Operators Manual

FHX Series

51395
Revision 2 06/2020

Amendment Record

FHX Series Operators Manual

Operators Manual
Document 51395

Fairbanks Scales

Created	07/2017	
Revision 1	07/2017	New Documentation release.
Revision 2	10/2017	Added Printer setup instructions
Revision 3	06/2020	Updated Installation > Power Supply wiring

Disclaimer

Every effort has been made to provide complete and accurate information in this manual. However, although this manual may include a specifically identified warranty notice for the product, Fairbanks Scale makes no representations or warranties with respect to the contents of this manual, and reserves the right to make changes to this manual without notice when and as improvements are made.

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Table of Contents

SECTION 1: GENERAL INFORMATION

1.1. Introduction

This manual describes the assembly of the Fairbanks FHX Series. Read this manual carefully. The installer must be informed on the contents of this manual. Always do things in the correct order. This manual should be kept in a dry and safe place.

Warnings & Safety measures

When installing the FHX Series, please observe the instructions and guidelines in this manual carefully. Always perform each step-in sequence. If any of the instructions are not clear, please contact Fairbanks Scales.

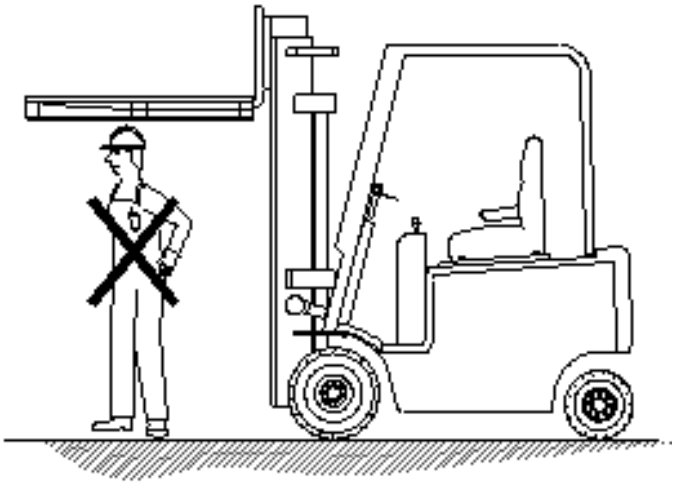
READ CAREFULLY

The installation of the Fairbanks FHX Series should only be performed by knowledgeable electrical hydraulic personnel.

Possible failures to the equipment must be communicated to your installer.

ATTENTION

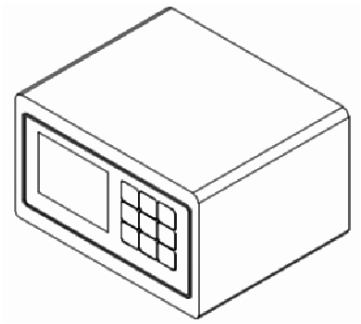
Always follow the safety measures concerning the forklift - or stacker truck.



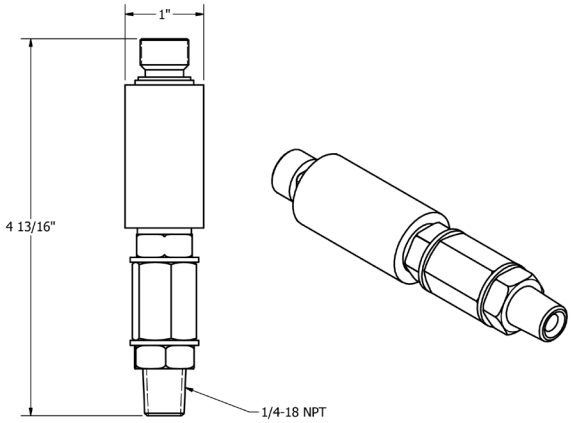
1.2. Description

The FHX Series weighing system consists of three main components:

1. Instrument
2. Pressure sensor
3. Speed sensor



Instrument



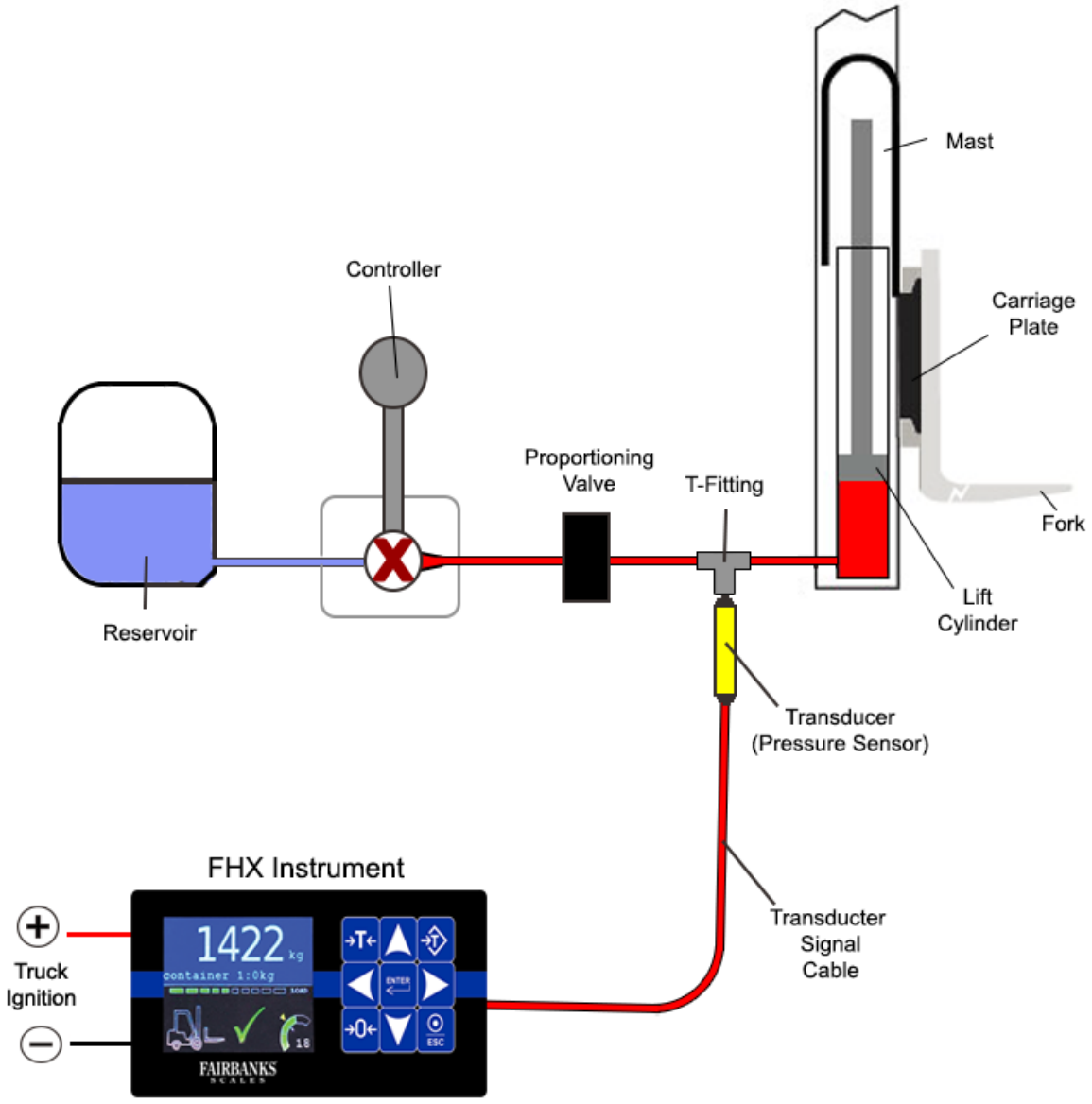
Pressure Sensor

Speed Sensor

The pressure sensor has to be connected to a T-fitting on the hydraulic system of the forklift truck. The instrument runs on 12 Volt DC.

The power supply of the instrument can be connected to the battery of the forklift. The most common voltages for fork-lift trucks are 12, 24, 48 and 80 V. In cases where the battery voltages are higher than 12 VDC, the system demands a DC-DC voltage converter with an output of 12 VDC.

1.3. Basic Hydraulic Pressure System



1.4. Accuracy

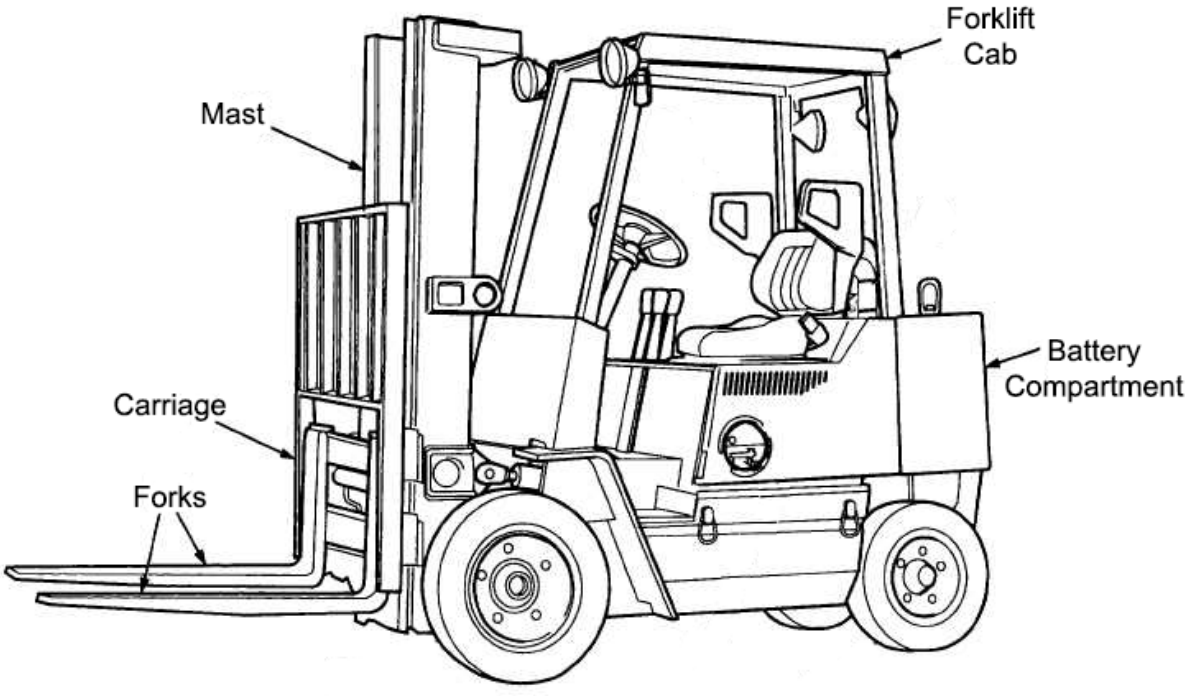
Measuring the oil pressure is a very precise job, but mechanical parts in the lifting mechanism and the position of the mast can adversely affect the accuracy.

The friction/resistance of the moving parts within the mast is a major influence on the weighing. The resistance of the coils by dirt or bad bearings increases the inaccuracy caused by:

- Internal leakage in the oil circuit;
- Eccentric load of the forks (the load is not centered on the forks);
- The difference at slow or fast approaching of the reference altitude.

With more ' stick and slip effect ', there is less repeatability, so less accuracy. Repeatability means that when you meassure the same weight in succesion, every time about the same weight appears in the display.

1.5. Basic Forklift Components



1.6. Technical Specifications

Models	FHX Series
Capacities	5,000 – 20,000 lbs (Meeting the truck's capacity)
Graduation	5 lbs @ 5,000 lbs 10 lbs @ 10,000 lbs 20 lbs @ 20,000 lbs
System Tolerance	0.2% of applied load, or the next higher scale division.
Protection Class	IP65 (instrument)
Instrument Enclosure	ABS
Power Supply	12V to instrument, 12V or 18-72V from forklift
Display	Graphic, full-color
Keypad	9 (On/Off, Tare, Manual Tare, Zero, Enter and Directional Arrows)
Operating Temperature	15°F to 105°F (-10°C to +40°C)
Pressure Sensor:	
Protection Class	NEMA 4
Construction	Stainless Steel
Pressure Rating	7,250 PSI

SECTION 2: BEFORE THE INSTALLATION

2.1. Capacity of the Forklift Truck

The FHX Series can be installed on forklift trucks with a capacity of up to 20,000 lbs.

2.2. Maximum Pressure in the Hydraulic System

The FHX Series will operate optimally at an oil pressure up to 7,250 PSI.

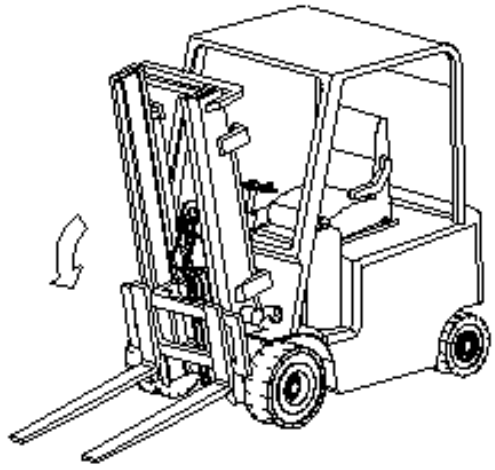
2.3. Battery Voltage of the Forklift Truck

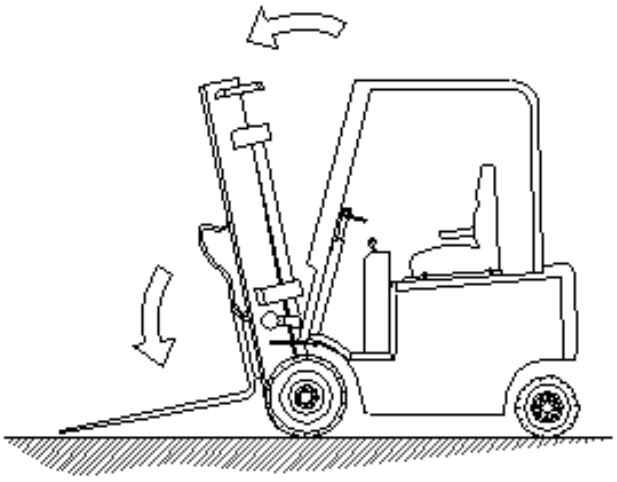
The most common voltages for forklift trucks are 12, 24, 48 and 80 VDC. The FHX Series operates on 12 VDC. In cases where the battery voltage is greater than 12 VDC, the system requires a DC-DC power converter with an output voltage of 12 VDC. This comes standard with each FHX Series.

2.4. Making the Hydraulic System Pressure Free

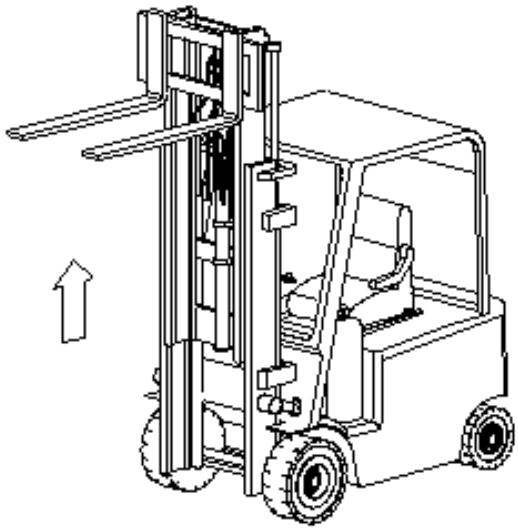
Before installation of the FHX Series, the hydraulic system of the forklift truck must be pressure free. There are two ways to do this:

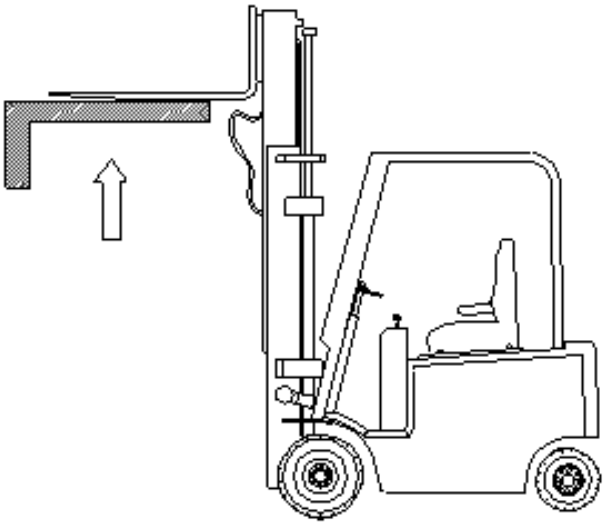
Option 1: Place the forks on the ground in their lowest position and make the hydraulic system pressure freely lowering the lifting cylinder into its lowest position. There should be slack in the chain.





Option 2: Lift the forks and position them on top of a supporting surface. Make the hydraulic system pressure free, by lowering the lifting cylinder into its lowest position. Be sure the chain has slack in it.





2.5. Mechanical Components of the Forklift Truck

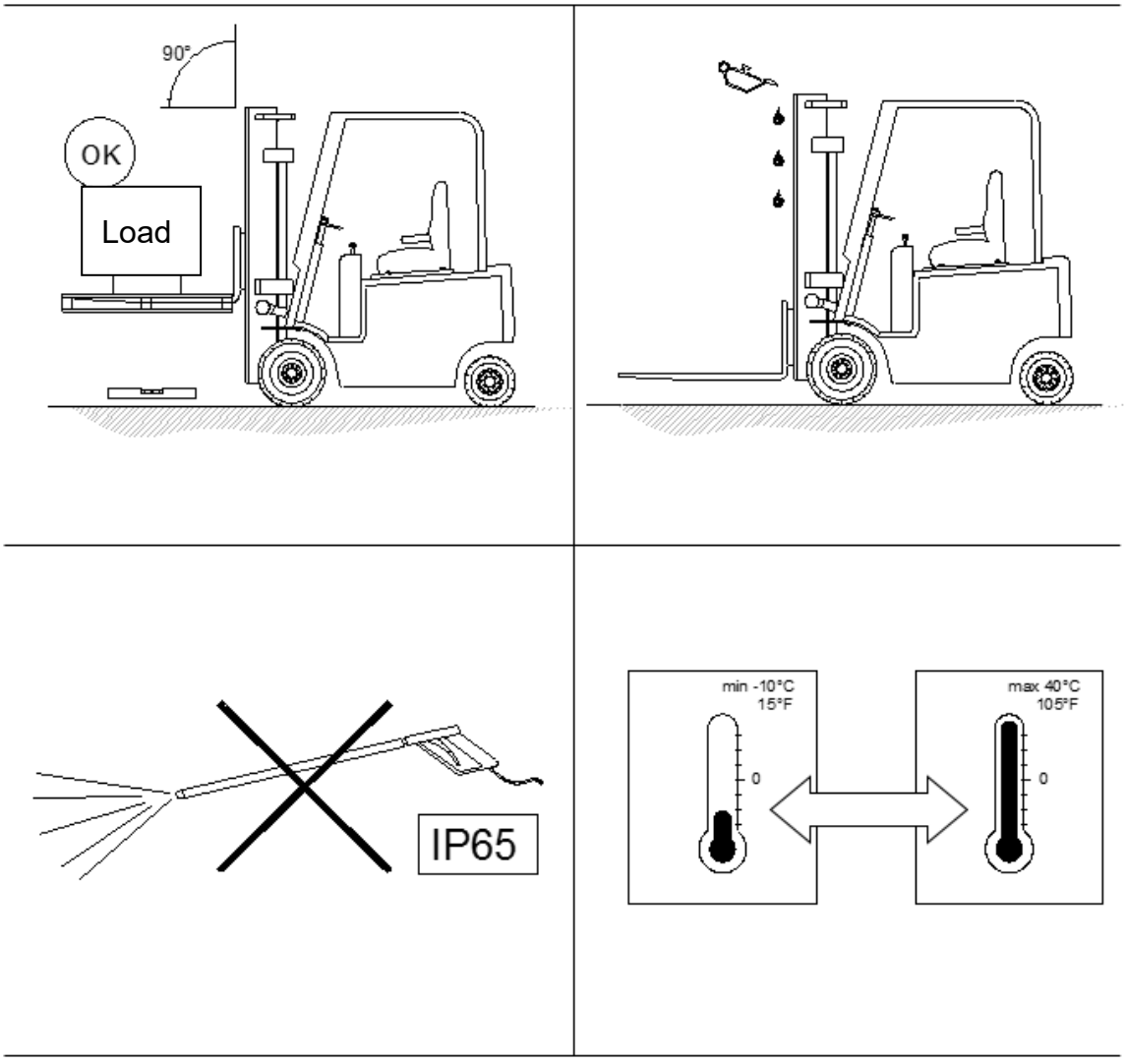
After installation of the FHX Series system on the forklift truck, the truck is part of the weighing system. The mechanical parts of the forklift truck, such as the mast and bearings, will influence the accuracy of the weightings. For this reason, it is important that these components are in good condition:

- No local wear in the mast of the forklift truck
- Clean the system
- Good lubrication of the mast and chains
- Regular maintenance so that the condition of the system is constant
- When lifting and decreasing the forks no whistling and cracking sounds from the mast

2.6. Proper Operating

The accuracy, repeatability and life expectancy of the FHX System is determined by how the system is used. A few guidelines include:

- Loads should be lifted at a 90-degree angle from the floor
- Hydraulic fluids should always be kept at proper levels
- System is not designed for wet or wash-down areas
- Operating temperature should remain between 15° F - 105° F



2.7. How can I weigh as accurately as possible?

As explained, the hydraulic measuring is very precise but the accuracy is influenced by the mechanical parts, for example, through dirt, bad bearings in the mast or internal leaks in the oil circuit. It can also be influenced when the load which has to be weighed is not in the middle of the forks. Another cause is that the system is not used correctly.

It is possible to increase the accuracy. How?

- By keeping the mast vertical during the load measurement, within 3°
- By putting the center of gravity in the middle of the forks and in the middle of the mast.
- By measuring the load at a fixed height.
- By not moving the forks to the reference height too fast. It is best to lift the forks past the reference height (the height of the stickers on the carriage plate and mast) and then lower them to the reference height. This should be done slowly, without sudden stops.
- When raising- or lowering the load takes relatively long you must raise parameter 1. Raising this parameter increases the measuring time.Standard P01 is set on 4 sec. (in most cases the correct configuration).
- Ensure oil liner and connection are not leaking fluid.

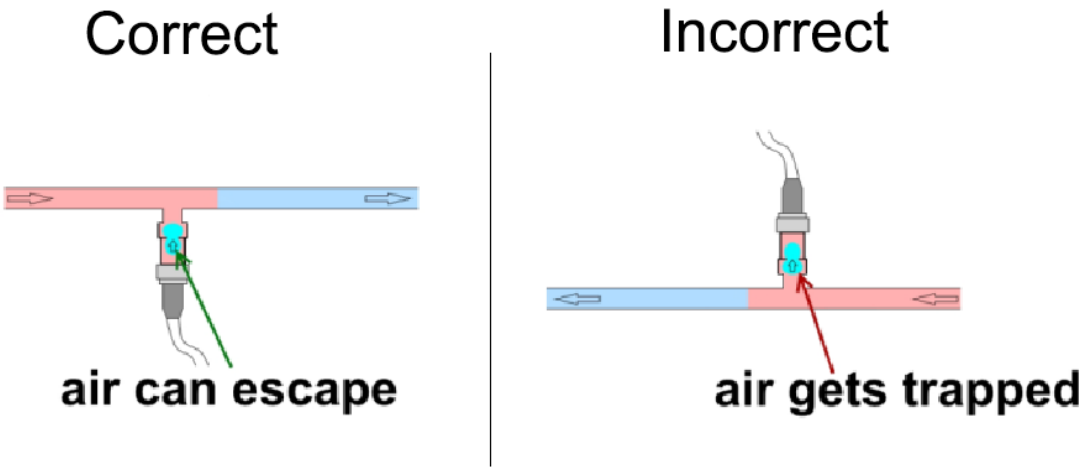
SECTION 3: INSTALLATION

- Fairbanks Scales Inc. recommends that the mechanical installation of this device be performed by a trained hydraulic expert.
- Fairbanks Scales Inc. recommends that any electrical wiring to the forklift or stacker should be done by a certified electrician.
- Fairbanks Scales Inc. recommends that all scale calibrations / adjustments be made by Fairbanks Scales Service, call 800-451-4107.

3.1. Hydraulics: Installing the T-Fitting

We recommend to have the installation of the pressure sensor in the hydraulic system of the forklift performed by an authorized lift truck dealer.

- Ensure that there is no pressure on the main cylinder line.
- The pressure sensor is mounted with a T-fitting in the high-pressure hose, between the valves and the cylinder.
- The connection on the pressure sensor is ¼" – 18 NPT.
- Protect the cable against moving, sharp or warm parts with the supplied protective cover.
- Mount the T-fitting so that the pressure sensor and the cable connection are pointing downwards. This will prevent air getting into the sensor.

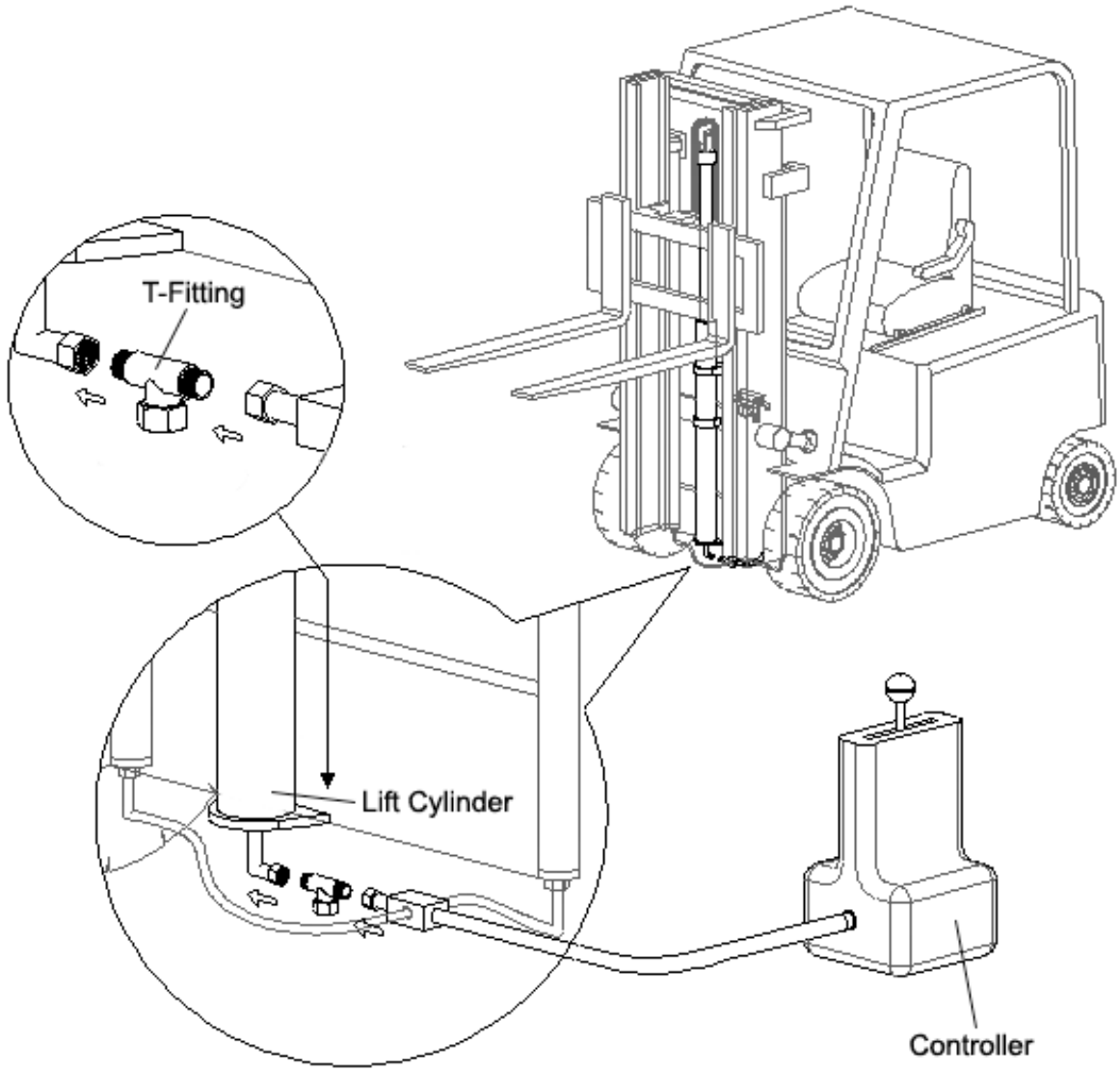


Choose a place where you can mount the sensor:

- Mount the pressure sensor in the pressure hose that raises and lowers the mast. In most cases, there is one cylinder which moves the carriage plate. The pressure sensor is mounted as close to the cylinder as possible.
- When the pressure hose splits to multiple cylinders, the pressure sensor must be mounted *before* the split.
- Do not mount the pressure sensor too close to the engine. Large differences in temperature can influence the accuracy of the system.
- If the forklift is used consistently, a piece of pipe or hose of ± 50 cm can be mounted between the sensor and the T-fitting. The pressure sensor is sensitive to temperature differences.
- If the moving oil becomes warm, the standing oil in this pipe or hose will remain cool.

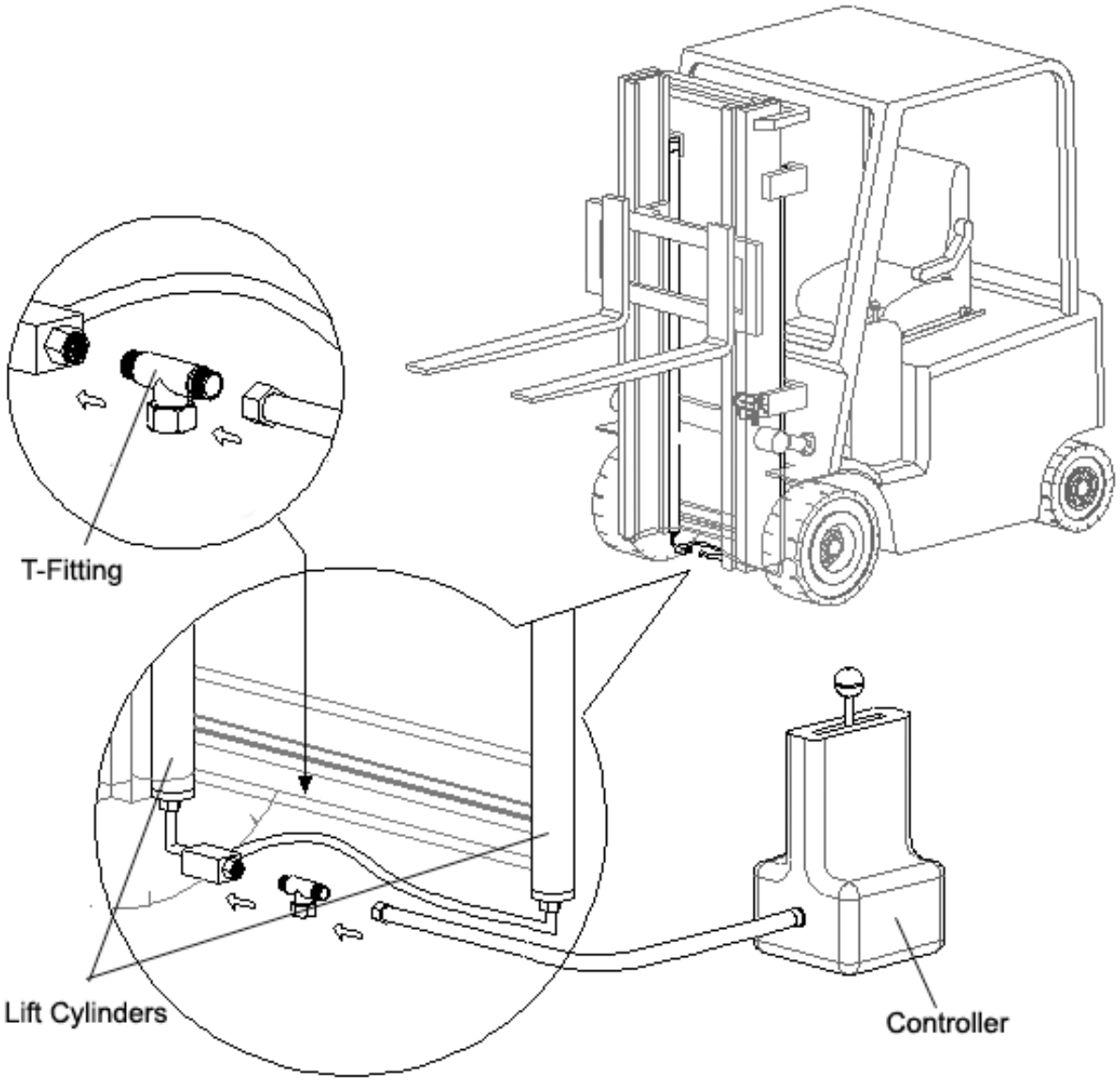
  The pressure sensor will not be effected by temperature differences.
- Place the pressure sensor close to the cylinder. There is often more room there and it is easier to reach.
- Choose, if possible, a place to mount the pressure sensor where there are the least steering and safety valves between the sensor and the cylinder.

Type A: 1 Central Cylinder

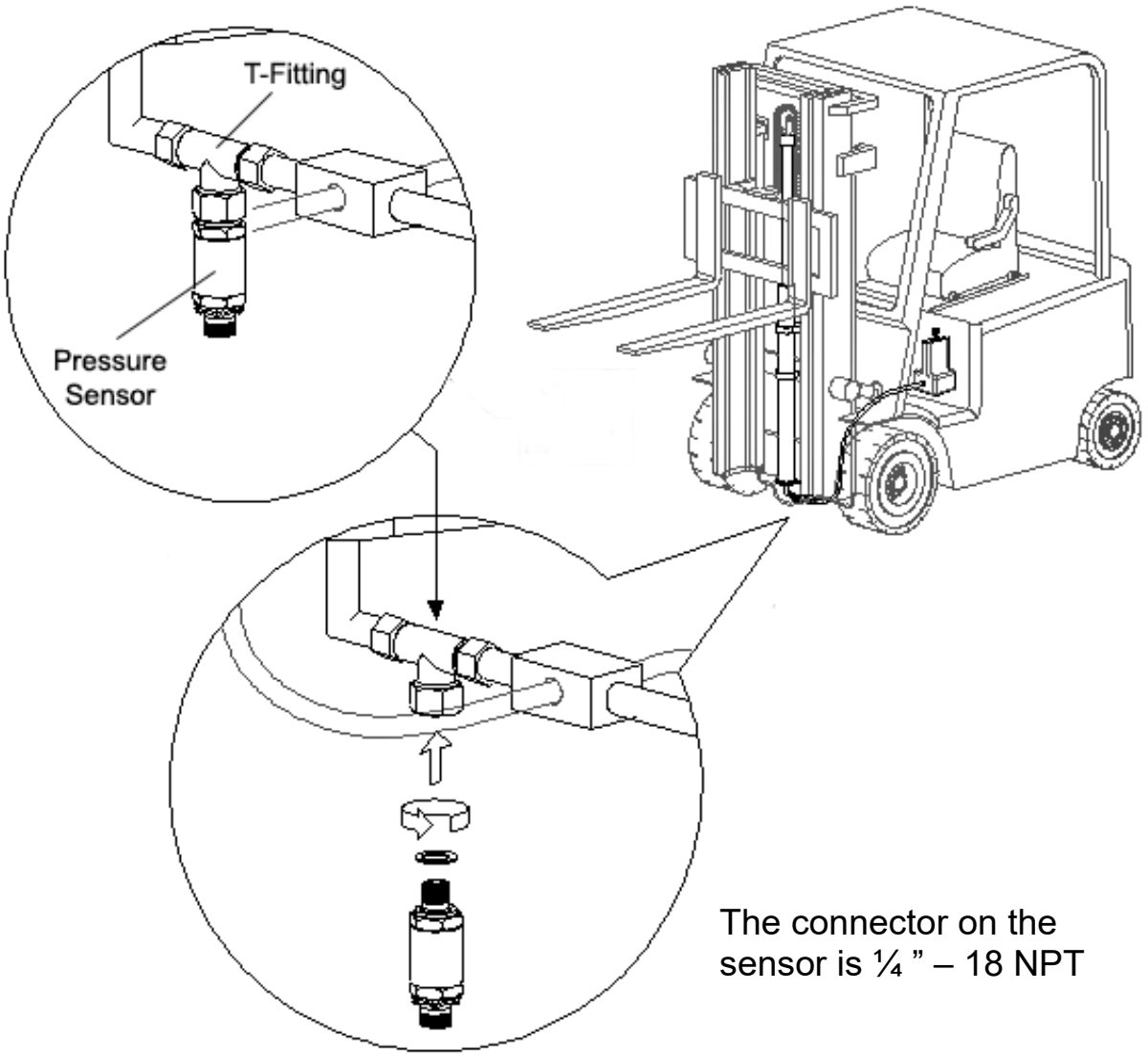


Mount the T-fitting into the hydraulic line of the truck near the cylinder for the rerouting of the pressure to the FHX Series.

Type B: 2 Cylinders on Both Sides



3.2. Hydraulics: Mounting the Pressure Sensor



The connector on the sensor is ¼ ” – 18 NPT

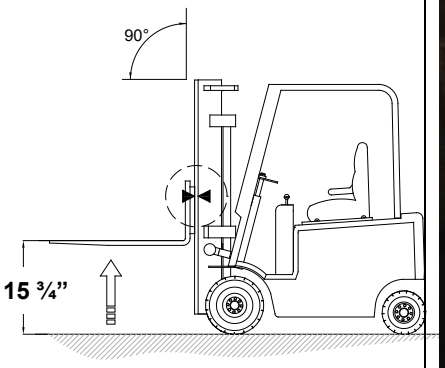
3.3. Mechanics: Installing the Speed Sensors

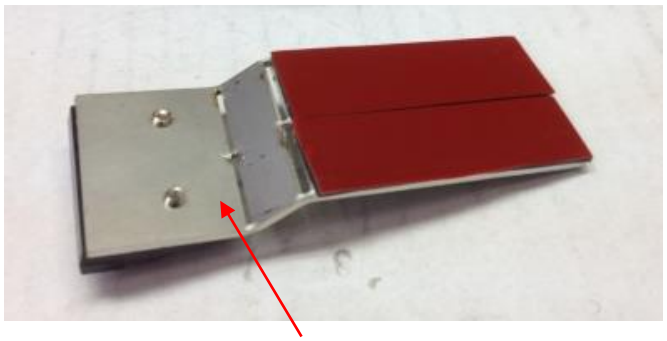
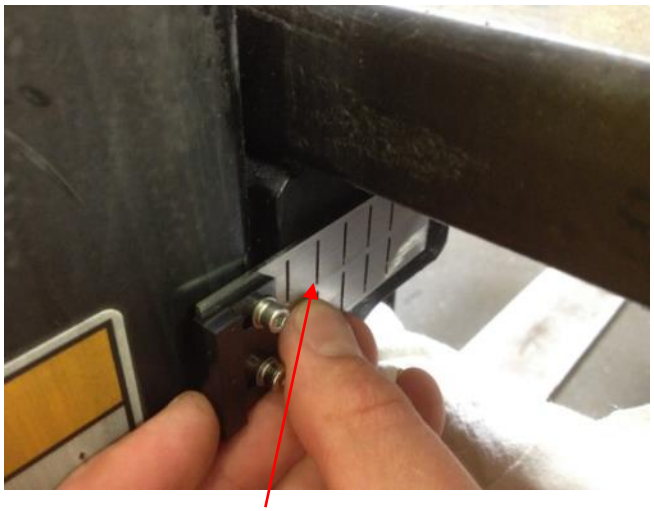
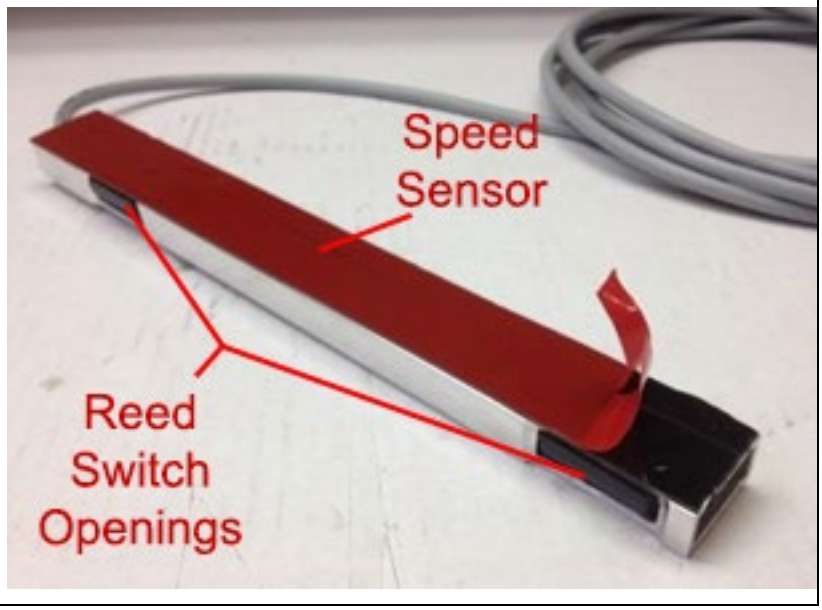
The speed sensor consists of the following parts:

- One magnet - to be installed at the fork board (moving part)
- One aluminium bar with 2 switches inside, to be installed at the mast (fixed part)

The distance between the magnet and the switches should be in the range ⅛" – ¼". So both parts must be aligned precisely.

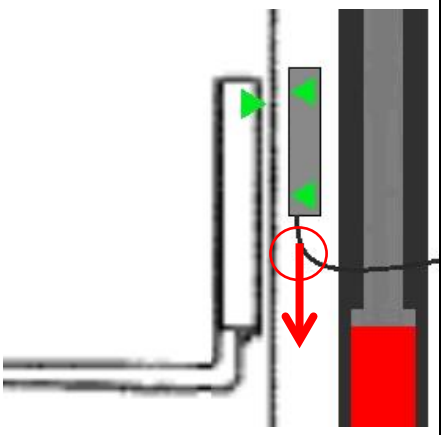
The magnet and lowest switch should meet when the forks are about 15 ¾" from the ground.

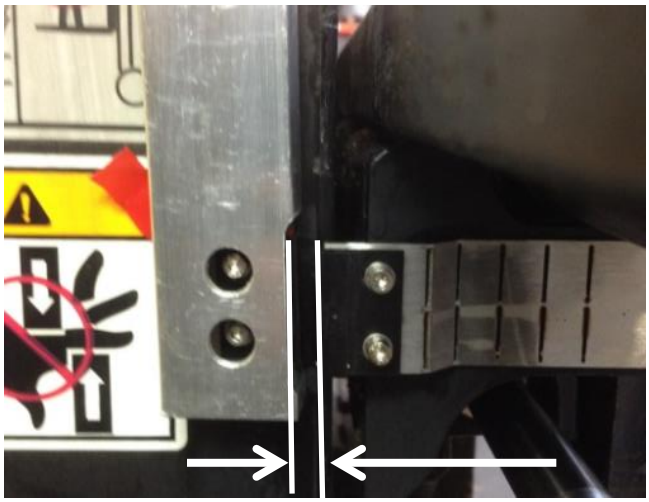


Clean the carriage plate, driver's side first, to ensure that the surface is clean and free of debris. On the carriage plate, driver's side, the holder can be installed with the adhesive tape or bolted.	
Place the speed sensor on a location where it is free from obstacles all the way up and down the mast.	
Clean the mast first to ensure that the surface is clean and free of debris. The speed sensor can be mounted on the mast with self-adhesive tape. ***The reed switch opening should face away from the driver***.	

Position the lower side of the aluminium speed sensor precisely. There should only be ⅛ - ¼” clearance between the lower reed switch and the magnet.

Note*: the cable must be positioned downwards.*





Gap = ⅛ - ¼”

Move the carriage plate up 8”, so the magnet is positioned in front of the upper reed switch.

Position the upper side of the aluminium speed sensor block precisely. There should only be ⅛ – ¼” clearance between the upper reed switch and the magnet.

Position the holder and check at the FHX instrument if both switches show a reaction in the display when the magnet passes by (after installation of the power supply).

Once system is completely wired and assembled, raise and lower the forks – making sure the display recognizes when the magnet passes each reed switch.

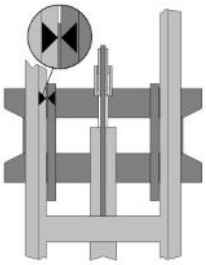
Place reference stickers, marking the reference height.

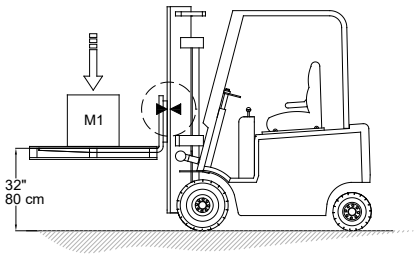
Two stickers are supplied with this kit. One of the stickers is placed on the mast and one on the carriage plate. The arrow stickers are used to show the reference height.

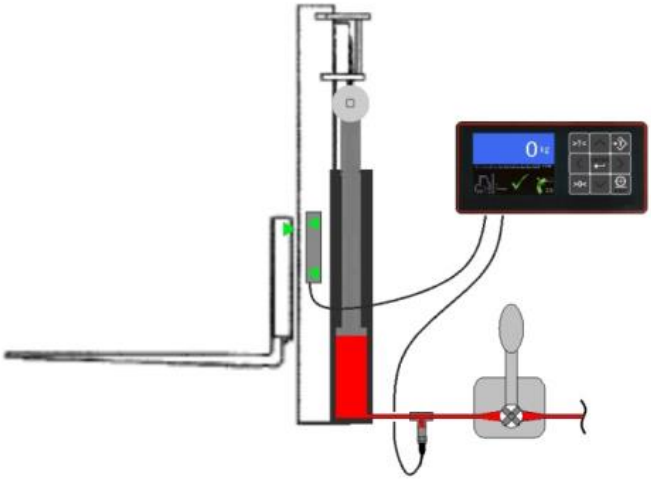
Location of reference arrows should be approximately 8” above upper reed switch.

Attention:

- Make sure that the fork lift operator can see the stickers;
- Make sure that there is minimal distance between the two arrows. The larger the distance, the more difficult it will be to gauge the height accurately.

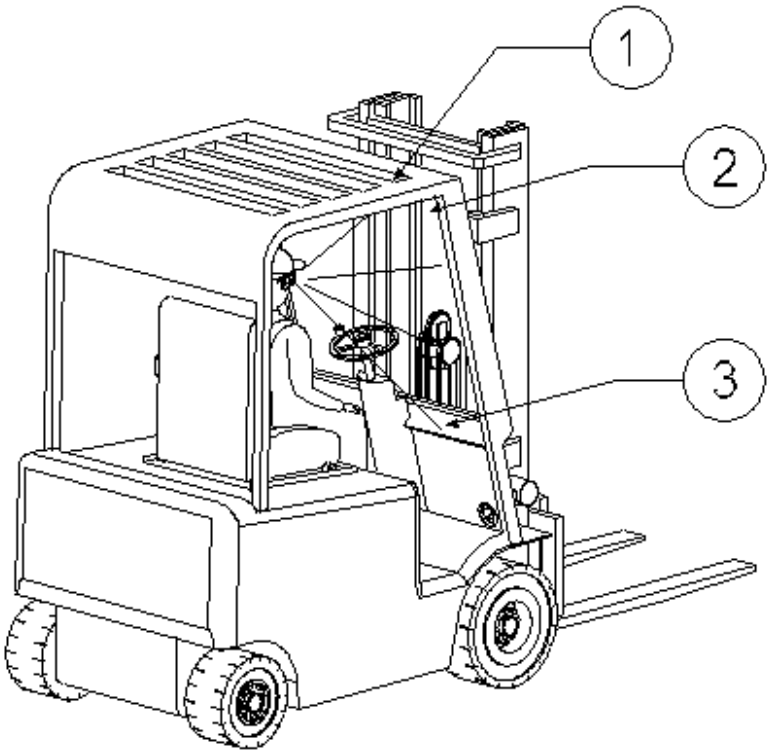


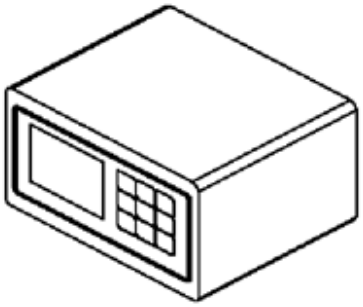




3.4. Mechanics: Installing the Instrument

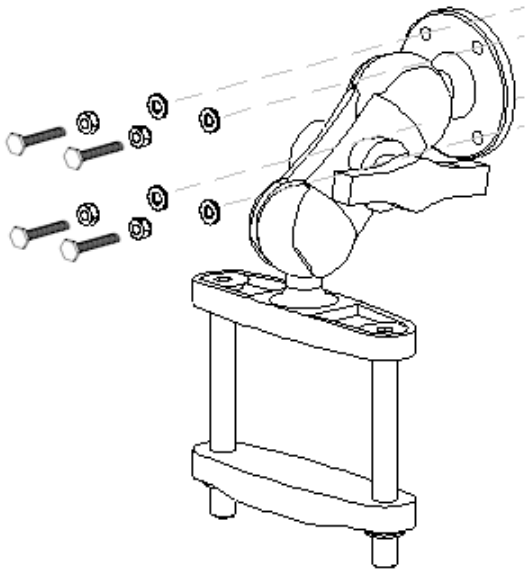
Position of the instrument





The instrument should be easy to view.

Installing the instrument



Use the instrument mounting bracket to install the FHX instrument in the truck's cabin.

3.5. Electronics: Mounting the Cables

Two cables should be mounted:

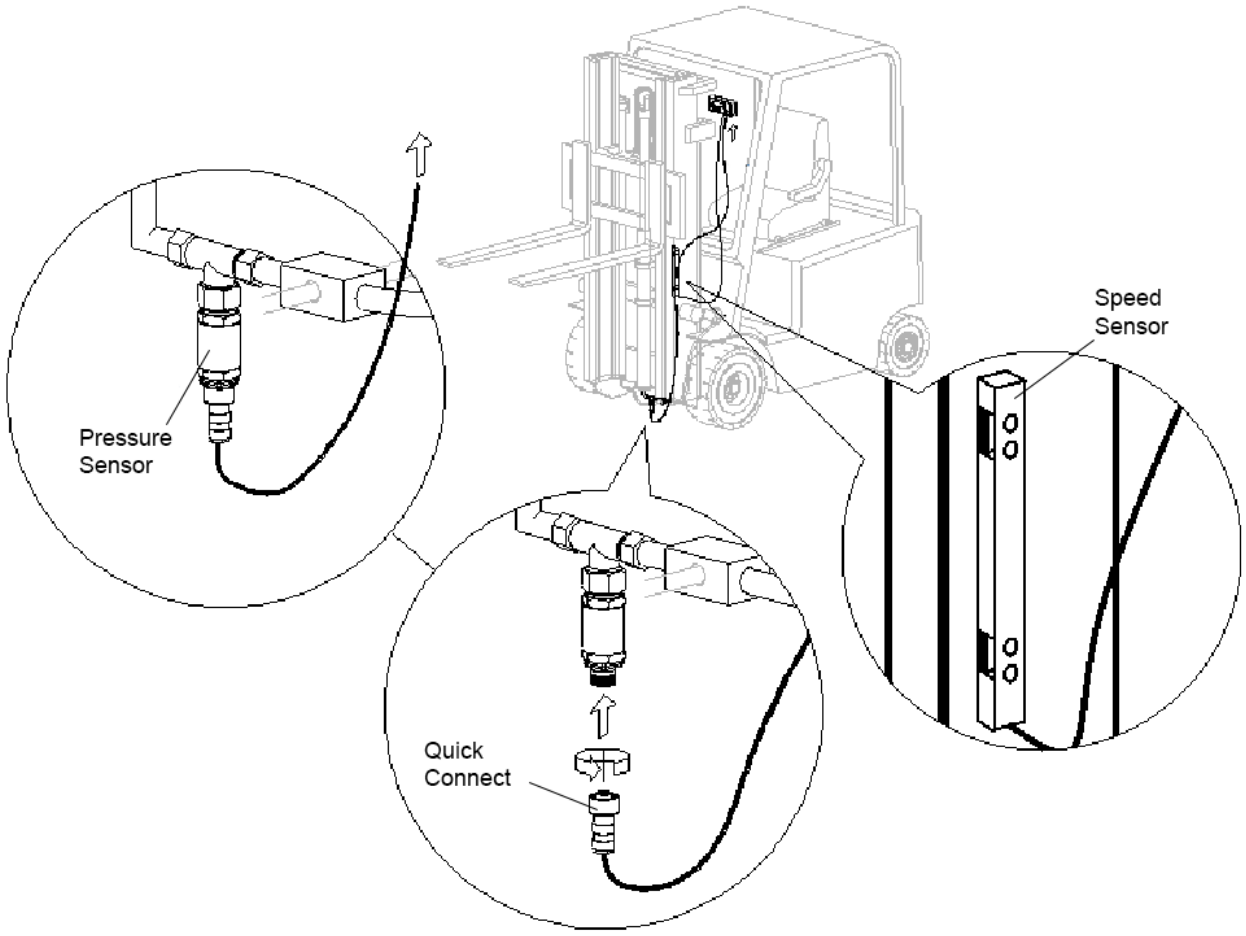
-cable for the oil pressure sensor
-cable for the speed sensor

When mounting the cables, it is important that the cable is protected. Keep the cable out of sight as much as possible, this minimizes the possibility of damage to the cable.

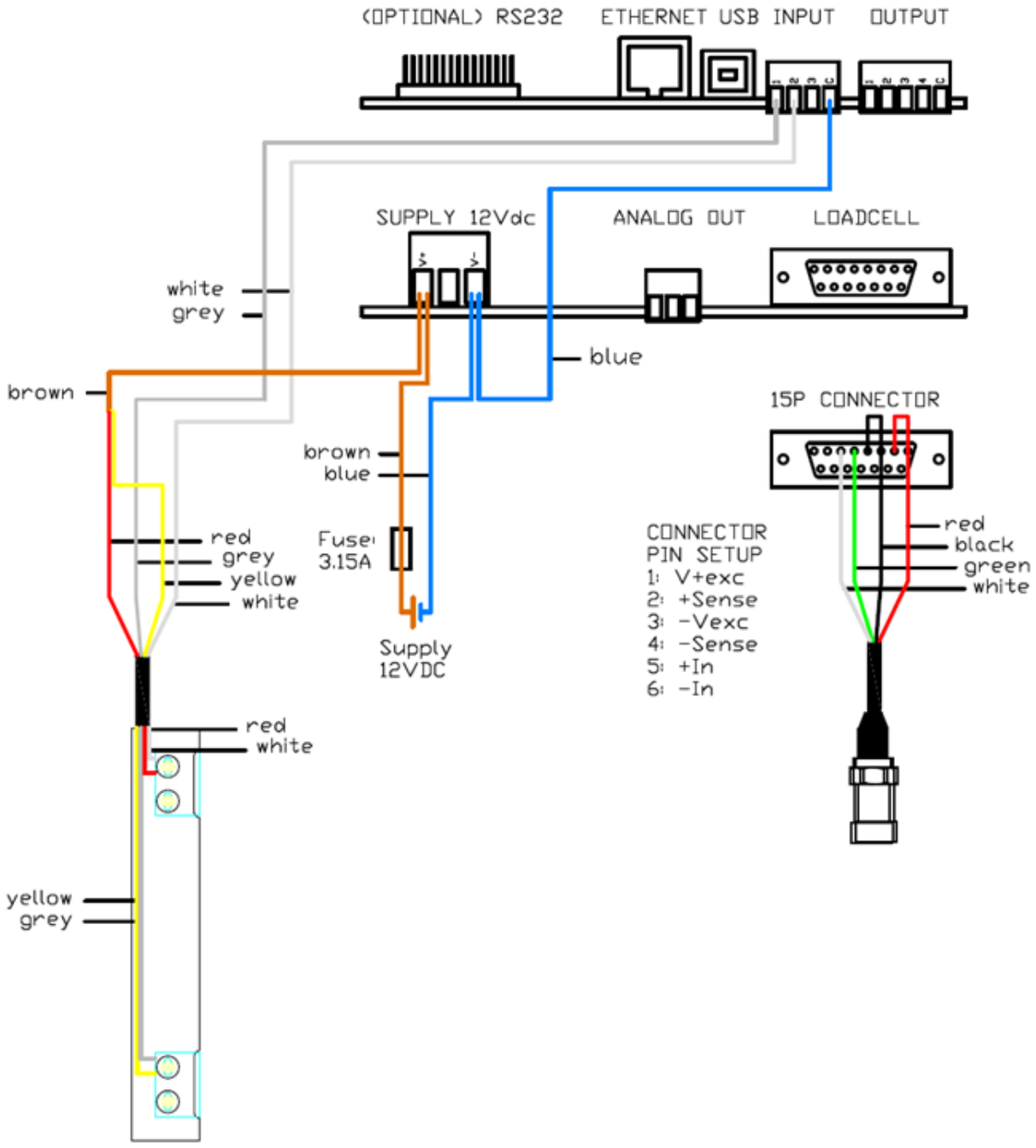
It may be necessary to thread the cable through small openings, openings through which the 18mm connector does not fit. In that case, it may be necessary to disconnect the cable and the connector, you must disconnect the cable at the instrument.

The system is supplied with a protective cover for the cable. This can be used where:

- the cable is near parts of the lift truck that become hot
- the cable is mounted near moving parts.



3.6. Electronics: Wiring Drawing Instrument



3.7. Connecting the Power Supply Cable

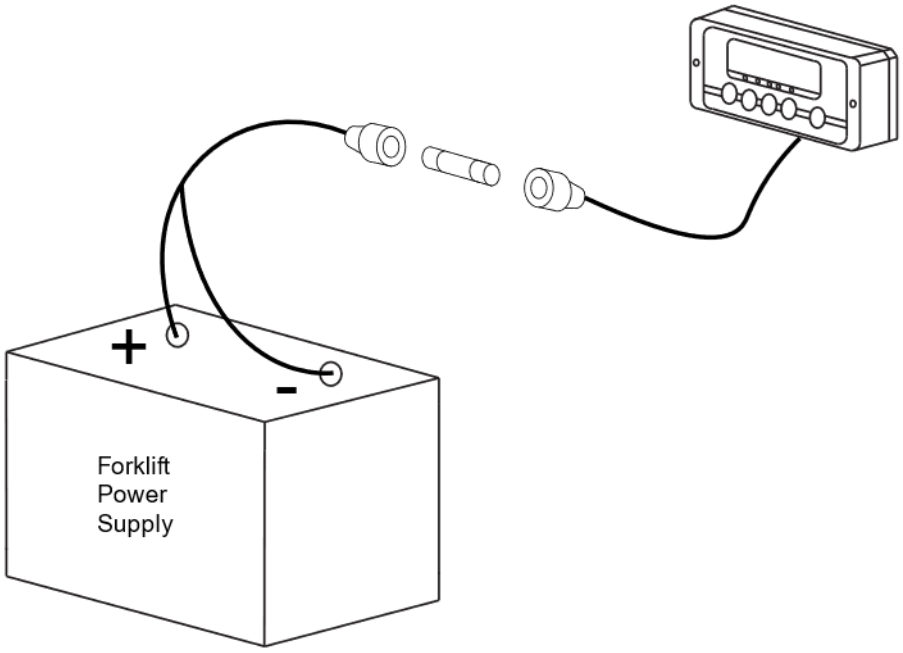
Warning: Installation of the scale instrument to the forklift power supply requires specific knowledge of the forklift's electrical system. Forklift owner is responsible for providing this information to the scale technician either with their forklift maintenance technician or wiring schematic of the forklift.

Instrument power supply from forklift truck

READ LABEL ON BACK FOR POWER SUPPLY INDICATOR

POWER REGULATOR INSIDE + = 12 VDC

FUSE: 3.15mA, 250V, 5x20mm slow blow



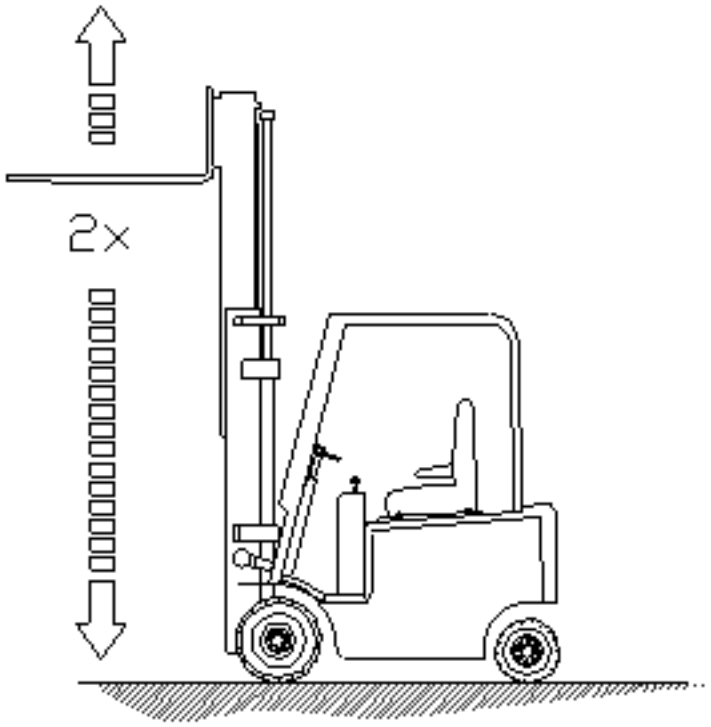
NOTE: Fuse and fuse holder ship loose with the instrument. This allows easier routing of the power cable. Once cable is routed, splice the fuse holder into the positive power line. Soldering is required.

The FHX Series instrument is standardly equipped with an *internal* 12 VDC power convertor, so can be connected to a 12 VDC power supply only.

Other power supply voltages from truck are available. In that case, the FHX Series instrument will be equipped with an *external* power convertor.

3.8. Remove Air from the Hydraulic System

Bring the forks to maximum height twice to remove any remaining air from the hydraulic system.



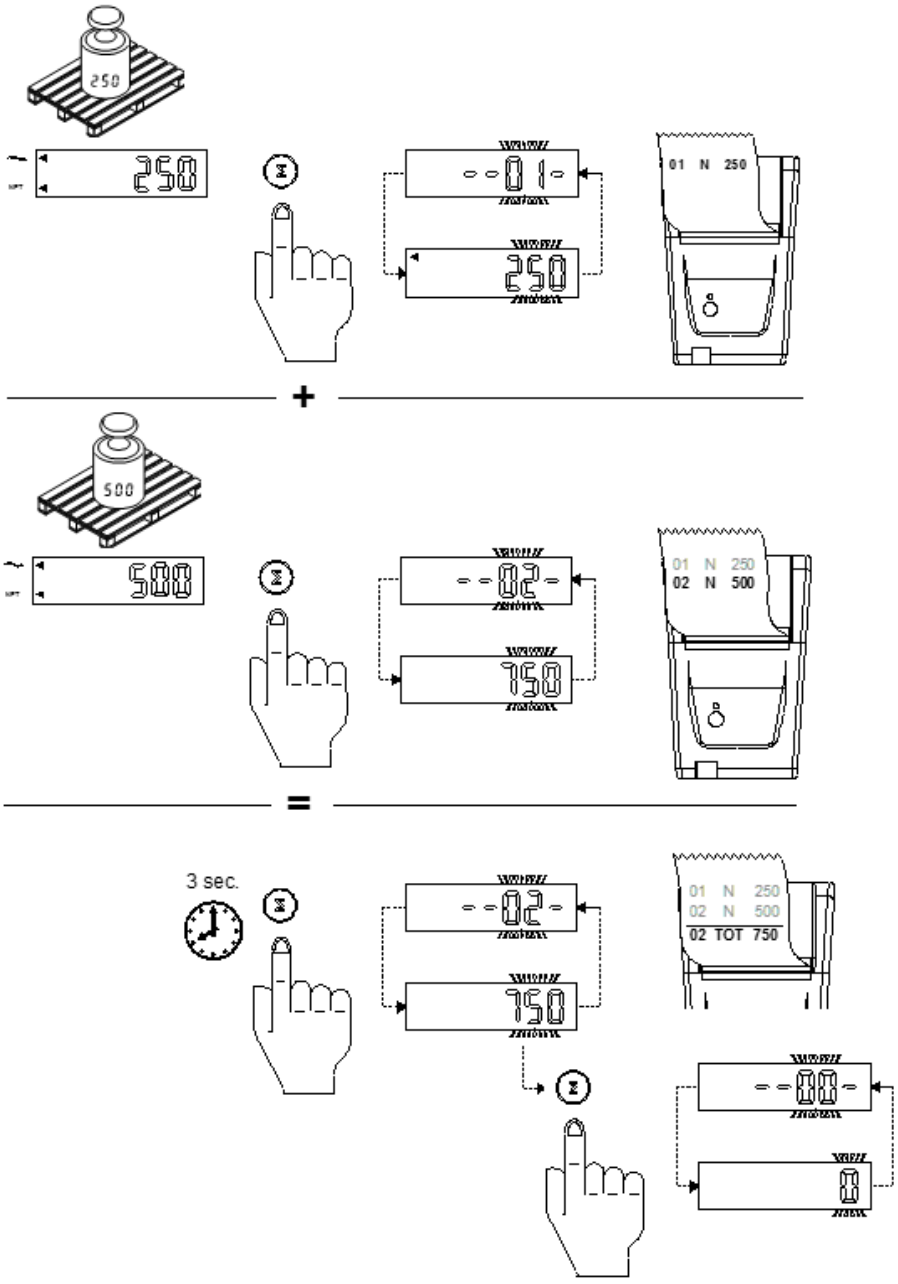
3.9. Printer (option)

3.9.1 On/off printer

Turn the printer on by pushing the Σ button. After 10 seconds. the printer shuts down automatically.

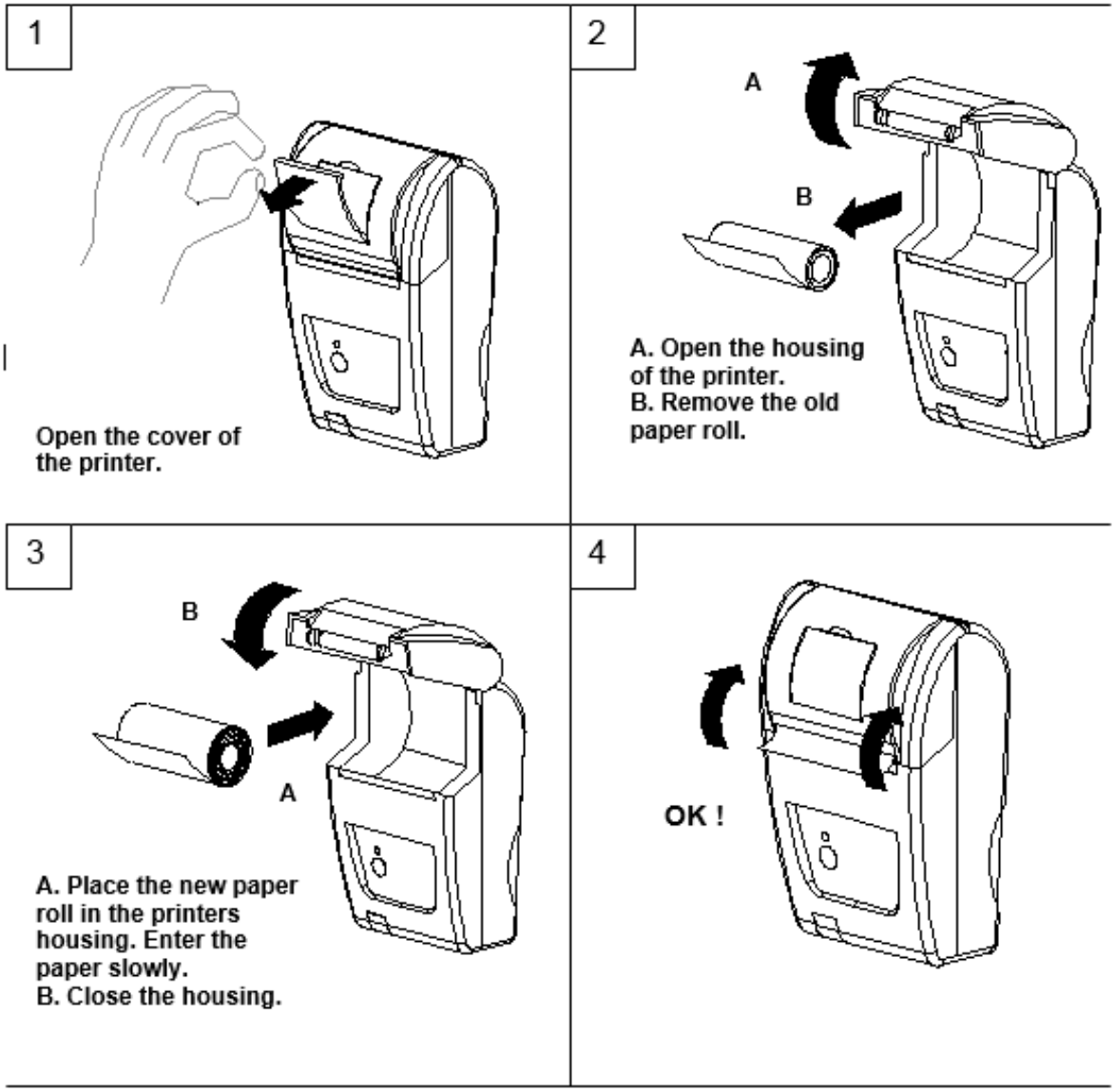
3.9.2 Printing

Current weighing data can be printed as individual weights and as a total weight.



Print Example:	01 B/G*	15 lbs.
	02 B/G	348.77 lbs.
	03 N	940.27 lbs.
	04 N	2645.54 lbs.
	04 PT	330.6 lbs.
	04 TOT	3949.581lbs.

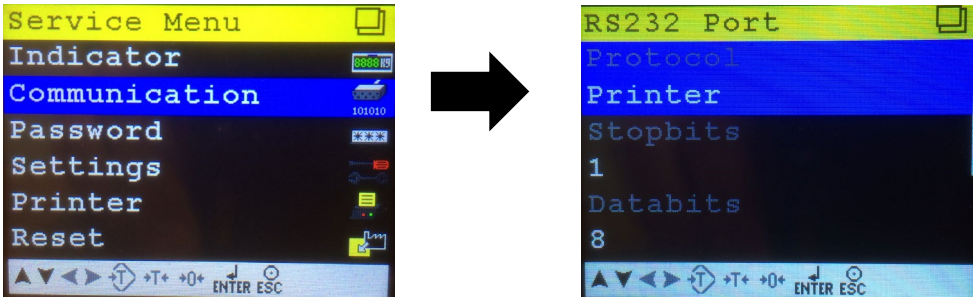
3.9.3 Replace Printer Paper



SECTION 4: PC PROTOCOL FOR FHX SERIES

4.1. Setting the parameter “Protocol”

With parameter “Protocol” under Communication the data protocol may be set. If the parameter is set to “ASCII”, the PC bi-directional command structure is active.



The indicator offers the possibility to communicate bi-directional with a PC or other hardware devices which can handle simple ASCII commands.

Protocol:

Baud rate: 600 to 19200 (default = 9600)

Data bits: 7 or 8 (default = 8)

Stop bits: 1 or 2 (default = 1)

Parity: odd/even/none (default = none)

Handshake: none

ASCII commands ***(2)**

ASCII command	Response String	Operation	
SZ<CR>	OK<CR>/ERR<CR>	Set zero value	
RZ<CR>	OK<CR>/ERR<CR>	Reset zero value	
SP<value><CR> ***(1)**	OK<CR>/ERR<CR>	Set preset tare value	
ST<CR> ***(3)**	OK<CR>/ERR<CR>	Set tare	
SG<CR>	G+0001.0<CR>	Send gross mode (continuously)	Not recommended

SN<CR>	N+0001.0<CR>	Send net mode (continuously)	Not recommended
SW<CR>	W+00010+000103805<CR>	Send weights mode (continuously)	Not recommended
RT<CR>	OK<CR>/ERR<CR>	Reset tare	
RP<CR>	OK<CR>/ERR<CR>	Reset preset tare	
GP<CR>	P+0001.0<CR>	Get preset tare	
GT<CR>	T+0001.0<CR>	Get tare	
GG<CR>	G+0001.0<CR>	Get gross	
GN<CR>	N+0001.0<CR>	Get net	
GW<CR>	W+00010+000103805<CR>	Get net, gross, status and checksum	

***(1):** The pre-set tare value should be given in with 5 digits always.

SP 00150 <CR>, (type: SP(space)00150(enter) to pre-set a tare value of 150 kg/lb.

***(2):** If the scale is busy with a handling, like zeroing or taring, and a command is generated at the same time the transmitted weight to the host might be incorrect.

***(3)**: If there is a previous tare active the scale will reset this and set the new tare.

4.2. Special commands 'GW' and 'SW'

The 'GW' and 'SW' are commands with checksums. With these commands it is possible to get net, gross and status data. The response string doesn't have the decimal point information. The 'SW' update rate is slower than the other commands.

Structure of the response string:

W	+00010	+00010	38	05	<CR>
Data ID	Net value	Gross value	Status(hex)	Checksum	End of string

Status bits:

Bit number	Bit definition	Status '0'	Status '1'
7 (MSB)	Indicator error	No errors	Indicator error

6	Tare active	No tare active	Tare active
5	Zero corrected	No zero correction	Zero corrected
4	Weight stable	Weight unstable	Weight stable
3	Within zero range	Out of zero range	Within zero range
2	HW overload	Under max load	Above max load
1	Speed warning	Weighing incorrect	Weighing correct
0 (LSB)	Totalize is possible	Totalize is not possible	Totalize is possible

Example:

38 (hex) = 0011 1000(binary)

bit 5, zero corrected

bit 4, weight stable

bit 3, within zero range

4.2.1 Calculating the checksum:

The checksum is the inverted sum of all ASCII characters in the response string previous to the checksum.

Example:

Response string = W+00010+000103805<CR>

Add all hex values of the characters in the string.
[W]+[+]+[0]+[0]+[0]+[1]+[0]+[+]+[0]+[0]+[0]+[1]+[0]+[3]+[8]
Total is 2FA(hex)

Remove the most significant digit, result is FA(hex)
Invert the hexadecimal value, result is 05(hex)
Convert the hexadecimal value to characters, result is [0][5]

FHX Series

Operators Manual

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