CAMBRIDGE

# SCALE WORKS INCORPORATED

# MODEL: DL-CSW-10AT-LFT
# CARRIAGE-MOUNT LIFT TRUCK SCALE SYSTEM

# INSTALLATION, SET-UP & OPERATION


MEASUREMENT CANADA
AM-5812C

Dyna-Lift-LFT Carriage
COC#: 03-082

Model CSW-10AT Indicator
COC#: 06-070A1

Made in USA


**Cambridge Scale Works. • P O Box 670 • Honey Brook, PA 19344**
**(800) 292-7640 • (610) 273-7040 • www.cambridgescale.com**



MANUAL P/N 5999-1010-01 (6/15)

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# SPECIFICATIONS

**Model CSW-10AT-LFT Electronic Lift Truck Scale:**

**Accuracy:** .01% of applied load.

**Operating Temperature:** 14 to 140 deg. F (-10 to 60 deg. C)

**Overload:** 500% of Rated Capacity.

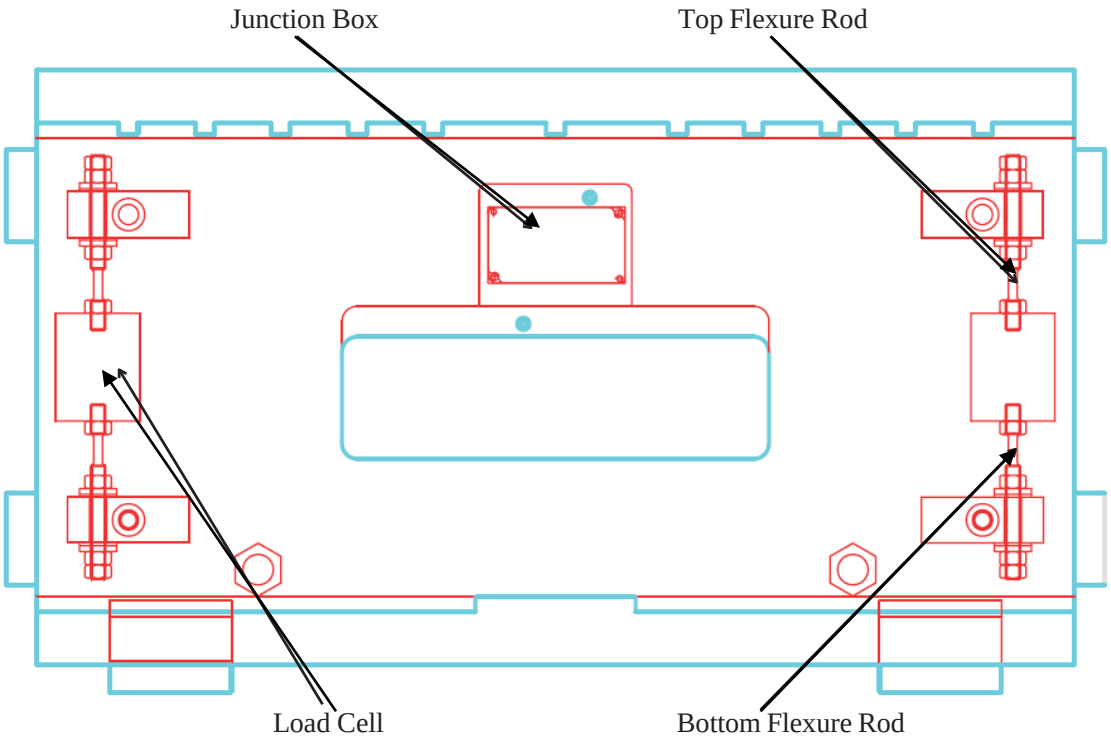
**Capacity:** 5,000 Pounds.

**Meter:** CSW-10AT-LFT with:

- .56 inch led display
- RS-232 Port for peripheral Device
- Mounting Hardware
- Operator Friendly

**Warranty:** Twelve (12) month Warranty against defect in workmanship and/or materials

# OWNERS INFORMATION




**Meter Serial Number:** _____

**Scale Section Serial Number:** _____

**#1 Load Cell Serial Number:** _____

**#2 Load Cell Serial Number:** _____

## Scale Capacity and Graduation

**Capacity:** _____ **X** **Graduation:** _____ **lbs**

# PARTS DESCRIPTION

## SCALE SECTION

The scale section attaches to the lift truck carriage and you will install your existing forks to the front of it. The scale section detects the weight of the load. The weight of the load is then sent to the ***CSW-10AT-LFT*** Meter through the signal cable.

## CSW-10AT-LFT METER

The CSW-10AT-LFT Meter converts the weight from the scale section into an accurate digital weight and displays it. Additionally, the ***CSW-10AT-LFT*** sends data/information to peripheral devices. Mounting hardware is also provided for the CSW-10AT-LFT so that it may be mounted to your fork truck in either the dash mount or overhead mount.

# UNPACKING YOUR SCALE

Your CAMBRIDGE Lift Truck Scale is shipped on a pallet. A Lift Truck Scale system includes the following components:

**1)** One Scale Section to attach to the forklift carriage with bottom cleats.
2) One Signal Cable (coil).
3) One Power Cable.
4) One Electronic Meter (***CSW-10AT-LFT***) with mounting hardware.
5) One Cable Protection Guard - attached to the scale section.
6) Ten 5 1/2 inch wire ties.
7) Ten 21 inch wire ties.

Upon receipt of your scale system, please inspect to make sure the above parts are present in your shipment.

# EQUIPMENT NEEDED FOR INSTALLATION

Prior to installing your lift truck scale, gather all equipment (listed below) needed to complete the installation;

- 1/2-inch hex allen wrench for removing and reinstalling the bottom cleats
- 1-1/2 inch open end wrench for adjusting the carriage adjustment bolts and tightening the nuts of the carriage adjustment bolts
- Cutting pliers for cutting the wire ties
- Adjustable wrench (10-inch) for installing the cable protection guard
- 5/16-inch hex allen wrench for removing and installing fork stops
- 4-inch grinder

# INSTALLATION: SCALE SECTION

NOTE: The Scale Section is shipped with the carriage adjustment bolts backed out. You must adjust the carriage adjustment bolts. Improper installation of the scale section causes most weighing problems. When installing the the scale section keep the following in mind.

1) Scale section must touch the carriage at four points.
2) Scale section must be as parallel as possible to the carriage.
3) Scale section must not rock, swing, or slide in any direction.

INSTALLATION:

**1)** Remove forks from your existing truck. Remove backrest if required

**2)** Make sure the carriage face is not too rough; if it is, use the grinder over any uneven areas.

**3)** Remove the bottom cleats from the scale section using the 1/2 inch hex allen wrench.

**4)** Remove the cable protection guard and bolt. Install the lifting eye provided. This allows you to lift the complete scale for installation.

# INSTALLATION: SCALE SECTION-Continued

**5)** Attach the scale section to the existing carriage. The top cleats of the scale will hold it to the carriage.

**6)** Make sure the top cleats are seated solid on the top of the carriage. The center stop pin should also be seated solid in the center notch of the carriage.

**7)** Raise the carriage and adjust the carriage adjustment bolts so that both bolts touch the plate of the carriage and daylight can be seen between the scale section and the carriage face. (lock down the bolts with locking nuts, 1 1/2-inch). Make sure the bolts are tight.

**8)** Install the bottom cleats provided with your system. Make sure they are tight. There must be daylight showing on the back and bottom of the cleats. No part of the cleat should touch the bottom of the carriage. If this happens, repeatability will be affected. Corrective action would be to install washers between the cleat and scale back plate to provide a clearance gap.

**9)** Remove the fork stops and attach the forks to the front of the scale.

**10)** Reinstall the fork stops.

**11)** Remove the lifting eye and reinstall the cable protection guard and bolt.

The scale section installation is now complete.

# INSTALLATION: CSW-10AT-LFT METER

**1)** The meter should be mounted where it is convenient for the operator. This may be on the inside roof of the cab or on the dash.

Use the bracket provided with your system. Remove the knobs, place bracket into position, insert screws to hold indicator bracket and tighten. If mounting overhead, attach the indicator bracket using the 2 mounting plates provided. Place the first plate on top of the roof, in position. Then use the bolts provided to go through the indicator bracket and the second plate. Mount this assembly through the cab roof and into the plate on top. Install the lock washers and nuts.

**2)** Attach the ***CSW-10AT-LFT*** Meter to the bracket by replacing the knobs and tightening to meter. (one knob per side)

**3)** Before installing the power cable be sure the power switch, on the rear of the meter, is in the OFF position. Route the power cable from the meter up and under the inside of the driver's cage and down the side closest to the battery using the shortest route possible. Connect directly to the battery. On electric trucks, attach power connection to the battery disconnect or to the first terminal point. Position the power cable to protect it from being cut or pinched then secure with wire ties provided.

**4)** Install the signal cable by attaching the 9-pin male connector of the cable to the CSW-10AT-LFT meter. The port is found on the rear of the meter labeled ***SIGNAL***.

**5)** Secure the cable close to the meter with a wire tie to provide a strain relief.

***Note: Take special care in routing the signal cable. Damage after installation is a common problem.***

**6)** Lay the signal cable along the route you have chosen between the meter and the scale section. The best route we have found to keep cuts to a minimum is through the center of the mast. However, if you have a 3-stage mast, run the cable along the side of the mast.

# INSTALLATION: CSW-10AT-LFT METER Continued

**7)** Secure the signal cable at the scale section end and at the top of the mast with wire ties provided.

**8)** Fully extend the mast to all positions to confirm the cable will not be stretched too tight. Check to make sure the cable will not be pinched or caught in any mechanical parts of the mast as it is being used.

**9)** Secure the cable with the wire ties provided in several locations.

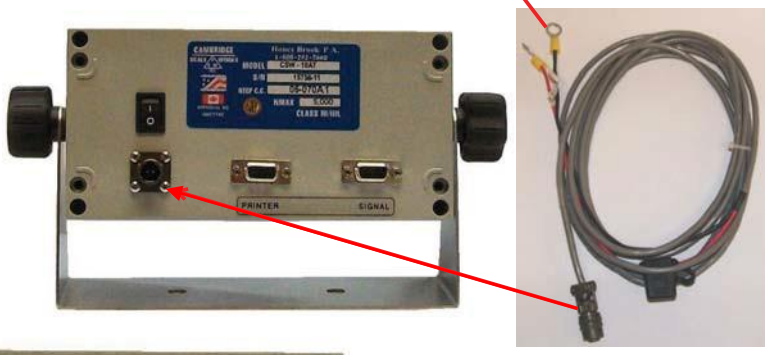
**10)** Attach cable to summing box in the scale section. Make sure this is a tight connection.

You are now ready to turn on the ***CSW-10AT-LFT*** indicator and begin operation.

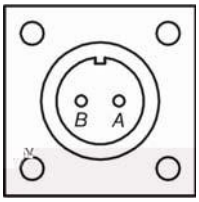
# Meter Connections

To connect power via fused DC power cable to the CSW-10AT-LFT Meter. First make sure the On/Off Switch on the rear of the meter is in the **OFF** position. Connect the ring terminals ***directly to the fork lift battery***.

Next, connect the other end of the cable to the rear of the meter for power.

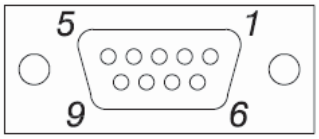



Power



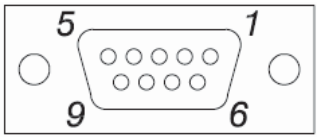

PIN # DESCRIPTION
A -------- +12VDC
B -------- GND

Communications port




PIN # DESCRIPTION
3 ---------- TXD
4 ---------- +5v
5 ---------- SGND

Signal connection




PIN # DESCRIPTION
1 ---------- +EXC
2 ---------- -SIG
5 ---------- SHIELD
6 ---------- -EXC
7 ---------- +SIG

LOAD CELL

# OPERATION

## Key Functions:

**ZERO** — Brings the scale to a zero balance reading.
If the ***ZERO*** key is pressed and held for 5 seconds the calibration zero value will be displayed.

**GRS/NET** — Toggles the display between gross weight and net weight. This key is also used to enter setup mode. Begin by pressing and holding this key until the parameter and calibration event counters are displayed. Immediately after ***code*** is displayed, enter in sequence ***Tare***, ***lb/kg***, ***GRS/NET***, and ***Print/Enter***. The display will indicate ***ScAlE***.
***-P xxx and C xxx are event counters that will increment each time one or more changes are made to the Scale or Calibration Parameters.***

**TARE** — Enters the gross weight value into the tare display and switches to the net display mode.
If the ***Tare*** key is pressed and held for 5 seconds the current tare value will be displayed.

**lb/kg** — Toggles the display between pounds and kilograms.

**PRINT** — Outputs the displayed weight data to the RS-232 port.

**Note:** All keys are disabled when the scale is in motion or overload.

## Error Messages

**ScnEg** — When the weight is more than 10 divisions negative from the zero calibration point.

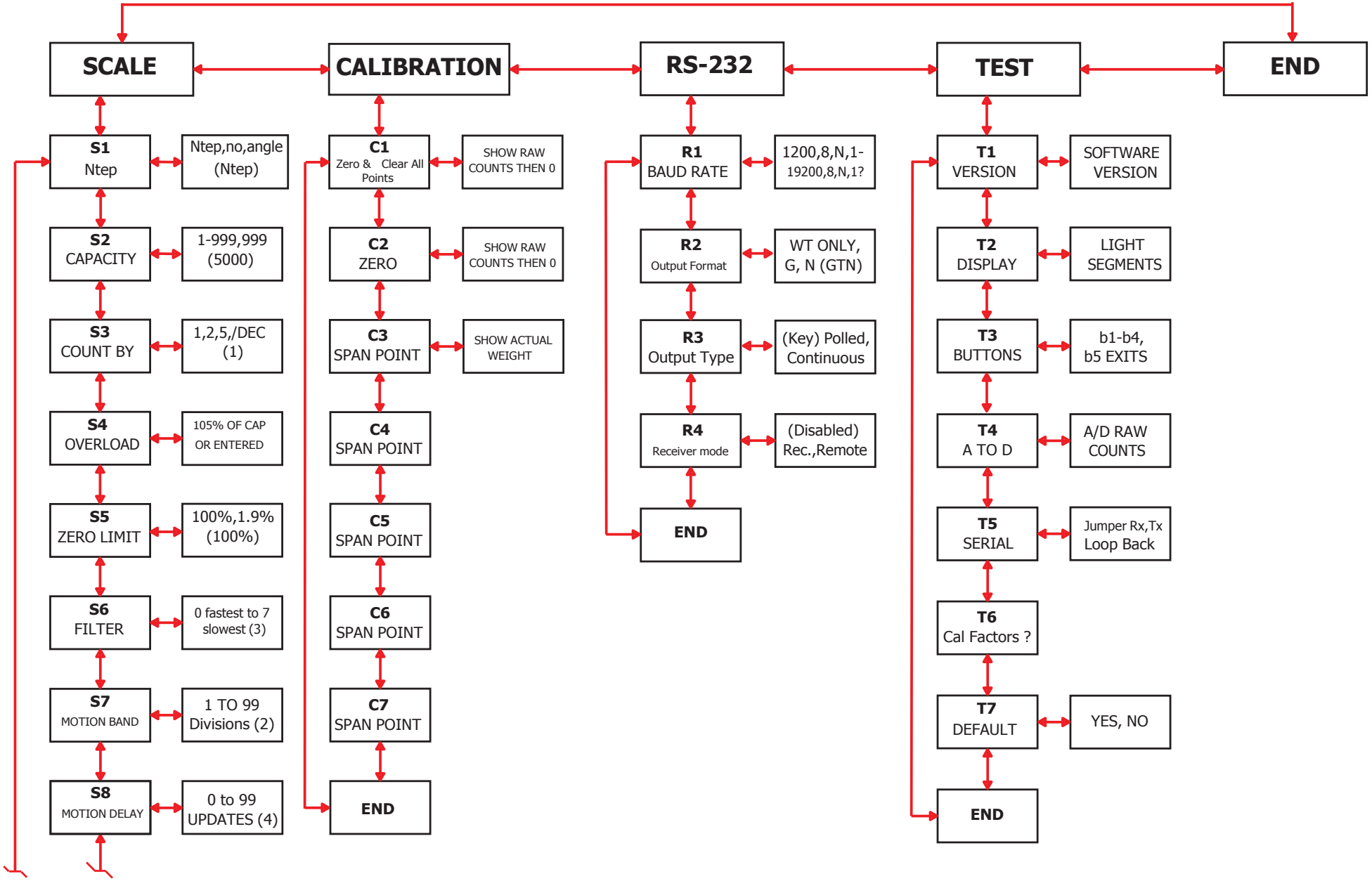
**oLD** — The scale is in an overload condition.

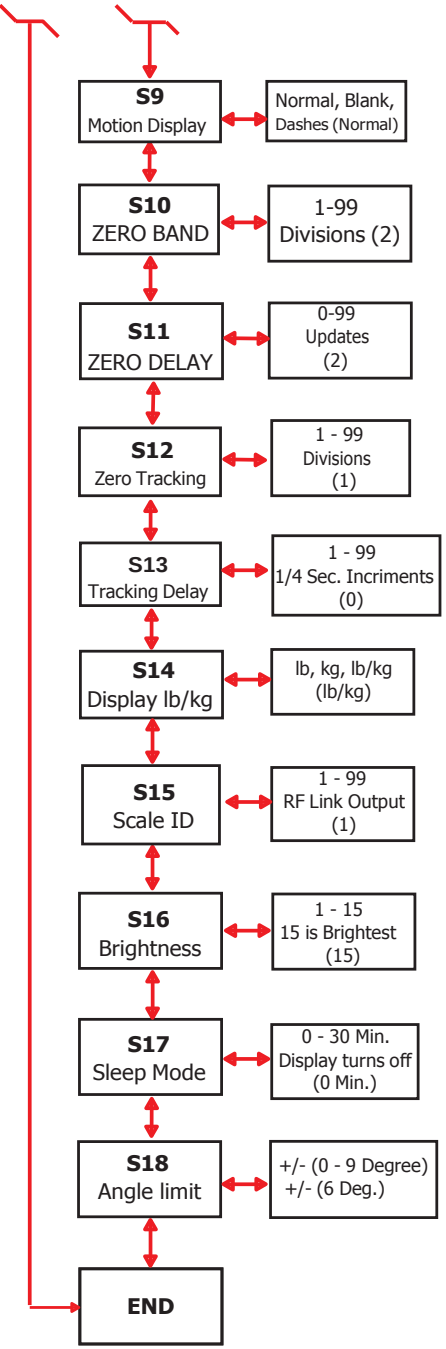
**bAt LO** — Will flash when the battery voltage falls to 10.8VDC and will be displayed constantly when the voltage falls to 10.2VDC.

**Err d** — More than 5000 scale divisions have been selected in ***S1*** Ntep or ***S1*** Angle mode.
More than 20,000 scale divisions have been selected in ***S1*** NO mode.

# 1.0 SCALE PROCEDURE

## 1.1 SOFTWARE NAVIGATION FLOWCHART






## 1.1 SOFTWARE NAVIGATION FLOWCHART (CONTINUED)


## 1.2 NAVIGATION KEYS

During setup you will be required to make numeric entries. (Ex: Capacity, Zero Band, etc...) The following table outlines the keys used to perform these entries along with their function.

ZERO-------KEY IS USED TO NAVIGATE UP.
GRS/NET---KEY IS USED TO NAVIGATE DOWN.
TARE--------KEY IS USED TO NAVIGATE LEFT.
lb/kg---------KEY IS USED TO NAVIGATE RIGHT.
PRINT-------KEY IS USED TO ENTER DATA AND RETURNS.

## 1.3 **Scale Menu Definitions:**

**S1** NTEP (NTEP): Maximum divisions limited to 5000. scale negative message is displayed if the gross weight goes more than 10 divisions below zero. If a capacity and count by of more than 5000 divisions is selected ***ERR d*** will be displayed and you will be returned to ***S2*** to select a new capacity or count by.
Angle: Enables angle correction for Legal For Trade lift truck scales.
No: 20,000 maximum division limits and no scale negative tests.

**S2** Capacity 1 to 950,000 pounds (5000).

**S3** Count By .001, .01, .1, (1), 10, 100,
.002, .02, .2, 2, 20, 200
.005, .05, .5, 5, 50, 500

**S4** Over load (105%) of scale capacity or user entered value.

**S5** Zero Limit (100%) or 1.9% of scale capacity.

**S6** Filter 0 - 7 (3) 0 is the fastest response or least filtering and 7 is the slowest response or most filtering

**S7** Motion Band 1 to 99 updates (2) the weight display must be stable within the selected number of updates for the motion indicator to be turned off.

**S8** Motion Delay 0 to 99 updates (4) the weight display must be within the motion band for the selected number of updates for the motion indicator to be turned off.

**S9** Motion Display (Normal): When the scale is in motion the motion LED will light.
Blank: When the scale is in motion the display will be blanked out.
Dashes: When the scale is in motion the display will show all Dashes.

**S10** Zero Band 1 to 99 divisions (2) the weight display must return to zero within the selected number of divisions to to be considered zero.

## 1.3 Scale Menu Definitions Continued:

| | | |
|---|---|---|
| **S11** | Zero Delay | 0 to 99 updates (4) the weight display must be within the zero band for the selected number of updates to be considered zero. |
| **S12** | Zero Tracking | 1 to 99 divisions (2) the number of graduations allowed to be automatically zeroed off. |
| **S13** | Tracking Delay | 0 to 99 [15second increments] (10) the amount of time the display must be within the allowed graduations before it will be automatically zeroed. |
| **S14** | Lb/Kg (Lb/KG): | Allows the indicator to be switched between pounds and kilograms by pressing the lb/kg key.<br>LB: This sets the display to pounds only.<br>Kg: This sets the display to kilograms only. |
| **S15** | Scale ID | (1) to 99 scale ID used in RF link output. |
| **S16** | Brightness | 0 to (15) adjusts the LED display intensity 15 is the brightest. |
| **S17** | Sleep Mode | (0) to 30 minutes. The display will turn off after the the set amount of time elapses with no scale activity. |
| S18 | Angle Limit | 0 - 9 Degrees (6). When the scale is beyond +/- (6) degrees the display will flash the actual pitch angle, then the the actual roll angle. No weight will be displayed until the scale is leveled to +/- 6 degrees or less. |
| **END** | | Exits back to the main Menu. |

( ) indicates Factory Set defaults.

## 1.4 Numeric Entries

When entering a numeric value, first press and release the ***lb/kg*** key to move right into the menu where the numeric value will be entered. Then press and release the ***ZERO*** key, the first digit in the value will flash. Press and release the ***ZERO*** and ***GRS/NET*** keys to increase or decrease the digits value. Press and release the ***Tare*** key to move to the next digit. Repeat the steps above to adjust the digits value. Repeat all steps until the numeric value is correct, then press and release the ***PRINT*** key to enter the data. The display will return to the menu.

## 1.5 Set Up Parameters

To begin press and hold the ***GRS/NET*** key until the parameter and calibration event counters are displayed. Immediatly after ***code*** is displayed, enter in sequence ***Tare***, ***lb/kg***, ***GRS/NET***, and ***Print/Enter***. The display will indicate ***ScAlE***.
***-P xxx and C xxx are event counters that will increment each time one or more changes are made to the Scale or Calibration Parameters.***

With the display indicating ***ScAlE***, press the ***GRS/NET*** key to move down. This allows the operator to change any of the scale parameters ***S1*** thru ***S17*****.** For example, press the ***GRS/NET*** key to move down until ***S2*** is displayed, ***S2*** is used to set the capacity of the scale. Press the ***lb/kg*** key to move right in the ***S2*** parameter. The current capacity will be displayed. Press the ***ZERO*** key, the first digit will flash. Enter the capacity using the steps described in section 1.3. When the capacity is correct, press the ***PRINT*** key to enter the value. The display will return to ***S2***.

Entering the count by. Press the ***GRS/NET*** to move down, ***S3*** will be displayed. Press the ***lb/kg*** key to move right into this parameter. The current "Count by" will be displayed. Press the ***ZERO*** and ***GRS/NET*** keys to adjust the divisions. Press the ***Tare*** and ***lb/kg*** keys to adjust the decimal point. Press the ***PRINT*** key,when finished, to enter the data. The display will return to ***S3***. Exit set up mode by pressing the ***Tare*** key, ***End*** will be displayed, then press ***Print/Enter***.

# 2.0 CALIBRATION PROCEDURES

## 2.1 Calibration Menu Definitions:

**C1** Zero All — Raw counts, (pitch and roll if in angle mode) will be displayed. When ***ZERO*** is pressed an analog aero is done and all calibration span points will be cleared. If in angle mode the pitch and roll offsets will also be zeroed.

**C2** Zero — Zeroed raw counts, (pitch and roll if in angle mode) will be displayed. When ***ZERO*** is pressed an analog zero is done and all calibration span points will NOT be cleared. If in angle mode the pitch and roll offsets will also be zeroed.

**C3** Span Point — The last calibration weight will be displayed then the actual weight on the scale will be displayed. ***If you do not wish to change the span point, press the TARE key to exit without making any changes.*** If the displayed weight does not match the known test weight, press the ***ZERO*** key to enter the correct weight. Use the steps described in section 1.4 for numeric entry. When the weight is correct press the ***PRINT*** key to enter the new value.

**C4 to C7** Span points — C4 to C7 are for linearity correction. They can be used in order and in any quantity or not at all if no correction is necessary. You may also return to C4 to C7 later and add a new correction point without effecting any original calibration points. The last calibration weight will be displayed then the actual weight on the scale will be displayed. If no calibration weight has been entered at this span point "notset" will be displayed then the actual weight on the scale is displayed. If the displayed weight does not match the known test weight, follow the steps described for C3 Span point on adjusting the weight and entering the value.

**END** — Exits back to the main Menu.

## 2.2 Calibration

Press and hold the ***GRS/NET*** key, as described previously in section 1.5. ***ScAlE*** will be displayed. Press the ***lb/kg*** key to move right, ***CALib*** will be displayed. Press the ***GRS/NET*** key to move down, ***C1*** will be displayed. Press the ***lb/kg*** key to move right, the raw counts will be displayed. With no weight on the scale and the scale level, press the ***ZERO*** button, "0" will be displayed. Press the ***Print/Enter*** key to enter the data. "0" is now entered and the display returns to ***C1***.

***Note: With the forks completely level use C1 or C2 to zero the angles. There is no need to use both C1 and C2.***

Press ***GRS/NET*** key to move down, ***C3*** will be displayed. Press the ***lb/kg*** key to move to the right, the last calibrated weight will flash then the current weight on the scale is displayed. Place a known test weight on the scale with the forks level. Press the ***ZERO*** key, the first digit of the weight will flash. Use the ***ZERO*** and ***GRS/NET*** keys to increase or decrease the digits value. Press the ***TARE*** key to move left, the next digit will flash. Repeat the steps until the correct weight is entered. Press the ***PRINT*** key to record the data. The display will return to ***C3***.

Press the ***GRS/NET*** key until ***End*** is displayed, then press ***PRINT***. Calibration is now complete.

## 2.3 Linearity Correction

If linearity correction is needed, press the ***GRS/NET*** key (from the calibration menu) to move down to ***C4***. Press the ***lb/kg*** key to move right, the last calibrated weight will flash or "***notset***" will flash if this point has not been previously set. Next the current weight on the scale will be displayed. Place a known test weight on the scale with the forks level. Press the ***ZERO*** key for the first digit of the displayed weight to flash. Enter the weight as described in section 1.4, then press the ***PRINT*** key to record the data. Continue these steps for ***C5***, ***C6*** and ***C7***.

Linearity correction points (***C4-C7***) can be used in any order and in any quantity or not at all if no correction is necessary. After calibration is complete you may also return to these correction points and make changes to its value without affecting any of the original calibration points.

# 3.0 COMMUNICATIONS SETUP

## 3.1 Communications Menu Definitions:

**R1** Baud Rate — 1200 to 115200 baud (9600), 8, n, 1

**R2** Output Format

0 - (Gross, Tare, Net)- "CR, LF, CR, LF [32 bytes of 2Eh], CR, LF, CR, LF, Gross (lb or kg), :, six ASCII characters [indicated weight], CR, LF, Tare (lb or kg), sp, :, six ASCII characters (indicated weight), CR, LF, CR, LF, CR LF, CR, LF" [100 bytes total output.

1 - (Weight only)- "Six ASCII Characters [indicated weight], CR, LF" [8 bytes total output].

2 - (Net only)- "NT, Sp, Six ASCII Characters [indicated weight], Sp, lb or kg, CR, LF" [14 bytes total output].

3 - (Gross only)- "GR, Sp, Six ASCII Characters [indicated weight], Sp, lb or kg, CR, LF" [14 bytes total output].

**R3** Output Type

0 - Output on command, standard print.
Output as selected by R2 Output Format.
If "Q" is received on the serial port the scale will output the same as if the PRINT key were pressed.
The same holds true for Z = Zero
U = lb/kg
D = GRS/NET
T = TARE

1 - Slave Display Output (numeric only) continuous Stx, Six ASCII Characters (indicated weight), CR, LF [9 bytes total output].

2 - Slave Display Output (alphanumeric) continuous Stx GR or NT or TR, six ASCII Characters (indicated weight), lb or kg, CR, LF [15 bytes total output].

3 - RF Link Output.

4 - Used for QSI terminal.

# 3.0 COMMUNICATIONS SETUP

## 3.1 Communications Menu Definitions Continued:

**R4** Receiver — 0 - Disabled - normal scale mode.

1 - Standard Receiver.
Receives R3.3 RF link output string displaying data as it appears on the scale. All keys are disabled except the ***PRINT*** key.

2 - Remote control.
Receives R3.3 RF link output string displaying data as it appears on the scale and allows full control of all scale meter functions.

**END** — Exits back to the main Menu.

( ) indicates Factory Default setting

# 4.0 TESTING PROCEDURES

## 4.1 Testing Menu Definitions:

| | |
|---|---|
| **T1** Version | Displays Software Version. |
| **T2** Display | Lights all display segments and indicating LEDs |
| **T3** Buttons | Press the ***ZERO*** key, b1 will be displayed.<br>Press the ***GRS/NET*** key, b2 will be displayed.<br>Press the ***Tare*** key, b3 will be displayed.<br>Press the ***lb/kg*** key, b4 will be displayed.<br>Pressing the ***PRINT*** key will exit back to the menu T3. |
| **T4** A to D | Displays raw counts where a 1mV/V signal from the scale will display 25,000 counts.<br>When in angle mode down ***GRS/NET*** will cycle Pitch, Roll and Raw counts. |
| **T5** Serial | Serial communications can be verified by connecting pins 2 and 3 on the serial port. A single character will be echoed and pass or fail will be displayed. |
| **T6** Setup data | Setup data will be sent out on the printer port. |
| **T7** Default | Resets the meter back to factory defaults clearing all calibration and setup data. "r you sure?" will be displayed then press the ***Tare*** key to exit without defaulting, or press the ***Print*** key to reset the meter to factory default. |
| **END** | Exits back to the main Menu. |

# 5.0 WARRANTY

**CAMBRIDGE** warrants the **DL-CSW-10AT-LFT** to be free of defects in workmanship and/or materials for 12 months from the date of shipment. This warranty of workmanship and/or materials is valid, if in the opinion of **CAMBRIDGE** the equipment has not been mechanically, environmentally, or electrically abused.

This warranty is limited, at the option of **CAMBRIDGE**, to repair, replace or an appropriate credit adjustment, not to exceed the original equipment sale price paid to **CAMBRIDGE**. **CAMBRIDGE** assumes no liability in connection with the sales of its products beyond that stated above.

Warranty replacement parts and or repair services are performed at the factory in Cumberland, Maryland or by an authorized service group approved by **CAMBRIDGE**.

Warranty does not include travel expense if a factory technician is requested to perform repairs at a location other than the factory.

It is the user's responsibility to follow the proper set-up, calibration and operating procedures of the **DL-CSW-10AT-LFT** as described in this manual. If the operator has difficulty using their **DL-CSW-10AT-LFT** properly, please contact **CAMBRIDGE** at 1-301-724-4082. Any one of our Technicians will be happy to work with the user via telephone.

Thank You!

# 6.0 ASSISTANCE

If at any time you require assistance with your **Model: DL-CSW-10AT-LFT** Lift Truck Scale System:

End User please contact your servicing scale dealer.

Authorized Cambridge Dealer/ Distributor please contact:

**CAMBRIDGE SCALE WORKS, INC.**
115 West Mary Street
Cumberland, MD 21502

Phone: (301) 724-4082
Fax: (301) 724-4964