DATALOGIC

APPLICATION NOTE

Matrix 410™ and Matrix 450™

PackTrack Calibration Procedure

Reference Software Versions:

VisiSet™ 6.70 and later

Matrix Application 6.56

History

Issue	Date	Paragraph	Change
Rev. 0	March 7th, 2014		First Release
Rev. A	March 21st, 2014	2.1	Added Calibration Pattern printing information (A4 or Letter sizes)
Rev. B	October 16th, 2014	Chapters 1, 2, 3 and 6	Added Mutli head Calibration and new PackTrack parameters

CONTENTS

1 PACKTRACK FOR MATRIX

1.1 OVERVIEW

PackTrack™ Operating Mode is a method used to correctly assign codes read to their corresponding parcel or pack in systems where multiple packs are simultaneously present in the reading area.

The figure below illustrates the main concepts defining a PackTrack™ system. The main hardware parts are: conveyor, Matrix reader(s), encoder (tach), and presence sensor (photocell).

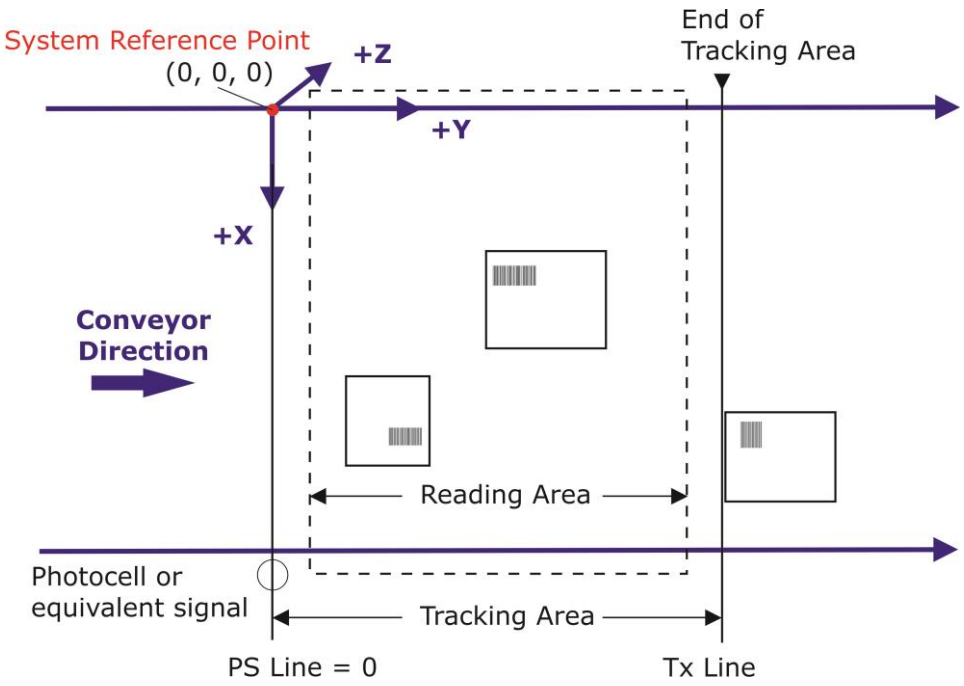
The Reading Area corresponds to the Field Of View of the Matrix reader.

An area called the Tracking Area is defined between the System Reference Point and the Transmission Line (Tx Line) and obviously includes the Reading Area. All packs passing through the system will have their position tracked.

The System Reference Point is defined as the point where the coordinates (X, Y, Z = 0). The Presence Sensor is normally aligned at the Y = 0 coordinate. If necessary it can be offset using the PS Line parameter.

The Encoder signal (Encoder Step), together with the Presence sensor is used to track the length of the pack as it passes through the system. The physical encoder can be replaced by an internal signal representing a constant speed conveyor, depending on the application.

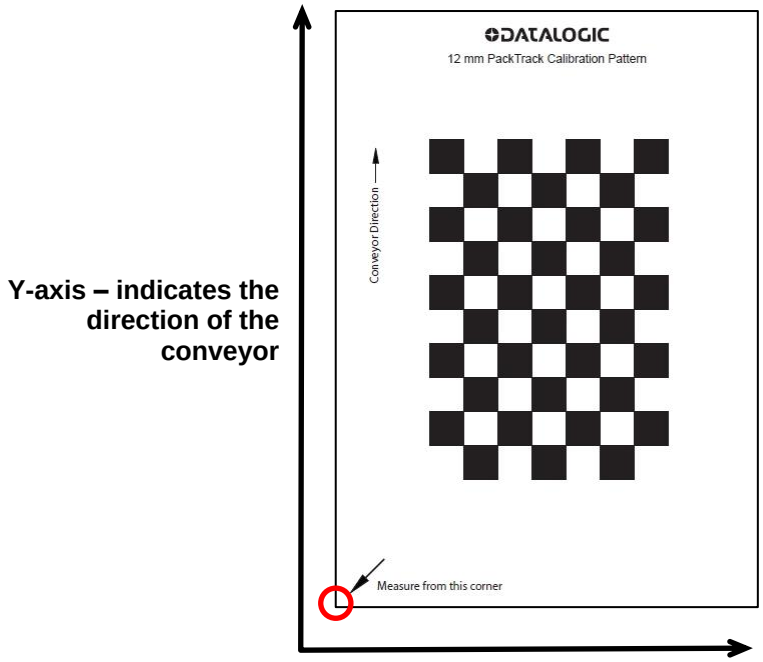
When the pack transits the Tx Line its message is sent to the Host.



1.2 CALIBRATION PATTERN

1.2.1 Top/Bottom Orientation

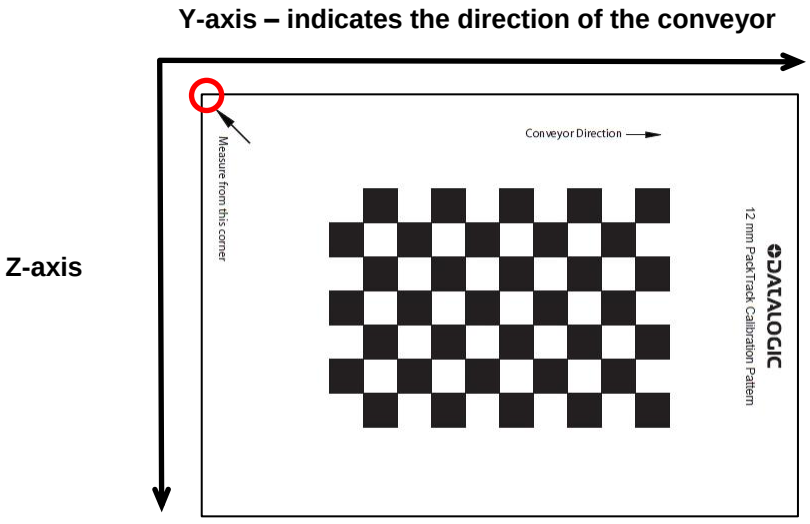
The Calibration Pattern has a precise orientation as shown in the image. The top has 4 black squares and the bottom has 3 black squares.



During the calibration process the user has to input the coordinates measured from the System Reference Point to the **lower left corner of the Calibration Pattern** indicated by the red circle.

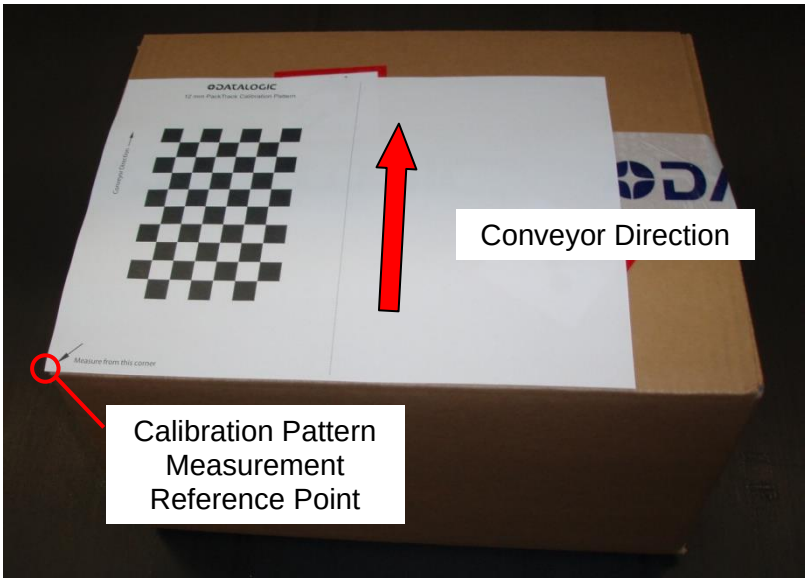
1.2.2 Left/Right Orientation

When calibrating left/right side readers, the Calibration Pattern is aligned to match the Y-axis (rotated 90° or 270°). This means the short side of the pattern is now aligned with the Z-axis.



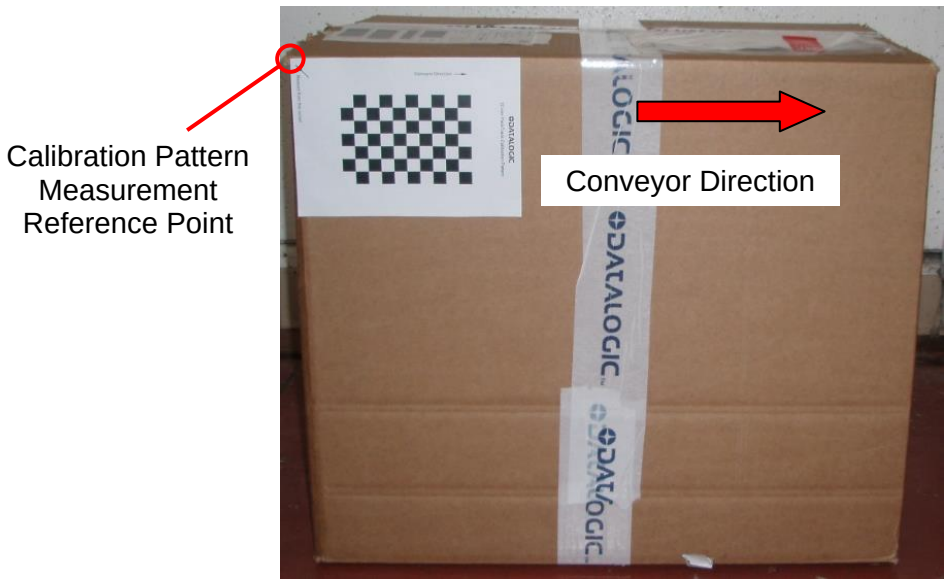
1.2.3 Top/Bottom Calibration Chart Positioning

For Top/Bottom readers, the pattern should be aligned with the lower left corner of the pack as shown below so that measurements can easily be taken from the pack itself. **The Conveyor Direction Arrow must always be aligned with the conveyor direction.**



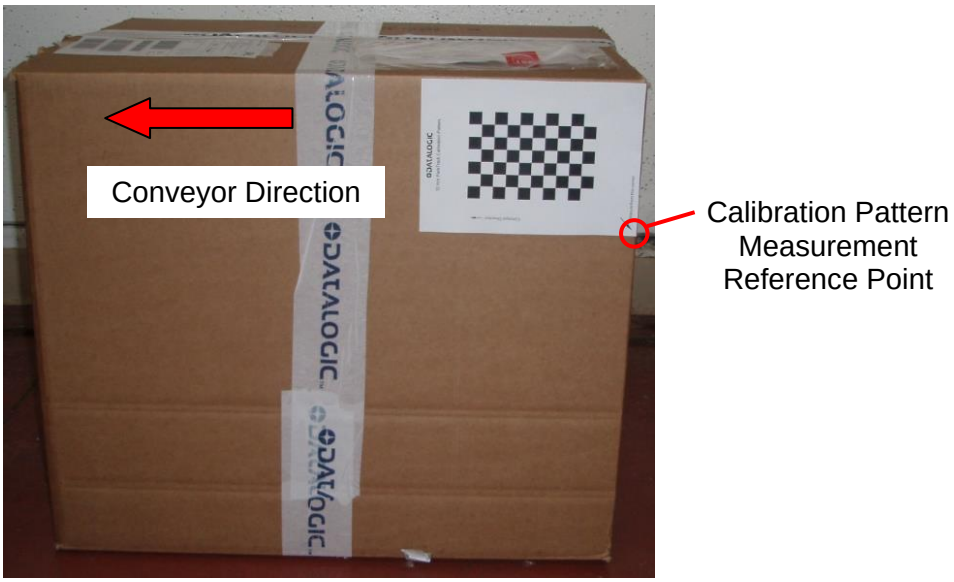
1.2.4 Right Side Calibration Chart Positioning

For Right side readers, the pattern should be placed as shown below so that measurements can easily be taken from the pack itself. **The Conveyor Direction Arrow must always be aligned with the conveyor direction.**



1.2.5 Left Side Calibration Chart Positioning

For Left side readers, the pattern should be placed as shown below so that measurements can easily be taken from the pack itself. **The Conveyor Direction Arrow must always be aligned with the conveyor direction.**



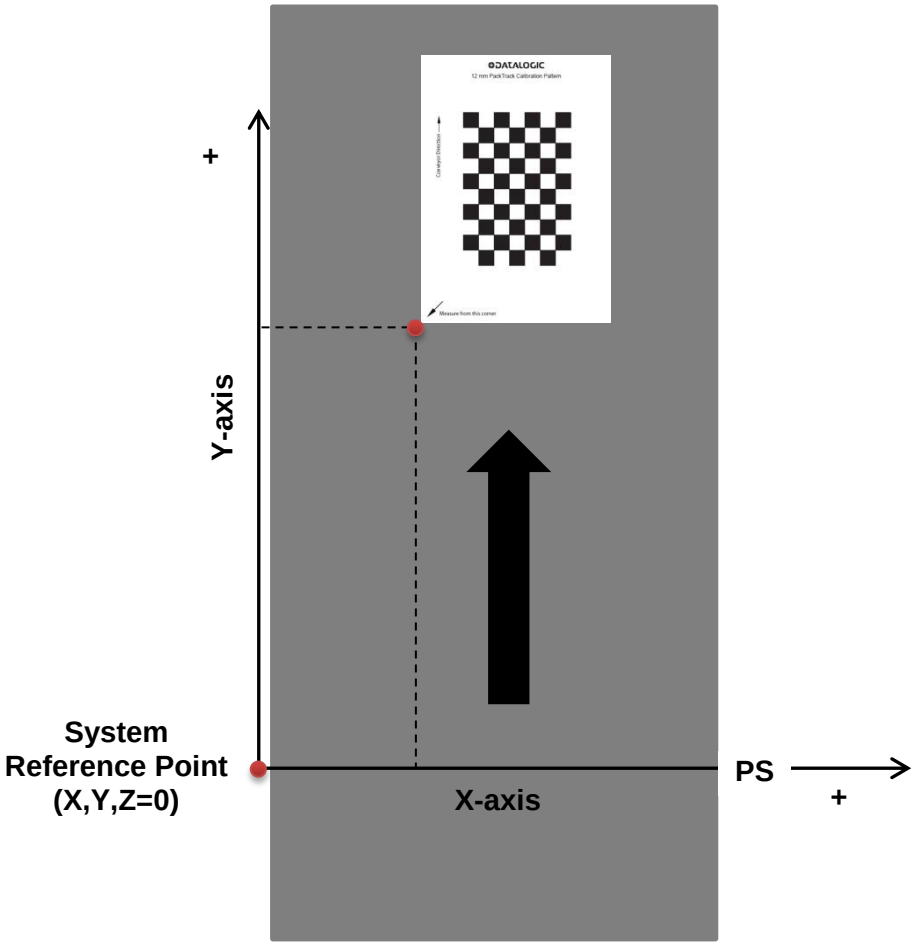
1.3 REFERENCE SYSTEM

The image below shows the coordinate reference system on the conveyor: the origin of the coordinate reference system is the System Reference Point.

The Y-axis runs parallel to the conveyor movement direction. So the Y coordinate of a point is measured as the distance between that point the and the System Reference Point along the conveyor direction.

The X-axis runs perpendicular to the conveyor movement direction. The X coordinate is measured as the distance between the point and the System Reference Point across the conveyor.

The Z-axis runs vertically through the conveyor plane with the positive direction above the conveyor.



2 PACKTRACK SETUP WIZARD

2.1 REQUIREMENTS

The following is a list of required hardware/software that supports PackTrack for Matrix and is necessary for performing the PackTrack Calibration.

- VisiSet™ release: 6.70 or later
- Matrix Standard Application Program Software: 6.55
- Products: Matrix 410™, Matrix 450™
- PackTrack Calibration Pattern

CAUTION: print either the **A4** or **Letter** size pdf file according to the paper size you are using. Printing on the wrong size paper or rescaling the Calibration Pattern will cause PackTrack calibration errors.

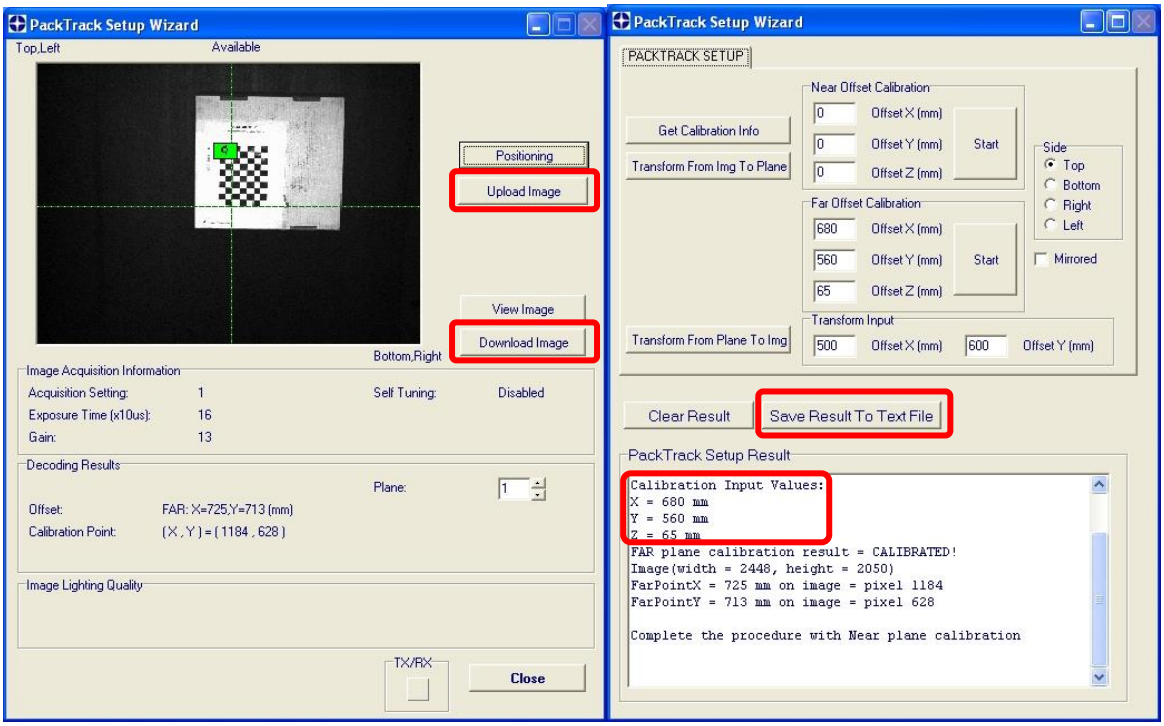
- Tape Measure
- These instructions

2.2 BACKUP AND RESTORE

For all Matrix 410™ and Matrix 450™ readers having sw 6.56 and later, Backup and Restore also saves the PackTrack Calibration parameters in the External Memory. These parameters however are not included in the configuration file saved to PC. Restoring these parameters must be performed from the External Memory.

However, during the PackTrack Calibration through the PackTrack Setup Wizard, the Near and Far images and the Setup Results text file can be saved (Backup) in order to perform an Off-Line Restore procedure at a future date.

In the PackTrack Setup Wizard, by using the **Download Image** and **Save Result To Text File** buttons, the PackTrack Calibration can be saved Off Line.



If it ever becomes necessary, the Near and Far images (previously downloaded) can be uploaded using the **Upload Image** button. By inputting the Near and Far Offset values (from the previously saved Results text file, the Calibration can be restored using the saved images instead of live images. These must be done one-at-a-time as in the following Calibration procedure.

2.3 TOP CALIBRATION USING PACKTRACK SETUP WIZARD

CAUTION: The conveyor must be STOPPED while performing this procedure!

NOTE: Standard Setup including optical Calibration must be completed before performing PackTrack Calibration.

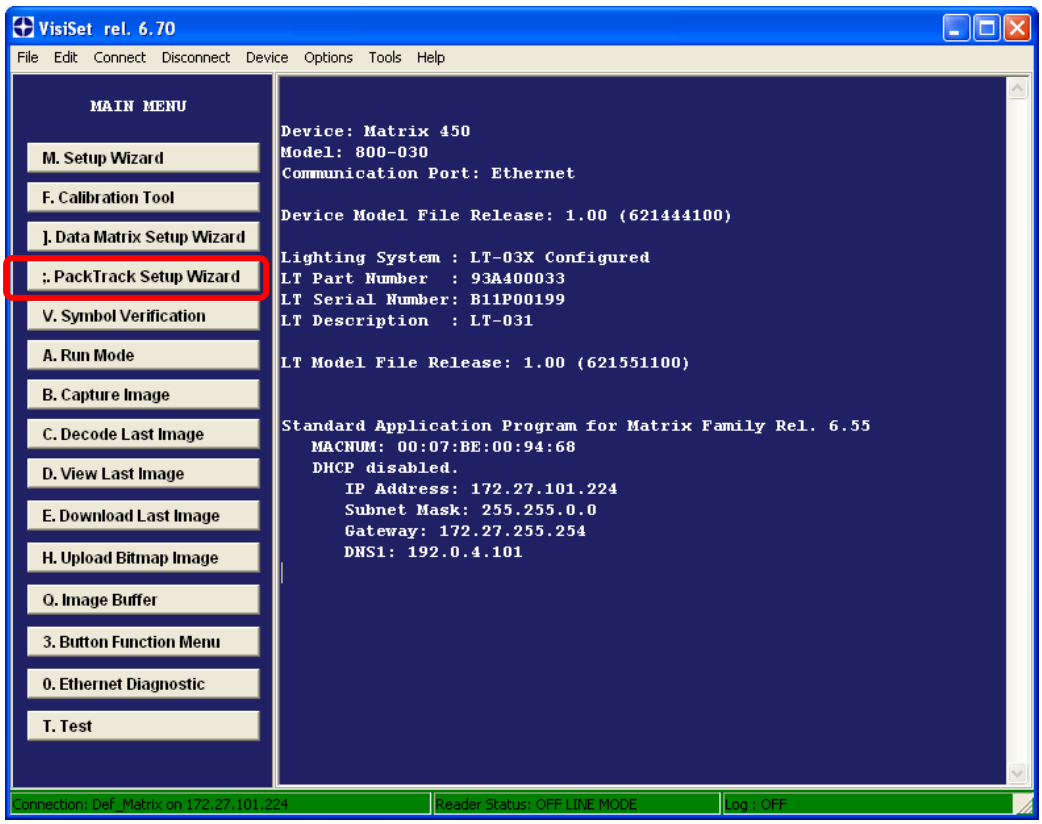
Calibration is performed using the Calibration Pattern positioned on the plane corresponding to the tallest pack, (Near Plane, i.e. closest to the Matrix reader) and on the plane corresponding to the shortest pack, (Far Plane, i.e. farthest from the Matrix reader).

The PackTrack Calibration is completed only after both planes have been calibrated and saved in Flash.

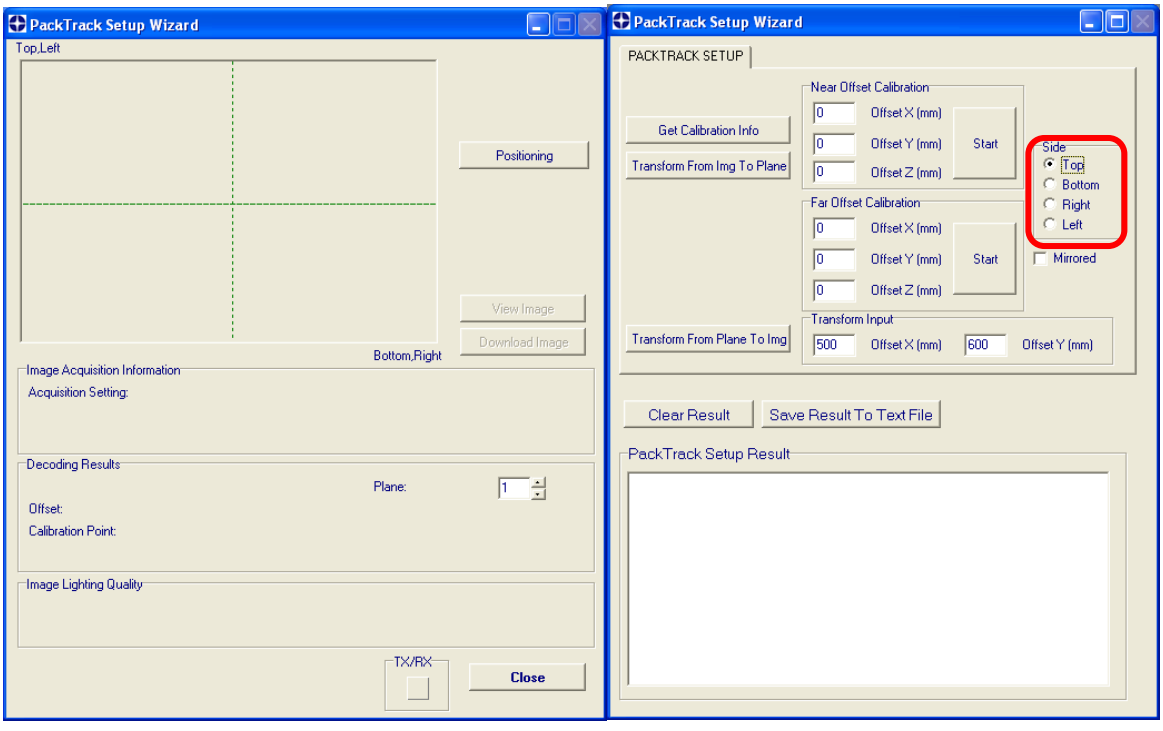
NOTE: Once a completed calibration is performed, it is not possible to perform calibration on a single plane, for example modifying one plane while maintaining the previous parameters of the other plane. The PackTrack Setup Wizard always requires both steps to be completed.

STEP 1 – Run PackTrack™ Setup Wizard:

a) Select the **PackTrack Setup Wizard** button from the VisiSet™ Main Menu.



b) Select the Top side radio button.



STEP 2 – Determine the PackTrack™ System Reference Point:

a) Determine the PackTrack™ System Reference Point, if possible **on the conveyor frame surface**, where the X, Y, Z co-ordinates = (0,0,0). Visibly mark this point on a piece of tape or other surface, so that it can be used to make the measurements necessary for calibration. The Y = 0 value **normally** corresponds to the PS Line position.

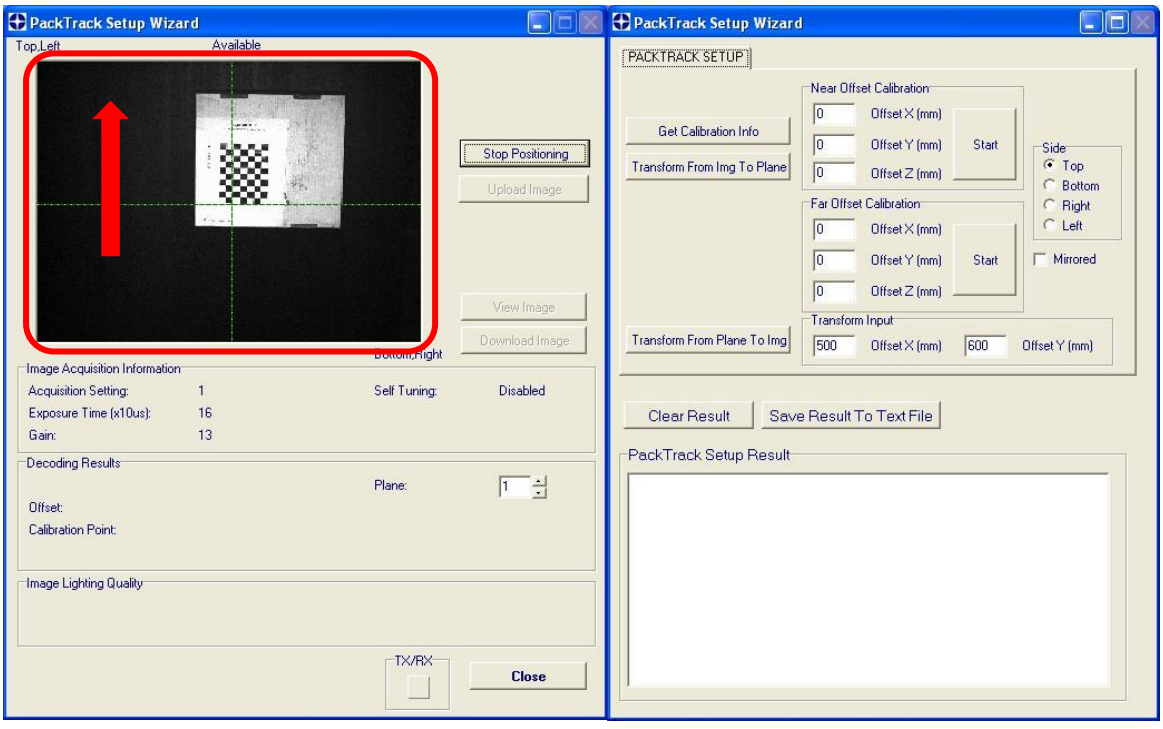
STEP 3 – Far Plane Calibration:

NOTE: Step 3 and Step 4 can be inverted.

a) Press the **Positioning** button. The reader begins to acquire images.

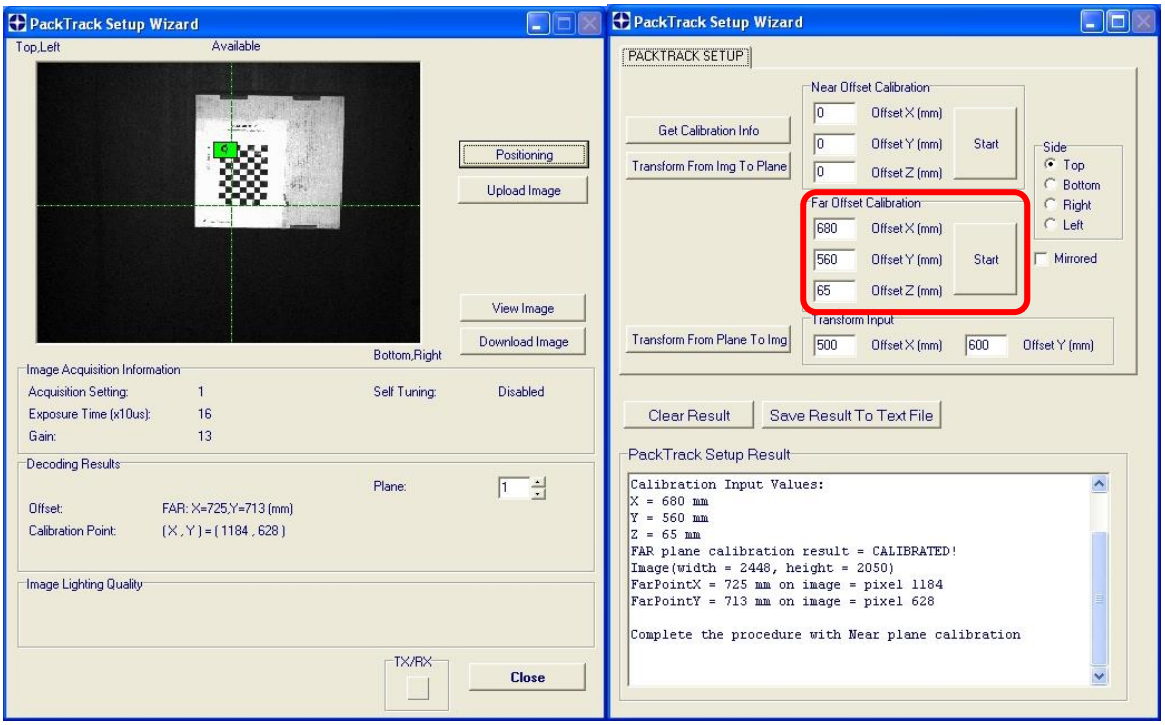
b) Place the Calibration Pattern so that it is completely visible in the VisiSet™ Setup window and it corresponds to the plane representing the shortest pack allowed to pass through the system on the conveyor. This is the Far Plane which can also be on the conveyor surface.

NOTE: the Calibration Pattern must be aligned so that the y-axis is parallel to the conveyor movement direction.



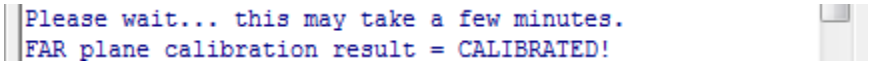
c) Press the **Stop Positioning** button. The reader acquires the last image.

d) Measure the X, Y and Z offsets from the System Reference Point to the lower left corner of the Calibration Pattern and input this data **(mm)** into the Far Offset Calibration boxes.



e) Press the **Start** button for Far Calibration.

f) Wait until the operation finishes.



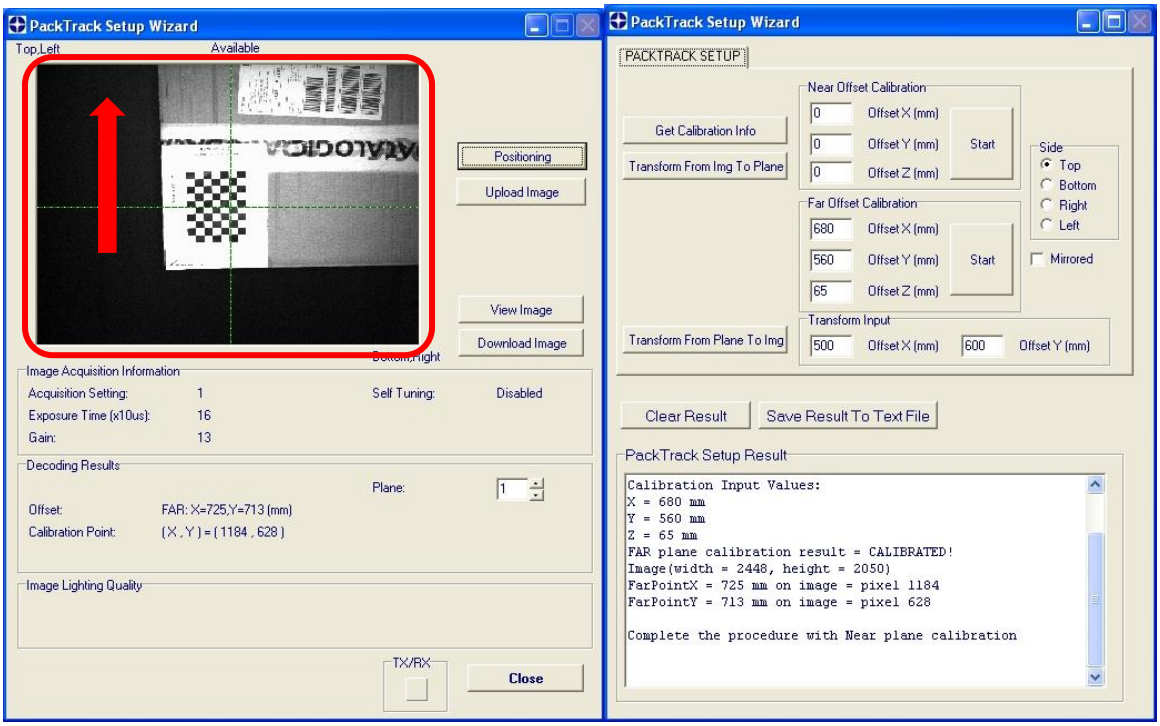
STEP 4 – Near Plane Calibration:

NOTE: Step 3 and Step 4 can be inverted.

a) Press the **Positioning** button. The reader begins to acquire images.

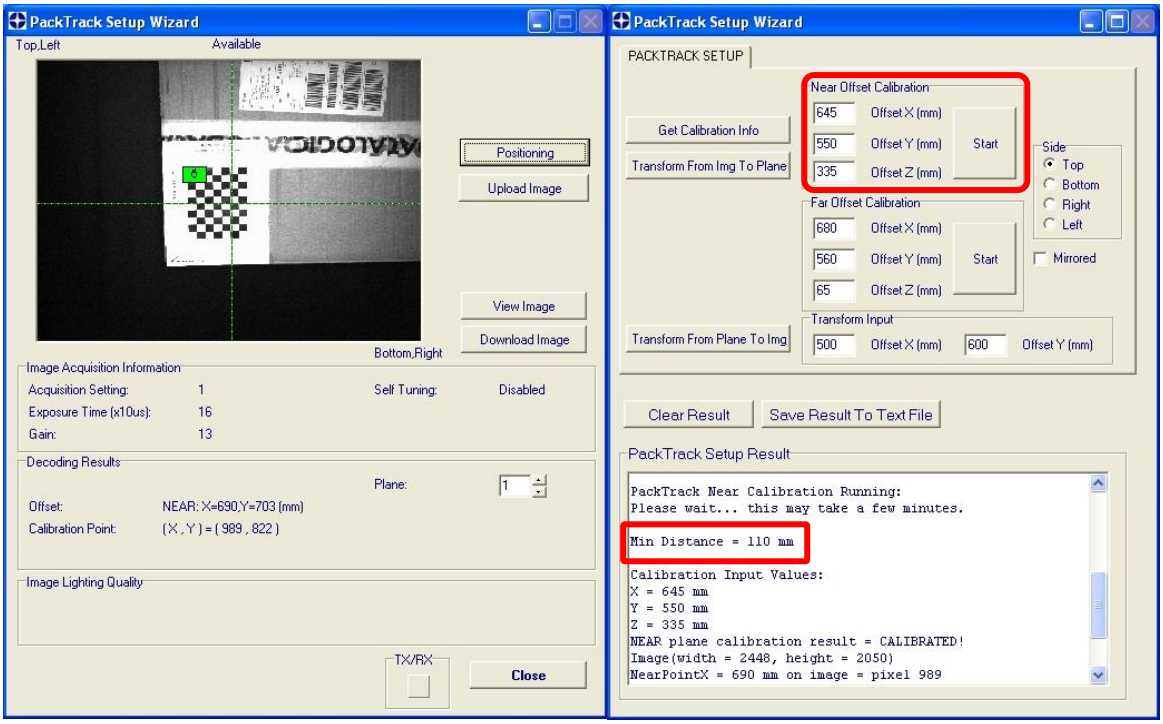
b) Place the Calibration Pattern on a pack so that it is completely visible in the VisiSet™ Setup window and it corresponds to the plane representing the tallest pack allowed to pass through the system on the conveyor. This is the Near Plane.

NOTE: the Calibration Pattern must be aligned so that the y-axis is parallel to the conveyor movement direction.



c) Press the "**Stop Positioning**" button. The reader acquires the last image.

d) Measure the X, Y and Z offsets from the System Reference Point to the lower left corner of the pack (aligned with the Calibration Pattern) and input this data **(mm)** into the Near Offset Calibration boxes.



e) Press the **Start** button for Near Calibration.

f) Wait until the operation finishes.

```
Please wait... this may take a few minutes.
NEAR plane calibration result = CALIBRATED!
```

Possible Error Causes:

- Calibration Pattern is not completely contained in the Field of View.
- Calibration Pattern is partially obscured by objects covering it

In this case (first time calibration), it is possible to repeat the Near Calibration without losing the previously completed Far Calibration.

After performing Calibration on both planes, the software will save the obtained calibration parameters in the reader's Flash memory.

The calibration also advises the minimum distance between packs for which correct code to pack assignment can be guaranteed. See par. 5.1.

At this point PackTrack Calibration has been successfully completed.

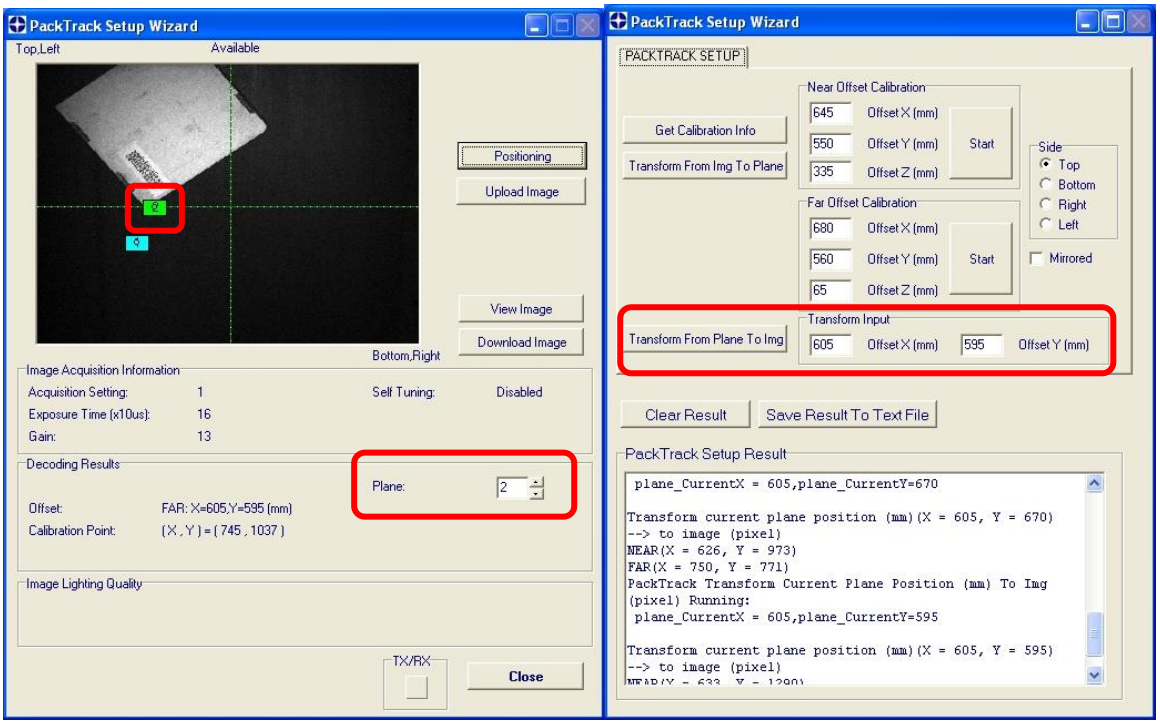
```
PackTrack calibration COMPLETED!
```

STEP 5 – Verify Calibration Results:

a) Place a pack, code or other object onto either the Near or Far plane at a different coordinate from the calibration offset, however it must be visible in the VisiSet™ Setup window.

b) Measure the X and Y offsets from the System Reference Point and input this data **(mm)** into the Transform Input boxes.

c) Press the **Transform From Plane To Img** button.



d) You will now see a green and blue marker representing the measurement points on the Near and Far planes. Select the **Plane** you used to take the measurements (1=Near, 2=Far) and Verify that the green marker in the VisiSet Setup window is positioned on the object edge where the measurement was taken.

2.4 LEFT CALIBRATION USING PACKTRACK SETUP WIZARD

CAUTION: The conveyor must be STOPPED while performing this procedure!

NOTE: Standard Setup including optical Calibration must be completed before performing PackTrack Calibration.

Calibration is performed using the Calibration Pattern positioned on the plane corresponding to the Near Plane, (i.e. closest to the Matrix reader) and on the plane corresponding to the Far Plane, (i.e. farthest from the Matrix reader).

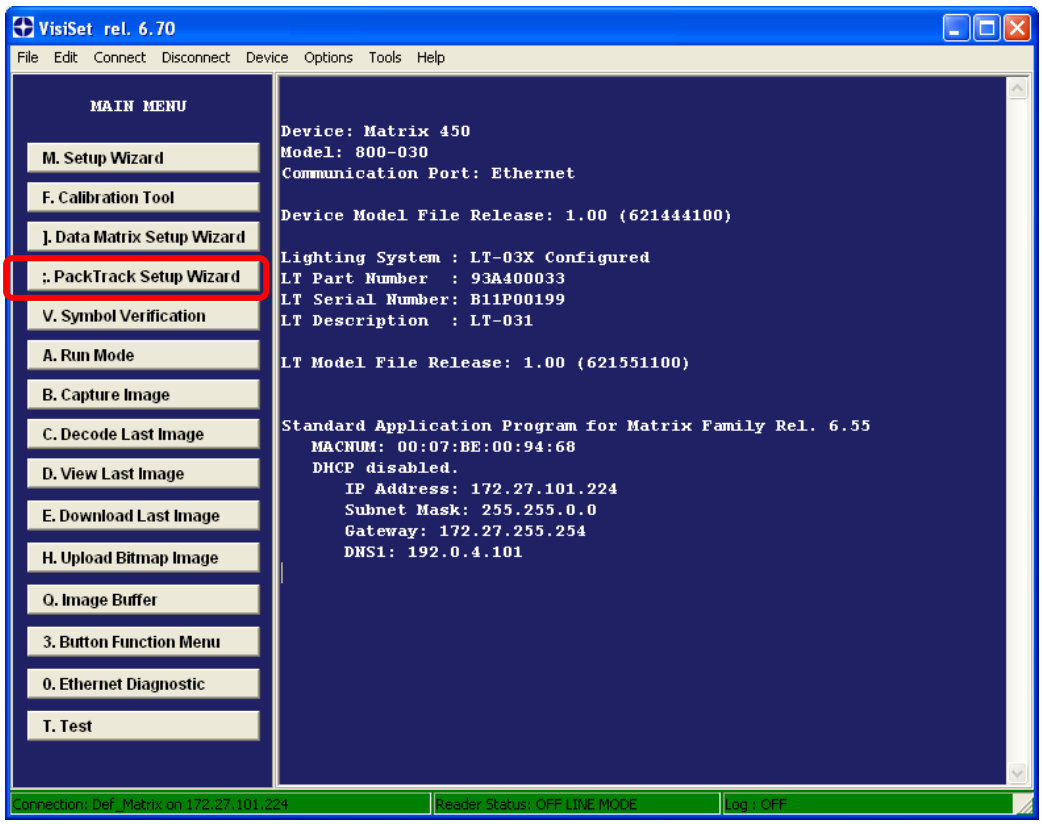
The PackTrack Calibration is completed only after both planes have been calibrated and saved in Flash.

NOTE: Once a completed calibration is performed, it is not possible to perform calibration on a single plane, for example modifying one plane while maintaining the previous parameters of the other plane. The PackTrack Setup Wizard always requires both steps to be completed.

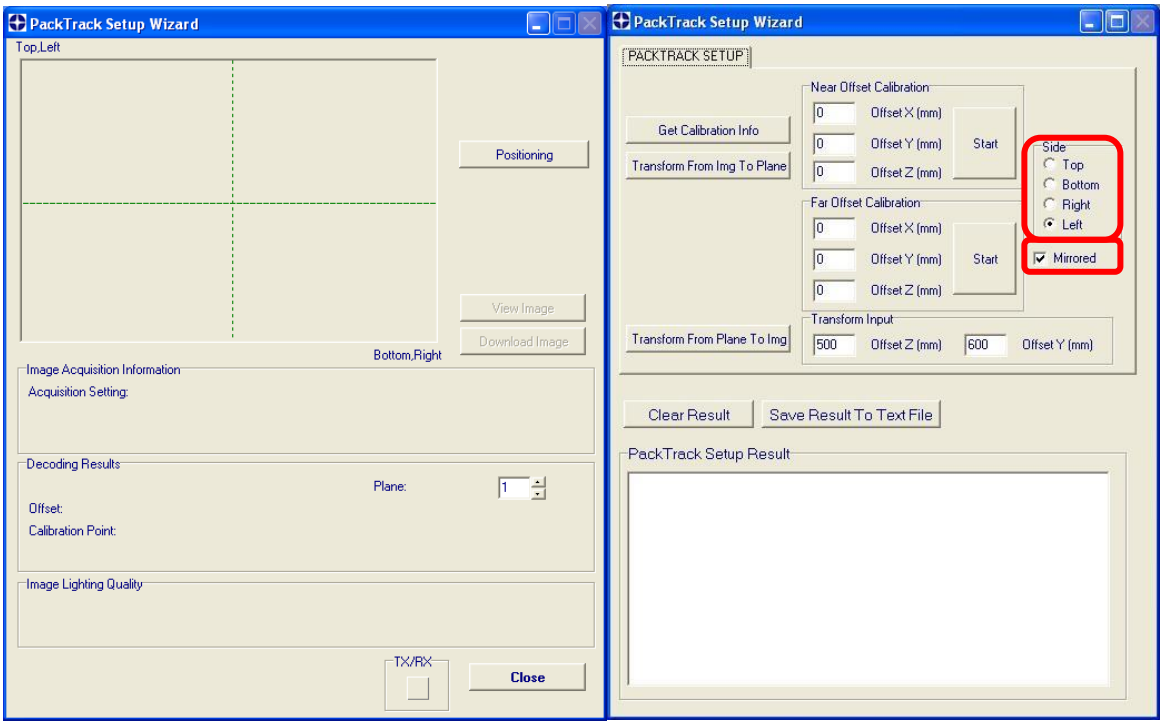
The following calibration procedure is performed on a Left side reader with mirror. The order of the Near Plane / Far Plane Calibration is switched to show that the calibration does not depend on this order.

STEP 1 – Run PackTrack™ Setup Wizard:

a) Select the **PackTrack Setup Wizard** button from the VisiSet™ Main Menu.



b) Select Left from the radio button. If using an external mirror for the side application, also check Mirrored.



STEP 2 – Determine the PackTrack™ System Reference Point:

a) Determine the PackTrack™ System Reference Point, if possible **on the conveyor frame surface**, where the X, Y, Z co-ordinates = (0,0,0). Visibly mark this point on a piece of tape or other surface, so that it can be used to make the measurements necessary for calibration. The Y = 0 value **normally** corresponds to the PS Line position.

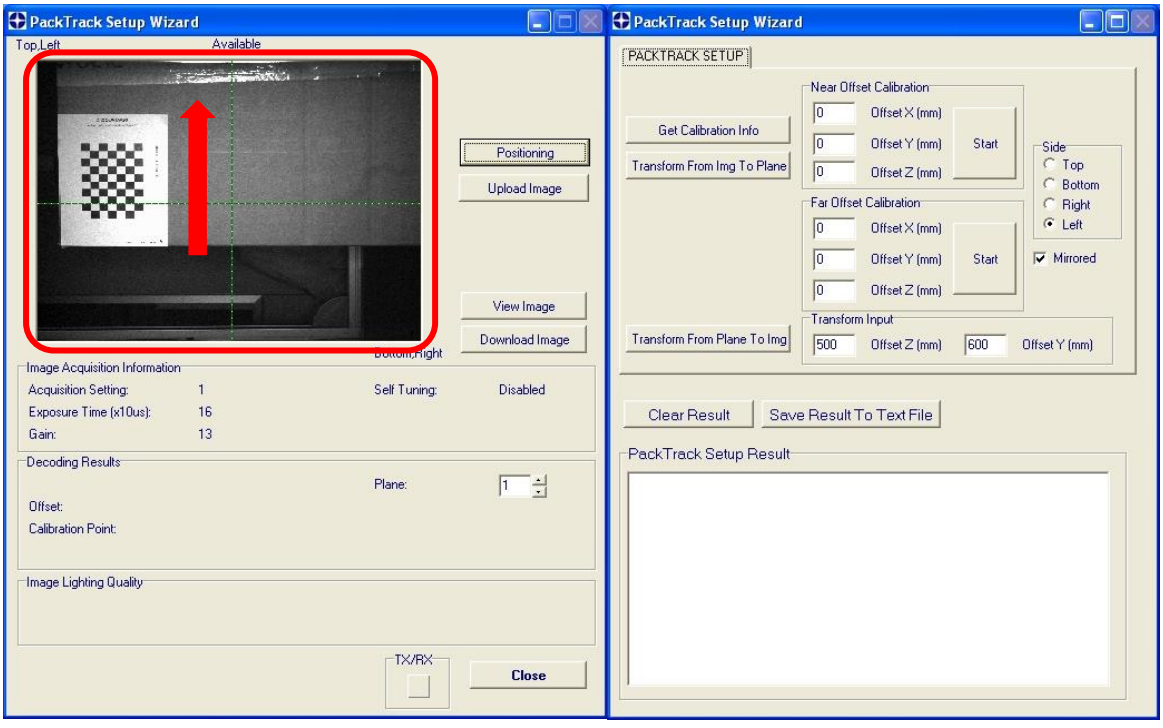
STEP 3 – Near Plane Calibration:

NOTE: Step 3 and Step 4 can be inverted.

a) Press the **Positioning** button. The reader begins to acquire images.

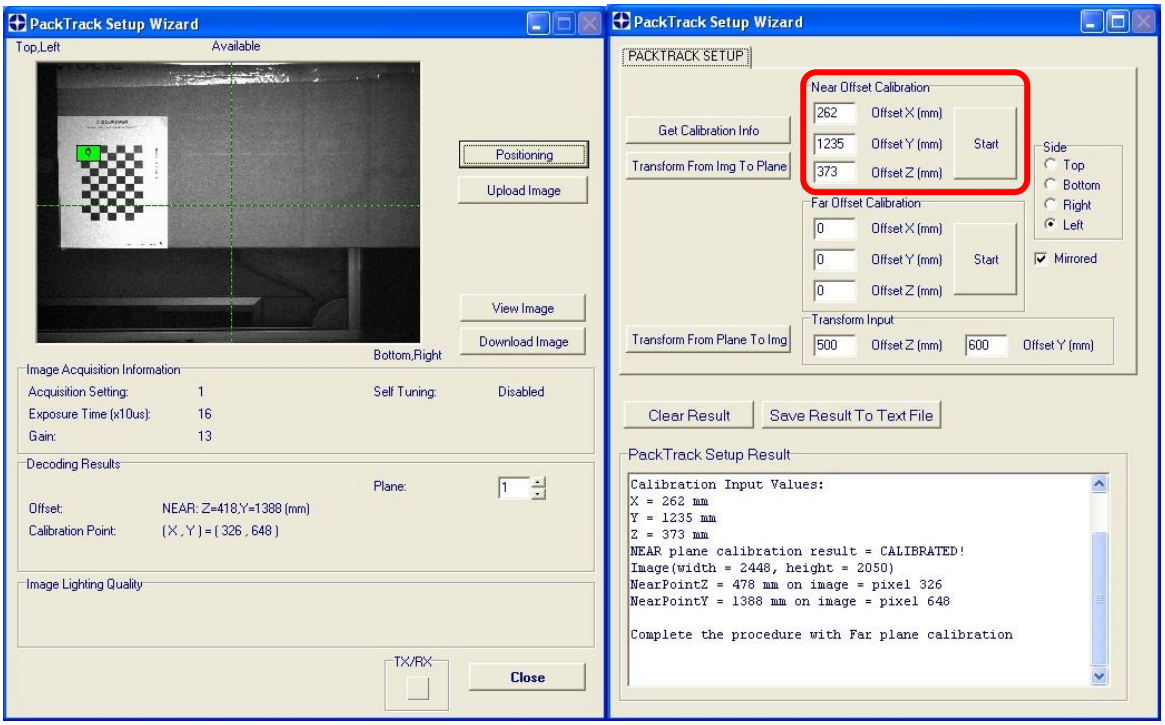
b) Place the Calibration Pattern (attached to the pack with tape) so that it is completely visible in the VisiSet™ Setup window and it corresponds to the plane representing the nearest pack allowed to pass through the system on the conveyor (extreme left side). This is the Near Plane.

NOTE: the Calibration Pattern must be aligned so that the y-axis is parallel to the conveyor movement direction.



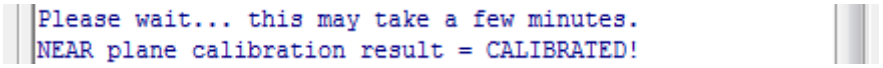
c) Press the **Stop Positioning** button. The reader acquires the last image.

d) Measure the X, Y and Z offsets from the System Reference Point to the Calibration Pattern Measurement Point and input this data **(mm)** into the Near Offset Calibration boxes.



e) Press the **Start** button for Near Calibration.

f) Wait until the operation finishes.



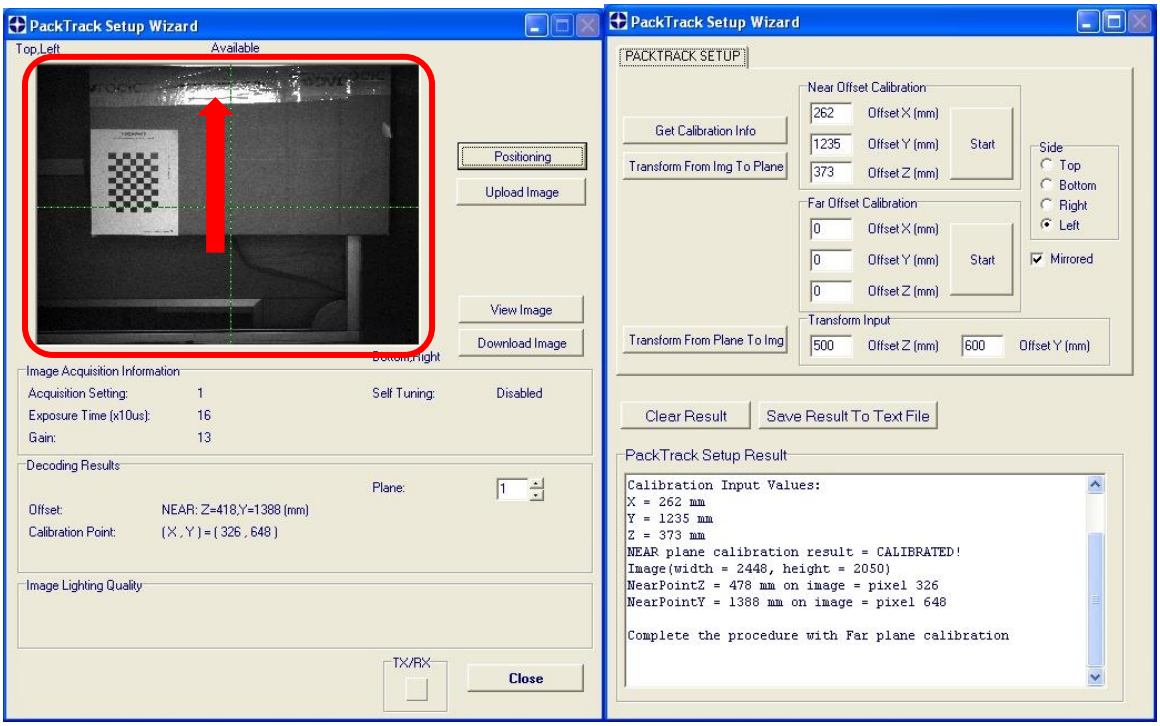
STEP 4 – Far Plane Calibration:

NOTE: Step 3 and Step 4 can be inverted.

a) Press the **Positioning** button. The reader begins to acquire images.

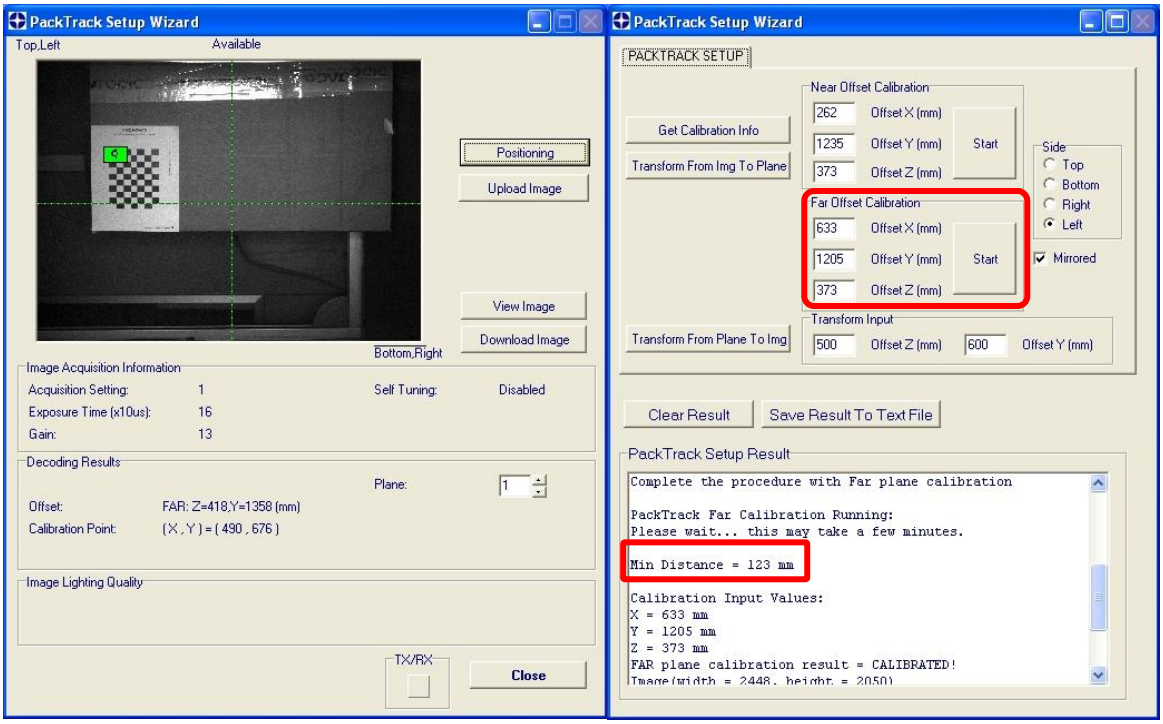
b) Place the Calibration Pattern on a pack so that it is completely visible in the VisiSet™ Setup window and it corresponds to the plane representing the farthest pack allowed to pass through the system on the conveyor (extreme right side). This is the Far Plane.

NOTE: the Calibration Pattern must be aligned so that the y-axis is parallel to the conveyor movement direction.



c) Press the "**Stop Positioning**" button. The reader acquires the last image.

d) Measure the X, Y and Z offsets from the System Reference Point to the Calibration Pattern Measurement Point and input this data **(mm)** into the Far Offset Calibration boxes.



e) Press the **Start** button for Far Calibration.

f) Wait until the operation finishes.

```
Please wait... this may take a few minutes.
FAR plane calibration result = CALIBRATED!
```

Possible Error Causes:

- Calibration Pattern is not completely contained in the Field of View.
- Calibration Pattern is partially obscured by objects covering it

In this case (first time calibration), it is possible to repeat the Near Calibration without losing the previously completed Far Calibration.

After performing Calibration on both planes, the software will save the obtained calibration parameters in the reader's Flash memory.

The calibration also advises the minimum distance between packs for which correct code to pack assignment can be guaranteed. See par. 5.1.

At this point PackTrack Calibration has been successfully completed.

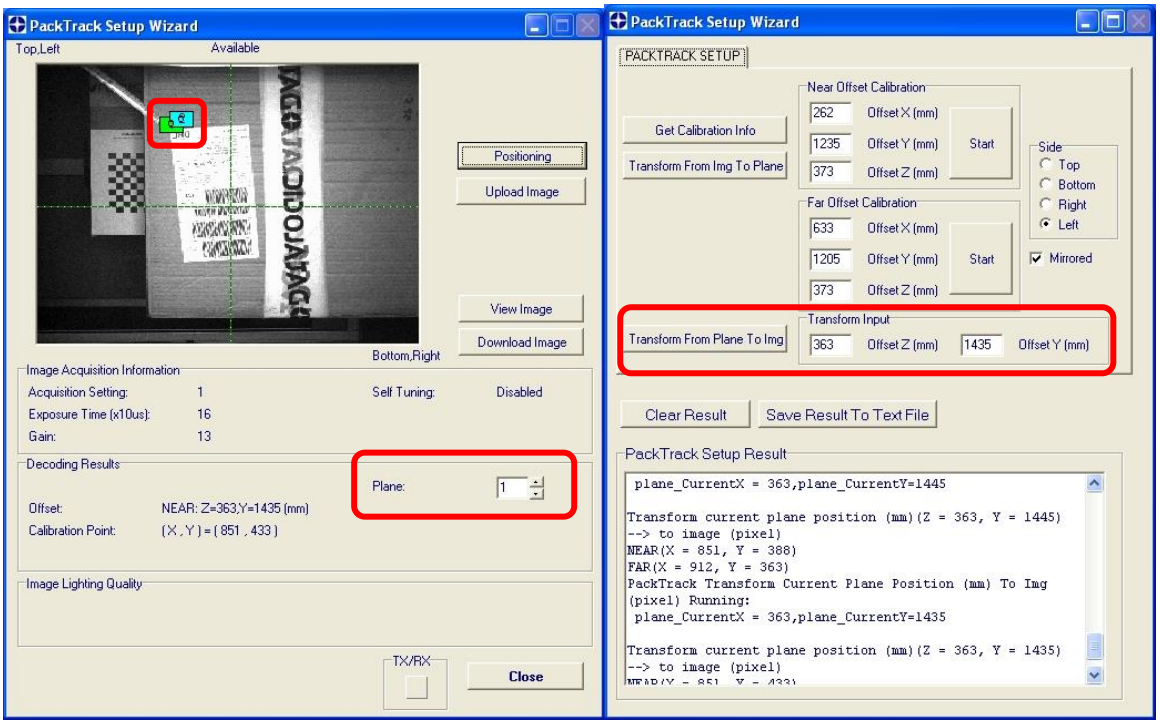
```
PackTrack calibration COMPLETED!
```

STEP 5 – Verify Calibration Results:

a) Place a pack, code or other object onto either the Near or Far plane at a different coordinate from the calibration offset, however it must be visible in the VisiSet™ Setup window.

b) Measure the Z and Y offsets from the System Reference Point and input this data **(mm)** into the Transform Input boxes.

c) Press the **Transform From Plane To Img** button.



d) You will now see a green and blue marker representing the measurement points on the Near and Far planes. Select the **Plane** you used to take the measurements (1=Near, 2=Far) and Verify that the green marker in the VisiSet Setup window is positioned on the object edge where the measurement was taken.

3 PACKTRACK PARAMETERS

The following parameters are used to define the PackTrack Operating Mode for your application. These parameters are also documented in the reader's Help On Line.

3.1 OPERATING MODE

Acquisition Trigger

Sets the trigger event(s) that cause Matrix 410™ to acquire an image. The possible options are:

- *Continuous* allows acquiring images continuously with a rate up to the maximum allowable frame rate per second for the given sensor depending on the decoding time.
- *Periodic* allows a continuous acquisition of images with the defined frequency. This allows reducing the acquisition rate (i.e. aligning it with the conveyor speed) to improve memory management for certain applications.

Acquisition Trigger Period (ms)

In PackTrack Mode, when the Acquisition Trigger is Periodic, this parameter sets the cycle time (period) for acquiring a new image.

Energy Saving

This parameter is valid when the Internal Lighting Mode (or LT-03x Lighting Mode) is *Continuous High Power* and the Operating Mode is *PackTrack* or *Phase Mode*.

For *PackTrack Mode*, when disabled, (default), the Lighting System will remain on at all times (in *Continuous High-Power Mode*) - independent of whether there are packs in the Tracking Area or not.
When enabled, the Lighting System will remain on (in *Continuous High-Power Mode*) only when packs are present in the Tracking Area. Under this condition the advantages are less power consumption and heat reduction.

3.2 PACKTRACK SETTING

The PackTrack Setting parameters allow managing the PackTrack Operating Mode. This Operating Mode is valid for stand-alone readers or Master/Slave SYNCHRONIZED multi-reader applications. For Master/Slave configurations, these parameters must be set for each individual reader, and must be identical, except for Lighting Delay (if necessary).

Lighting Delay

This parameter allows de-synchronizing image illumination so that (if necessary) the illuminators of different readers in a Master/Slave configuration don't blind one another by illuminating at the same time. All the reader's can be set so that crossing illuminator lobes never acquire simultaneously. When a reader is not supposed to acquire, its electronic shutter is closed and it is completely "blind". In this way even if illumination of one reader crosses another reader's field of view, it does not disturb the acquisition.

The Master normally has its Lighting Delay value set to 0. Individual slaves, usually only those who have crossing illuminator lobes, can be delayed by up to 10,000 ms in 100 μs increments.

Physical Encoder

It enables the encoder which is physically connected to the input selected in the Encoder Reference Signal parameter. For correct functioning, define the Encoder Step parameter (hundredths of a millimeter). The maximum allowable Encoder frequency is 2.2 kHz.

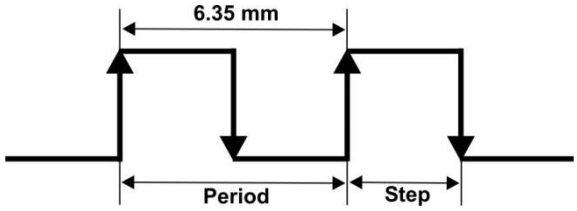
If disabled, the conveyor speed is supposed to be constant. Thus, it is only required to define the *Conveyor Speed* parameter.

Encoder Step

It defines the distance (in hundredths of a millimeter) of a single step of the encoder.
Depending on the *Encoder Reference Signal*, the Encoder Step signal refers either to the encoder single period (if only Leading **or** Trailing Edge is enabled), or to half the encoder period (if Leading **and** Trailing Edges are both enabled, each front is used). In this case the Single period value must be divided by two (see example).

Example:

Encoder circumference = 305 mm
Periods per Revolution (PPR) = 48
Single period is 305/48 = 6.35 mm



- If *Encoder Reference Signal* = Leading **or** Trailing edge (single);
  Encoder Step is 6.35 mm (**635**)
- If *Encoder Reference Signal* = Leading **and** Trailing edges (both);
  Encoder Step is 6.35 /2 = 3.175 mm (**318**)

Encoder Reference Signal

Selects which Input and which edge(s) are used for the encoder signal. Typically Input 2 is used as the encoder input. If only one edge is used as the reference signal the Encoder Step parameter refers to the pulse period. If instead both edges are selected, then the Encoder Step parameter refers to half the pulse period. See *Encoder Step*.

NOTE: Both inputs (Ext. Trig. and Input 2), are exclusive (only one or the other). It is not possible to select Ext. Trig. input, if already used for the PS Line.

Max Conveyor Speed (mm/sec)

This parameter indicates the maximum conveyor speed of the application. The possible values are from 500 to 4000 mm/s. The default setting is 2500.

It compares its value with the *Encoder Step* value and automatically **forces** the relative encoder input *Debouncing Filter* parameter to the maximum allowable value. See *Debouncing Filter*.

NOTE: PackTrack™ supports conveyor speeds between 400 mm/s and 2500 mm/s including start/stop applications. For values outside this range, consult your Datalogic Technical Service Representative.

Conveyor Speed

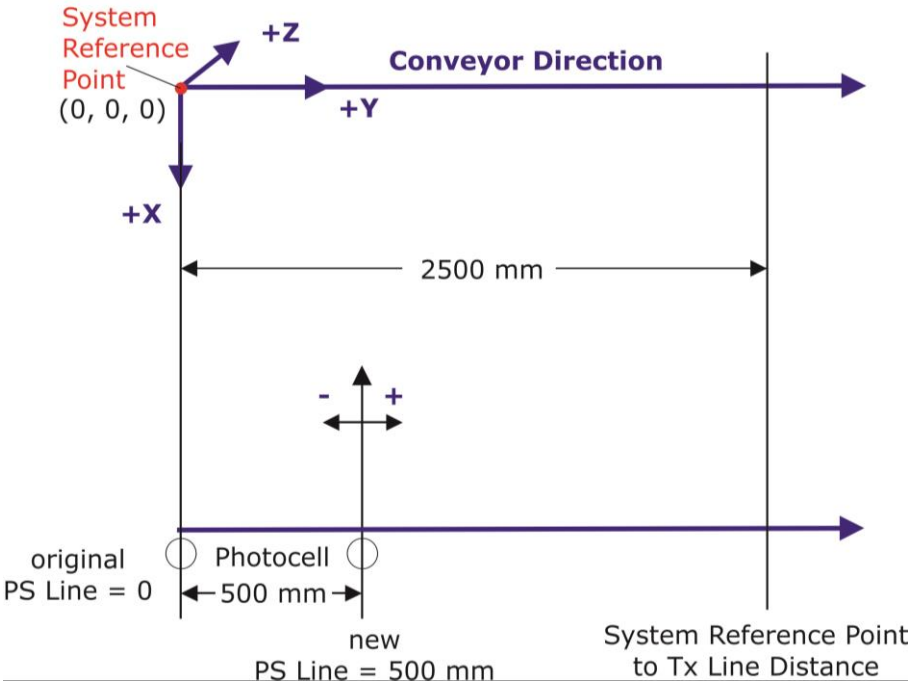
This parameter is available only when the Physical Encoder is disabled. It defines the constant speed of the conveyor in mm/sec.

PS Line

This parameter defines where the read signal Y coordinate (mm) is, in reference to the origin of coordinates used for PackTrack™ configuration (System Reference Point).

Normally the PS Line coincides with the PackTrack™ System Reference Point where X, Y, Z = 0.

If the presence sensor (external trigger) is moved, you must set the PS Line accordingly (see the figure below). This however has no effect on the PackTrack™ System Reference Point to Tx Line Distance.



PS Line Direction

When the PS Line value is different from 0, this parameter defines whether the PS Line coordinate is before (negative) or after (positive) the System Reference Point with respect to the conveyor direction. When the presence sensor is aligned to the System Reference Point (=0) the PS Line Direction is indifferent.

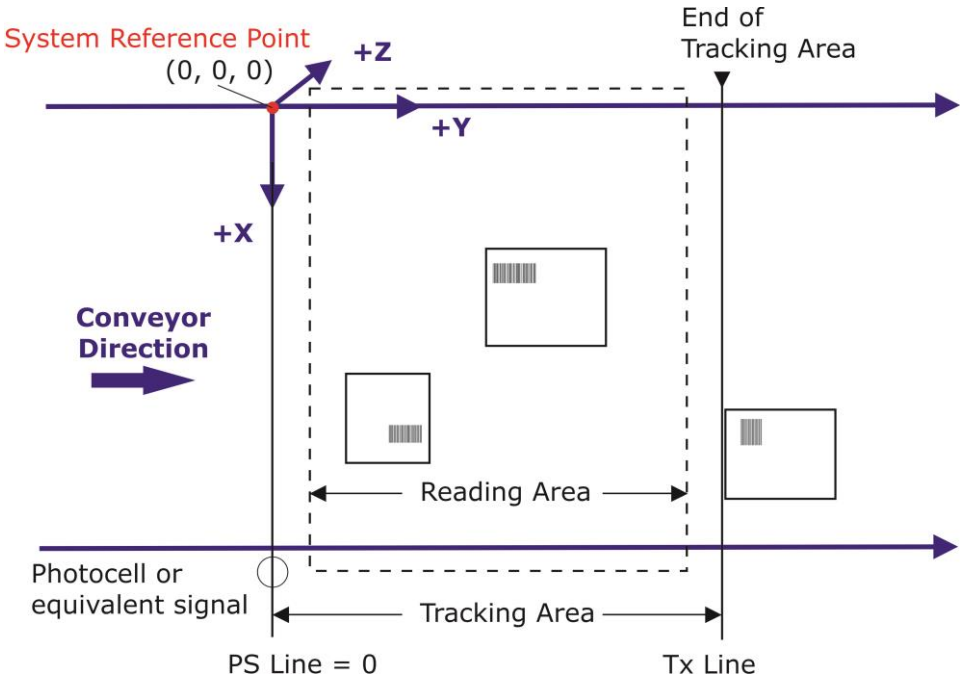
Presence Sensor Input

It defines the input to be used for the presence sensor. You can manage the level of the input signal from the ***Digital I/O*** *Active State* parameter.

NOTE: Both inputs (Ext. Trig. and Input 2), are exclusive (only one or the other). It is not possible to select Input 2, if already used for the Physical Encoder.

Tx Line Distance

It defines the distance (mm) between the System Reference Point (X, Y, Z = 0) and TX line, which determines the tracking area.



Transmission Edge

This parameter is used by the reader as reference for data transmission.
A pack exits the Tracking Area either when its *Leading* edge reaches the Tx Line, or its *Trailing* edge leaves the Tx Line.

Selection:	**Trailing**	pack exits when its end leaves the Tx Line
	Leading	pack exits when its beginning reaches the Tx Line

Max Number of Packs

It defines the maximum number (>2) of packs that can be managed within the reading area.

Minimum Distance Between Packs

It defines the minimum distance (mm) between consecutive packs. The possible values are from 0 to 3000 mm.
The default setting is 0 which means ignore any minimum distance error (all data is transmitted).
It is advised to use the value indicated in the PackTrack Setup Result during the PackTrack Setup Wizard calibration procedure. This value can be retrieved by running the PackTrack Setup Wizard and clicking the Get Calibration Info button.

In general, the smaller the distance between Far Plane (minimum height pack) and Near Plane (maximum height pack) which is application DOF, the closer the packs can be placed together.

Minimum Distance Error Behaviour

It defines the reader behaviour in case of a Minimum Distance Between Packs error:

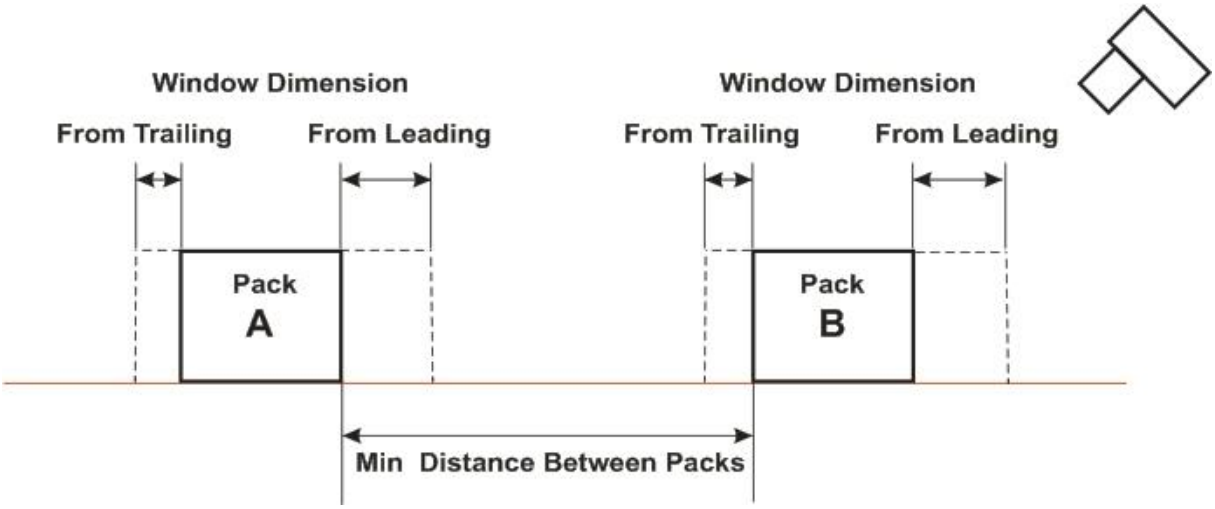
Selection:	**Compose**	composes the read packs and transmits all data in a single message
	Discard Last	discards the last received pack

Minimum Pack Length

It defines the minimum length of a pack (mm). The possible values are from 0 to 5000 mm. The default setting is 0 which means ignore any minimum pack length error (all data is transmitted).

Window

The measurement of a barcode position in absolute coordinates performed by the readers may be affected by a small error. PackTrack™ evaluation can fail in assigning the barcode for this reason. With the Window parameter, the Y coordinates that delimit the pack can be virtually extended to improve the assigning success rate (see the following figure). The Window is defined as the Window Dimension from Trailing + Pack Dimensions + Window Dimension from Leading.



The sum of the Leading and Trailing Window dimensions **should be minimized** (less than the minimum distance between two consecutive packs) to correct small errors in pack assignment. The code will be assigned within the Window.

If the sum of the Leading and Trailing Window dimensions is **more** than the minimum distance between two consecutive packs, (therefore an overlapping error), a warning message appears and the window is set to the maximum value (Leading + Trailing = Minimum Distance Between Packs). The code will be assigned within the Window of the closest pack, however this can also produce assignment errors for particular applications.

Window Dimension From Leading (mm)

Specify a value between 0 and 250 mm to extend the leading edge of all packages. Normally this parameter is set equal to the trailing value so that the window extends the pack equally in both directions. In some cases, (i.e. low DOF) the extension is only necessary in one direction and therefore it can be different from the trailing edge value.

Window Dimension From Trailing (mm)

Specify a value between 0 and 250 mm to extend the trailing edge of all packages. Normally this parameter is set equal to the leading value so that the window extends the pack equally in both directions. In some cases, (i.e. low DOF) the extension is only necessary in one direction and therefore it can be different from the leading edge value.

Debug Message Tx

This parameter should not be used in normal conditions, but only when errors or problems occur during the system functioning in order to troubleshoot the PackTrack operating mode. Runtime logging will degrade the overall performance therefore after installation/commissioning it is strongly recommended to disable Debug Message Tx.

It selects the interface used to send debug information messages. The interface should be different from the output data interface or output data transmission should be disabled on the logging interface.

If disabled, no logging messages are sent.

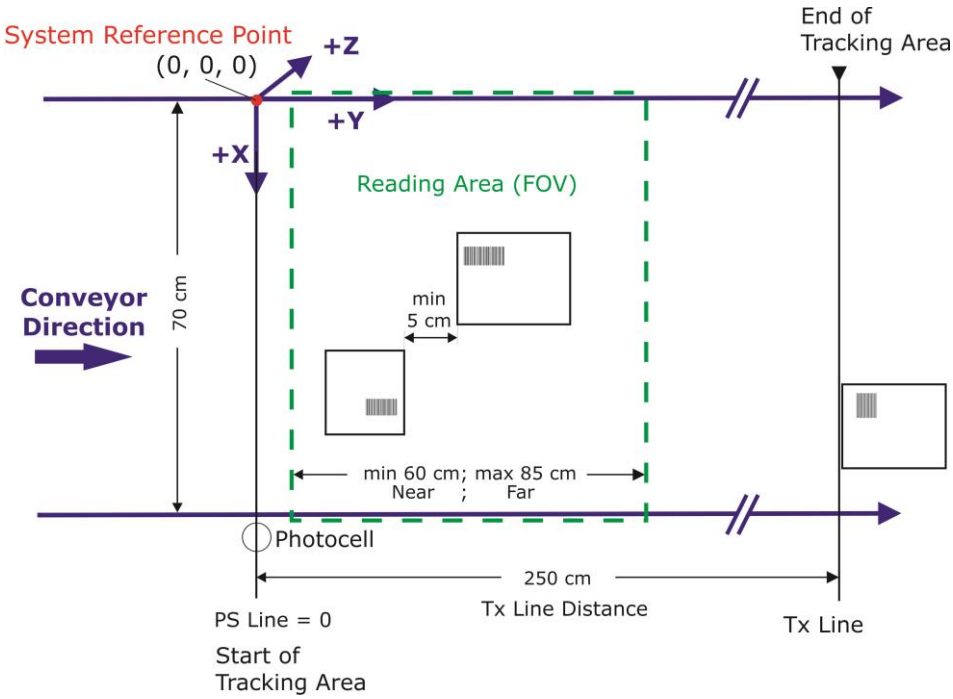
4 APPLICATION EXAMPLE

The following is an example application to show the PackTrack™ parameter settings.

A Matrix 450™ + LNS-1225 reads 1D codes at a Reading Distance between 200 and 285 cm over a 70 cm wide conveyor whose max speed is 1.8 m/s. Physical Encoder circumference = 300 mm; PPR = 48.

Near Plane: FOV_H@200 cm = 71.3 cm; FOV_V@200 cm = 60 cm

Far Plane: FOV_H@285 cm = 101 cm; FOV_V@285 cm = 85 cm



Parameter Settings:

Operating Modes

PACKTRACK SETTING
Physical Encoder: *Enabled*
Encoder Step (hundredths of mm):*625*
Encoder Reference Signal:*Input 2 Leading Edge*
Max Conveyor Speed (mm/sec): *1800*
Presence Sensor Input: *Ext. Trig.*
PS Line: *0*
Max Number of Packs: *5*
Minimum Distance Between Packs (mm): *50*
Minimum Pack Length (mm): *100*
Tx Line Distance (mm): *2500*
Transmission Edge: *Trailing*

Digital I/O

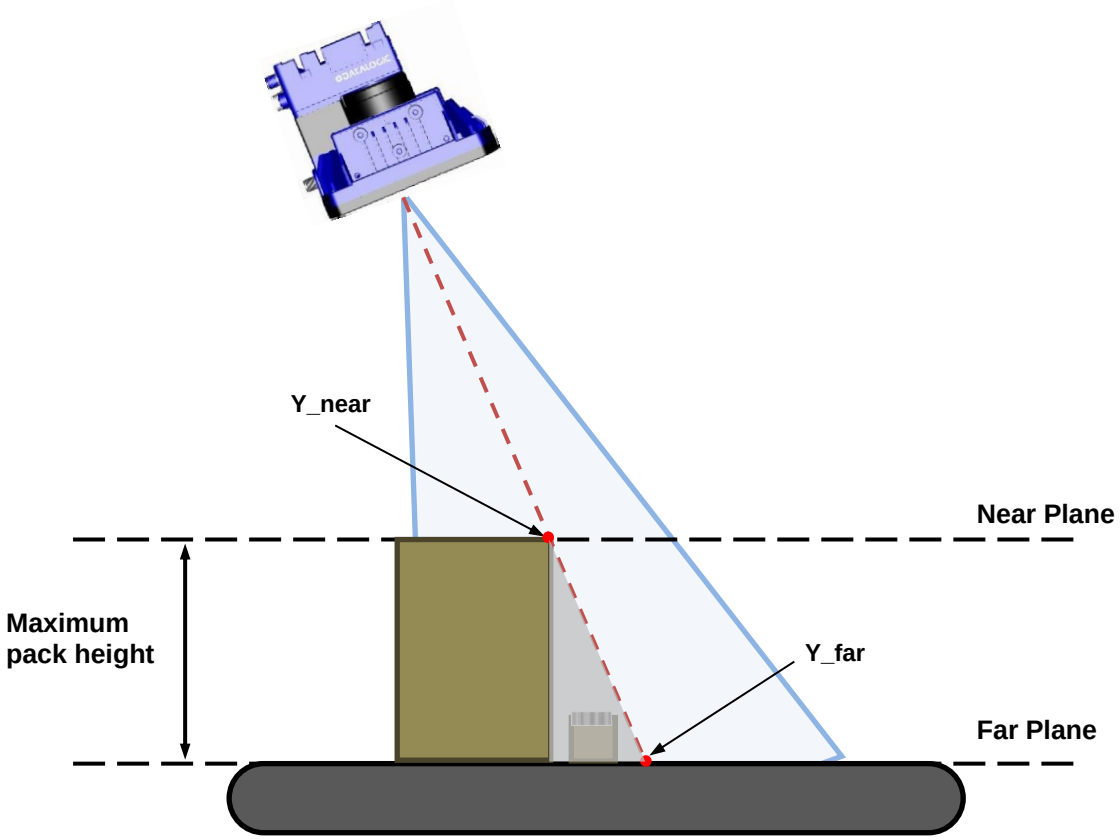
INPUT 2
Active State: *Closed*

5 CALIBRATION DETAILS

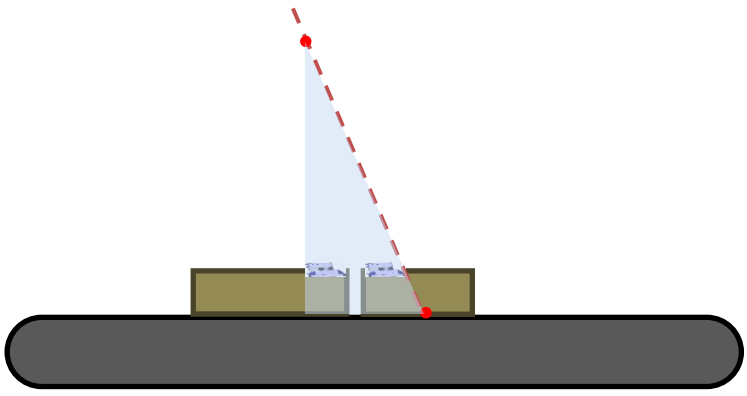
When the device calibrates the Near or Far plane, it uses the chessboard pattern to compute and transform points from one coordinate system to another: in this case, from the Image plane coordinate system to the Near or Far plane coordinate system.

5.1 MINIMUM DISTANCE BETWEEN PACKS

The minimum distance between packs must be correctly assigned. If this distance is set too short for the application, conditions can exist where codes may not be seen by the reader or assignment errors can occur. The following figures show these scenarios.



code not seen by reader

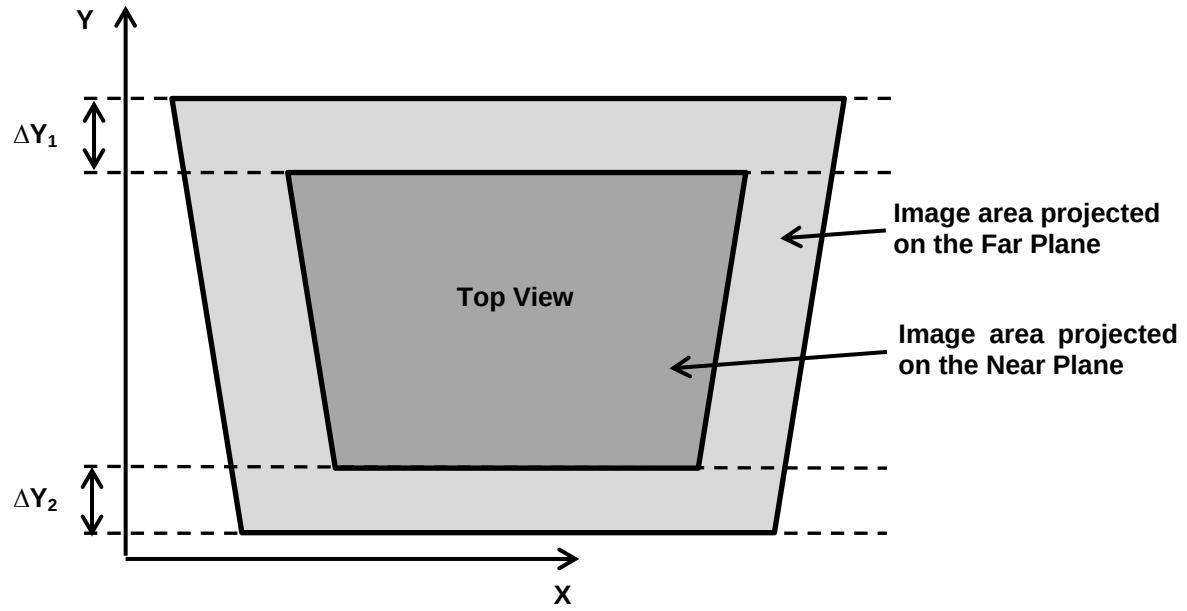


possible assignment error

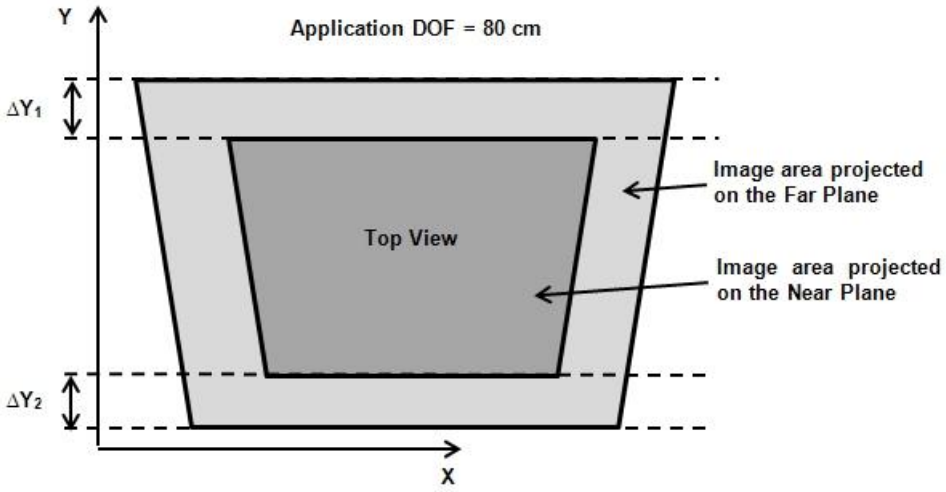
After the calibration of the Near and Far planes, the reader applies the transformation to the corners of the image, in order to automatically compute the minimum distance between packs. Doing this it finds the real coordinates of the quadrilateral that delimits the viewing area, both on the Near and Far Plane.

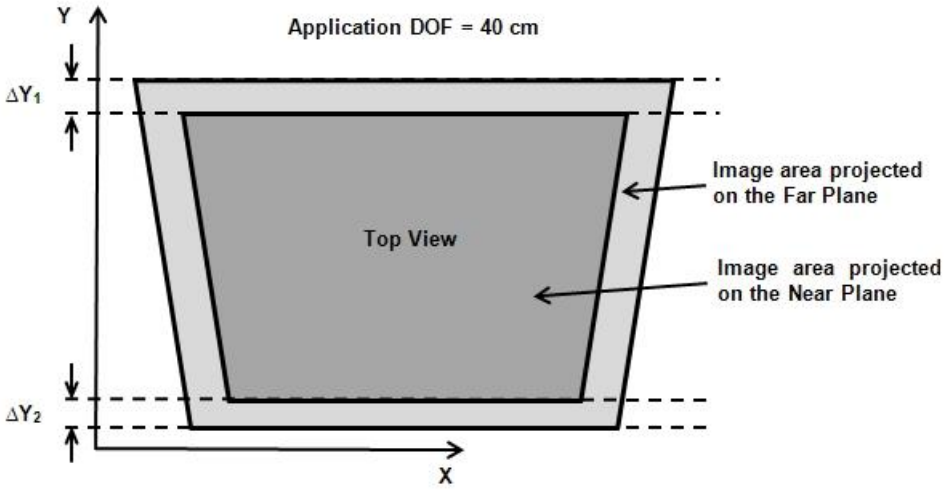
The quadrilateral is not a perfect rectangle due to the skew angle applied to the reader, required to avoid direct reflections which can blind the sensor.

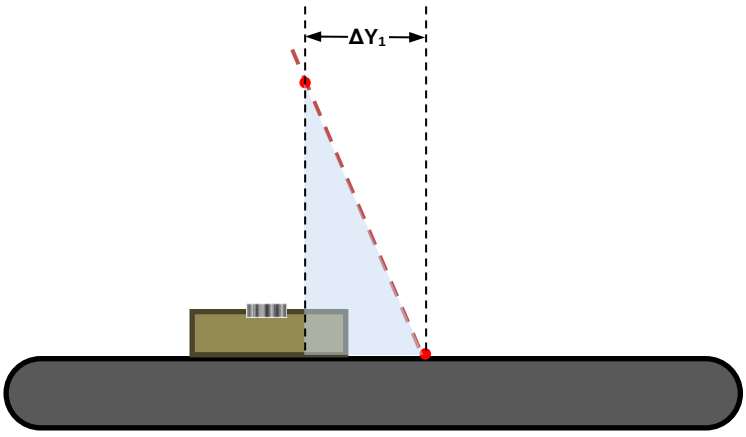
The Minimum Distance Between Packs is the greater of ΔY_1 or ΔY_2. This value will be indicated in the PackTrack Setup Result message of the PackTrack Setup Wizard. It is advised to use this value in the relative setup parameter.



In general, the smaller the distance between minimum and maximum pack height (Far and Near planes or application DOF), the closer the packs can be placed together. See the example diagrams below:







5.2 CODE ASSIGNMENT TO PACK

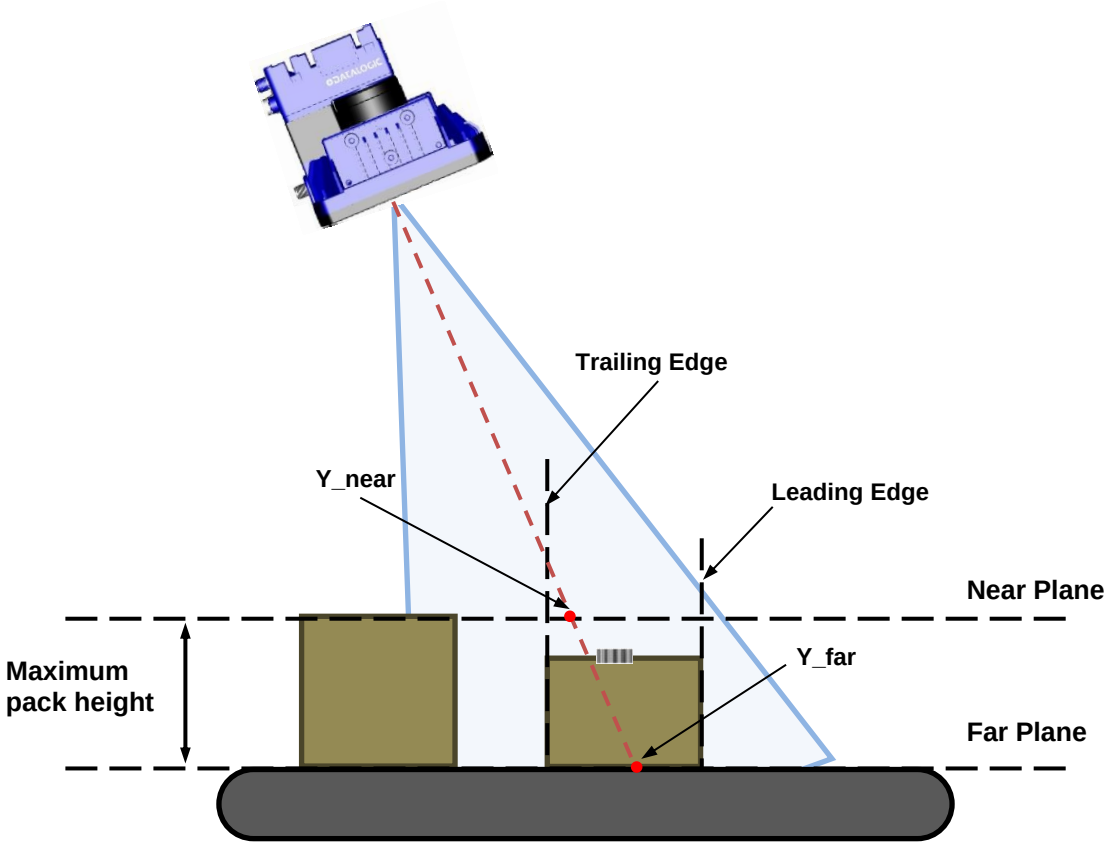
Whenever a code is found by the decoding library, the device knows the coordinates of the center of the code in the image coordinate system. In order to assign the code to the proper pack, the reader follows these steps:

a) It uses the coordinate system transformation to find the position of the code in the Near and Far Plane.

b) For each pack:
   i. It computes the position of the leading and trailing edge of the pack, using the information given by the encoder.

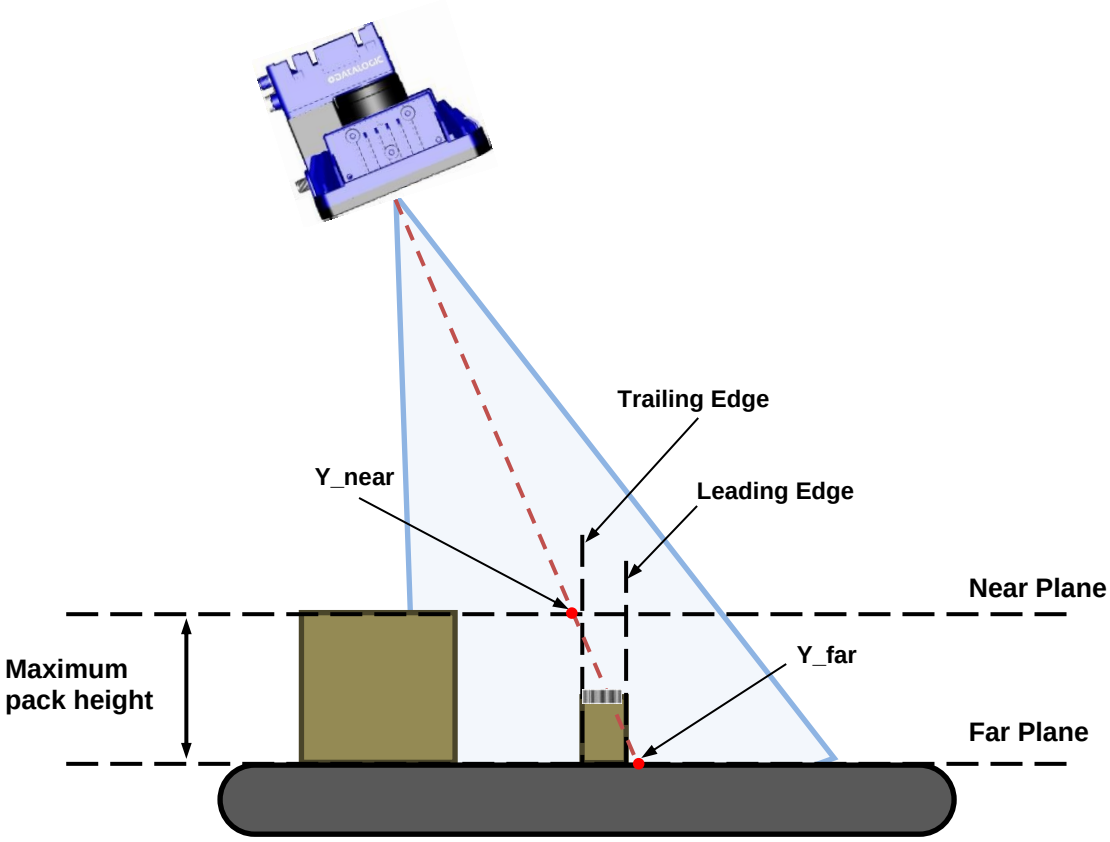
   ii. It compares the coordinates of the code with the position of the pack to decide if the code is inside or outside of it. The code is considered inside a pack if it satisfies at least one of these conditions:

```
(Y_near < Leading Edge AND Y_near > Trailing Edge)
 (Y_far < Leading Edge AND Y_far > Trailing Edge)
```



But also for shorter packages the following is true:

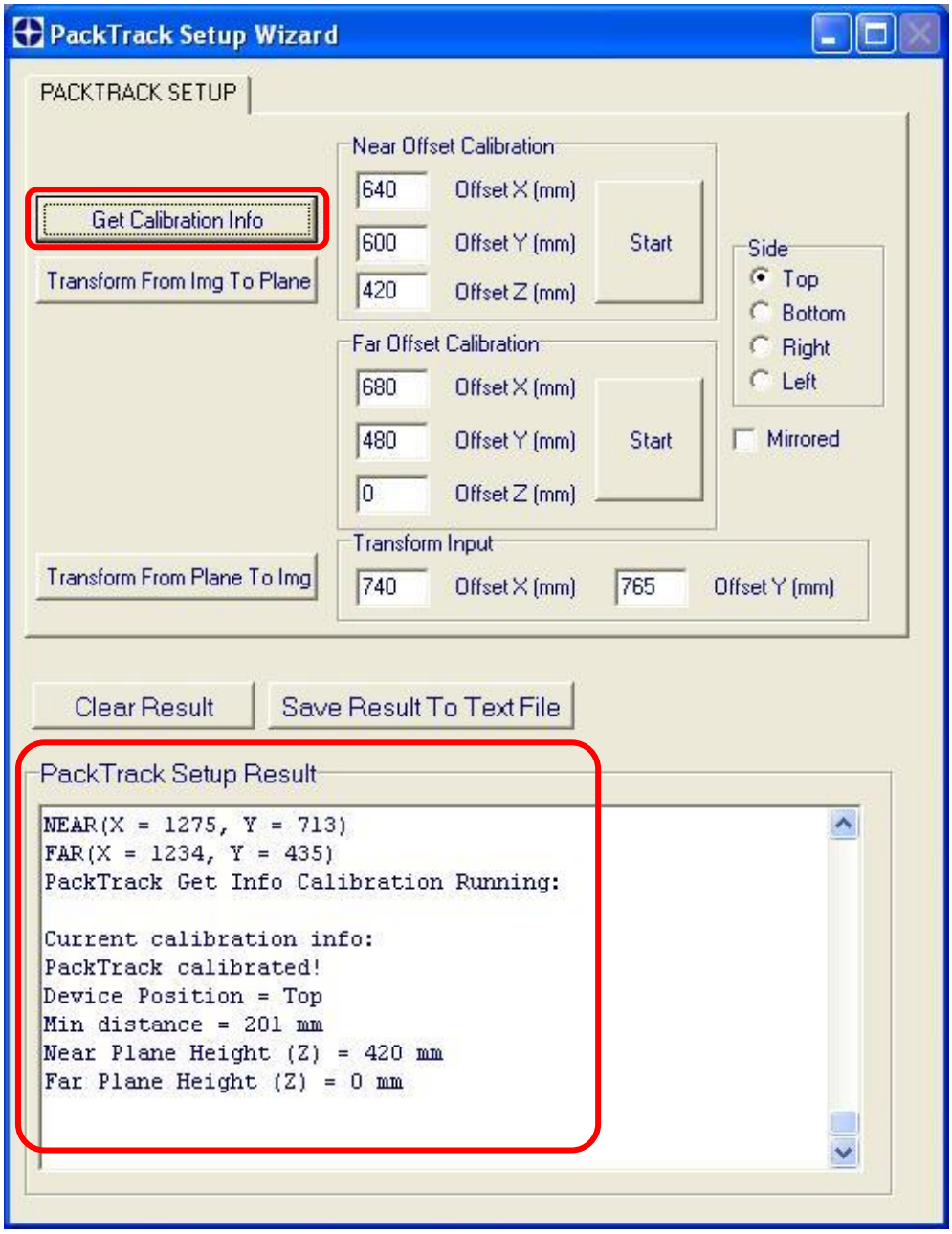
```
(Y_near < Trailing Edge AND Y_far > Leading Edge)
(Y_far < Trailing Edge AND Y_near > Leading Edge)
```



6 TROUBLESHOOTING

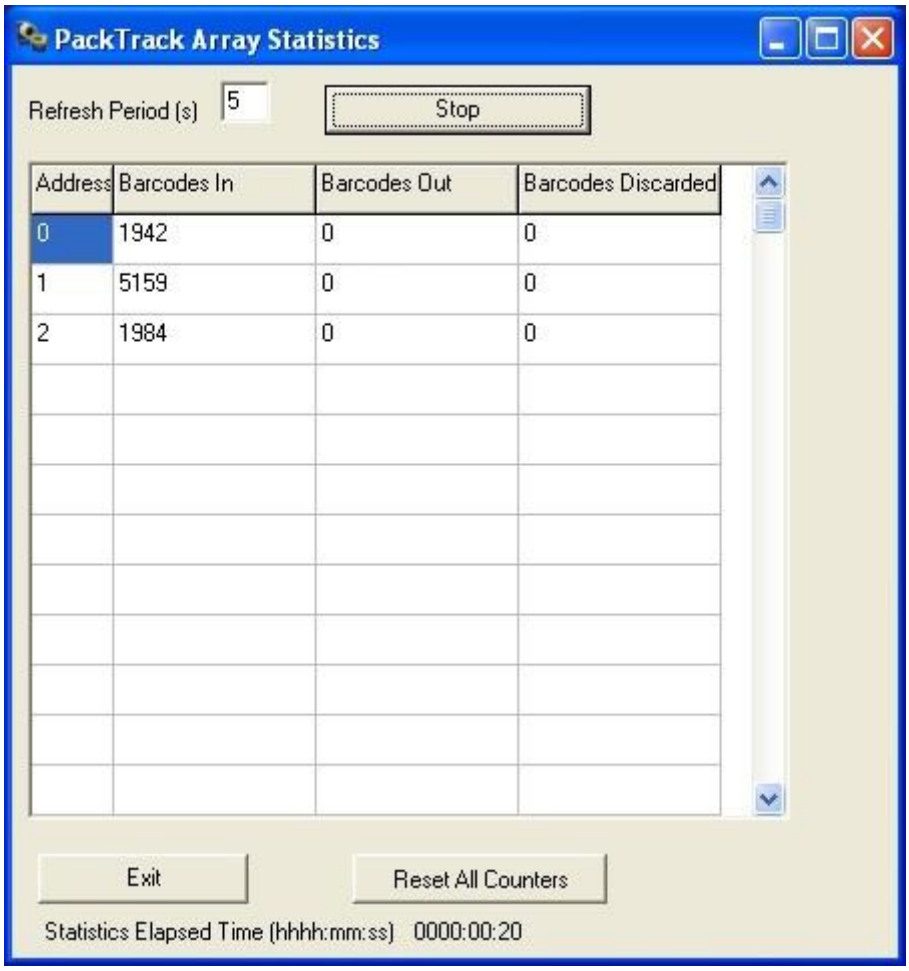
6.1 GET CALIBRATION INFO

At any time you can enter the PackTrack Calibration tool and click on the **Get Calibration Info** button to obtain current calibration settings.



6.2 PACKTRACK ARRAY STATISTICS

For Master/Slave applications, when using VisiSet™ in Run Mode, from the Master you can open the Tools>Get PackTrack Array Statistics item to open the window where you can verify the reading performance of the Master and individual Slaves in the PackTrack ID-NET network.



This is helpful to determine the overall health of the reading station. Both Master and all Slaves are listed in this table. The counters keep track of the number of Barcodes In, Out and Discarded. The Barcode Out and Discarded counters should be very low in a healthy station. If any reader has a high number of Barcodes Out or Barcodes Discarded, you should open the System Statistics window of the specific reader for further analysis. See par. 6.3.

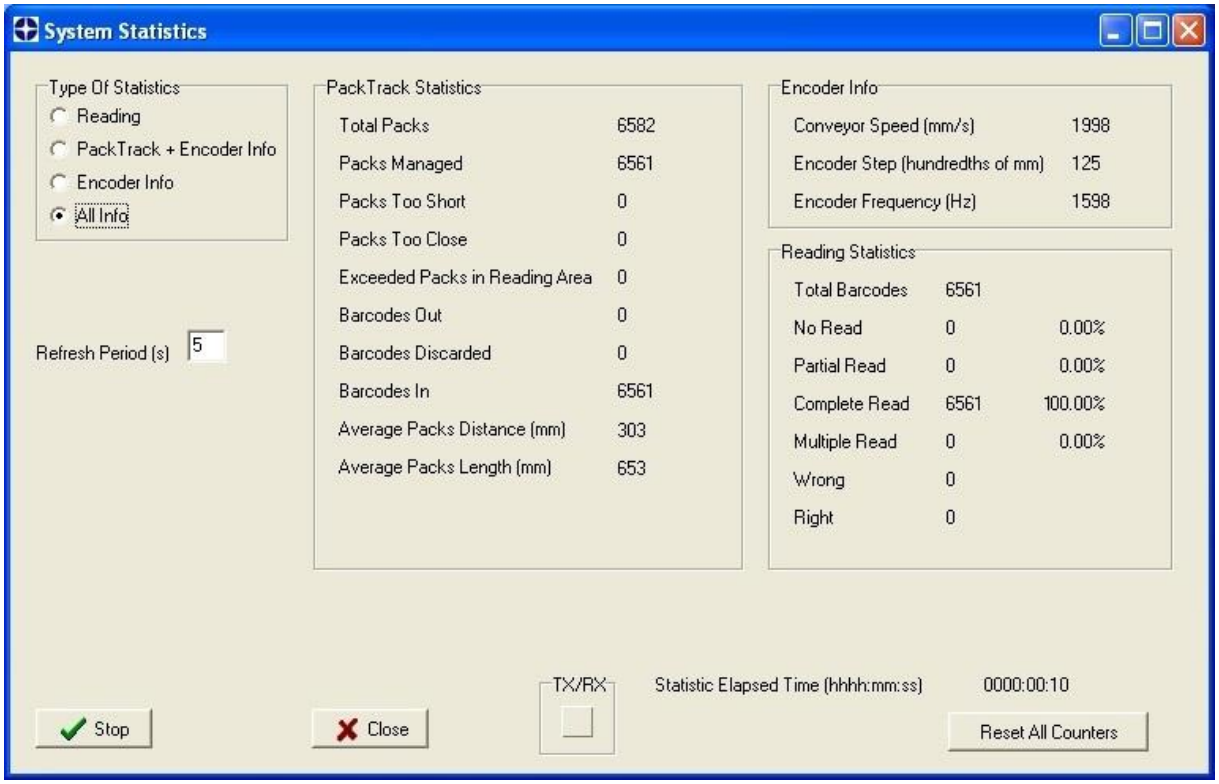
Barcodes In should be a very high percentage with respect to the other counters. The Barcode In counters only report the first occurrence of a barcode decoded for a given slot (no redundant reading is counted).

The **Refresh** Period determines the frequency of updating the counters.

The **Reset All Counters** button acts only on the counters relative to this window and does not affect the counters in the System Statistics window.

6.3 SYSTEM STATISTICS

When using VisiSet™ in Run Mode, you can open the Tools>Get System Statistics item to open the global statistics window where you can verify PackTrack, Encoder and Reading Statistics.



These Statistics contain global system information as well as specific reader statistics depending on which reader is being analyzed.

- **Reading Statistics** report data relative to the System (Reading Station) if the Master reader is being analyzed. For Slave readers it reports data relative to the specific Slave being analyzed.

- **Encoder Info** reports data relative to the System (Reading Station) if the Master reader is being analyzed.

- **PackTrack Statistics** always report data relative to the specific reader being analyzed (Master or Slaves). This is helpful to determine the overall health of the specific reader. The counters keep track of the number of Barcodes In, Out and Discarded as well as other statistics. The Barcode Out and Discarded counters should be very low in a healthy reader.
  Barcodes In should be a very high percentage with respect to the other counters. The Barcode In counters report all occurrences of decoded barcodes for a given slot (all redundant reading is counted).

The **Refresh** Period determines the frequency of updating the counters.

The **Reset All Counters** button acts only on the specific reader (Master or Slave) and does not affect the counters in the other specific reader windows or the PackTrack Array Statistics window.

6.4 VERIFY SYSTEM REFERENCE POINT

To discover where the System Reference Point is located for any PackTrack calibrated application:

a) Place a pack, code or other object onto either the Near or Far plane at the center of the FOV VisiSet™ Setup window.

b) Press the **Transform From Img To Plane** button.

In the Decoding Results area choose the same plane used in step a). The Offset item reports the X and Y coordinates (Z and Y coordinates for side readers) of the System Reference Point from the center of the FOV.