTAL weight does NOT erase the weight memory.

Clear the Accumulator Memory.
Press and hold the PRINT button until the display indicates the memory is clear and displays the Total = "0".
Bleed-Off  

Best hydraulic weights are displayed immediately after stopping the lift.

Hydraulic pressure lifting a load will change immediately when the lift is stopped. This is caused by “bleed-off”, the normal leakage of hydraulic fluid past o-rings, seals and valves.

Operations which affect weight consistency:

- Bleed-off
- Engine RPM
- Hydraulic Pump RPM
- Mast Tilt
- Fork Offset/Sideshift/Multi-stage position, etc.
- Position of Load on forks
- Speed or Height of lift
- "Feathering/Babying" or variation of lift speed
- Electronic/Proportional/Automated Features

A Final Reminder . . .

- - - Safety - - -

is the First Operating Consideration.
Help reduce workplace accidents.
Keep your own operation SAFE.

* * *

Suggested initial operation for consistent weight:

- Position the forks ready to lift.
- Press the load down/slack the chain to establish starting pressure
- Tilt the mast back
- Lift quickly, with steady speed, do not baby the system.
- Stop at a consistent height. Do not "feather" in to the 'spot'.
- Approximate height is good enough. Do not “tweek” the controls. When lifting, avoid idle or low lift speed. Expedite the lift, just as when you are loading or stacking.

In "KEY" Mode (the Indicator displays the live pressure converted to weight), follow the general positioning and lift guidance, but lift past the "weigh-point" or "sweet-spot", stop the lift and ease the load down to the weigh-point and stop. (This process requires a new calibration for the holding pressure, instead of the lifting pressure and often produces more consistent weights.) When the forks are stopped, the first two or three displayed weights are generally the most reliable. If the operator waits for the bleedoff to flatten, the weighing process can require large delays.

In the KEY Mode, the operator's judgment and experience are essential elements for obtaining accurate and repeatable weights. In AUTO Mode, the stable weight display is held until the load is removed.

Summary:

These are not hard and fast "rules", but only suggestions. Only you can determine the "correct" operation to produce best results. (Some trucks weigh best at idle.)
Most hydraulic scale installations produce consistent 98-99% accuracy.
So can yours.
Hydraulic Weighing Systems

by

American Forklift Scale LLC
4804 Granite Dr. #160
Bldg. F-3 Suite 293
Rocklin, CA 95677
Tel: 888-640-2725  FAX: 916-660-0679
http://www.americanforkliftscale.com/

Technical Support 24-7

tech@americanforkliftscale.com

(Cell) 805-236-7406

For Advice and Assistance with:
Installation
Setup
Calibration
Operation
Trouble-shooting
Any Other Assistance

We are here to assist Dealers and Operators!
Please call on our experience.