ExpressCube™ Conveyor 480R

Troubleshooting & Repair Guide

Version 1.4

Issued: February 2014

Important

All information contained in this Troubleshooting & Repair Guide is subject to change without notice.

Please address any comments or suggestions regarding this user guide to:

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Attention: Documentation

For additional product information refer to our web site: www.expresscube.com

For additional technical assistance please e-mail: xsupport@expresscube.com

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1. General

1.1. Introduction

The ExpressCube™ 480R unit will quickly and accurately dimension and weigh cuboidal packages. The ExpressCube 480R unit will calculate dimensional weight based on the acquired measurements and preprogrammed factors. The user can preprogram four factors that can be selected to calculate dimensional weight.

1.2. Specifications

MODEL	**EC-480R**
Physical Characteristics	
Dimensions: (Inches)	55.5 x 36 x 73 [L x W x H]
(Centimeters)	140 x 91 x 185 [L x W x H]
Weight : (lbs)/(kg)	**500 lbs/ 227 kg**
Adjustable Platform Height to Match Conveyor : (in)/(cm)	30 in - 40 in 75 cm – 100 cm
Operating Environment	14 to 104F (-10 to 40C)
Imperial Measurements	
Max Dimensional Capacity (in)	48.4 x 32 x 37 [L x W x H]
Resolution/Min Dimensional (in)	0.2 / L,W=3;H=2.4
Maximum Weight (lb)	**300**
Weight Resolution (lb)	0.1
Metric Measurements	
Max Dimensional Capacity (cm)	124 x 81.5 x 94 [L x W x H]
Resolution/Min Dimensional (cm)	0.5 / L,W=8;H=6
Maximum Weight (kg)	136
Weight Resolution (kg)	0.05
Features	
Printer Port (RS-232) [1]	Standard
Hand Scanner Port (RS-232) [2]	Standard
USB Computer Port [3]	Standard
SizeIt Software	Optional
ExpressCube LCD Controller	Optional
ExpressCube Customer Display	Optional

Feature Notes: [1] Printer not included; [2] Hand Scanner not included; [3] Computer not included

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2. Basic Electronic Architecture

2.1. Summary

The ExpressCube contains two separate functions that are both controlled by the main CPU board [ECP-MC-H] and the A/D network hub [ECP-ADNH-A]. The **Dimensioning** function utilizes the sensors in the three separate axes to measure the distance between the edges of the package that is resting on the surface of the sensors.

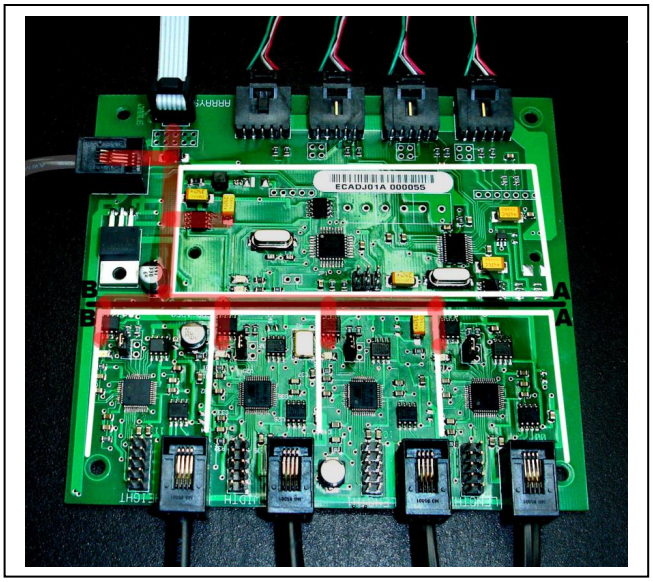
The **Weighing** function uses four load cells located under the measurement platform. Each load cell is wired into sophisticated analog to digital circuitry located on the A/D network hub that processes the load cell data into a weight measurement.

The **485 buss** is used by the main CPU board to communicate internally to each of the microprocessors for the dimensioning banks, the load cell circuitry, the status LEDS in the front of the unit, and, externally to the LCD Controller [LCU-03R] and the Customer Display unit [DCU-03R] if connected.

2.2. Dimensioning Circuitry

2.2.1. Resolution A/D Network Hub

The Resolution A/D network hub board is unique to the Resolution ExpressCube systems. The A/D network hub board is a multi-functional board that processes the measurement data collected from both the dimensional arrays and the load cells. In the following sections, the operation of the parts of board will be discussed according to its function. The complete board is presented in this section only. The 485 communications buss is highlighted in red. Note: The some 480R uses an additional length array channel with a second piggyback A/D Network hub board. Recent models use the 4 dimensional arrays on one board.



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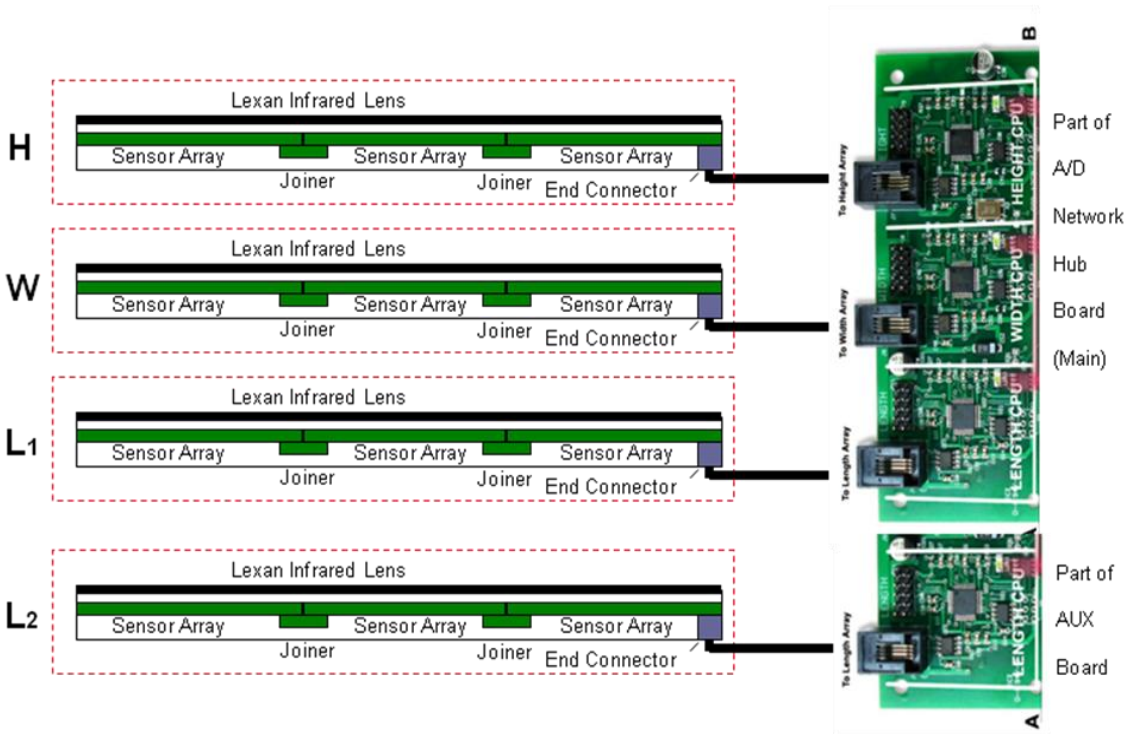
2.2.2. Physical Layout & Connections



Physical Layout

Each dimensioning array bank consists of an aluminum channel that houses multiple sensor units. Each sensor array is 16mm (6.3") in length and is connected in series with a joiner connector to form a continuous measurement array bank of the required length. The length array consists of two dimensioning banks placed back to back. Both the sensor array and the joiner are held in place by grooves that run the length of the extrusion. Installation and removal is accomplished by sliding the arrays from the end of the channel. The cable is connected to the sensor arrays by using a sensor end connector in place of the joiner board. The cable is run from the end connector to the appropriate designated (Length[1], Length[2], Width, Height) connector on the A/D network. (This replaces the strapping options on the sensor end connector used in older ExpressCube models).

There is a Lexan™ infrared lens that slides into the outside groove of the array channel and protects the dimensioning sensors from physical abuse. The infrared lens can be replaced easily by removing the lens cap.

The cabling for the dimensioning arrays is connected and runs on the underside of the weighing platform. Each of the cables from the dimensional arrays is terminated on the network hub attached to the underside of the platform. A special CPU/HUB cable attaches the network hub to the main CPU board located on the fixed base below the weighing platform.

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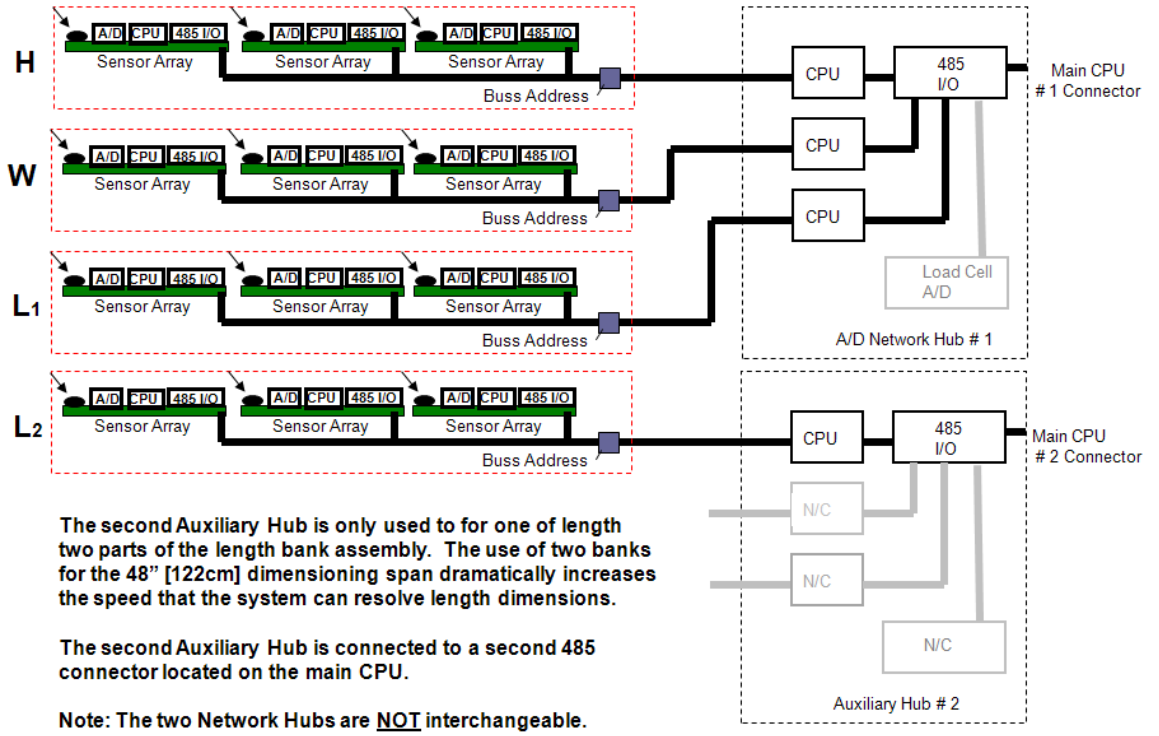
2.2.3. Electronic Operation & Data Flow



Electronic Operation

The ExpressCube uses 16 cm (6.3") sensor arrays which are placed in dimensional banks. The number of sensor arrays in each dimension bank is: Length = 8 arrays; Width = 5 arrays and Height = 6 arrays.

The dimensioning function is achieved by interpreting the reading of sensor arrays by a sensor CPU. Each sensor array is connected on a 485 buss and directly addressable by the hub CPU. The hub CPU performs the preliminary scan, gain control and final measurement scan of all the sensor arrays in the dimensional (L_1, L_2, W or H) axis. The hub stores the current measurement and communicates the data through the 485 buss cable to the main CPU board.

Although the sensor arrays are electronically connected in parallel on the 485 buss, the buss does physically pass through each array before reaching the next array. This characteristic is used to allow the arrays to automatically address themselves from the closest to the A/D network hub outward.

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Each sensor array is a two sided printed circuit board consisting of a sensor side that faces toward the lens and a component side that faces the inside of the aluminum channel.

Sensor Side of the Sensor Array There are 32 pairs of IR (Infrared) sensor and IR LEDs located every 5 mm along the 16 cm strip. Although the pairs are separated by 5mm between them, the combination of the calibration procedure and a proprietary software application allow the sensors to detect the edge of a package in 1 mm increments.

Component Side of the Sensor Array The Sensor Array is an intelligent device that contains a CPU running software that reads the sensors and, when requested by the main A/D network hub CPU, it sends the data for measurement processing. The chips on the board contain multiplexing circuitry, digital conversion circuitry, a local CPU with program & volatile memory and 485 interface chips.

As the 485 data is daisy-chained through each array, the technician can use the diagnostic software to verify which sensor arrays are responding identifying both the last listed sensor array as well as the first missing sensor array. The components are surface mounted such that if any problems are detected, the sensor array board must be replaced.

Note that the communication traveling on the 485 buss between the main CPU board and the A/D network hub includes the data traveling to the load cell circuitry.

2.2.4. Array Calibration

The main CPU board determines the size of parcels by finding the edges of the boxes based on the data sent back from the sensors. The ability to locate edges anywhere along the sensor array can only be accomplished if the entire sensor array reflects a linear measuring surface. Variations in the sensor operating characteristic and imperfections in the Lexan™ IR lens can create errors or false edges to appear to the main CPU. An example is given below.

Raw Data From Sensor Array **CPU Compensation After Calibration**

To calibrate, the platform is empty and a reading is taken from the sensors by the main CPU board. The readings may indicate irregularities as illustrated on the left. The main CPU then adjusts and records these factors to achieve a linear measuring area as represented in the illustration on the right.

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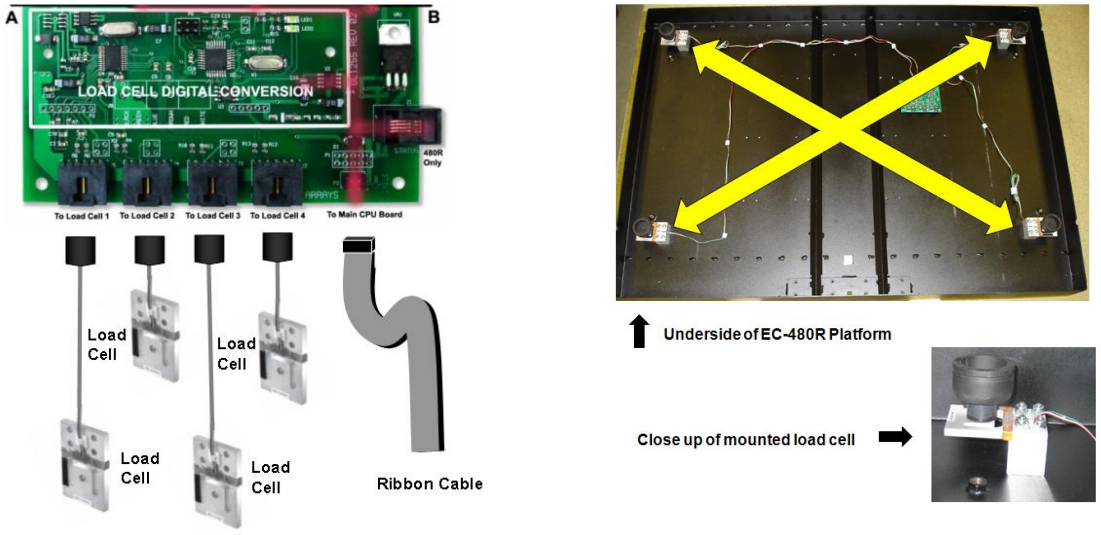
If a sensor is detected that is too far out of range (e.g. not working), the main CPU will correct as best as possible then flash the yellow dimensioning light. Measurement error is a maximum 0.5cm /0.2" over the affected sensor.

2.3. Weigh Scale

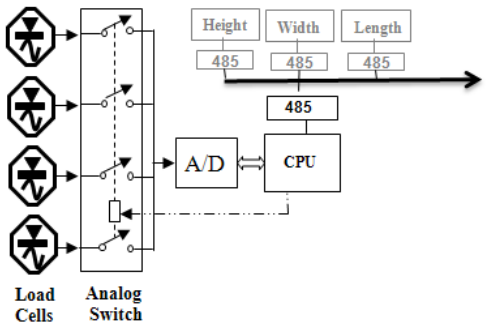
2.3.1. Physical Layout



Electronic Weigh Scale Connections and Load Cells

The weigh scale portion of the ExpressCube 480R consists of four load cells that support the dimensioning platform. Each cable from the load cells is wired under the platform and connected directly into the A/D Network Hub.

2.3.2. Electronic Operation



Electronic Operation

Each load cell is connected independantly to the A/D Network hub. The electronic load cell circuitry has a microprocessor that reads the digital value of the load cell through an analog to digital (A/D) converter. Special circuitry allows each of the load cells to be read in this manner. The CPU now has each load cell value to perform the load cell equalization and weight calculation.

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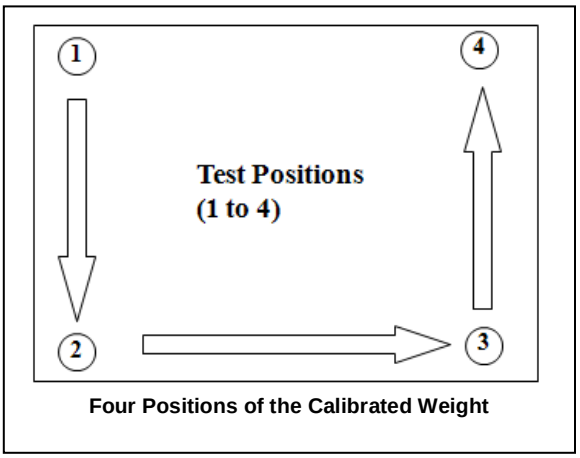
The reading of each load cell permits the ExpressCube to treat each load cell by factoring the unique sensor characteristics of the load cell with the weight reading it provides. It is important to note that identical load cells will provide linear readings in relation to the weight placed on it but the actual value may vary slightly due to slight differences in the sensor characteristics. This can impact the scale readings that occur when these load cells are combined to provide only one signal to determine weight. Prior manufacturers would either grade the load cells into subgroups to match similar load cell characteristics into the same scale. For other manufacturers, resistor bridges were provided to allow the differences to be mechanically balanced at time of scale manufacture. ExpressCube resolution does not require resistor bridge or special load cell groupings.

2.3.3. Weigh Scale Calibration

It is required that the ExpressCube load cells individual characteristics are recorded in order for the CPU to properly add the correct weight reading of each load cell into one accurate reading. This is accomplished during the weight calibration for the ExpressCube weigh scale.



Four Positions of the Calibrated Weight

To calibrate the weigh scale, the selected calibration weight is placed on each of four corners and a CPU records all load cells for all four positions. These readings to allow the CPU to accurately determine each load cells individual characteristics and calculate the actual weight independent of the position on the platform.. (Note: Refer to the repair section for a detailed description of the weight calibration procedure).

What is happening: Each reading of the four load cells (LC#1-4) must be modified by a coefficient representing the load cell physical characteristics. For a weight placed on the ExpressCube platform:

Weight = w(LC#1)+x(LC#2)+ y(LC#3)+z(LC#4)

In the calibration process, the CPU is trying to identify the four (w, x, y, z) unknown load cell coefficients. Placing a known weight in each of four corner positions and recording the values provides four equations with four unknowns. A solution is then calculated by the CPU to give values to each of the four load cell's coefficients.

A weight now placed in any position on the platform can be very accurately determined using the known coefficients in the above formula.

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3. Diagnostics & Troubleshooting

3.1. First Check …..

- Verify that power is on and the adapter is plugged into a working electrical outlet.
- Verify that lens is clean and that the dimensioning arrays have been calibrated.
- Verify that unit is operating completely free of obstructions and that nothing is touching any part of the platform.
- Verify that there is no contact between the measuring platform and object such as wires, the wall, the operator (during the measurement), the yellow guard bar, etc.
- Verify that the 480R is operating level using the threaded legs to level the platform.
- Verify that the units and dim weight selections are correct.
- Verify that the unit has been cycled off with the power removed from the 480R before connecting and re-powering.
- If third party software is used, check with an ExpressCube LCD Controller, Customer Display or SizeIt software that the third party software readings correspond to the actual machine results.

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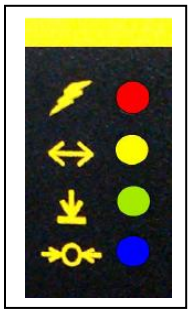
3.2. LED Status Indicators – Diagnostic Indicators



The first stage of troubleshooting should always begin with the status LEDs located on the top of the ExpressCube 480R height assembly. While these LEDs provide basic operating activities when in the steady state, the built in system diagnostics uses them to signal detected problems in the circuitry functions. Any LED that is flashing instead of a constant illumination – it is operating in a diagnostic mode.

Diagnostic LED Indication:

Illumination	**Pattern**
Pulse	One flash once every 2 seconds
Three Pulse	Three rapid flashes every two seconds
Slow Blinking	Two flashes every second
Fast Blinking	Five flashes every second

In the table below the LED state Not Flashing exists if the LED is either off or steady but not pulsing or flashing.

Power 	**Dimension** 	**Weight** 	**Zero** 	**Comment**
Pulse	Not Flashing	Not Flashing	Not Flashing	Indicates a communications failure between status board and the main CPU board. Check the operation board by using Prog button on LCD Controller to check CPU board operation. Fault can also indicate a failure in the cable between LED Status Board and main CPU board.
Slow Blinking	Not Flashing	Not Flashing	Slow Blinking	Indicates input power supply is too low. Replace power adapter. Note: the unit will stop measurements when power is too low.
Steady	Not Flashing	Never On	Always On	This indicates that the main CPU is reading a constant value from the A/D circuitry for all platform loads. Causes 1) improper calibration 2) A/D failure on network hub

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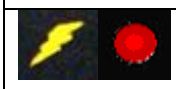
Power	Dimension	Weight	Zero	Comment
				
Slow Blinking	Slow Blinking	Not Flashing	Not Flashing	Indicates that that there is a failure with one of the array bank processors on the A/D network hub board.
Steady	Three Pulse	Not Flashing	Not Flashing	This indicates that there is an incorrect number of arrays responding. Either the system is configured incorrectly or there is an array failure in one of the banks.
Slow Blinking	Not Flashing	Slow Blinking	Not Flashing	The main CPU is unable to get a response from the A/D digital processor.
Slow Blinking	Slow Blinking	Slow Blinking	Not Flashing	This indicates that there is a failure in the 485 buss between the motherboard and the A/D network hub. The failure could be in either the A/D network hub circuitry, the cable/connection, or, the main CPU board. 1) Replace the CPU/HUB cable. 2) Replace the A/D network hub. 3) If 1) & 2) have no effect – replace the main CPU board.
Steady	Fast Blinking	Fast Blinking	Fast Blinking	These sequential blinking LED's indicate that a lens calibration is in process.

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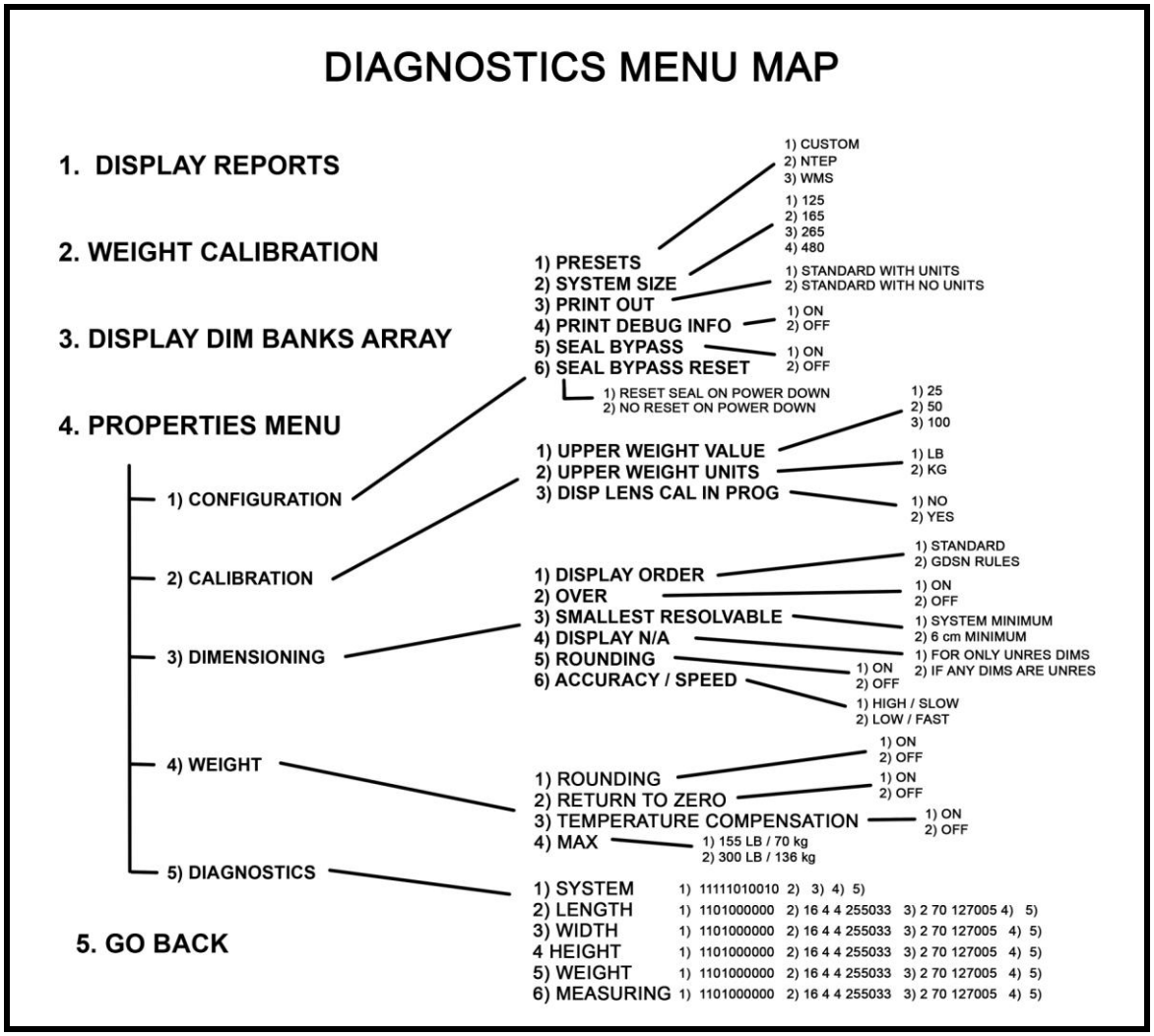
3.3. LCD Controller - Configuration & Diagnostic Menu

3.3.1. General Description

The diagnostic LCD Controller operation enables the controller to be used to perform analysis on some of the key internal components of the ExpressCube Resolution systems. These added features are intended for use only by qualified technicians and are accessible from the controller by pressing sealed button on the back of the ExpressCube Resolution. After pressing the sealed button press'1' to access Properties Menu (sub-menu of main) or '2' to access Main Diagnostics Menu.

3.3.2. Diagnostic Menu Summary



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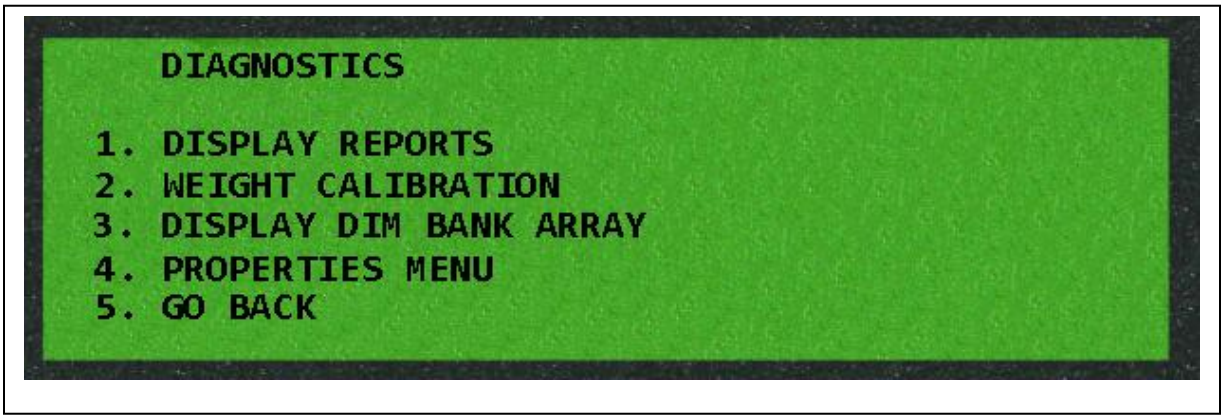

Display Reports: Displays Operating System software versions for ExpressCube Resolution and the LCD Controller. The display report indicates what the array configuration is required and the actual number arrays that the main CPU board is available. In addition, weight reading and temperature are indicated

Weight Calibration: Provides a step by step procedure for calibrating the weight scale. The parameters of the weight scale including the calibration weights used are set in the Properties Menu.

Display Dim Bank Array: Displays a graphic image showing the performance of every sensor in each DIM bank array.

Properties Menu: This menu is used to define the size and operating characteristics of the ExpressCube Resolution systems. All components are designed to work in either the 125R, 165R, 265R or 480R systems. In addition, this menu will designate if the unit operates in NTEP, WMS or a custom selection of operating characteristics.

Go Back: Leaves the diagnostic mode and returns the LCD Controller to normal operation.

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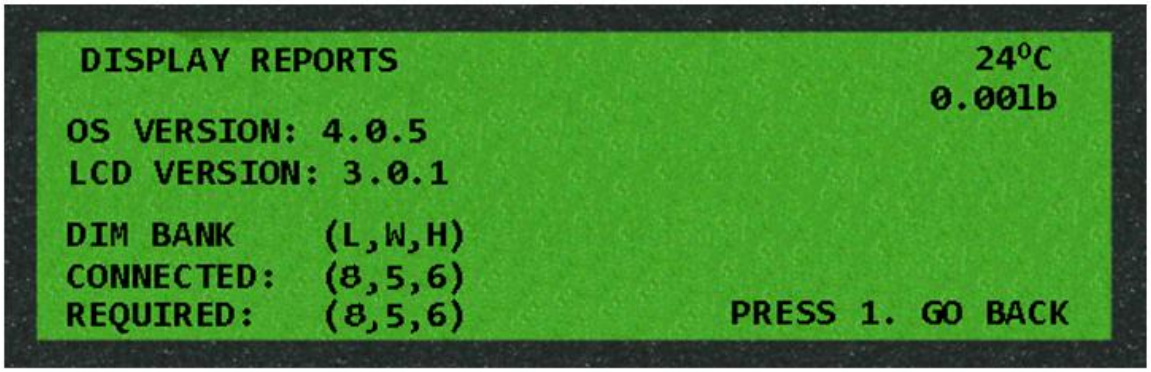
3.3.3. Display Reports



OS VERSION

This displays the operating software version that is in the ExpressCube Resolution dimensioning system. Keep this number handy if you report a trouble to a service center.

LCD VERSION

This displays the operating software version that is in the ExpressCube LCD Controller. Keep this number handy if you report a trouble to a service center.

DIM BANK (L,W,H) CONNECTED & REQUIRED

This is a very handy diagnostic tool when troubleshooting dimensioning problems. These numbers indicate the number of arrays that the machine requires for the model that is selected [Required] and the number of arrays that the machine has communication [Connected]. Any difference between the Required & Connected arrays displayed will cause the yellow dimensioning light to flash and the dimensioning function to malfunction. The correct number of arrays for each size of the ExpressCube Resolution systems is illustrated in the table below.

Model	L	W	H
165R	4	3	5
265R	4	4	6
480R	8	5	6

Temperature

The temperature in the display widow measures the temperature measured inside the ExpressCube Resolution system in Celsius [aka: Centigrade]. There is an option (recommended) to use temperature compensation in weight calculation. The CPU uses the temperature to correct the effect of temperature on various components.

Weight

This number displayed is the current weight reading of the platform in the selected units.

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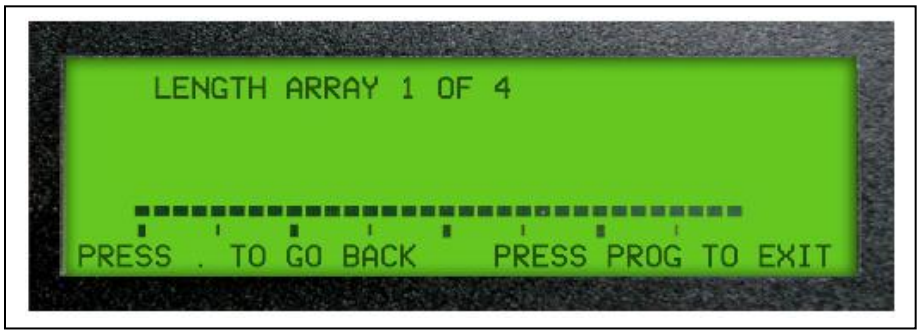
3.3.4. Display Dim Bank Array



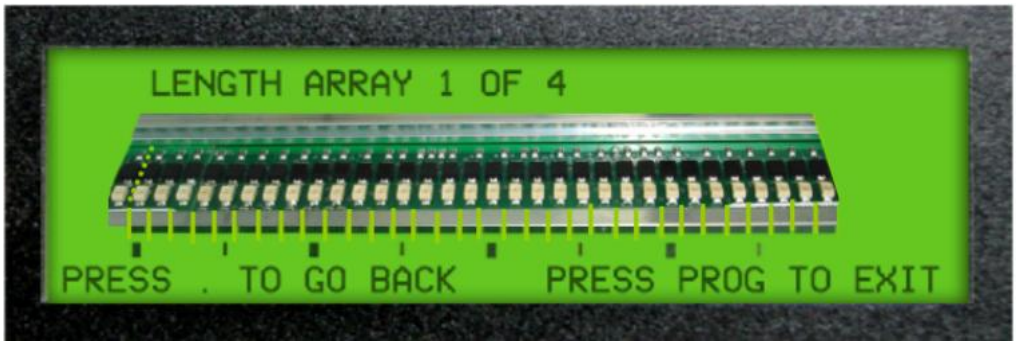
General

This diagnostic tool allows a technician to test the sensitivity of each array in every dimensional bank in an ExpressCube Resolution system. It is a good tool to use when the yellow dimensioning LED is flashing to indicate a faulty response from a sensor. Entering this feature immediately starts the user with the output of a sensor array. A detailed description on the use of this feature is given below.

NOTE: The sensor dimensional bank display can only function on the sensor arrays the main CPU board can see. Verify the 'Connected' array count before attempting this feature (See 3.3.3 for more details).

Relationship of Bar Graph to the Sensor Array

Base line of the display has 32 individual bar graph segments each representing one set of transmitting and receiving sensors. The picture at the below illustrates the relationship of the bars to a physical array in the ExpressCube unit. Note that each pair is represented by a bar graph. Using the address of the particular array (in this example – the first sensor array in the length dimensional bank) it is possible to locate the exact sensor pair that is giving a poor reading.



Relationship of Bars to Actual Sensors of an Array

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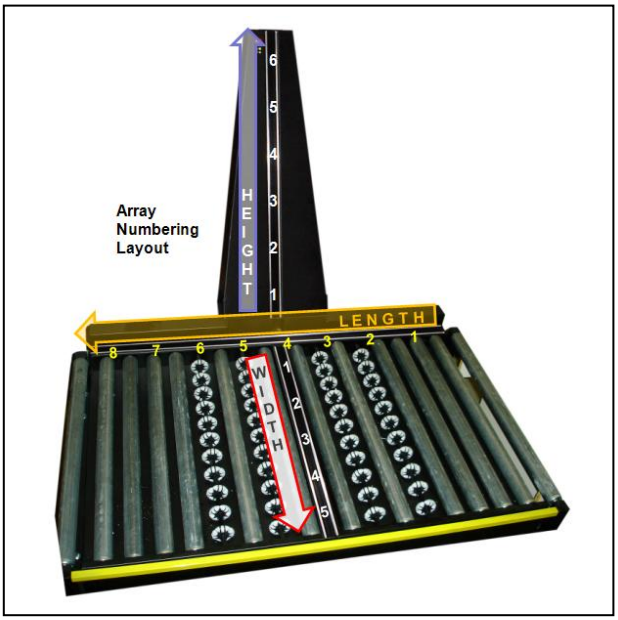
Sensor Array Address

The array location specified in the LCD Controller is illustrated in this guide. There are three different menus for each dimensioning array bank. Use the number key to test a specific sensor array in a dimensional array bank.



Use the 'Acquire' key to toggle between different dimensioning array banks.

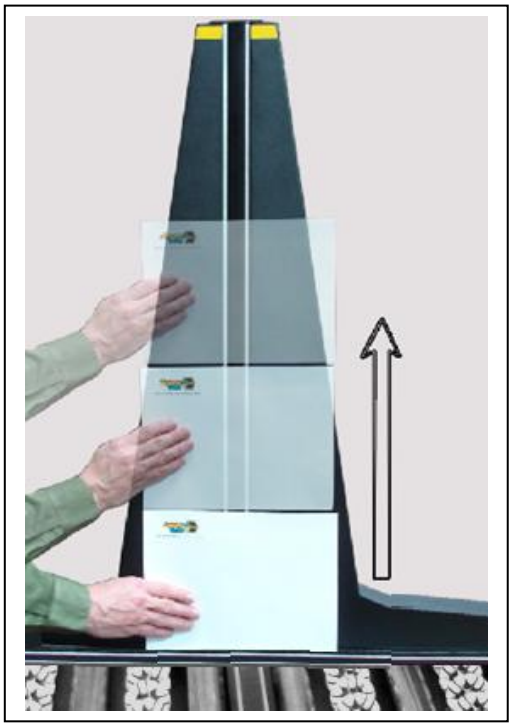
Length is located across the back of the ExpressCube and the numbering starts from the right side of the unit.

Width is located back to front of the unit with the sensor array count starting from the back of the platform.

Height is located on the rear vertical array with the sensor count starting at the base of the platform.

Sensor Array Test Procedure

Use white paper to show reflection from each 6.3" (16cm) array sensor on the LCD Controller display. The use of white paper will allow any reduced or problem sensor pairs to be easily identified.



Position a white paper over the first sensor in the appropriate dimensional array bank. Verify that the LCD Controller is set to display the first sensor array. Move the paper over the second, third, etc sensor arrays while observing the results on the LCD Controller.

Switch dimensional array banks (Acquire key) and start at the first sensor array of this bank. Repeat the procedure as necessary. Press 'Prog' to exit the function.

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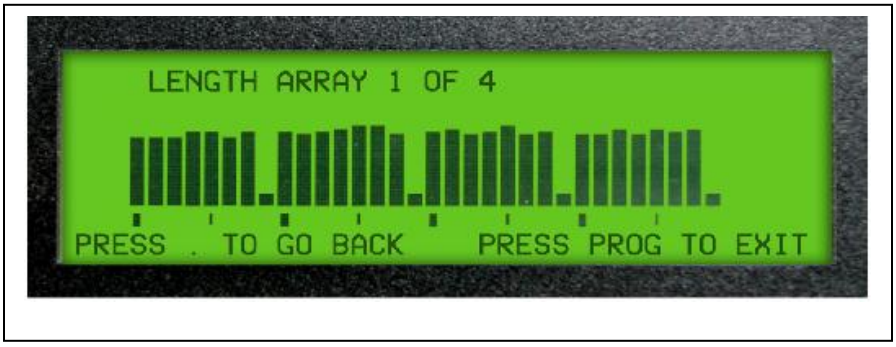
Interpreting Sensor Array Results

Successful tests will show all the bars will be at least 70% of maximum and very close to the same level. It is not necessary for the bars to be identical height as the main CPU records and compensates for differences during the recalibration procedure.

If a sensor is weak or defective, the one bar in the array will be noticeably smaller. The ExpressCube will flash the Yellow dimensioning LED when a defective sensor is detected. The system will continue to work by minimizing the effect of the defective sensor. Although the impact maybe minimal, the system can have a less accurate measurement in the immediate vicinity of the defective sensor pair.

The sensor pairs are actually cycled in groups of eight to save the energy draw of the system. If the driver circuit for one group fails, the sensor pairs can fail in groups of eight. An simulated failure of this nature is illustrated



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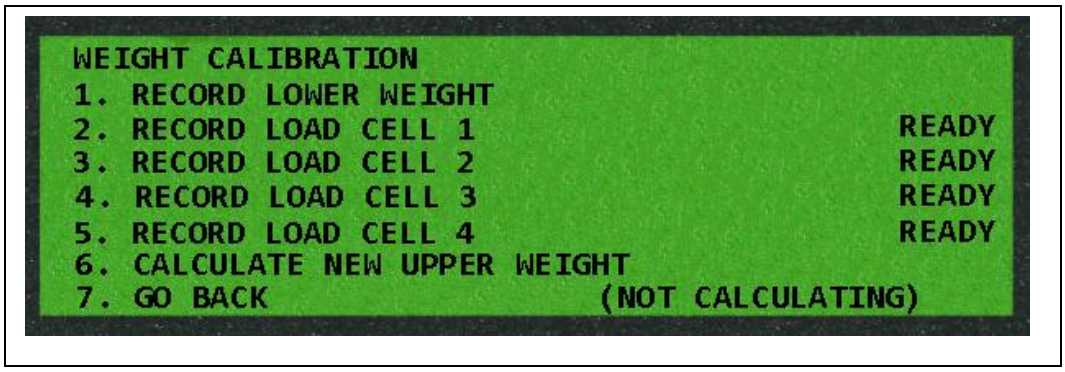
3.3.5. Weight Calibration

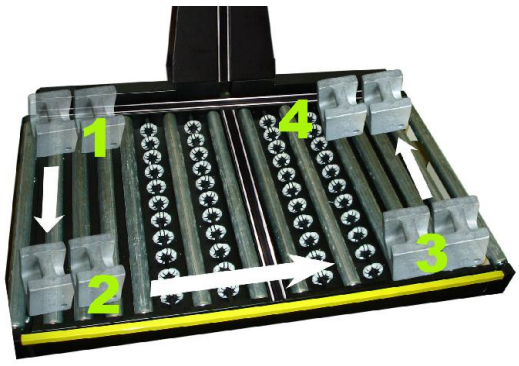


This menu will walk the technician through a six step process to calibrate the weigh scale. The current weight reading of the scale is indicated on the center display. The platform should be empty before the calibration routine is started.

***** Allow Scale To Settle ~ 5 seconds After Calibration Weight is placed on the platform Measurements *****

1. With an <u>empty</u> platform, press number '1' to calibrate the lower weight. Wait for 'Recording' to be replaced by 'Recorded'

The sequence of placing the calibration weight on the load cells is irrelevant as long as the calibration weight is placed on a different load cell for each measurement.



Four Positions of the Calibrated Weight
(Two 50 lb Calibrated Weights Illustrated)

2. Place the calibration weight on the platform over a load cell. Wait a few seconds for the scale to settle and then select number 2 to record the weight. The platform should not be touched until the display has indicated 'Recorded'.

3. Place the calibration weight on the platform over an adjacent corner (over a different load cell). Wait a few seconds for the scale to settle and then select number 3 to record the weight. The platform should not be touched until the display has indicated 'Recorded'.

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4. Follow the direction around the platform from the original position, placing the calibration weight on the platform over a different corner (over a different load cell). Wait a few seconds for the scale to settle and then select number 4 to record the weight. The platform should not be touched until the display has indicated 'Recorded'.

5. Place the calibration weight on the platform over the final corner (over the last load cell). Wait a few seconds for the scale to settle and then select number 5 to record the weight. The platform should not be touched until the display has indicated 'Recorded'.

6. The location of the calibration weight can left anywhere on the platform for this step. Press the '6' for the Resolution CPU to calculate the characteristic co-efficient for each load cell based on the previous readings. When the 'Recorded' display is showing, the calibration is finished. The calibration weight may be moved around on the platform to verify the calibration result. Press '7' to return to main menu.

   Note: Weight can vary by 0.04 lb [0.02 kg] in WMS mode and no greater than 0.1 lb [0.05 kg] in NTEP mode.

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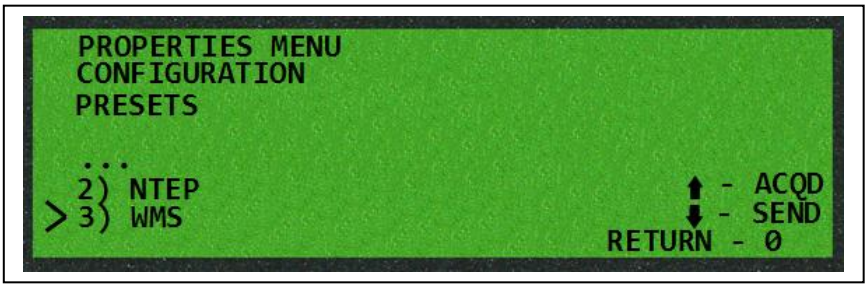
3.3.5.1.Configuration

3.3.5.1.1.Presets



There are two configuration presets and all other configurations are considered custom. If the NTEP or the WMS preset is altered in anyway, the configuration is considered a custom configuration. The configuration is stored in non-volatile memory to maintain the settings even if the unit is powered down.

NTEP

The NTEP setting sets the ExpressCube operation to be in full compliance of NTEP and Measurement Canada requirements for a legal for trade system. This configuration is much more restrictive in the presentation and operation compared to an ExpressCube operating in the WMS configuration

WMS

The WMS setting permits all distinguishable measurements to be displayed. In addition the WMS configuration accommodates a much wider range of measurement applications. The WMS also includes unique features such as non-return to zero which enables a faster parcel measurements.

CUSTOM

Custom configuration is an indicator and not a functioning preset condition. The custom indication can be a simple calibration operation (indicated after seal is broken) to selection of options not part of a preset selection.

Note: The selection of a preset configuration will automatically select all the features & properties to allow the ExpressCube to perform as per specified for the identified selection. This feature permits distributors to quickly set the ExpressCube Resolution as required for the environment that it is working.

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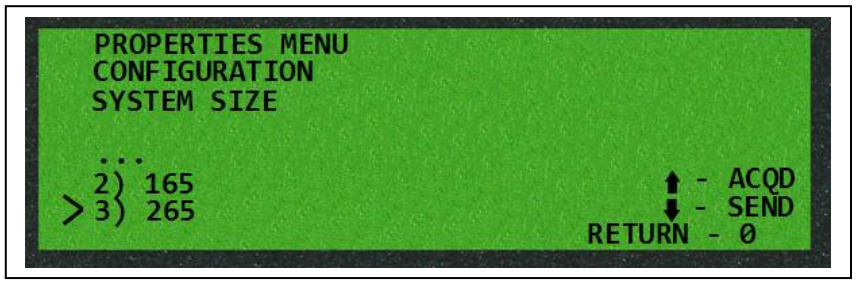
Using the Properties Menus to changing any of the features or operating properties from a preset configuration will over ride the default settings. This can be useful to meet special operating requirements of the customer. [e.g. WMS with GSDN output]

<u>Altering any of the NTEP configuration settings or modification of internal physical or wired components will void the NTEP certification and may cause the unit to fail NTEP on-site inspection.</u>

3.3.5.1.2.System Size



This menu selection defines the Resolution model that the electronics is installed. The effect of this selection will define the number of 16 cm (6.3") arrays that the network hubs are looking. The number of arrays is indicated in the selections below:

125R

Configuration: Length = 4 arrays; Width= 3 arrays; Height= 3 arrays

165R

Configuration: Length = 4 arrays; Width= 3 arrays; Height= 5 arrays

265R

Configuration: Length = 4 arrays; Width= 4 arrays ; Height= 6 arrays

480R

Configuration: Length = 8 arrays; Width= 5 arrays ; Height= 6 arrays

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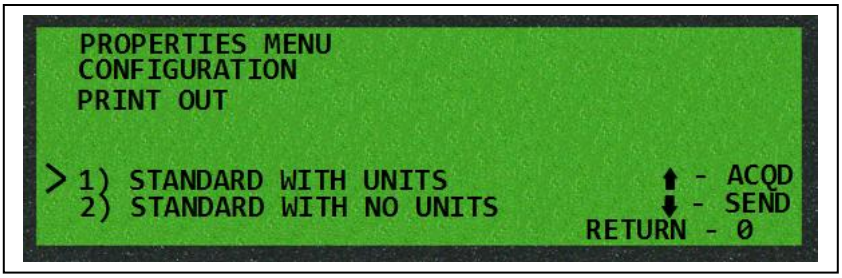
3.3.5.1.3.Print Out



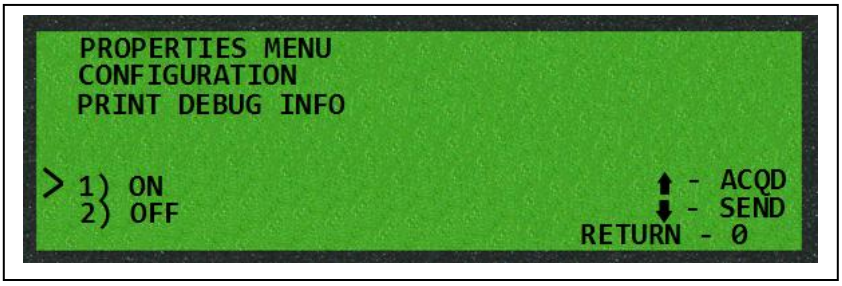
Standard

The data from the ASCII printer port includes the units (in/cm; lb/kg)

No Units

The data from the ASCII printer port does not include units (in/cm; lb/kg).
Note: This format is used when the data is interfaced into a computer but it is important that the units is defined and not changed by the user or a USB software control.

3.3.5.1.1.Print Debug Info



This is a diagnostic tool that is currently being developed. Activating this tool, the RS232 printer port will provide a summary of internal steps performed by the ExpressCube for diagnostic purposes.

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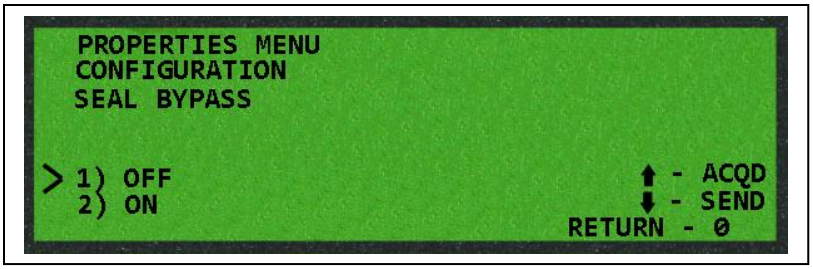
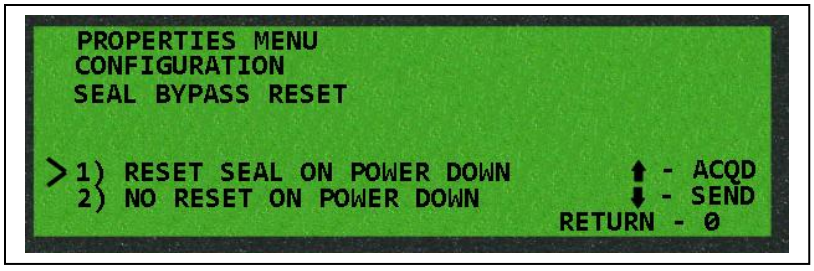
3.3.5.1.2. Seal Bypass



The access of to the diagnostic menu must be preceded by pressing the diagnostic button in the back of the unit. This is usually sealed to prevent user access to the diagnostic menu. The seal bypass is used by technicians that are performing a testing and require unrestricted access to the diagnostics menus.

3.3.5.1.1.Seal Bypass Reset



Normally, after the technician has performed service work, when the unit is powered down, the seal is reactivated and the button must be pressed to access the diagnostic menu. There is an option for the technician to turn this feature off during testing.
** This condition must be turned ON when testing is complete to prevent the user from accessing the menu **

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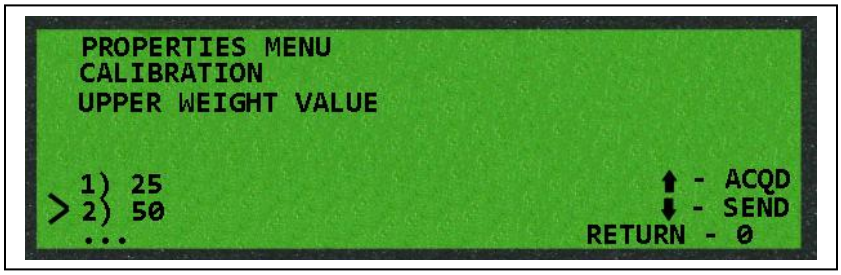
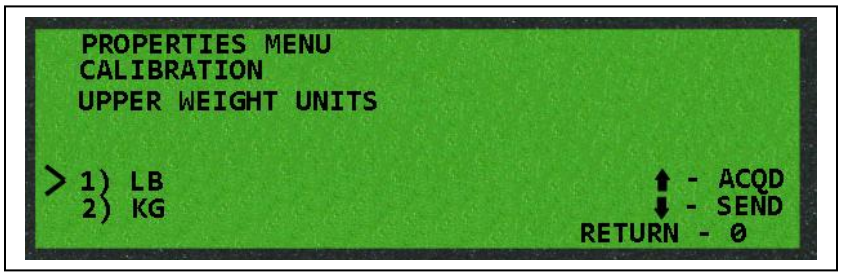
3.3.5.2.Calibration

3.3.5.2.1. Upper Calibration Weight Value



This selection defines the numeric value of the weight used when calibrating the weigh scale. (It is used in conjunction with the unit definition following this selection).
Selection choices are: **25, 50, 100**

3.3.5.2.2.Select Calibration Weight Units



This selection defines the units used when calibrating the weight defined in the previous selection. Selection choices are: pounds [**lb**] or kilograms [**kg**]

3.3.5.2.3.User Access to Lens Recalibration Feature

This selection allows the user to access the lens recalibration feature from the program menu [Prog]. (Recommended) There are some locations that under certain conditions do not want the user to initiate the lens recalibration procedure. There is a choice of ON or OFF.

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3.3.5.3.Dimensioning

3.3.5.3.1.Display Order

The Length, Width, and Height dimensions of a parcel measured by ExpressCube are normally determined by the orientation of the parcel on the dimensioning platform. There are Warehouse applications that follow the GS-1 guidelines as set out in GSDN procedures. The ExpressCube can operate in either of these two formats:

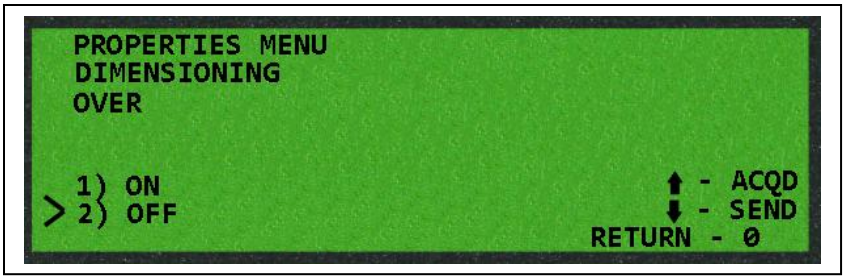
Standard

Parcel dimensions are displayed and output according to the orientation on the measuring platform.

GSDN

Parcel dimensions are assigned to Length, Width & Height according to their relative numeric value [GSDN International Guidelines]. Measured values are assigned from largest to smallest measurement in the order of Length, Width then Height independent of the orientation of the parcel on the measuring platform.

3.3.5.3.2.Over Sized Dimension



The ExpressCube outputs 'N/A' [Not Available] when as valid dimension cannot be determined (or NTEP only- if any dimension cannot be determined). When this feature is activated, the word 'OVER' is displayed in lieu of a dimension when the ExpressCube detects that a parcel is extending beyond the edge(s) of the measurement platform.
Note: This setting not available in NTEP configuration.

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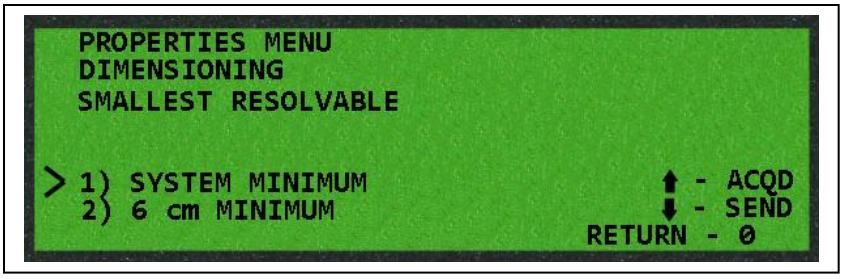
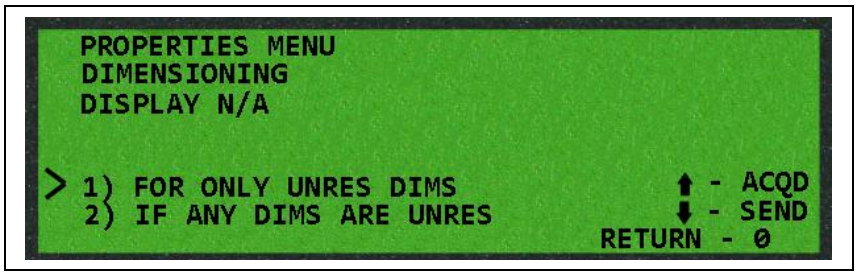
3.3.5.3.3. Smallest Resolvable Dimension



NTEP rules limit the smallest dimension that can be displayed on the ExpressCube unit (2.4in; 6.0cm). Optionally, the System Minimum feature removes any software imposed limits and displays all resolved measured dimensions without restriction.

3.3.5.3.4.N/A [Not Available] Display Rules



NTEP rules dictate that if any dimension cannot be resolved, all dimensions must indicate N/A [Not Available]. There are warehouse applications in which one unmeasured dimension maybe expected but it is desired to obtain the other resolved dimensions.

This feature permits the ExpressCube to display 'N/A' on all dimensions if any dimension is not resolved (NTEP) or only display 'N/A' on an unresolved dimension with the displayed resolved dimensions.

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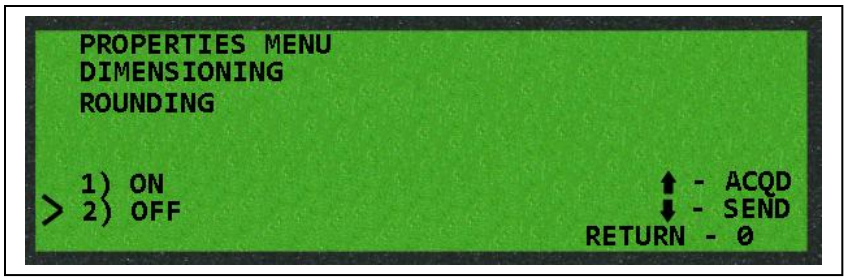
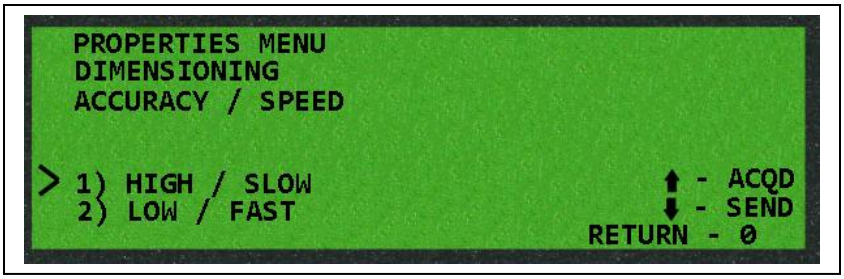
3.3.5.3.5.Dimension Rounding



In the NTEP configuration, the ExpressCube always modifies the obtained dimensions to conform to the specified NTEP accuracy [0.2 in/ 0.5 cm] by rounding the measurement to the closest NTEP allowed unit. This feature will permit the ExpressCube to display/output the actual dimensions measured [0.1 in/ 0.1 cm].

3.3.5.3.6.Dimensioning Accuracy Speed



The ExpressCube system increases the dimensioning accuracy by measuring the object multiple times to resolve small differences. In some applications, the ExpressCube could be taking additional time to produce dimensional accuracy that is irrelevant to required measurement. This option gives better speed efficient if the ExpressCube by decreasing the measurement routine.

This feature allows the ExpressCube to increase dimensional speed slightly by limiting the normal higher accuracy resolving procedures. The selection is:

Dimensioning High Accuracy/ Normal Speed

This is the default setting for both NTEP and WMS ExpressCube configurations.

Dimensioning Modest Accuracy/ High Speed

This is the setting should only be used for applications were fast dimensioning speed is critical to the measurement application.

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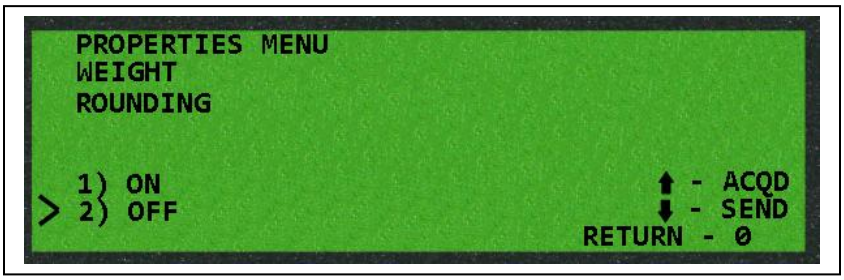
3.3.5.4. Weight

3.3.5.4.1.Weight Rounding



In the NTEP configuration, the ExpressCube always modifies the obtained weight reading to conform to the specified NTEP accuracy [0.1 lb/ 0.05 kg] by rounding the measurement to the closest NTEP allowed unit. This feature will permit the ExpressCube to display/output the actual weight measured [0.01 lb/ 0.01 kg].

Note: It is recommended that due to the vibrations from forklift trucks and motorized conveyor systems occurring in the warehouse environment that the weight rounding is set on (i.e. 0.1 lb/ 0.05 kg).

3.3.5.4.2.Return to Zero Weighing

The NTEP configured ExpressCube system will wait for the platform to return to zero before attempting another measurement. This feature is designed to prevent the accidental double measurement (and billing) of the same package. By turning off the return to zero requirement in WMS applications, a faster through put of measurements is possible.

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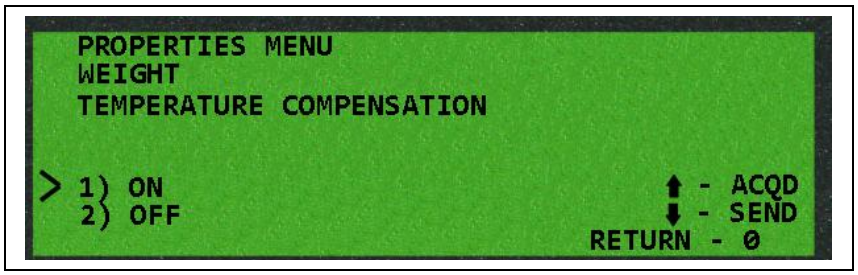
3.3.5.4.3.Temperature Compensation

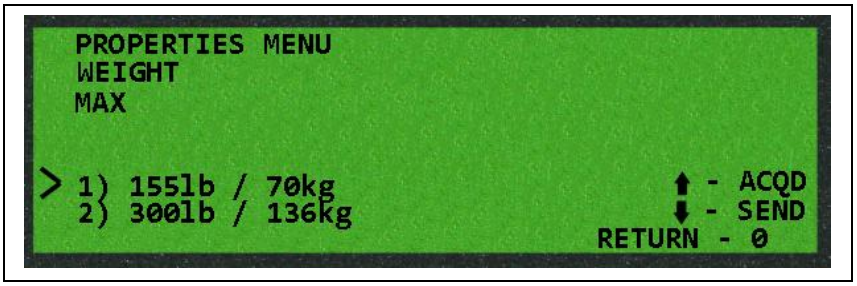


Load cells and other components can be affected by the wide range of temperatures that can be encountered in warehouses around the world. These variations are studied and special circuitry has been added to measure ambient temperatures and compensate for deviations in measurements that they may cause.

This feature will disable the temperature compensation circuitry.

Note: This functionality is for diagnostic purposes only. Temperature compensation should be on for normal operation.

3.3.5.4.4. Maximum Weight Measurement



This feature sets the maximum allowable weight measurement for the ExpressCube system. The default settings are: ExpressCube 125R, 165R & 265R = 155 lbs/70 kg; ExpressCube 480R = 300 lbs/ 136 kg.

Note: This functionality is for diagnostic purposes only and the maximum weight should be left on the 300 lbs/ 136 kg selection.

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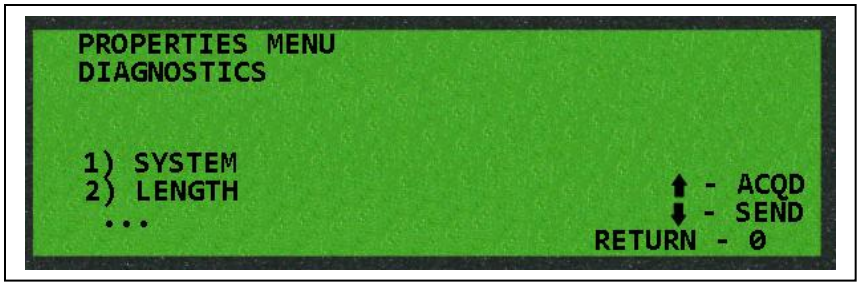
3.3.5.5. Diagnostics



The ExpressCube can monitor operating parameters and establish numerical codes based on the performance. In the event that a problem occurs that requires more in depth analysis, ExpressCube engineers may request any of the selected data strings for reference. The data is organized into the following functional groups: System, Length, Width, Height, Weight & Measuring.

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3.4. Troubleshooting Buss Problems

Any failure in the internal 485 buss will affect the operation of the ExpressCube system. The LED status board has a computer in it and is connected to the main CPU board by the internal 485 buss. If the LED status board does not receive a specific periodic communication from the CPU motherboard – it will flash the red LED indicating communication or main CPU failure. If the red LED does not light at all, it indicates a possible power failure. Refer to LED indicator section 3.2 for more detail on LED diagnostic indicators.

- **RED LED of Status Board Not Operating:** If the red LED on the status board is not functioning check the power adapter. Check the external ExpressCube ports (485) with an LCD controller. If the LCD Controller display is completely blank without a segment showing, there is a power interruption on the main CPU board.

- **No Weight or Dimensions -Red LED Steady – Yellow & Green LEDS Off:** If the motherboard is not in communication with the dimensional arrays or weight A/D, the respective LED would be flashing. Verify that the LCD Controller is in communication by pressing the Prog key. Look to a problem with the main CPU board for this condition.

- **No Weight or Dimensions –Red, Yellow & Green LEDS Flashing:** If the motherboard is not in communication either the dimensional arrays or the weight A/D, look for a problem with either the cable connecting the CPU motherboard with the active network hub or the active hub board itself.

- **No/ Limited Dimensions – Weight Operating - Yellow LED Flashing:** This indicates that the main CPU board may have a problem with a dimension 485 buss. If the problem is with the 485 buss of a dimensional assembly, the Display Report will show an incorrect number of arrays. Each dimension bank (length, width, height) has its own 485 buss that operates independent of the other 485 busses. Test: Swap a working dimensional bank connector into the network hub and use the Display Reports determine if the network hub port can now see the arrays in the connected dimensional bank. If …..>

  If the Display Reports cannot see the new dimensional assemble, the problem is with the active network hub.

  If the Display Reports can see the new dimensional assemble, the problem is with either the connecting cable or the first array of the faulty dimensional assembly.

  Note: In the event the problem is in the auxiliary hub, only one section of the length dimensional bank will be affected.

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- **Weight Not Operating – Dimensions Operating – Green LED Flashing:** This indicates a problem in the weight circuitry and not the 485 buss. Refer to section 3.5 Weight Scale Troubleshooting for troubleshooting techniques.

3.5. Weigh Scale Troubleshooting

3.5.1. General

It should be noted that weigh scale troubles will affect the dimensioning capability of the ExpressCube Resolution because a stable weight must be achieved before the dimensioning process is started. Refer section 3.4 Troubleshooting Buss Problems for more detail.

Note: Always start weight troubleshooting with a weight calibration routine. (Section 3.3.5)

Although there are only three main active parts to the weight scale [load cells, active hub, main CPU motherboard], there are a few areas of the system that can cause incorrect readings. The following sections provide a troubleshooting guideline depending on the nature of the weighing problem.

3.5.2. Fluctuating or Rapidly Changing Display

This condition can prevent the weigh scale from maintaining a zero condition or become very slow determining a weight. If the customer reports that the random display is intermittent, pay particular attention to the environmental checks listed below.

- Verify that the ExpressCube system is on a solid footing with all four legs on the floor. Check to see that there is not a source of vibration (compressor, heavy stamping machine, etc) close enough to shake the platform and disturb the weight reading.

- Verify that the ExpressCube is properly grounded. If the metal has lost contact with the electrical ground on the main CPU board, static or general RF noise can affect the capability of the digital load cell converter to resolve the sensor outputs of the load cell. Connect a wire from any plug screw to a bare portion of the metal frame (e.g. an aluminum dimensioning channel) to see if there is an improvement. A permanent connection can be made between the connector plug and one of the circuit board mounting screws if necessary. If you are removing the base, there is a grounding point in the rear center mounting screw of the main CPU board. Clean the area and tighten the screw.

- Check the power adapter to verify that the electrical interference from the switch power supply is not originating from the adapter.

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If the above procedures fail to clear the problem, the A/D converter on the active network hub may be defective. Replace the active hub if the problem persists.

3.5.3. Inconsistent or Incorrect Weight Measurements

- Check the area around the platform to be certain that there is not any object touching the platform or the height dimensional assembly. The measuring platform must be free to move without any physical contact with external objects, paper, etc.

- Verify that there is not any objects that are bridging the platform and the separate guide rollers located at extreme lefdt & right of the measurement platform.

- Recalibrate the weigh scale following the procedures outlined in section 3.3.5.

- If after recalibration the measured weight returns various incorrect weight measurements, a load cell may have to be replaced. Place the calibrated weight in each corner and note the weight discrepancy. A malfunctioning load cell will indicate a larger weight discrepancy when the load cell in placed on top of the defective load cell.

- If there is not a noticeable difference from placing the calibrated weight over each of the load cells, replace the active hub board as the tests are indicating a problem in the A/D section of the active hub.

3.5.4. Permanent Zero or Constant Weight Reading

A permanent Zero indication or constant weight value occurs when the main CPU board is receiving the same weight value from the digital converter independent of the actual weight placed on the platform. The following procedures will help locate the problem.

- It is possible that an odd physical circumstance or unauthorized service attempt activated the calibration cycle on the ExpressCube scale and recorded the same weight as both maximum and minimum values. The machine may have lost the programming through an electronic static discharge/noise. For both potential problems, calibrate the ExpressCube system and if the problem persists, continue with the procedure listed below.

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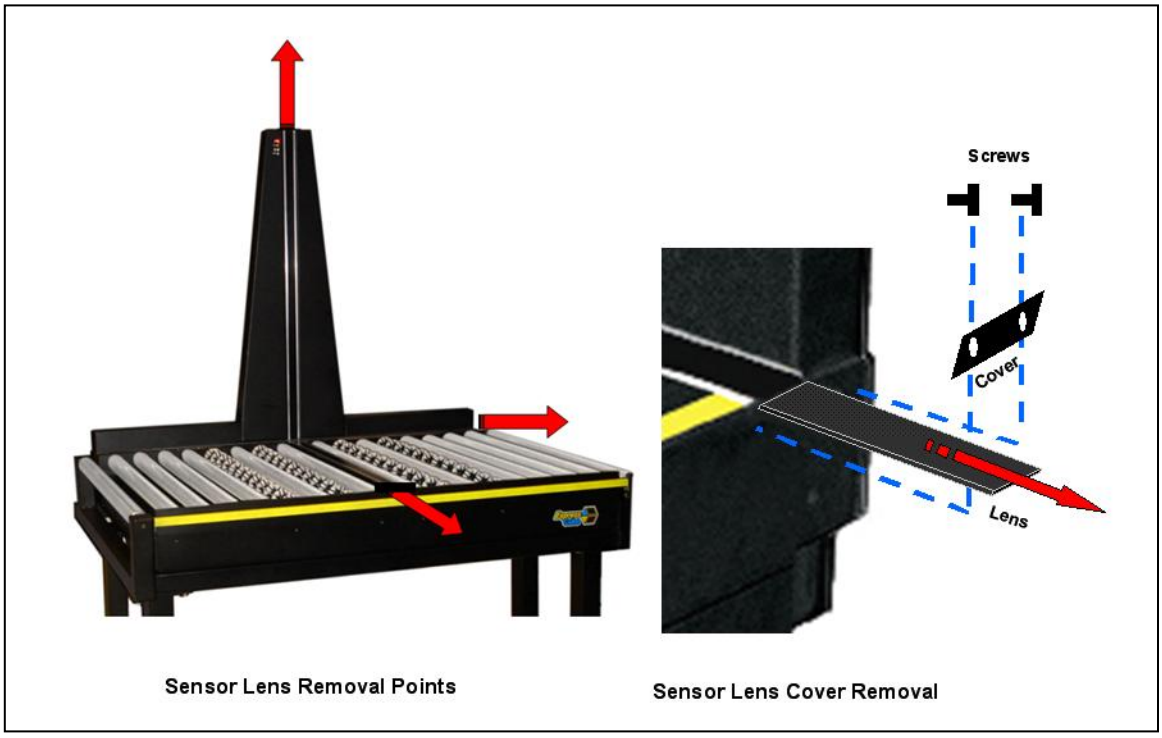
- The only other cause of this problem is a malfunctioning A/D circuit on the active hub. Replace the active hub following procedures described in the Repair section of this guide.

4. Repair

4.1. Replacing the Sensor Lens

If a sensor lens becomes foggy (opaque) from wear, cracked or broken it should be replaced. All three lenses have a cover to permit safe and quick replacement of the lens. The covers are held on by two screws and there locations are illustrated below.



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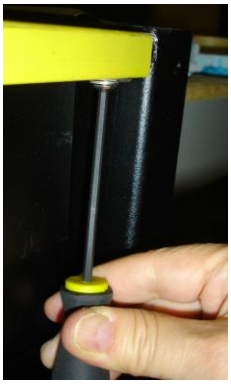
4.2. Removal of the Width Dimensional Bank

4.2.1. Remove Yellow Guard Rail

To access the dimensional bank, first remove the yellow guard rail in front of the machine. There are two styles of guard rails.

If the guard rail is secured underneath, loosen the screw holding the catch on the underside of the guard rail. Move the sliding catch to allow the guard bar to lift up. After lifting the guard bar, move the rail out so that the opposite end will slide out of the retaining bracket.

If the screws are mounted from the front, simply undo the two screws at either end of the guard rail to remove the rail.



Fastener under the bar

4.2.2. Remove Front Two Panels

To remove the two front panels, unscrew the screws located between the rollers that fasten each panel. Each panel will be held by either two or three screws depending on the 480R model.

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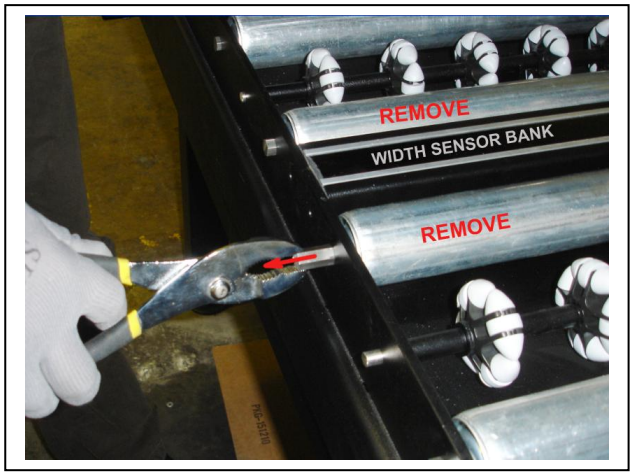
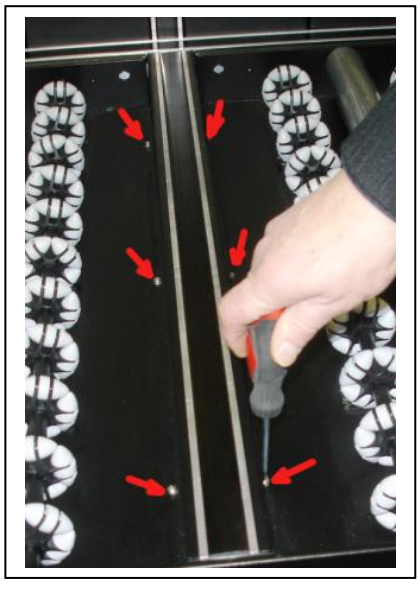
4.2.3. Remove Rollers on Either Side of Width Array Bank



Use pliers to pull the conveyor roller axel toward the 480R front. As the axel retreats into the conveyor roller at the far end, lift the back of the roller up and then remove roller from platform.

4.2.4. Remove Width Array Bank Assembly

Remove the six screws holding the width array bank assembly to the platform as illustrated.



Gently lift the width bank assembly and unfasten the RJ connector from the bank of the array. Note: Keep cable and connector away from the cable feed hole in the platform so that connector does not slide into the platform hole.

The aluminum array channel can be removed from the metal support bracket by undoing the two nuts located on the underside of the metal support.

The dimensional arrays can be accessed/ replaced as necessary by sliding the arrays from the dimensional channel.

To reassemble and install the width array bank, reverse the procedure as described taking care not to pinch the cable as the width array assembly is screwed onto the platform.

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4.3. Removing the Height Dimensional Bank For Service

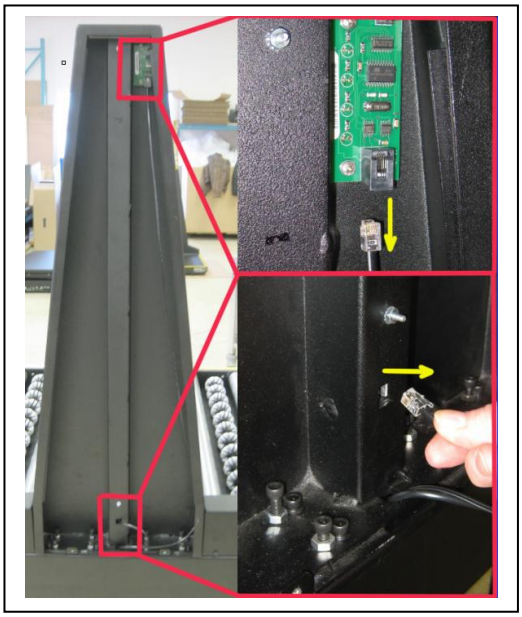
4.3.1. Removing the Back Height Cover

Note: To access and service both the height dimensional bank and the length dimensional bank, it will be necessary to have access to the back of the 480R.

Remove the two screws that secure sliding back cover on the back of the height panel. After removing the two screws, the back cover may slide back ~ 1/3 of the length before it can be lifted out of its track.

4.3.1. Removing the Height Array Assembly

Remove the two RJ connectors located at the base and top of height bank assembly. The location is illustrated on the illustration to the right. The RJ connector has a tab that is squeezed slightly toward the wire that allows easy removal of the connector.



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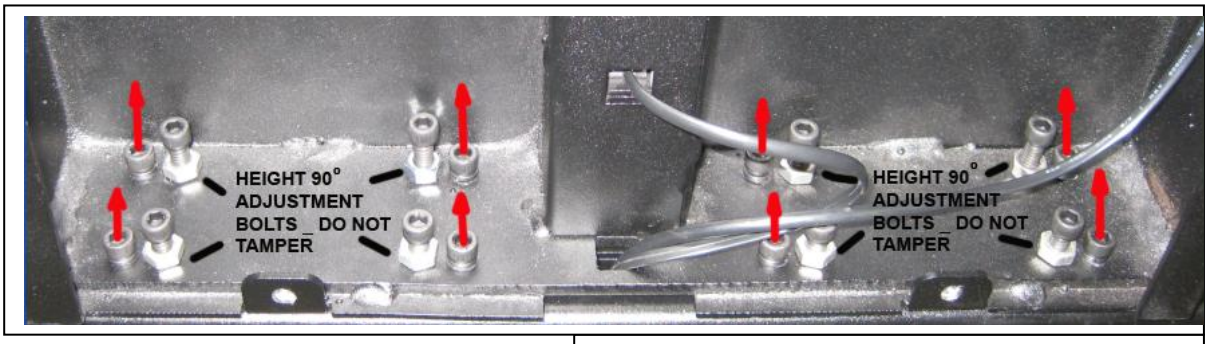
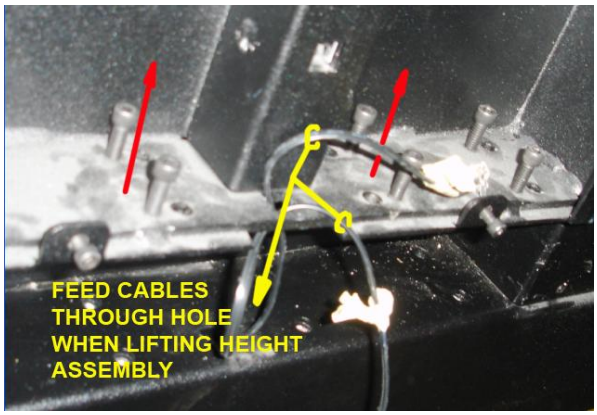
Remove the eight bolts that hold the height assembly to the platform. These bolts are removed completely and set aside.

►DO NOT REMOVE ALIGNMENT BOLTS IDENTIFIED BELOW.◄



Carefully lift the height assembly as the cable is fed back through the access hole.

When the height assembly is clear of the cables, place it in a a flat surface with the lens facing down.

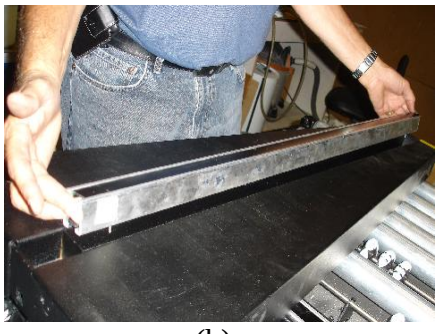


4.3.2. Removing the Height Dimensional Bank to Access Arrays

(a) Using a nut driver, remove the two nuts that hold the height bank channel in place.

(b) Flip height bank over and lift out the height channel bank.

(a)



(b)

Refer to section 4.5 for a detailed description removal of arrays from the aluminum channel for service.

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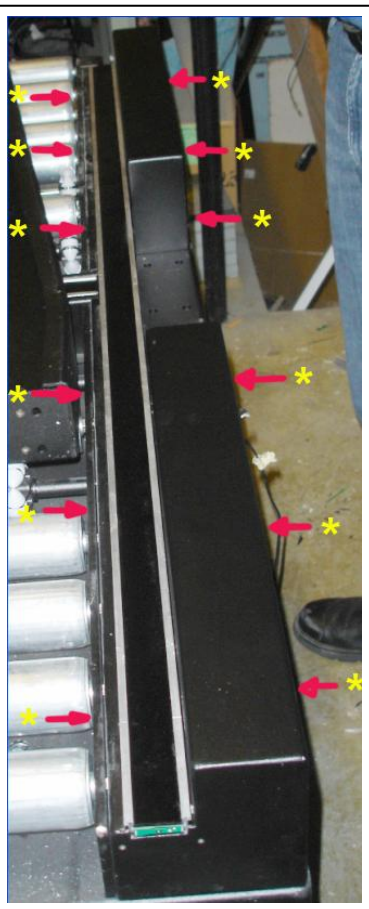
4.4. Removing the Length Dimensional Bank for Service

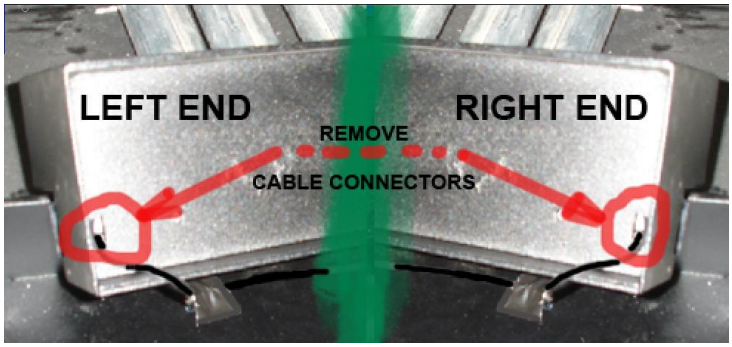
4.4.1. Removing the Length Array Assembly



Note: The height bank assembly must be removed as outlined in Section 4.3 before the length array bank can be removed.

Remove the 12 screws (illustrated with '*' at right) holding the length array assembly to the main platform. If the rolls require removal to remove the screws, use the procedures outlined in Section 4.2.1 to 4.2.3 to access and remove the necessary rollers. Note: The length array assembly will rest on the platform with the screws removed.

Gently lift the back end, carefully tilting it forward to expose the cabling. Remove the cable connections at each end of the length array assembly.



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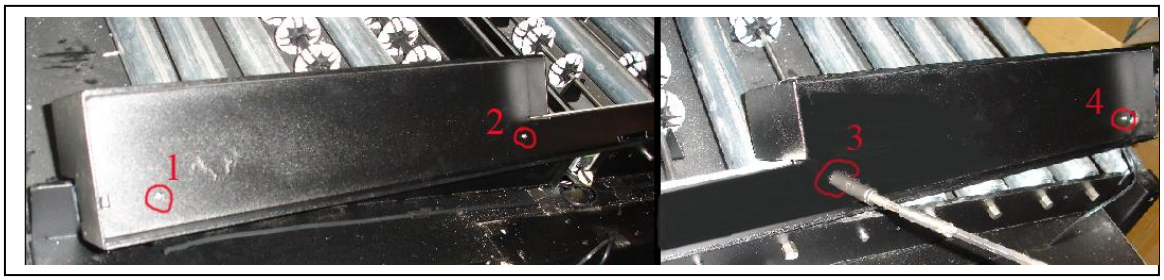
4.4.2. Removing the Length Dimensional Channel to Access Arrays

With the underside facing you, remove four nuts that secure the length aluminum channel bank. The nuts are located symmetrically on each side of the length bank assembly.



Carefully rotate the channel back with the sensors facing up. Push the exposed studs underneath up to evenly lift the channel from the holder.

Refer to section 4.5 for a detailed description removal of arrays from the aluminum channel for service.

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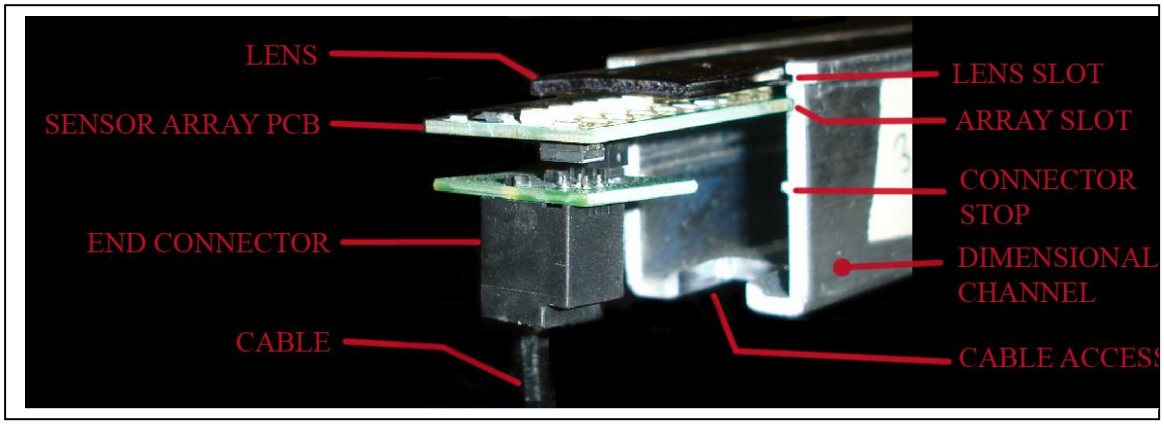
4.5. Removing & Replacing a Sensor Array(s)

4.5.1. Dimensional Channel Structure

General

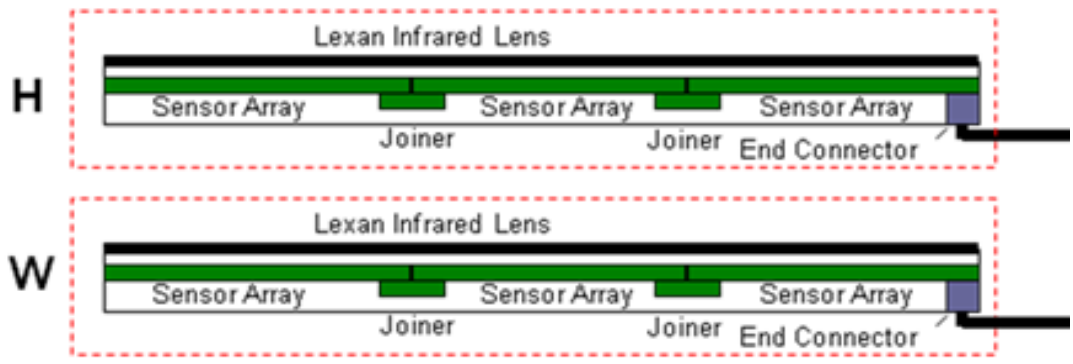
All sensor arrays are physically identical and electronically orient themselves when the hub polls the arrays upon power up. The first sensor that has the end connector that connects to the cable via an RJ style connector. The sensors assume their numerical assignments based on their position from the end connector.

They slide into a metal extrusion in a designated groove just below the lens. The assembly is described in detail in the accompanying illustration.



Height, Width Assemblies

The height and width arrays have one end connector. The arrays are connected by polarized joiner connectors form one dimensional assembly in the dimensional channel.



Note: Actual number of arrays : Height = 6 arrays, Width = 5 arrays

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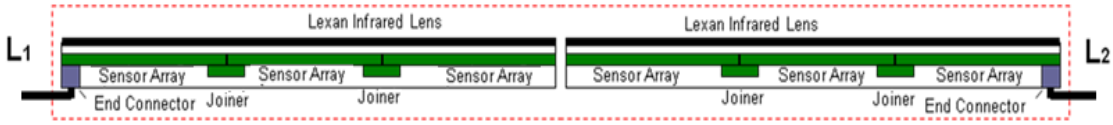
Length Assembly Assemblies

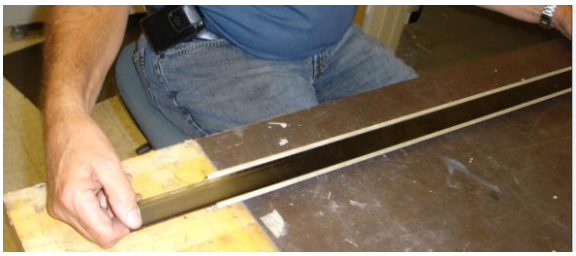
The length array assembly actually consists of two array sub-assemblies that are oriented in the dimensional channel back-to-back. Each array subassembly has an end connector located at opposite ends of the dimensional channel. The arrays are connected by polarized joiner connectors form one continuous array assembly.



Note: Both array sub-assemblies have 4 arrays each.

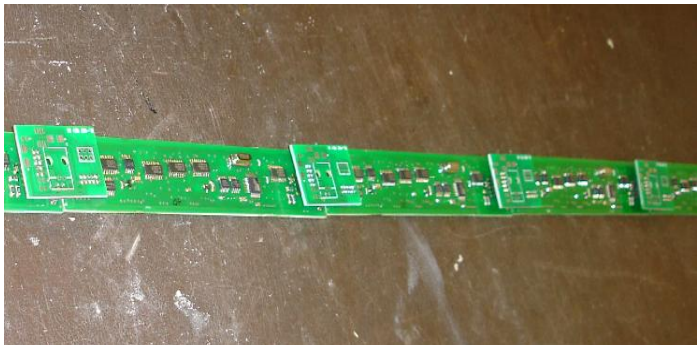
4.5.2. Removing the Sensor Arrays

Place the dimensional assembly on a flat work area Slide the lens off the dimensional channel and place aside.



Carefully slide the array sub-assembly out of the dimensional channel taking care to support the middle of the sub-assembly as it exits the channel.

Place the sensor arrays face down (sensors pointing down) on the work surface before disconnecting and reconnecting individual arrays.



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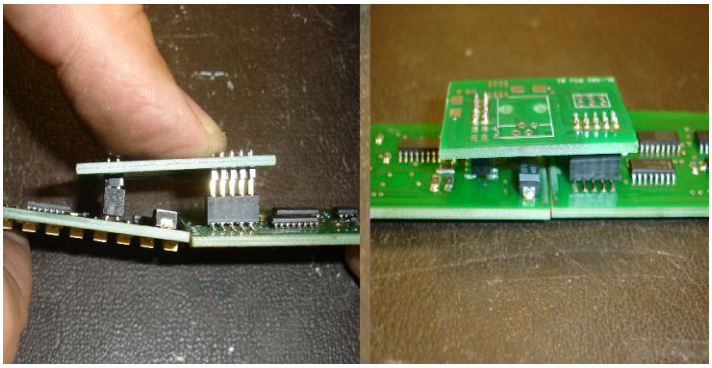
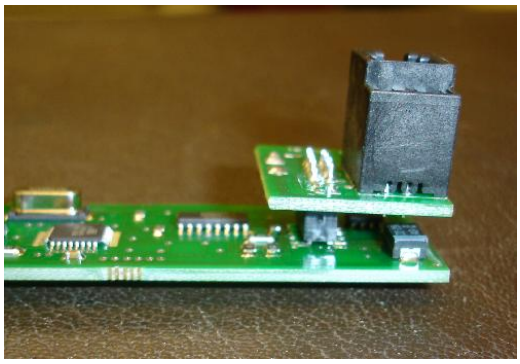
4.5.3. Reassembling the Sensor Arrays

To join two sensor arrays together, use the joiner as illustrated on the right. The joiner is designed to automatically orient the arrays correctly.

Push the joiner completely into the connector, checking that all the pins are seated. The joiner should be parallel to assembled arrays as illustrated.

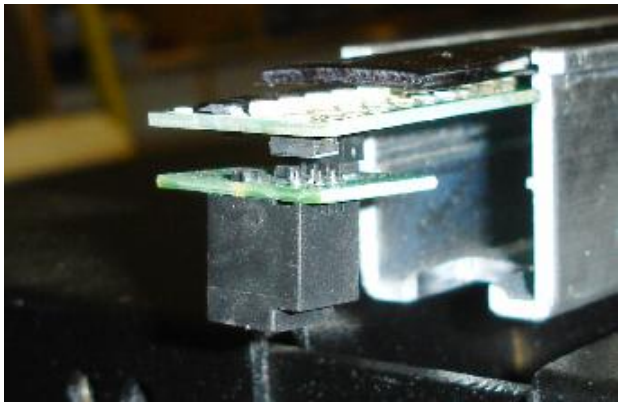




The end connectors fit into the connector such that the outside edges of both the and the sensor array are even.

Ensure that all pins are correctly seated and that the connector is parallel to the sensor array board.

Carefully align the sensor subassembly into grooves (2nd groove from the top and slide into the dimensioning channel



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4.6. Removing / replacing the Main CPU & Hub Assembly

4.6.1. Introduction

This section will assist in the replacement of three components of the existing 480R system. One is a main CPU board that terminates the cable connections to the machine. The other two components are active hubs which are mounted in a module that will screw into the system with four screws.

All connections into the assembly are made through snap in connectors. All components are accessed through a hinged access door located under the machine at the front right hand side of the machine as viewed directly in front.

4.6.2. Access Panel

The access panel will have cables connected it. These should be disconnected noting the cable connections. [right]

Remove the screws holding the access panel closed to allow the access panel to swing down. [below]

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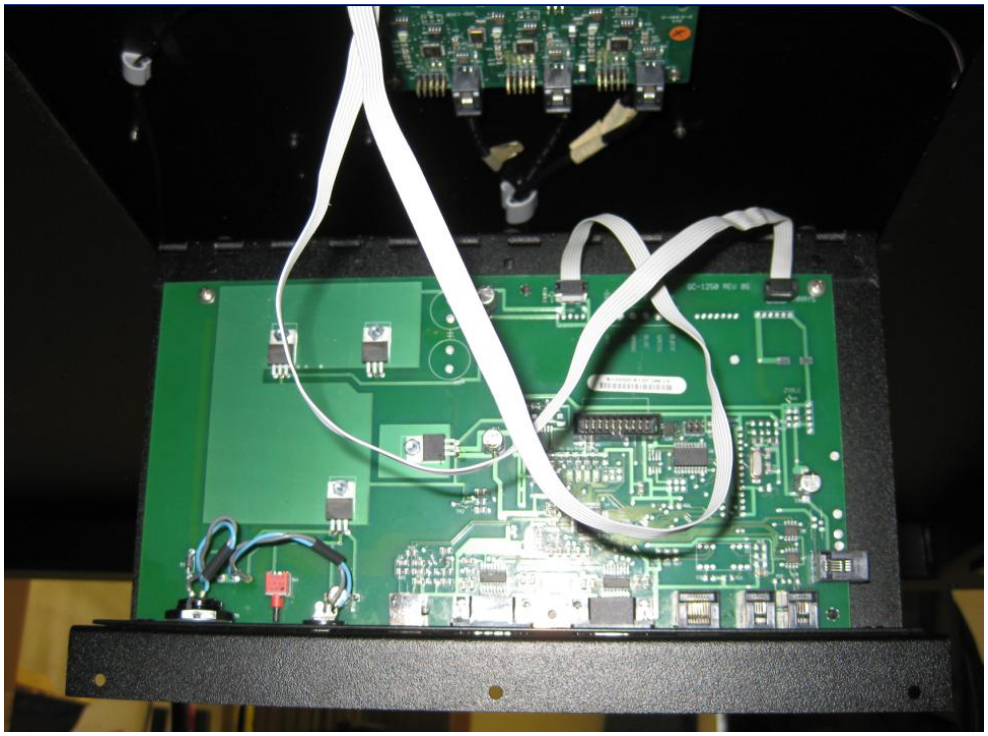
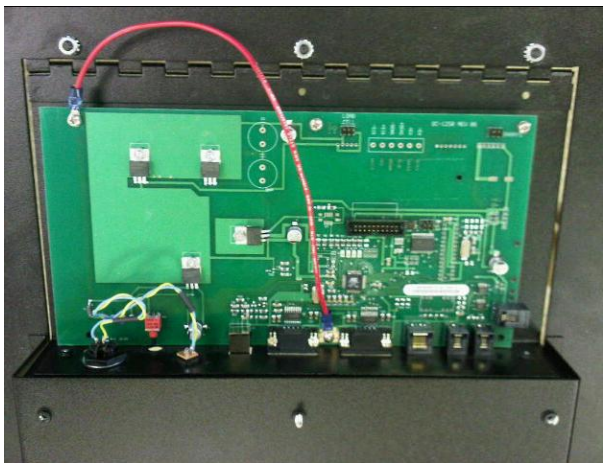
4.6.3. CPU Removal

The main CPU is secured to the access panel that swings down A close up of the board is illustrated below.



Remove the two ribbon cables that connect the main CPU board to the hubs. If there is a ground strap connected to the center of the board it will be come out as the board is removed. The strap is secured to one of the screws holding the board in, thus will lift out with the board. Another photo illustrating the strap is shown below.



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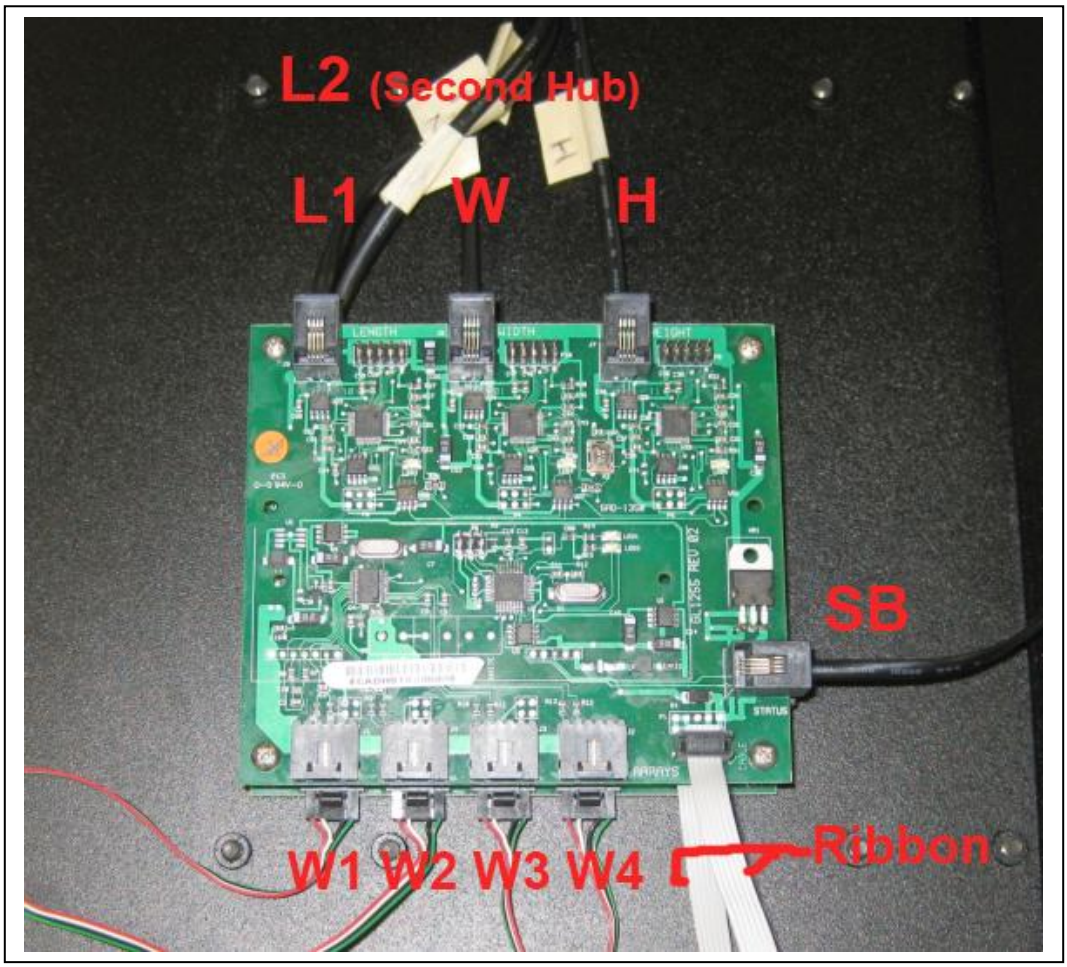
4.6.4. Hub Assembly Cables (Summary)

A picture of the hub assembly viewed looking into the access panel is illustrated below.



The cables are labeled and are listed in this summary:

Label	Hub 1	Hub 2	Comment
W1	**X**		Load Cell 1
W2	**X**		Load Cell 2
W3	**X**		Load Cell 3
W4	**X**		Load Cell 4
SB	**X**		Status Board (Front LEDs)
H	**X**		Height Dimensioning Bank
W	**X**		Width Dimensioning Bank
L1	**X**		½ Length Dimensioning Bank
L2		**X**	½ Length Dimensioning Bank
Ribbon	**X**	**X**	Replacement one daisy cable

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4.6.5. Disconnect Hub Assembly Cables

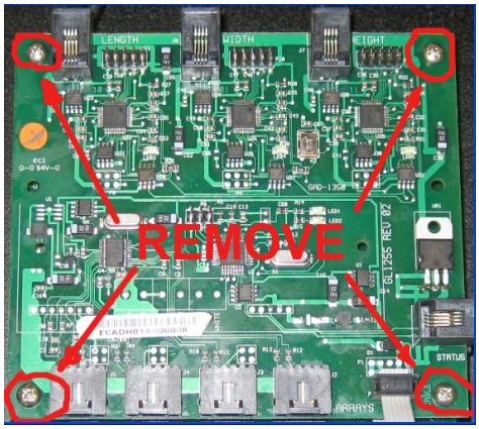
Carefully disconnect the cables from both active hub/ hubs noting their locations. There three types of connections on the hub board:

Flat header: Used by the ribbon cables – just lift straight up (friction held –no tab)

Flat Tab: Used by the load cell connectors – press the tab in the center of the connector down and pull to remove. Load cell order is arbitrary (not set).

RJ Connector: Familiar telecommunications type connector – depress the plastic and pull straight out to remove.

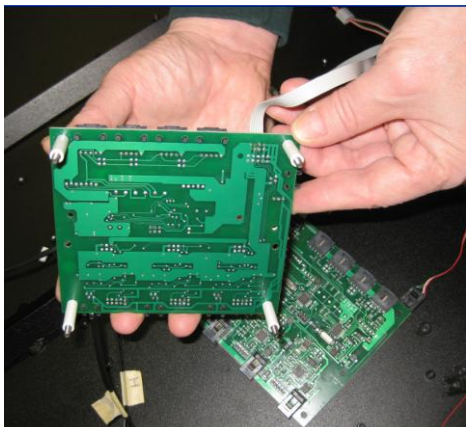
4.6.6. Remove Single Hub



Carefully remove the four screws as shown above.

The hub board will drop out quite easily for replacement.

4.6.7. Remove Dual Hub Assembly



Carefully remove the four screws as shown above. Note that the hub boards and spacers can come apart as indicated above.

New hub boards are single board 4 dimensional port design an will fit the existing fittings without modification.

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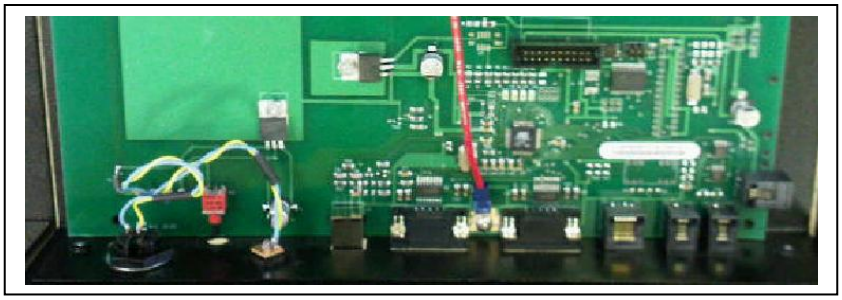
4.6.8. Install the Main CPU

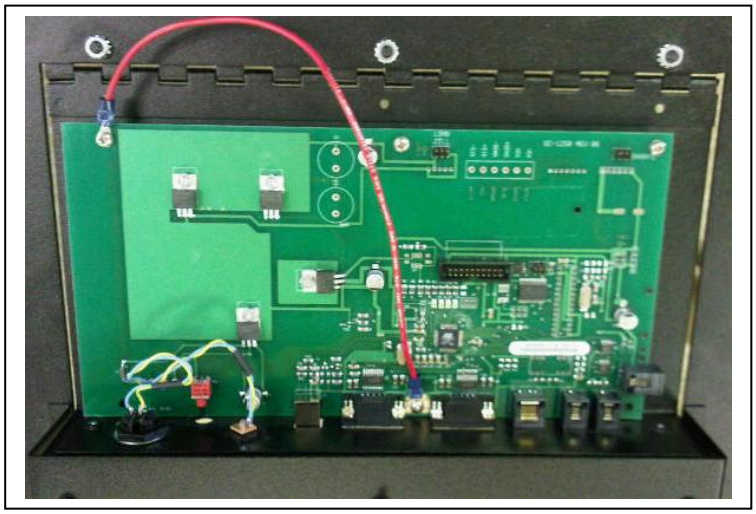
Note: It is optional if the technician wishes to disconnect the ribbon cable from the hub or leave it on while the CPU is mounted. If the ribbon cable is disconnected – please note the connector and orientation of the cable before it is removed.

Remove the red grounding strap from the center front of the existing CPU board and add the cable to the new motherboard if supplied

Note: Red grounding wires are only used on some 480Rs and should be reattached if supplied..



Reinstall the main CPU board onto the access panel as illustrated below:



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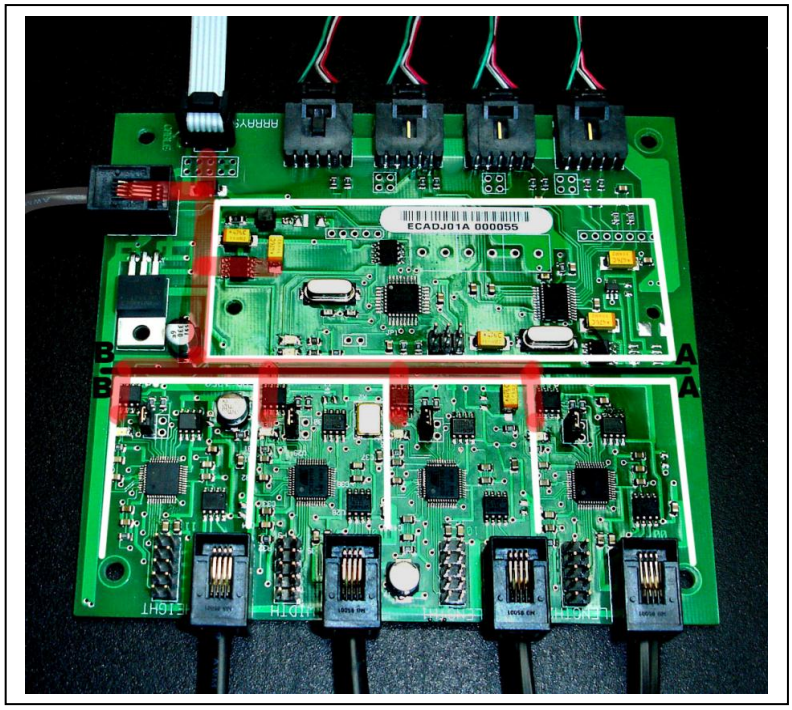
4.6.9. Install the Hub Assembly

Orient the hub board so that the cable connectors are facing the appropriate cables. It is suggested that the L2 connector is plugged into the bottom board before the hub assembly is mounted – but this is up to the discretion of the technician.



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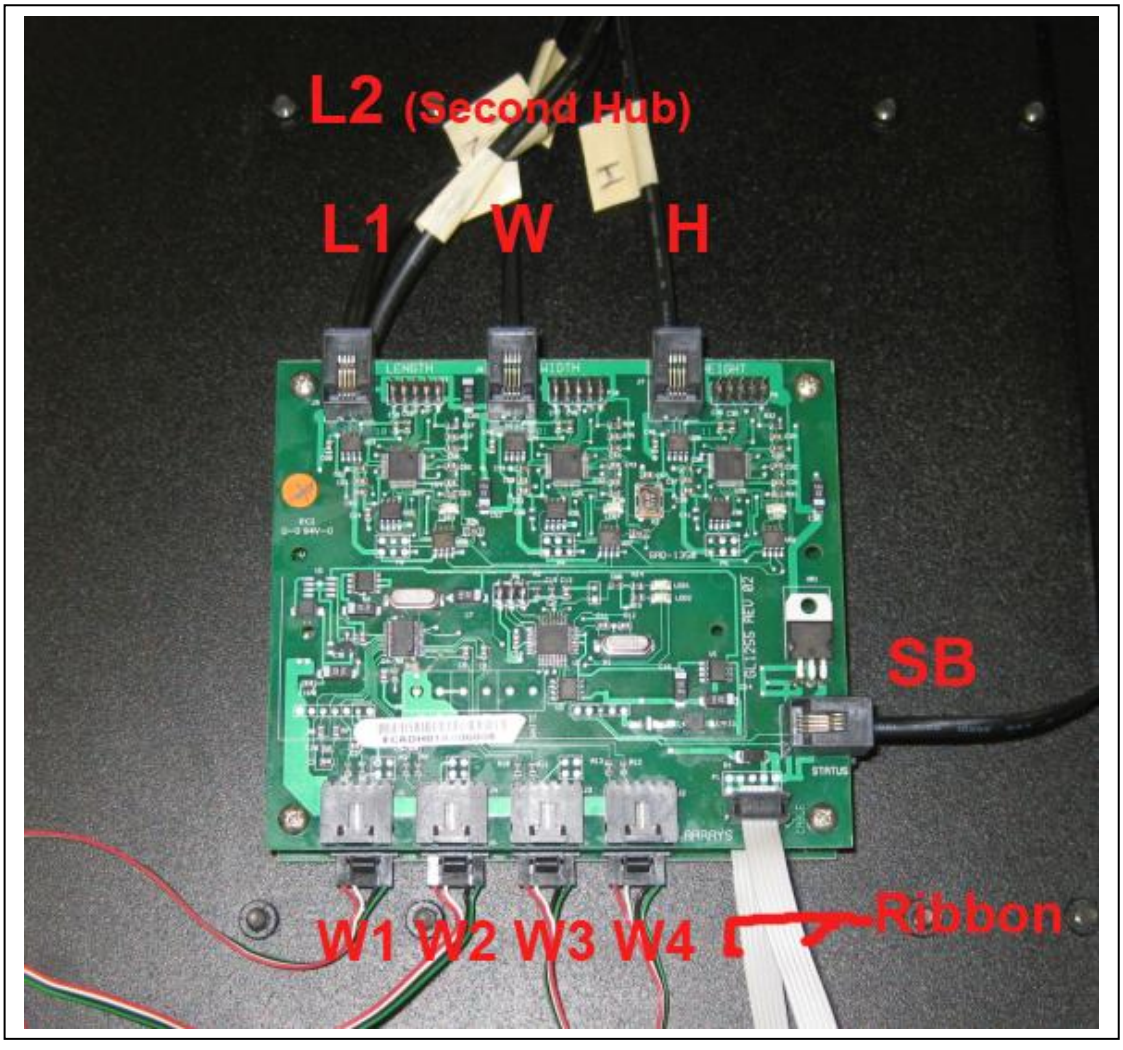
4.6.10.Connect the Cables onto the New Hub Assembly

The connection of the load cell connectors do not have to follow any particular orientation as the system record their characteristics during weight calibration.

The connection of the RJ connectors is important and is written in detail on the circuit board. The layout is also shown in detail below:



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4.6.11.Testing

Before closing the access panel, connect the power adapter and the LCD Controller.

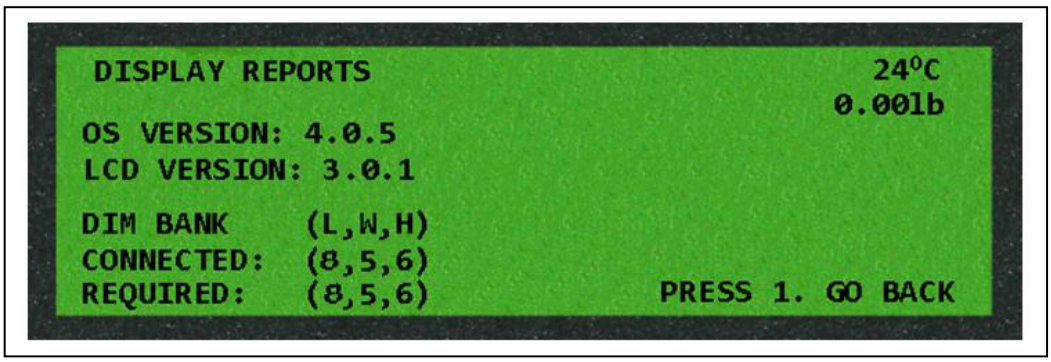
Turn power on and wait 1 minute for internal system configuration to complete.

Press the recessed button located beside the power button for one second (pen, or small tool maybe necessary).

Press the number ‘2’ to access the Diagnostics Menu

Press the number ‘1’ to access the Display Reports.

Verify that the Dim Bank : Connected /Required numbers are as indicated below.



If the numbers do not match, turn off, disconnect power and check the connections.

4.6.12.Close Access Panel and Reconnect Cabling

[Power Off] Close access panel & secure. Remove ExpressCube seal and the cover cap and place over the reset hole in the new CPU board.

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ExpressCube Resolution Programming Worksheet				
Feature	**NTEP**	**WMS**	**Custom**	**Notes**
Configuration				
System Size	Factory Set	Factory Set	Keep Factory Setting	
Print Out	Standard with Units	Standard with Units		
Debug Print Info	OFF	OFF	Keep OFF	For technical debugging purposes only
Seal Bypass	OFF	OFF	Keep OFF	For technical debugging purposes only
Seal Reset Bypass	Reset Seal	Reset Seal		
Calibration				
Upper Calibration Weight Value	50 / 100	50 / 100		Units & weight value selected should not exceed 300 lb/ 136 kg weight capacity of the scale.
Calibration Weight Units	lb	lb		
Display Lens Calibration in LCD Controller PROG Menu	YES	YES		
Dimensioning				
Display Order	Standard	Standard		
Over Sized Dimension Indication	OFF	OFF		
Smallest Resolvable Dimension	6 cm	System Minimum		
N/A [Not Available] Display Rules	If Any Dim is N/A	Only Unresolved Dim		
Dimension Rounding	ON	OFF		
Dimensioning Accuracy Speed	HIGH / SLOW	HIGH / SLOW	HIGH / SLOW	Technical Debugging Only
Weight				
Weight Rounding	ON	OFF		Recommend ON for 480R
Return To Zero Weighing	ON	OFF		
Temperature Compensation	ON	ON	ON	Technical Debugging Only
Maximum Weight Measurement	300 lb/ 136 kg	300 lb/ 136 kg	Keep 300 lb/ 136 kg	.

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5. Service Part Ordering Numbers

Assembly	Part Name	Part Number
	Sensor Array	ECP-SA-H
	Sensor End Connector	ECP-XSA-A
	Lens 30"	ECP-LENSA-30
	Lens 36"	ECP-LENSA-36
	Lens 48"	ECP-LENSA-48
	Array Channel 30"	ECP-CHANA-30
	Array Channel 36"	ECP-CHANA-36
	Array Channel 48"	ECP-CHANA-48
Weighing	4P 75 KG Load Cell	ECP-LB-A
	4P Rubber Mount	ECP-LM75
Main Electronics	480 Main CPU	ECP-MC-K
	480 A/D Network Hub	ECP-AD-J
	4P LED Status Board	ECP-SB-H
	CPU/HUB Cable	ECP-NHCPU-A
	CU/HB 3ft Maintenance	ECP-XNHCPU-A
	Universal Power Supply	ECP-PS-A
LCD Devices	LCD Controller-DGNSTC	LCU-03R
Assessories	SizeIt II	PPS-01
	Null Modem Cable	ECP-NUL-A
	Dual End Null Modem Cable	ECP-DUL-A
	USB Cable	ECP-USB-A
	Data Logger Software	ECD-01

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