



DICKY-john[®]
A DIVISION OF TSI[®]



Operator's Manual

INSTALAB[™] 700

NIR Analyzer



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SAFETY NOTICES

Safety notices are one of the primary ways to call attention to potential hazards.



This Safety Alert Symbol identifies important safety messages in this manual. When you see this symbol, carefully read the message that follows. Be alert to the possibility of personal injury or death.

WARNING

WARNING

Use of the word **WARNING** indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION

CAUTION

Use of the word **CAUTION** with the Safety Alert Symbol indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

NOTICE

NOTICE

Use of the word **NOTICE** without the safety alert symbol indicates a potentially hazardous situation which, if not avoided, may result in equipment damage.



INTRODUCTION

The Instalab™ 700 (IL700) is a self-contained optical reflectance instrument, designed to quickly and accurately measure the percent of constituent concentration (moisture, protein, oil, starch, fiber, ash, etc.) in a wide range of commodities common to the grain, feed, and food industries. Near Infrared Reflectance (NIR) technology within the unit analyzes numerous solid, semi-solid, and liquid materials and is an alternative to wet chemistry. Key components of the IL700 include:

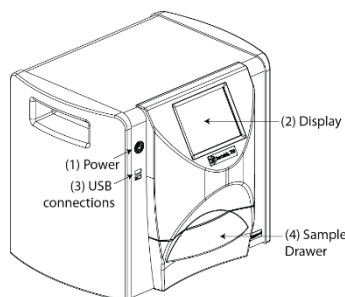
- Automatic and manual gain selection adjusts the gain for low-reflectance samples
- Thermoelectrically-cooled detector that maximizes sensitivity and dynamic range
- A completely sealed and thermally isolated optics chamber
- An integrated, computerized self-test mode to continuously monitor instrument performance and pinpoint errors
- Non-volatile flash memory stores calibrations and other system parameters

With sufficient calibration data, the Instalab™ typically provides accuracy comparable to laboratory results. In daily operation, the Instalab's repeatability and precision surpasses typical laboratory testing since operator technique is less crucial and instrument error is minimal.

UNIT OVERVIEW

1. Power (on/off) button
2. Touch screen display
3. USB connections (2) front (2) back
4. Sample drawer
5. Lifting location / handles

Figure 1
IL700





DECLARATION OF CONFORMITY

The IL700 is in conformity with the provisions of the following directives and regulations:

- 2011/65/EU Restrictions of Hazardous Substances in Electrical and Electronic Equipment (RoHS)
- EN2006/95/EC Low Voltage Directive
- EN2004/108/EC EMC Directive
- IEC EN61010-1:2010 (3rd Edition) Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements
- ANSI/UL CAN/CSA - C22.2 NO. 61010-1: 2010 (3rd Edition)
- IEC 61326-1:2013 Electrical Equipment for Measurement, Control, and Laboratory use - EMC requirements - Part 1: General requirements
- ETL Safety Mark UL61010-1

FEATURES

- Memory storage for numerous calibrations (limited only by flash memory space)
- Text-based calibration files that provide all calibration coefficients moisture basis parameters, formats, etc.
- Sample presentation system provides rotating sample cup for averaging of sample reflectance minimizing the effects of non-homogeneity, and particle size variation
- Sample cup interchangeability
- Embedded processor along with Win-CE operating system accommodates field updates
- Circuitry ensures excellent long and short-term stability due to elimination of electrical drift
- Circuitry ensures stable, nonvolatile storage of calibration constants and system parameters without dependence on an alternate power source such as batteries
- Thermoelectrically cooled photo detector eliminates temperature drift errors
- Field-proven, long-life, tungsten halogen light source
- Sealed optics chamber minimizes dust and maintains optical filters at a constant temperature
- Modular construction for ease of service
- Self-test provision eliminates operator error, continuously verifies operational status, and speeds servicing of the unit
- Diagnostic modes for fault isolation
- High-speed operation
- Automatic and manual gain selection provides optimum gain characteristics for products with low reflectance characteristics
- Exporting log data allows calibration development with numerous commercially-available regression packages



SPECIFICATIONS

Physical (English / Metric)

Weight: 31 lbs/14.06 kg

Dimensions: (See Figure 2)

Height: 13.93 in/35.4 cm

Width: 15.52 in/39.42 cm

Depth: 14.25 in/36.19 cm

Electrical

Power Requirements: 110/220 VAC, 50 to 60 Hz, <100 Watts

Serial Computer Interface: RS-232-C and USB

Light Source: Tungsten Halogen, T3, Clear, 6V-20W

ETL Mark: UL61010-1

Environmental

Pollution Degree: Indoor use only, Office-lab environment,
Measurement area isolated from on board circuitry

Operating Temperature: +5 C° to +40 C°
(Accuracy range specification +10 C° to +35 C°)

Humidity: 5% RH to 95% RH to 27.7 C°,
(Non-condensing decreasing linearly to 60% RH at
35 degrees C, with decreasing linearly to 50% at 40 degrees C)

Storage Temperature: -20 C° to +60 C°

Altitude: up to 6562 ft. / 2000 meters

Functional Language: English with additional
languages available

Sample Integration Technique: Rotating cup

Filter Band-pass: Approximately 10 nm

Number of Optical Filters: 4 to 10

Detector: Thermoelectrically cooled lead sulfide (PbS)

Reference Measurement:

Through entire optical system, against ceramic disk

Gain Setting: Automatic for reference gain, calibration file
controls gain for sample

Diagnostics: Diagnostic screens for troubleshooting

Typical Analysis Time: 10 seconds

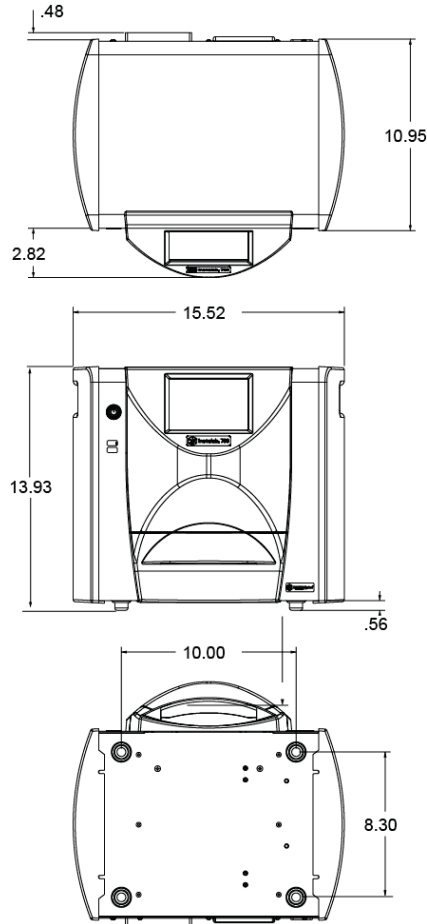
Calibration Storage: Flash memory



Printer: Optional

Figure 2

Dimensions



NOTICE

NOTICE

Appropriate space must be left around the input power connector to allow easy disconnection at the unit.

WARNING

WARNING

Always use proper power cord with the unit



ACCESSORY TOOLS

The IL700 includes (2) standard granular sample cups and sample cup loading tools that includes a scoopula, spatula, sample cup holding fixture, and (2) brushes.

Figure 3

Sample Loading Cup Tools



OPTIONAL ACCESSORIES

- Sample cup options:
- Liquid sample cup (stainless steel cover p/n 46803-0100, stainless steel base p/n 46803-0110)
- Semi liquid and solid open sample cup accessory kit includes tray and 3 sample cups (p/n 45592-1650)
- 4 inch large open sample cup (holder p/n 46811-1211, 4 inch open sample cup p/n 46811-1410)
- A printer that is RS232 compatible or a USB printer that supports Printer Control Language (PCL) can connect to the IL700 to print test data results to a ticket. Header and footer data can be added to the ticket. The data can be automatically printed at the end of each measurement cycle or manually initiated by pressing the **Printer** button.
- Printer connections are at the rear of the IL700 with a standard 9-pin RS232 connector configurable for most baud rates, data bits, parity, and stop bits popular with RS232 devices and a USB (Type A) connector. All printer output formats are designed to work best with printers having a minimum of 40 characters per line.

Figure 4

Printer





INSTALLATION

Inspect the unit for damage that may have occurred during shipping. Save all packing materials until the inspection is complete. If damage is found, immediately file a claim with the carrier and notify your DICKY-john® sales representative.

CAUTION

CAUTION

The Instalab™ and printer (optional) must not be used in hazardous (classified) locations as defined in Article 500 of the NFPA Handbook of the National Electrical Code.

PLACING THE UNIT

1. The Instalab™ should be placed on a level surface and in a location where it is protected from rapid changes in ambient temperature.
2. Connect the power cord to a 3-wire (grounded) 120 VAC, 60 Hz or a 220 VAC, 50 Hz outlet. The unit automatically adjusts for 120V or 220V.

WARNING

WARNING

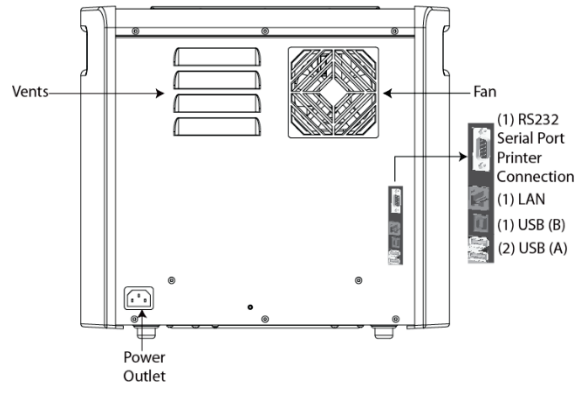
The grounding pin on the power cord plug is connected to the Instalab™ enclosure. If an adapter with a grounding wire is used, verify the grounding wire is connected to a good earth ground. Otherwise, a shock hazard may be present. Do not use a 3-pin to a 2-pin adapter.

EXTERNAL COMMUNICATION CONNECTIONS

- 4 USB Type A connections (2 in front, 2 in back) for connection to a keyboard, mouse, printer, or flash drive (only 3 USB devices are supported at any one time).
- 1 USB Type B connection to connect the IL700 to a PC for downloading of software to the device, installing calibrations, or remotely accessing data from the instrument
- 1 RS232 serial port printer connection (9 pin)
- 1 Ethernet LAN connection



Figure 5
External Communication Connections





CALIBRATIONS

Calibrations can be obtained from multiple sources:

- DICKEY-john® (calibrations for common products)
- Universities (development of new calibrations)
- User (development of own calibrations for specific product line)

NOTE

DICKEY-john® has developed some universal calibrations for certain products. These may be obtained from your DICKEY-john® sales representative.

CAUTION

CAUTION

The Instalab™ is intended for measurement of dry, non-hazardous materials. Should you determine you desire to measure other materials, please contact DICKEY-john® Technical Support first!

UNIVERSAL CALIBRATIONS

Calibrations developed for common products and constituents are referred to here as universal calibrations. Typically used in any Instalab™ that has the required filters by making a sample bias adjustment.

Use the following procedure to enter, store, and test a universal calibration. Adjust the machine bias to make the predictions agree with the reference analysis. For each constituent calibration, other than moisture, pay careful attention to the moisture basis. Lab results must be adjusted to or compatible with this moisture basis. Refer to the Appendix for moisture basis explanation.

1. Enter the calibration file via a USB memory device.
2. Randomly gather 20 samples at different times of the day from the same point of the operation the Instalab™ will be monitoring.
3. Grind, if required, and mix each sample and divide each mixed sample into three parts: two parts for laboratory analysis and one part for the Instalab™ analysis.
4. Perform the laboratory analysis separately on the two parts of each sample comparing the results. Do not use

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samples whose laboratory analysis differ enough that the accuracy is suspected.

5. When both analyses for the same samples are close enough to ensure laboratory accuracy, average the two results.
6. Log the laboratory analysis and Instalab™ analysis on the Instalab™ Bias Adjustment Worksheet.

Figure 6
Instalab™ Bias Adjustment Worksheet Example

Instalab Bias Adjustment Worksheet

Revolution by Evolution

Date: _____ Instalab Serial #: _____

Product: Hard Red Wheat Grinder Serial #: _____

Sample # (N)	CONSTITUENT <u>Protein (.2)</u>		CONSTITUENT _____		CONSTITUENT _____		CONSTITUENT _____	
	Lab Analysis (%)	Instalab Analysis (%)	Lab Analysis (%)	Instalab Analysis (%)	Lab Analysis (%)	Instalab Analysis (%)	Lab Analysis (%)	Instalab Analysis (%)
1	10.56	10.51						
2	11.02	10.77						
3	13.57	13.52						
4	12.20	11.95						
5	11.67	11.42						
6	13.50	13.05						
7	12.22	12.57						
8	11.60	11.35						
9	10.98	10.73						
10	12.90	12.65						
11	12.37	12.12						
12	13.42	13.18						
13	10.20	9.95						
14	11.06	10.81						
15	12.07	11.82						
16	12.35	12.10						
17	13.50	13.25						
18	11.17	10.92						
19	11.11	10.86						
20	12.07	11.82						
Sum	259.95	254.95						
Average (Sum/N)	12.0	11.75						

Standard Average	12.0	→		→		→	
Minus Instalab Average	11.75	←		←		←	
Equals Bias Change Req'd	.25						



Figure 6 depicts twenty laboratory analyses performed with sufficient accuracy (logged under the Lab Analysis column). Instalab™ analyses were also logged under the Instalab™ Analysis column.

- Each column was added then divided by the number of samples (SUM divided by N).
- The Instalab™ average is then subtracted from the laboratory's analysis average.
- The result (".25" in this example) is the amount of bias adjustment required to make the Instalab percent analyses agree with the laboratory determinations.
- Bias adjustments are made by editing the calibration file, known as "Adj_Bias" parameter.

BIAS ADJUSTMENT

Refer to the System Setup section, Edit Product, Edit Constituent to modify the "Adj_Bias" value.

A bias adjustment is typically required to make a universal calibration agree with a reference lab. A bias adjustment compensates for machine differences as well as reference lab differences. Reference labs do not all agree and this bias adjustment aids in tailoring the unit to a particular reference lab.

Provisions are also included for making slope adjustments. However, such adjustments are typically not needed for most applications.

CUSTOM CALIBRATIONS

It is common for owners of the Instalab™ to make their own calibrations. The following steps provide the basics for calibration development:

GATHERING A SAMPLE SET

Instalab™ prediction performance is primarily dependent on the care taken in gathering, selecting, and preparing training samples for calibration. The calibration process is essentially one in which the instrument is "taught" to relate specific reflectance data to known chemical reference analysis of a selected set of training samples. If the Instalab is "shown" a sample with reflectance characteristics unlike those included in the selected training sample set, less accurate predictions can result. Therefore, the training set should have a variety for a robust calibration.



IMPORTANT

The calibration training sample set includes all combinations and concentrations of constituents whether all constituents are of immediate interest or not. This is necessary because in reflectance spectroscopy, the reflectance at any given wavelength is influenced to some degree by each constituent present in the sample.

SAMPLES REQUIRED FOR CALIBRATION

The number of samples necessary to perform a multiple linear (least square) regression varies. At least 30 samples are recommended for calibration and an independent set of samples (approximately the same number) are required to test the calibration.

SAMPLE COLLECTION

Calibration samples must be collected from the same point in the process that the Instalab™ monitors. Within a multistage process, the product may have different characteristics at different points in the process. If the Instalab™ is to monitor several different points of the process, separate calibrations may have to be developed for each point that is to be monitored.

For a processed product, an ideal time to collect samples for a wide range of constituent concentration:

- When the plant is running under abnormal conditions
- The operation is just returning to normal

Taking samples at frequent intervals during these periods usually produces a training sample set with a good range and combination of constituents not always found under normal plant conditions.

Selection of a training sample set for calibration may frequently be aided by using a “rough” calibration, such as a calibration for a similar product to segregate samples and to ensure a set of samples across the desired range of interest are collected. This technique reduces the number of samples to be analyzed by the more cumbersome reference methods.

PRODUCT CHARACTERISTICS

Variations in product characteristics such as color, hardness, and the amount of hull or foreign material may necessitate separate calibration constants for determinations.

Color and hardness can affect the amount of light that is absorbed by the product and the amount that is reflected. The amount of hull and foreign material can affect the particle distribution causing different sized particles to be unevenly distributed throughout the sample.



Also the NIR method is sensitive to particle size and particle size variations. All samples in the training set and in future analysis should have a similar grinding process.

SAMPLE MOISTURE CONTENT

The moisture content of a sample is important since the concentration of the remaining constituents (expressed as a percentage of the total weight) is a function of the moisture content.

Example:

A product with the following analysis:

Moisture	7.0%
Oil	8.0%
Protein	72.0%

If this same sample is dried to 3% moisture the analysis becomes:

Moisture	3.0%
Oil	8.34%
Protein	75.1%

If this change in moisture occurs between the times the laboratory reference analysis and Instalab™ analysis is performed, as much as a 3.1% difference in protein determinations could result.

IMPORTANT

If an As-Is calibration is developed, the moisture of the sample should be recorded at the time of collecting logs on the Instalab™. Also moisture should be measured at the time of the As-Is lab analysis. This allows constituent values to be adjusted to a common moisture basis should the moisture change between log collection and lab analysis.

SAMPLE STORAGE

Care must be exercised in sample storage and handling to minimize moisture loss.

- Tins with “slip-fit” lids should be sealed with vinyl tape. Glass jars with tight fitting screw lids may be satisfactory, but it is desirable to choose jar sizes to minimize the dead air space above the sample.
- Some materials cannot be stored for long periods of time without undergoing changes in composition, such as some high oil products.
- Chemical and biological degradation of samples can be slowed by keeping the samples refrigerated. Refrigerated



samples should be allowed to return to room temperature before analysis.

- If samples have been stored for a long period of time, it is advised to re-determine the moisture and convert the analysis of the other constituents to a present moisture basis before using the sample for Instalab™ calibration or bias adjustments.
- Re-sealable plastic bags (of at least .004" thickness) are recommended for sample storage when storage is necessary. For moisture levels of 16% or greater, double bag each sample.

CALIBRATION DEVELOPMENT

LOG DATA COLLECTION

Log data must be collected using all installed filters to collect reflectance data (logarithms) for developing or testing calibrations.

Two gain selections are available:

- Standard gain uses a sample gain for each filter equal to the reference gain for that filter.
- Enhanced gain uses a sample gain equal to 2 times the reference gain for each filter. The difference log shall reflect the 125 decrease due to this added X2 gain. This is typically used for samples that are extremely dark with low reflectivity. An enhanced gain adds additional gain to raise the signal level and places log values in a more optimum location (100 - 300).

IMPORTANT

See Appendix C for a detailed explanation of system and mode gains.

NOTE

Sample motor off should be selected for samples with a light consistency, i.e. powder, that could escape the sample cup during rotation.

When collecting log data, provisions are provided for selecting "standard" or "enhanced" gain:



Choices available for Data Collection:

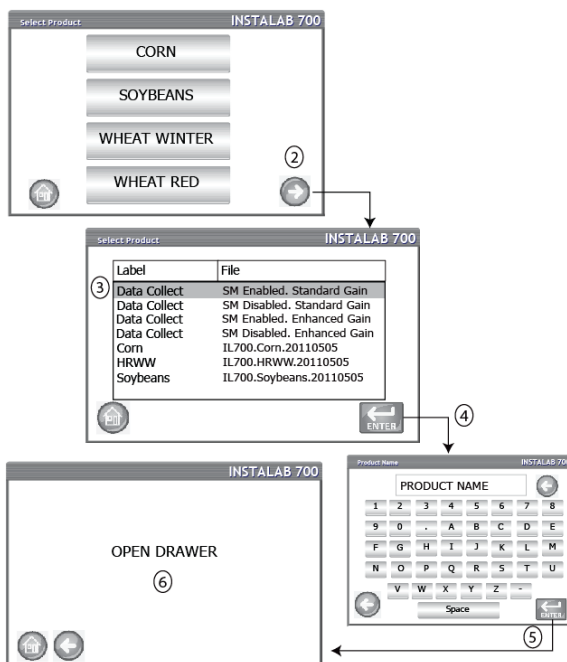
- Sample motor on/Standard gain (typically for granular material)
- Sample motor off/Standard gain
- Sample motor off/Enhanced gain
- Sample motor on/Enhanced gain

Samples are identified and their logs stored in the Instalab's database. These logs are later downloaded and matched with laboratory reference values for the constituents of interest. Ideal log values are within the 100 - 300 range. Values greater than 400 may warrant the use of the enhanced gain if not already selected.

To collect Log Data:

1. At the Main Menu screen, press the **Analyze** button.
2. At the Select Product screen, press the **Next** button until the product window displays.
3. Highlight the appropriate Data Collect choice.
4. Press the **Enter** button and type in the product name.
5. Press the **Enter** button to accept.
6. Open the drawer to start the reference scan.

Figure 7
Collecting Log Data

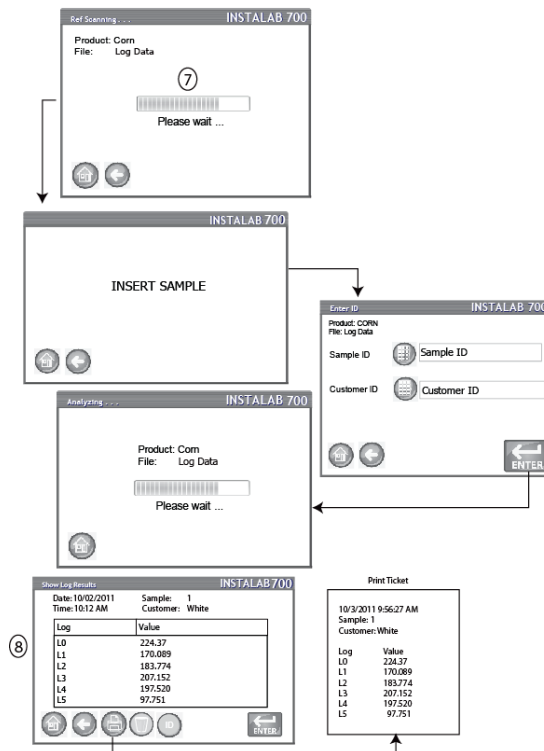


7. At the Insert Sample screen prompt, close the sample drawer with the installed sample.



8. The Sample ID will be required for log collection independent of how the results settings are set. All other result setting parameters apply.
9. Log results will display on the screen. The results are stored in the database unless the results are aborted.

Figure 8
Log Data Analysis and Results



LAB REFERENCE VALUES

For each sample and each constituent of interest, lab reference values must be obtained. For non-moisture constituents, it is important to have agreement on the moisture basis. The “native” calibration moisture basis will be the lab reference moisture basis. If the moisture basis is “As-Is”, the moisture of samples tested on the Instalab™ must be the moisture of the lab reference values (or lab reference constituent values must be adjusted to be the same as that tested in the Instalab™).

REGRESSION ANALYSIS

For all samples, the log values are treated as independent variables and the lab reference values as dependent variables. This data can be used by any commercially available regression program that can do MLR (multiple linear regressions). The result is a bias constant and multiple log coefficients: KA, K0, K1,



etc. Only the contributing filters as determined by the regression program are used. Typically only 3 or 4 filters are selected. Too many filters can cause “over fitting” of the data.

CALIBRATION FILE

An IL700.[PROD].[YYYYMMDD].cal file is created using the coefficients from the regression program. PROD describes the product while YYYYMMDD provides dating of the file.

The .cal file is a 16 bit unicode text file that can be created on any text editor capable of formatting in 16-bit unicode. The layout for this file is depicted in Figure 9.

The calibration file shown in Figure 9 contains a Notes column that isn't required in the final calibration file.

CALIBRATION FILE EXAMPLE

The example calibration file consists of rows that contain two parameters. The first parameter is the name of the item of interest and the second is its assigned value. A Notes column is optional and provides a description of the item and possible values.

Under [MAIN], the file has some basic parameters related to all constituents. The filters required for this calibration, the product label, whether the sample motor is ON or OFF, and gain selection are examples of these parameters.

IMPORTANT

Filters entered in the calibration file under [MAIN] should be entered as whole numbers even if a wavelength has a decimal. For example 671.4 nm filter should be entered as 671.

Up to ten constituents can follow identified by the heading C0, C1, C2, etc. Appropriate parameters are repeated for each constituent.

At the end of the file, ISS (ISSUE) records the date and time of any significant change to this file. Typically, Adj_Bias and Adj_Slope are considered user adjustments and do not require ISS update when changed.

Currently all calibration (.cal) files are “open” files with CS=0 (checksum = 0).



Figure 9
Calibration File Example

```

[Main]                ;Revised 26 Apr 2011 (MB etc) rws
PL=DDGS              ;The Product Label to be used by the instrument
F0=2310              ;Filter #0 wavelength in nm / 0 if not required
F1=0                 ;Filter #1 wavelength in nm / 0 if not required
F2=2180              ;Filter #2 wavelength in nm / 0 if not required
F3=2100              ;Filter #3 wavelength in nm / 0 if not required
F4=1940              ;Filter #4 wavelength in nm / 0 if not required
F5=1680              ;Filter #5 wavelength in nm / 0 if not required
F6=0                 ;Filter #6 wavelength in nm / 0 if not required
F7=0                 ;Filter #7 wavelength in nm / 0 if not required
F8=1759              ;Filter #8 wavelength in nm / 0 if not required
F9=2340              ;Filter #9 wavelength in nm / 0 if not required
SM=ON                ;Sample Motor (SM) is ON or OFF during measurement
Gain=S               ;S for standard / E for enhanced
[CO]                 ;Start of Constituent 0
CL=Crude Protein     ;Constituent Label
UL=30                ;Upper Limit
LL=25                ;Lower Limit
Units=%              ;w/w (Indicate here with a note ratio units: w/w = wt/wt or v/w = vol/wt)
MB=A                 ;Native Calibration MB
                    ;(Blank) if moisture
                    ;A = As-Is
                    ;0 - Dry Basis
                    ;XX.X for XX.X Basis where XX.X is %Moisture value
AMB=15.0             ;Alternative MB
                    ;XX.X Moisture value
                    ;A = As-Is
                    ;Leave blank if not required
                    ;if [MC_Basis=N] AND [(MB=0 or XX.X)AND (AMB=0 or xx.x) OR ((MB=A or
AMB=A) AND MC_Basis=Y Exists in file)]
MC_Basis=N           ;Moisture Constituent for Basis (N - No / Y - Yes)
Display=NA           ;N=Native Calibration only
                    ;NA=Native calibration and Alternate MB
                    ;A=Alternate MB only
                    ;(blank)=Do not display this constituent
Format=00.0          ;Display Format (00.0 / 00.00 / 00.000)
Adj_Bias=0           ;Adjustable Bias Default Value=0.0 Range +/- 100
Adj_Slope=1.00       ;Adjustable Slope Range = .80 to 1.20 %x=Adj_Slope (Bias+K0*L0 ;+K1*L1+ ...
) + Adj_Bias         ;Default Value = 1.00
KA=23.28346          ;Default Bias
K0=-0.21294          ;K0
K1=0                 ;K1
K=0.74628            ;K2
K3=-0.51264          ;K3
K4=0                 ;K4
K5=-.08296           ;K5
    
```

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K6=0	;K6
K7=0	;K7
K8=0	;K8
K9=0.07167	;K9
[C1]	;Start of Constituent 1 (add constituents in this pattern up to 10 total)
CL=Moisture	;Constituent Label
UL=14	;Upper Limit
LL=7	;Lower Limit
Units=%	;w/w (Indicate here with a note ratio units: w/w = wt/wt or v/w = vol/wt)
MB=	;Native Calibration MB ;(Blank) if moisture ;A = As-Is ;0 - Dry Basis ;XX.X for XX.X Basis where XX.X is %Moisture value
AMB=	;Alternative MB ;XX.X Moisture value ;A = As-Is ;Leave blank if not required ;if [MC_Basis=N] AND [(MB=0 or XX.X)AND (AMB=0 or xx.x) OR ((MB=A or AMB=A) AND MC_Basis=Y Exists in file)]
MC_Basis=Y	;Moisture Constituent for Basis (N - No / Y - Yes)
Display=N	;N=Native Calibration only ;NA=Native calibration and Alternate MB ;A=Alternate MB only ;(blank)=Do not display this constituent
Format=00.0	;Display Format (00.0 / 00.00 / 00.000)
Adj_Bias=0	;Adjustable Bias Default Value=0.0
Adj_Slope=1.00	;Adjustable Slope %=Adj_Slope (Bias+K0*L0 ;+K1*L1+ ...);+Adj_Bias ;Default Value = 1.00
KA=12.43708	;Default Bias
K0=.24596	;K0
K1=0	;K1
K2=0	;K2
K3=0	;K3
K4=.09395	;K4
K5=.15049	;K5
K6=0	;K6
K7=0	;K7
K8=-.11842	;K8
K9=-.34051	;K9
[Main]	
ISS=201006291715	;Based on date & time; any change modifies (YYYYMMDDTTTT)
CS=0	;Encrypted check-sum ;set to "0" for Open file



CALIBRATION FILE GENERATOR

A spreadsheet is available to aid in generating a .cal text file:
Cal_File_Maker.xlsm

This file allows the user to fill in the appropriate cells and creates the .cal text file simplifying file creation and reducing the probability of typing errors.

Contact DICKEY-john® Tech Support at 1-800-637-3302 for the Calibration Filter Generator spreadsheet.

Figure 10
Calibration File Generator Spreadsheet

Cal_File_Maker_20111103.xlsm
John Smith
03 Nov 2011

Fill out this form changing cells highlighted in yellow if needed
This template allows .cal files to be made from the information contained below. Any format or logic errors will show here >>>>>>>Format test OK
Indicate the .cal file storage location using "File Path" (highlighted in green) Cal File Created

File Name	IL700.Soybeans3.20110818.cal																																											
Product Name	Soybeans3																																											
Filters Required	<table border="1"> <thead> <tr> <th>Filter</th> <th>Value</th> <th>Requirement</th> </tr> </thead> <tbody> <tr><td>F0</td><td>2310</td><td>1</td></tr> <tr><td>F1</td><td>2230</td><td>1</td></tr> <tr><td>F2</td><td>2180</td><td>1</td></tr> <tr><td>F3</td><td>2100</td><td>1</td></tr> <tr><td>F4</td><td>1940</td><td>1</td></tr> <tr><td>F5</td><td>1680</td><td>1</td></tr> <tr><td>F6</td><td>1445</td><td>0</td></tr> <tr><td>F7</td><td>1722</td><td>0</td></tr> <tr><td>F8</td><td>1759</td><td>0</td></tr> <tr><td>F9</td><td>2345</td><td>0</td></tr> <tr><td>Sample Motor</td><td>ON</td><td></td></tr> <tr><td>Gain</td><td>5</td><td></td></tr> </tbody> </table>					Filter	Value	Requirement	F0	2310	1	F1	2230	1	F2	2180	1	F3	2100	1	F4	1940	1	F5	1680	1	F6	1445	0	F7	1722	0	F8	1759	0	F9	2345	0	Sample Motor	ON		Gain	5	
Filter	Value	Requirement																																										
F0	2310	1																																										
F1	2230	1																																										
F2	2180	1																																										
F3	2100	1																																										
F4	1940	1																																										
F5	1680	1																																										
F6	1445	0																																										
F7	1722	0																																										
F8	1759	0																																										
F9	2345	0																																										
Sample Motor	ON																																											
Gain	5																																											
File Path (E:\)																																												

Constituent Label	C0	C1	C2	C3	C4
Upper Limit	17	17	24		
Lower Limit	5	5	16		
Units	%	%	%	%	%
Units Note	w/w	w/w	w/w	w/w	w/w
Native Moisture Basis		A	A		
Alternate Moisture Basis			15		
Moisture Constituent	Y	N	N	N	N
Display	N	N	NA	N	N
Format	00.0	00.0	00.0	00.0	00.0
Adjustable Bias	0	0	0	0	0
Adjustable Slope	1	1	1	1	1
Ka	11	35	15	0	0
K0	0	-0.3249	0.3775	0	0
K1	0	1.2032	0	0	0
K2	-0.1419	0	-0.2449	0	0
K3	-0.1054	-0.6528	-0.2951	0	0
K4	0.2264	0	0	0	0
K5	0	-0.2144	0.1519	0	0
K6	0	0	0	0	0
K7	0	0	0	0	0
K8	0	0	0	0	0
K9	0	0	0	0	0



SAMPLE PREPARATION

DRY POWDER

GRINDING SAMPLES

After being collected, whole grain samples or poorly ground samples must be ground to a uniform particle size. Since the reflectance from a sample is inversely related to particle size, it is common that particle size variations can contribute to testing or calibration errors.

Sources of error caused by particle size variations can be minimized with care in grinding. Obviously, the calibration sample set and the prediction set must be treated in the same manner and should be as nearly identical in particle size and the particle size distribution as possible.

Products such as flour, vital gluten, and dry yeast typically do not require grinding to reduce the sample to a uniform particle size. Whole grain and other meal products (gluten feed, corn grits, forage, silage, and oil seeds) do require suitable grinding prior to analysis.

Low oil and low moisture products can be ground by using cyclone style mills such as a Udy Cyclone Mill (the belt driven model is preferred over the direct drive version). High oil products can require the use of a knife mill of the type used for home preparation of freshly ground coffee. The Krups Mill or the Mitey Mill are examples.

NOTE

Once a grinding method has been chosen, the grinding technique should be documented and care taken to ensure the technique is repeated exactly on all samples. In turn, this produces consistent sample material.

NOTE

Materials being ground and prepped for sampling with this unit may present a breathable dust hazard. Use your designated procedure for handling materials during sample preparation.

NOTICE

NOTICE

Do not grind samples near the air intake of the IL700 as dust can be drawn into the unit, clogging the filter. Sample preparation should be performed away from the Instalab™ unit.



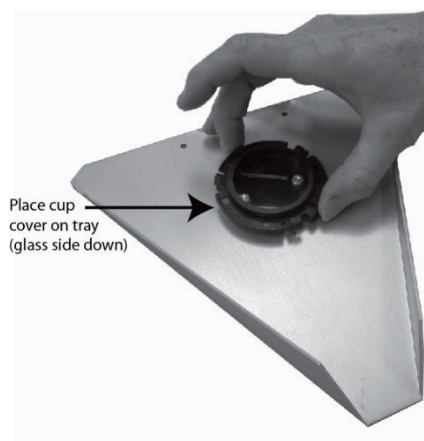
MIXING OF SAMPLE MATERIAL

Since the Instalab™ determines the total sample composition by analyzing less than one-half a cubic centimeter, that portion must be representative of the whole. All constituents present must be distributed equally throughout the sample. Typically, 15 to 20 complete turns of the ground sample with a steel spatula are adequate for sample uniformity.

LOADING A STANDARD SAMPLE CUP

1. Begin by cleaning the window of the sample cup. Use a Scott lint free micro-wipe or equivalent. If necessary, dampen the wiper with isopropyl alcohol to remove oil residue. Brushing with a soft camel's hair brush can be sufficient for non-oily products such as wheat or oats.
2. Place sample cup cover (part with window) on loading tray (refer to Figure 11). Place the cup with the glass window down and twist the cup clockwise until it locks into place.

Figure 11
Sample Cup Cover on Tray



NOTE

Do not get finger prints on glass window of sample cover.

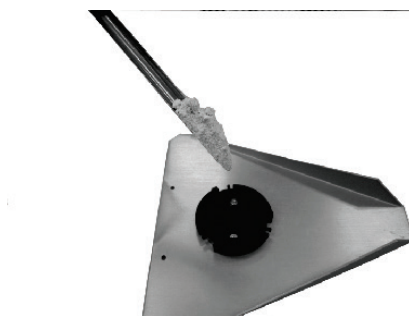
3. Obtain a heaping scoopula of the sample from a well-mixed sample container using a sideways scooping motion.

Figure 12
Heaping Sample Using Scoopula



4. Dump the sample onto the center of the sample cup window.

Figure 13
Fill Sample Cup



5. Slide the sample off the tip of the scoopula to form a conical pile. Do not disturb the pile with the tip. If the cup well is not filled up to the rim, take a second scoopula full of the sample and fill in all holes.
 - The sample should form a mound in the center of the cup about 1 cm above the level of the cup rim.

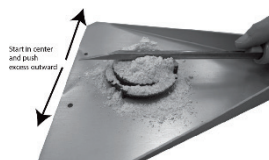
Figure 14
Heap Sample to Form Mound



6. Tamp the sample into the cup starting at the center of the mound and proceeding to the sides using the flat side of the scoopula.

Figure 15

Tamping Sample Into Cup



7. Pack the sample until the surface is flat and flush with the rim of the cup. **Sample should be tightly packed to eliminate any air pockets.**
8. Carefully brush off all sample excess from around the rim of the cup using the brushes supplied. **Be careful not to disturb the smooth surface of the sample in the cup.**

Figure 16

Pack Sample

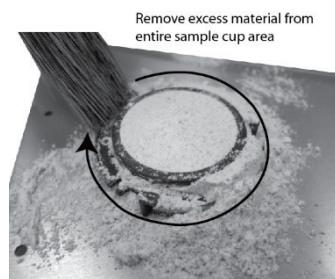
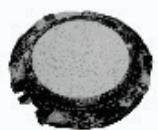


Figure 17

Cleaned Sample

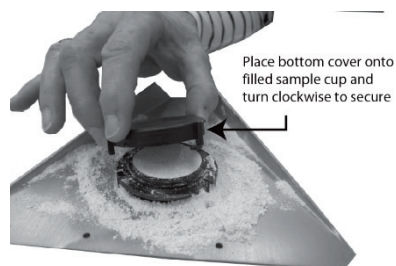


9. Place sample cup bottom cover over filled sample cup. Use slight downward pressure on the cup bottom while turning it clockwise.
10. Release the pressure and then twist the cup bottom counterclockwise while lifting the filled sample cup from the loading tray.



Figure 18

Place Sample Cup Bottom onto Filled Cup



11. Clean remaining sample residue from sample cup lip.

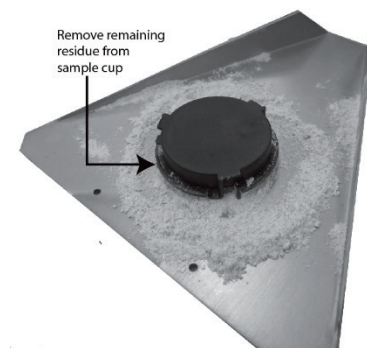
NOTICE

NOTICE

Use your designated procedures for handling materials during sample preparation.

Figure 19

Remove Sample Residue



12. Thoroughly clean the tray after loading the sample cup.
13. After the test is complete, disassemble the sample cup.
14. Press the two halves together and turn the cup top counterclockwise.
15. Clean all sample material from the sample cup before reusing.

NOTE

Do not touch and/or fingerprint the glass cover.



SEMI LIQUIDS AND SOLIDS

An open sample cup allows testing of semi liquids (pastes and slurries) and solids (meats and cheeses). The open sample cup kit contains an open sample cup and a sample cup holder.

To prepare Sample:

1. Place the sample cup holder onto a flat surface and put the sample cup into the holder.

Figure 20
Sample Cup and Holder



2. Using a spatula or appropriate utensil, place the sample into the cup.

Figure 21
Preparing Sample Cup



3. The sample should be prepared such that the sample surface is flat and flush with the rim of the cup. **Sample should be tightly packed to eliminate any air pockets.**



Figure 22
Level Sample in Cup



4. Remove excess sample residue from sample cup lip and holder using a towel or cloth.

Figure 23
Remove Excess Residue



5. Remove cup from the holder. The sample cup is ready for analysis.

Figure 24
Prepared Sample



LIQUID

The liquid sample cup is a 2-piece assembly consisting of a stainless steel base and cover. During analysis, light travels through the chamber two times (once to the ceramic puck and once when it is dispersed by the ceramic to the detector).

Preparing the Sample:

1. Remove cover from base.



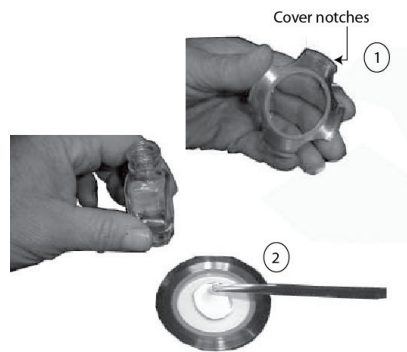
2. Place a small amount of liquid onto the middle of the base glass such that it puddles in the center and covers an area approximately 20 mm in diameter.

NOTE

Do not get fingerprints on glass window.

Figure 25

Place Liquid onto Cup Base



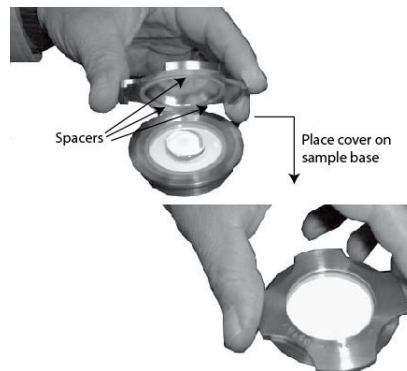
3. Place the cover onto the sample base to form a tight seal and secure test chamber. The sample should flood the entire surface of the glass.

IMPORTANT

Inspect the sample for voids. There should be no air bubbles present that could compromise analysis.

Figure 26

Secure Cover on Base



4. Place the sample cup onto the drawer holder assembly without dislodging the cup cover.



5. When testing is complete, disassemble the sample cup and clean.

NOTICE

NOTICE

Do not immerse the base unit in cleaning solution. Using minimal water on the glass and drying with a cloth is sufficient. The top cover can be cleaned under running water and dried with a cloth. After cleaning, inspect the three spacing balls located on the underneath of the top cover. If any spacer is missing do NOT continue to use the cup.

4 INCH LARGE OPEN SAMPLE CUP

NOTICE

NOTICE

The unit should be turned off and allowed to cool before the sample tray cup is changed out.

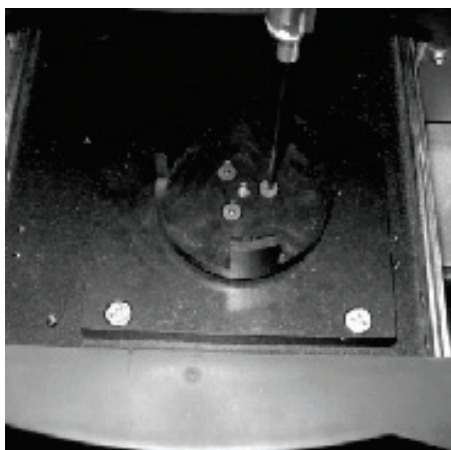
The large open sample cup is an option for use with whole, sample-type grain. To use the large sample cup, the standard sample tray must be removed and replaced with a larger sample tray.

To install the large sample cup and tray:

1. Open the drawer and remove the (3) Allen head screws from the standard tray using a 5/64 Allen driver. Set aside the screws to re-attach the large tray.
2. Remove the sample tray from the plate.

Figure 27

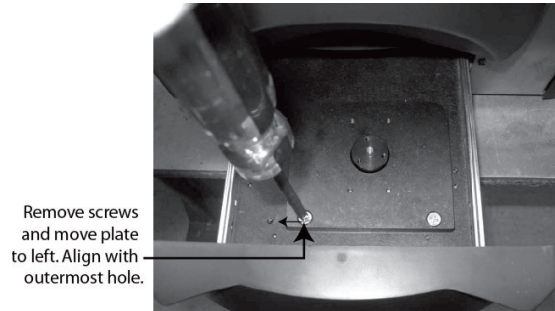
Remove Standard Sample Tray





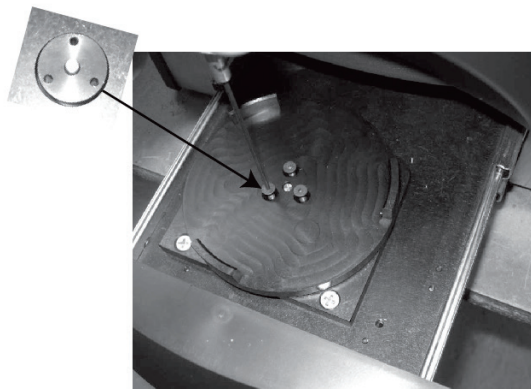
3. Remove the (2) #2 Phillips screws from the sample motor mounting plate.
4. Move the sample motor plate approximately 1" to the left and align the motor plate screw hole with the outermost mounting plate hole.

Figure 28
Re-align Mounting Plate



5. Re-insert the (2) Phillips screws through the mounting plate and secure to the drawer tightening to 6 in. lbs.
6. Place the large sample tray onto the sample motor plate aligning the (3) Allen screw holes to the plate holes.
7. Secure the plate with the (3) Allen heads screws. Tighten to 6 in. lbs.

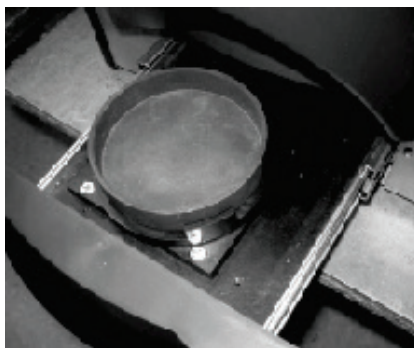
Figure 29
Install Sample Tray



8. Place sample cup into tray. Installation is complete.



Figure 30
Sample Cup Placement





NAVIGATION

The user interacts with the IL700 via the LCD touch screen display. Screen interaction by finger touch or using a dull, pointed object, such as a stylus or retracted pen is recommended.

Refer to Maintenance section for cleaning display.

NOTICE

NOTICE

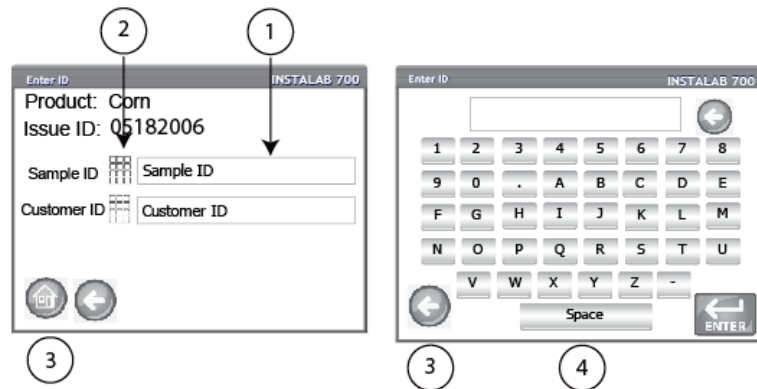
Do not use any sharp objects on the display. Damage to screen can result.

The following methods are used to navigate through and interface with the unit:

1. Text input boxes
2. Keypad icon (enables keyboard)
3. Navigation buttons
4. Virtual keyboard

Figure 31

LCD Touch Screen Display



USING EXTERNAL DEVICES

The following external devices can be used to enter data and navigate through the screens by connecting to the USB ports (2 front/2 back):

- keyboard
- mouse
- barcode scanner



TOUCH SCREEN BUTTON FUNCTIONS



HOME

Home button is available on most screens and, when pressed, returns to the Main Menu screen.



POWER OFF

Power Off button turns the system off from the touch screen display. The system must be turned on using the On/Off button located on the front panel but can be turned off from either the screen display or the On/Off button.



PRINT

Print button allows printing test results to a local printer. Refer to the Setup section for print requirements.



BACK

Back button returns to the previous screen.



ENTER

Enter button accepts action taken and proceeds to next screen. Parameters changed on the screen typically requires the Enter button to be pressed to save changes.



USB

USB button is used when connecting the unit direct to a computer for downloading software and installing calibrations.



ID

ID button displays the ID screen to manually modify or add a Customer ID or Sample ID.



CLEAR

Clear button removes a test result and does not save the results to the database.



INSTRUMENT INFORMATION

Instrument Information button appears on the Main Menu screen providing details regarding unit service date, serial number, and software version. Typically used for troubleshooting purposes.



LCD DISPLAY TOUCH SCREEN CALIBRATION

Display Touch Screen Calibration button re-calibrates the display when screen responsiveness does not occur effectively to a finger touch or stylus.



KEYPAD

The **Keypad** icon appears on those screens that require text entry. Pressing the Keypad icon opens the virtual keyboard for typing text on the screen. The virtual keyboard is used when an external keyboard, mouse, or barcode scanner are not available.





PASSWORD RESTRICTIONS

Setting an administrator user name and password to restrict modification of system settings to an administrator are optional. The unit is shipped with an Admin user name of "GUEST" and password setting of "GUEST".

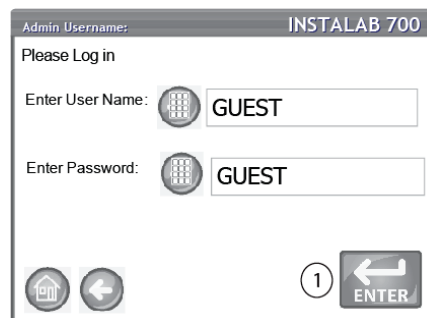
OPEN ACCESS

Keeping the Admin user name and password as "GUEST" retains the unit in open access mode allowing any user to enter System Settings and modify unit settings.

- Press the **Enter** button to proceed.

Figure 33

Password Screen (Open Access)



RESTRICTED ACCESS

To restrict access to System Setup screens that affect overall unit functionality, a new Admin User name and password must be created.

NOTE

An external keyboard, barcode scanner, or mouse can be used to enter data into the unit

To create an Admin User Name and Password or change an existing User Name and Password:

1. At the Main Menu screen, press the **Setup** button.
2. If currently in open access mode, leave the Admin User name and password as GUEST. If already secure, enter appropriate User Name and Password and press the **Enter** button.

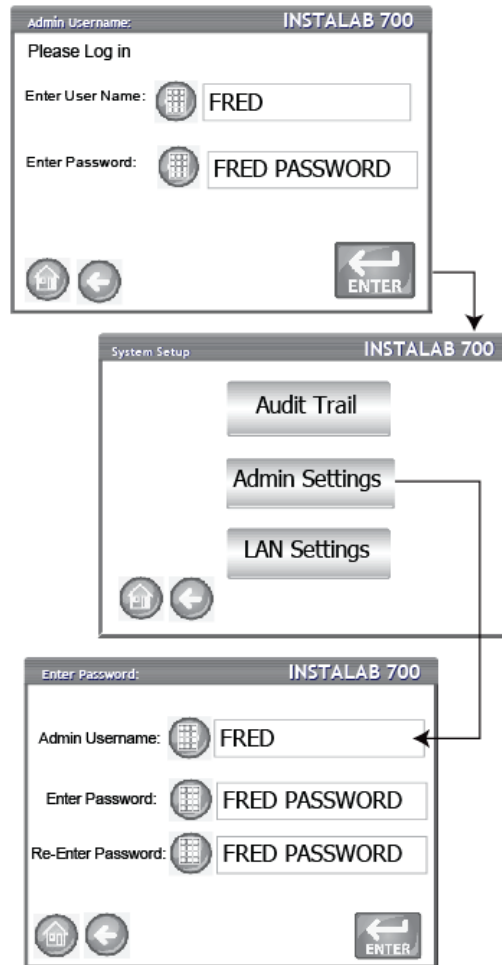


3. At the System Setup screen, press the **More** button to display the next System Setup screen.
4. Press the **Admin Settings** button to display the Password screen.
5. Press the Admin Username keypad icon and enter an administrator user name.
6. Press the **Enter** button to accept.
7. Enter a password and re-enter the password to confirm.
8. Press the **Enter** button to accept.

Once a new password is created, the unit is configured so that an administrator name and password is required to gain entry into the System Setup screens. Password and user name can be any combination of letters and numbers.

Figure 34

Password Screens





RESTORE TO OPEN ACCESS

To remove restricted access to System Setup screens, at the Admin Username screen, enter the user name of RESET and password of RESET and press the **Enter** button.



SYSTEM SETUP

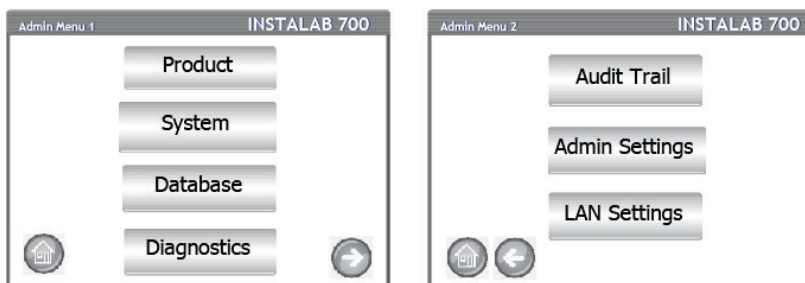
System Setup establishes basic unit operating parameters and allows customization of the user interface by:

- Editing an existing product and loading new products (Product button)
- Setting system parameters for external devices, language, time/date, sample result output, sample/customer ID's, upgrading system software, and printer format selection (System button)
- Clearing stored test results and backup of records (Database button)
- Diagnostics for calculating raw log and reference values and troubleshooting (Diagnostics button)
- Viewing of Audit Trail log (Audit Trail button)
- Creating passwords for admin users (Admin Settings button)
- Ethernet connectivity settings (LAN Settings button)

To view System Setup options:

1. At the Main Menu screen, press the **Setup** button.
2. Enter User Name and Password, if required, and press the **Enter** button to display the Setup screen. If defaulted to Name (Guest) and Password (Guest) press the **Enter** button.

Figure 35
System Setup Screen



PRODUCT

The Product screen is used to:

- Edit an existing product's calibration parameters
- Copy similar product parameters to create a new product
- Delete a product
- Import a product



A product's parameters can be modified to user preferences; however the product label name or file name cannot be duplicated.

To Select a Product:

At the Admin Menu screen, press the **Product** button.

EDIT PRODUCT

A product's parameters can be edited by:

- modifying generic product parameters (Main)
- creating a new constituent
- editing an existing constituent
- deleting a constituent

All constituents for a product are listed in the product window on the Edit Product screen. Each product contains:

- a Main section that includes global settings common to all constituents; such as filters, product label, sample motor control, and gain setting
- all constituents for the product

NOTE

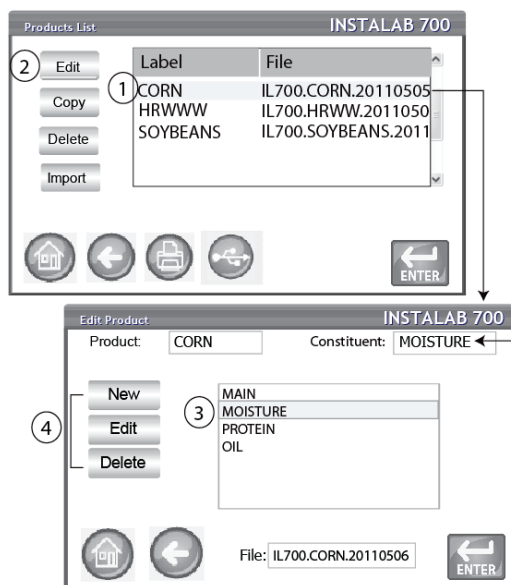
Modifying a product's parameters can affect grain test results.

To Edit a Product:

1. At the Product List screen, highlight the product in the window.
2. Press the **Print** button to print a list of products and their respective file names. Do not highlight a product.
3. Press the **Print** button to print all parameters of a particular calibration. Highlight the product.
4. Press the **Edit** button to display the Edit Product screen.
5. At the Edit Product screen, highlight Main or a constituent listed in the window.
6. Constituents can be altered by creating a new constituent, editing an existing constituent, or deleting a constituent.



Figure 36
Edit Product Screens



To Create a New Constituent:

NOTE

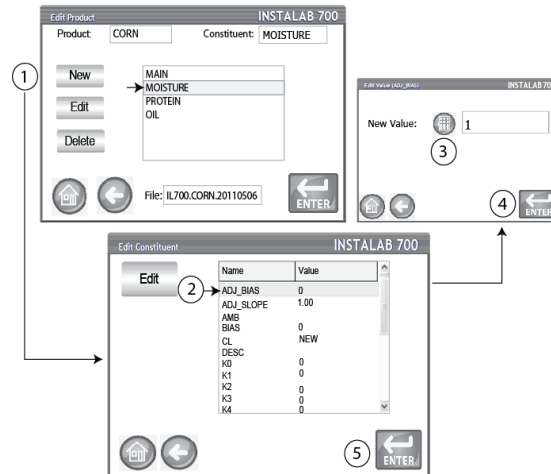
New products can also be added by importing with a USB memory device. Refer to the Import Product section for importing files.

1. Having selected a product to edit, the Edit Product screen shows a list of constituents. Press the **New** button to add an additional constituent.
2. On the new constituent screen, all parameters show default values.
3. To enter in values, highlight the parameter to change and press the **Edit** button.
4. At the Edit Value screen, press the keypad icon to enter desired value. A new constituent label name (CL) defaults to the name "NEW". Enter an appropriate constituent label name (CL).
5. Press the **Enter** button, as required, to return to the Edit Constituent screen.
6. Press the **Enter** button again to display the new constituent on the Edit Product screen.
7. To save changes, press the **Enter** button and return to the Product List screen.



- Pressing the **Back** button or **Home** button will not save changes.

Figure 37
Create a New Constituent



NOTE

For a constant to appear as a % symbol in the Units column, a text code can be entered using the virtual keypad. The text code is entered as **-PCT-** (dashes are required).

To Edit an Existing Constituent:

- At the Edit Product screen, highlight the constituent and press the **Edit** button. Existing name/values display on the Product View screen.
- Highlight the name/value to change and press the **Edit** button. Enter new name at the Edit Value screen.
- Press the **Enter** button, as required, for new changes to appear at the Product View screen.
- Press the **Enter** button to return to the Edit Product screen.
- Press the **Enter** button to save all changes and return to the Product List screen.

TIP

Continue pressing the **Enter** button until a screen appears that has no **Enter** button to ensure a save has occurred.

Pressing the **Back** button or **Home** button will not save changes.

To Delete a Constituent:



1. At the Edit Product screen, highlight the constituent and press the **Delete** button. The constituent is removed from the name/value window.

IMPORTANT

Verify that the desired constituent is selected. There is no delete confirmation screen and the constituent is removed when the Delete button is pressed.

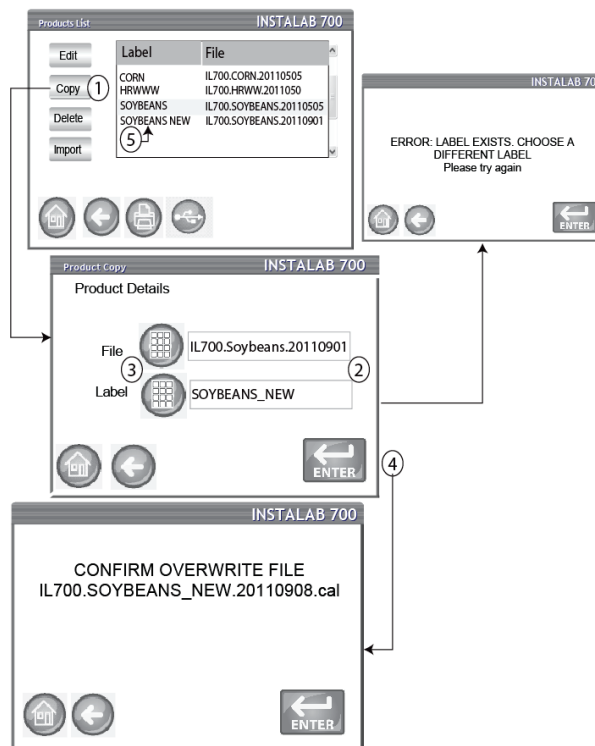
COPY PRODUCT

A new product can be created by copying a similar product's parameters/ constituents.

To Copy a Product:

1. At the Products List screen, highlight the product to copy and press the **Copy** button.
2. At the Product Copy screen, a new file name and a new product name are suggested.
3. Press the keypad icon to enter a different file name and/or product label, if desired.

Figure 38
Copying a Product File



IMPORTANT

If a product label already exists, the product label must be changed on the existing file, on the new file, or by deleting the existing file with the conflicting label. Also, if overwriting a file with the same name solves the conflicting label issue, this is allowed after confirmation of the overwrite.

4. Press the **Enter** button, as required, to save.
5. The new product label and file name appear on the Products List screen.

DELETE PRODUCT

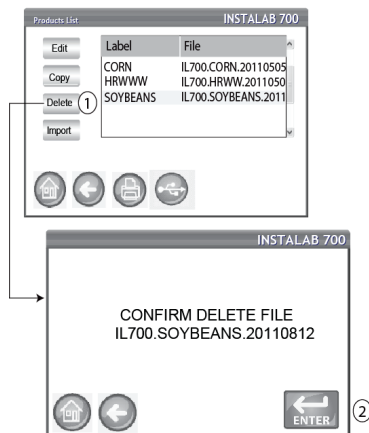
A product and its calibrations can be deleted so that it does not appear on the active user screens.

Delete a Product:

1. At the Products List screen, highlight the product to delete and press the **Delete** button.
2. At the Delete File screen, press the **Enter** button to proceed.

Figure 39

Delete Product Screen



IMPORT PRODUCT

New products can be loaded to the IL700 using a USB memory device. Follow the onscreen instructions to begin file import.

To Import a Product:

1. Insert USB memory device into unit.
2. At the Products List screen, press the **Import** button.
3. Select the desired directory, if shown, displayed in the Directory Contents window. The number of directories and/or files on the USB displays on screen.



4. Press the **Enter** button to view calibration (.cal) files.
5. The number of files stored on the USB device display in the Directory Contents window.
6. Pressing “..” displayed in the Directory Contents window returns to the previous level in the directory structure.
7. Press the **Enter** button again to display the file name on the USB.
8. Select the checkbox(s) for the files to import. The box must be checked for the download to occur.
9. Press the **Import** button to begin import.
10. Verify product(s) imported at the Product List screen.

Figure 40
Import a Product File

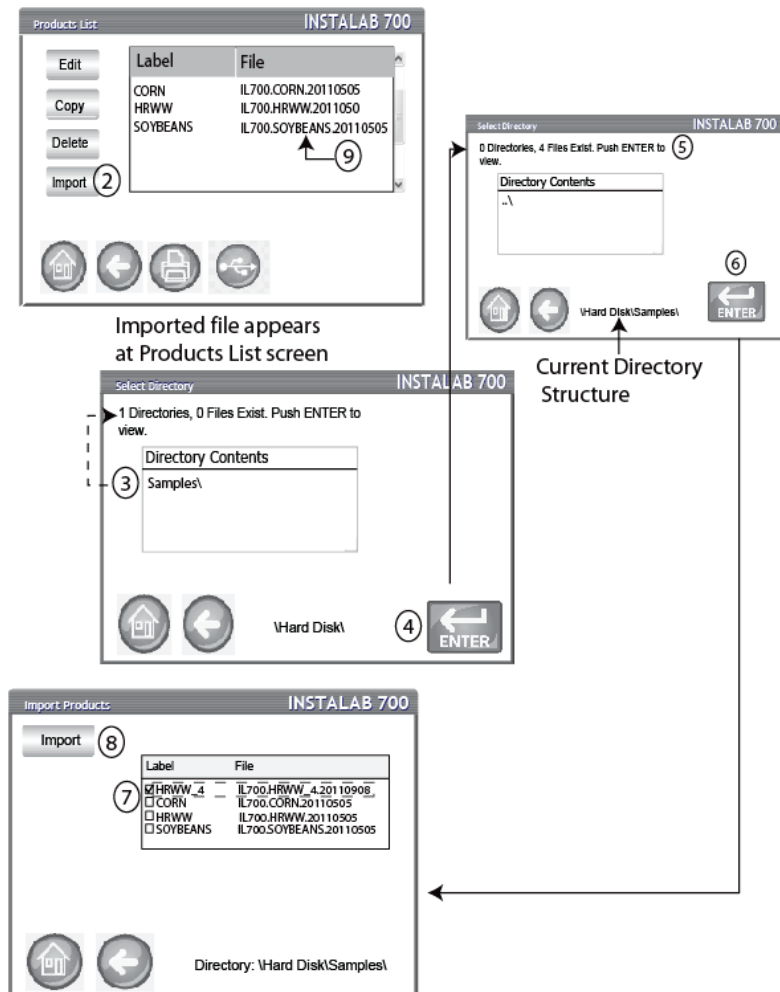
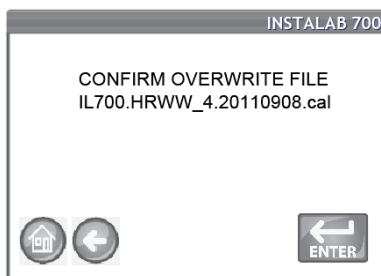




Figure 41

Confirm Overwrite File Screen



NOTE

An existing file that has the same file name as an imported file can be overwritten with operator approval. However, overwriting a file of a different file name with the same product label name is prohibited and must be resolved before file import is allowed.

SYSTEM

System screens allow customization of the unit's functionality, print settings, and system upgrades:

- Printer Settings
- Results Settings
- System File
- Time and Date
- Owner Data
- Language
- Upgrade

PRINTER SETTINGS

A USB or RS232 serial port connection is available to connect a printer that prints test data results to a ticket. The ticket can be customized to include details pertaining to the prediction results. The unit can be set to automatically or manually print a ticket at the end of each test. The printer prints only those parameters that show on the Results screen. If no alternate moisture basis information displays, it will not print. If a parameter is hidden due to its calibration file configuration, it also will not print.

Serial data streaming is an option that follows the same rules as printing except serial streaming includes place holders for all parameters even if values are not provided.

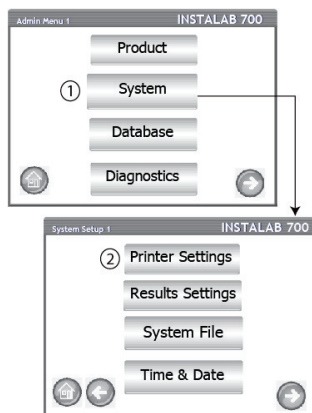
To set Printer Settings:

1. At the Admin Menu screen, press the **System** button.



2. Press the **Printer Settings** button to display the Printer Setup screen.

Figure 42
Printer Settings Screen



3. At the Printer Setup screen, select the check box for the type of connection between the unit and printer:
 - RS232 connection using a straight modem cable
 - Star USB when connecting to an SP712 USB printer
4. For an RS232 connection (printer or serial output), select the Baud Rate, Data Bits, Parity, and Stop Bits that are appropriate.

NOTE

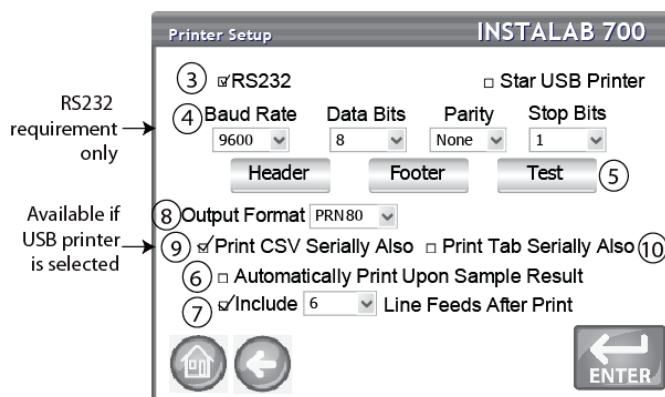
Refer to next page for adding a Header and Footer to print on each ticket, if desired.

5. Press the **Test** button to verify that printer connections have been established.
6. When enabled, **Automatically Print Upon Sample Result** applies to both printing and data streaming. A ticket will print at the end of each analysis.
7. When enabled, **Include Line Feeds After Print** allows additional line feeds to be added at the end of each ticket after printing. Applies only to printing.
8. Select the output format based on printer type:
 - PRN80 - Standard 80 column printer output (80 characters per line)
 - SP200 - (RS232 only) Star Printer compatible (does not recognize the tab for column spacing and inserts spaces for column alignment)



9. Print CSV Serially Also: Enable this selection when test results are sent to both a printer and a computer. Baud rate, byte size, parity, and stop bits must also be defined to match the RS232 computer output.
10. Print Tab Serially Also: Similar to Print CSV Serially Also but uses a tab delimiter.

Figure 43
Printer Setup



STREAMING DATA SERIALLY

Streaming data to an external device is done using one of two methods:

- Print CSV Serially (data separated with commas) or
- Print Tab Serially Also (data separated with tabs)

Data streaming occurs with both automatic printing and manual printing.

Enable Data Streaming:

1. At the System Setup screen, press the **Printer Settings** button.
2. Select the STAR USB printer. Data streaming can only occur with this printer type.
3. Select either Print CSV Serially Also or Print Tab Serially Also.

Data streaming functionality is now enabled.

NOTE

Use an RS232 null modem cable for interface to a computer.



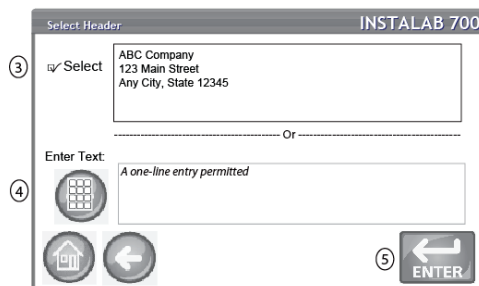
ADD HEADER/FOOTER TO TICKET

Header and Footer text can be added to print on a print ticket. Owner Data text can be selected as the default or customized text can be entered.

To Enter a Header/Footer:

1. At the Printer Setup screen, press the **Header** button.
2. To use the Owner Data address information, enable the check box next to the company name and address. If the Owner Data text box is blank, owner data information has not been entered at the Owner Data screen and can be entered at the System Setup screen, **Owner Data** button.
3. To enter other text, deselect the Select check box.
4. Press the keypad icon to open the unit's keyboard and enter desired text.
5. Press the **Enter** button to accept.
6. If desired, a footer can be entered by pressing the **Footer** button at the Printer Setup screen.

Figure 44
Header Screen



RECOMMENDED PRINTER SETUP

The below table provides recommended printer settings based on printer type. These are only recommendations and can be modified as needed.

PRINTER	CABLE	PRINTER TYPE	BAUD RATE	DATA BITS	PARITY	STOP	FORMAT
Star SP712 USB	USB (A-B)	Star USB					PRN80
Star SP712RS232	Straight	RS323	9600	8	None	1	PRN80
SP200 RS232	Straight	RS232	9600	8	None	1	SP200



RESULTS SETTINGS

A Sample ID and Customer ID can be enabled so that a sample is identified and saved with this information each time a test is performed. These functions can be set to automatically populate or require a manual entry for each test.

To edit Test Result Settings:

1. At the System Setup screen, press the **Results Settings** button.
2. Enable the check box of desired ID's required when running samples.
3. Press the **Enter** button to accept.

Sample ID

Requires a Sample ID to be associated with each test and prints to ticket.

NOTE

If a minus/dash (-) symbol is used before a numeric digit, the auto sequence sample ID will auto sequence to the next lower number (ABC-123 will auto advance to ABC-122). A dash (-) symbol used within alpha characters will not affect auto sequencing.

Auto Sequence Sample ID

Automatic number sequencing to the next higher number will occur with additional tests of the same sample eliminating the need to manually enter the ID. A sample ID of ABC123 will auto advance to ABC124.

Customer ID

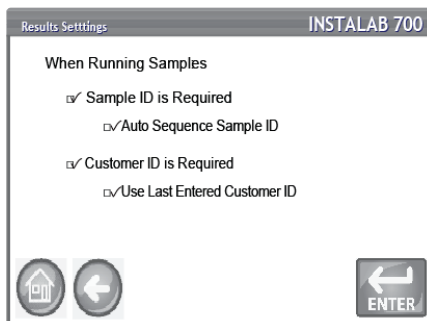
Requires a Customer ID to be associated with each test and prints to ticket.

Use Last Entered Customer ID

Continues to use the last entered Customer ID with each test unless manually changed or a power cycle occurs.

Figure 45

Results Settings Screen

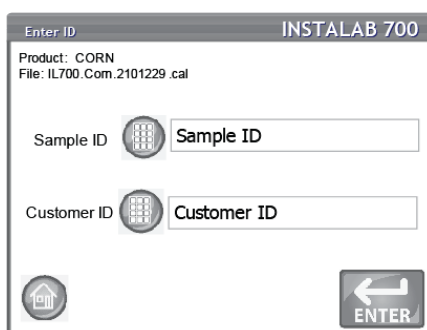




If Auto Sequencing Sample ID is disabled but a Sample ID is required, an Enter ID screen appears when testing a sample that requires manual entry of the Sample ID. With Auto Sequence Sample ID enabled, the same screen appears with the next higher value automatically entered that can be manually changed, if desired.

The Customer ID function performs in the same manner as Sample ID except Customer ID continues to use the last customer ID as opposed to Sample ID auto sequencing to the next higher number.

Figure 46
Enter ID Screen



SYSTEM FILE

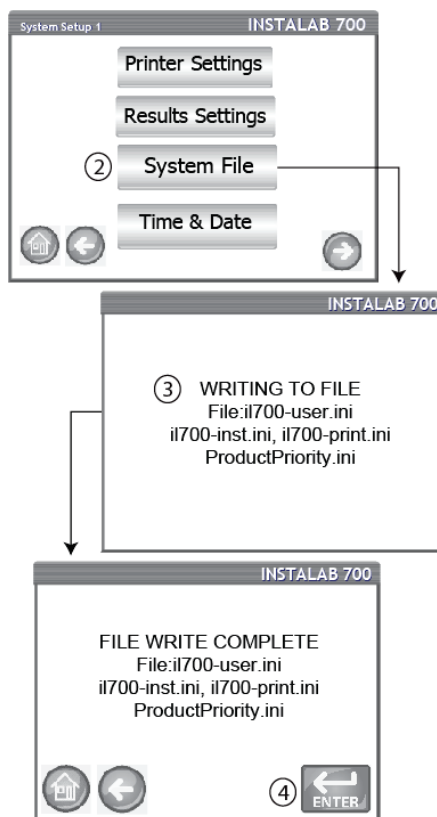
System file settings can be exported to a USB memory device. These files can then be used to later restore files to the unit or transfer system files to another unit requiring the same settings.

To export System Files:

1. Insert USB memory device.
2. At the System Setup screen, press the **System File** button.
3. Writing to File screen indicates that files are exporting to the memory device displaying the file names transferred.
4. At the File Write Complete screen, press the **Enter** button to return to the System Setup menu.
5. Memory device can be removed from the unit.



Figure 47
System File Screens



TIME AND DATE

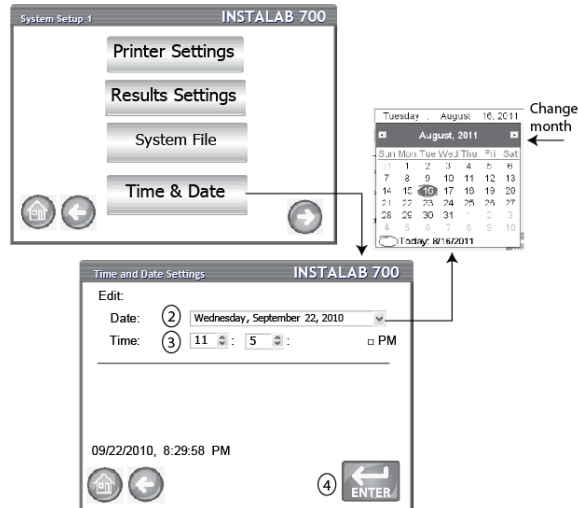
Display of time and date on the unit can be changed to user preference. Time displays in a 12 hour format.

To edit Time and Date:

1. At the System Setup screen, press the **Time and Date** button.
2. To select a date, press the Date drop down arrow to display the calendar.
3. Set the time by selecting the hour and minutes. Select the PM check box, if applicable.
4. Press the **Enter** button when done.



Figure 48
Time and Date Screen



OWNER DATA

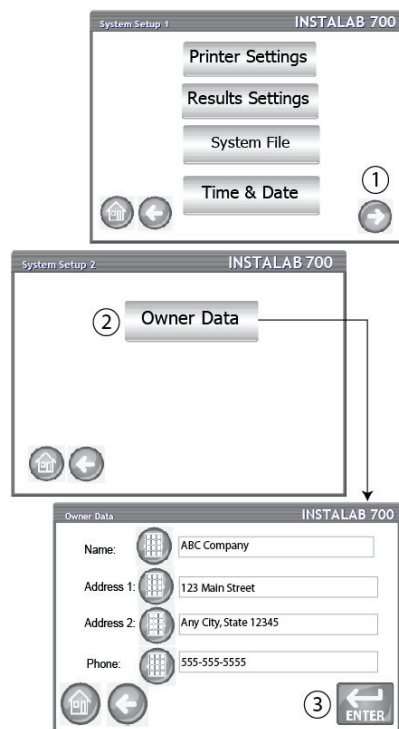
Enter name, address, and phone information, if desired. Data entered at this screen can be used as the header/footer on a print ticket.

To edit Owner Data:

1. At the System Setup screen, press the **More** button until the **Owner Data** button appears.
2. Press the **Owner Data** button and enter name, address, phone number by pressing the keypad icon.
3. Press the **Enter** button when finished.



Figure 49
Owner Data Screens



AUDIT TRAIL

Any changes in the audit file that relate to system functionality and testing are recorded and stored. This includes events such as system setup changes, product name deletions, time and date of occurrences. The audit file has a maximum capacity of 1,000 events with the oldest event being replaced when the file becomes full.

To View Audit Trail:

1. At the Admin Menu 1 screen, press the **More** button to display and press the **Audit Trail** button.

The Audit Trail screen displays:

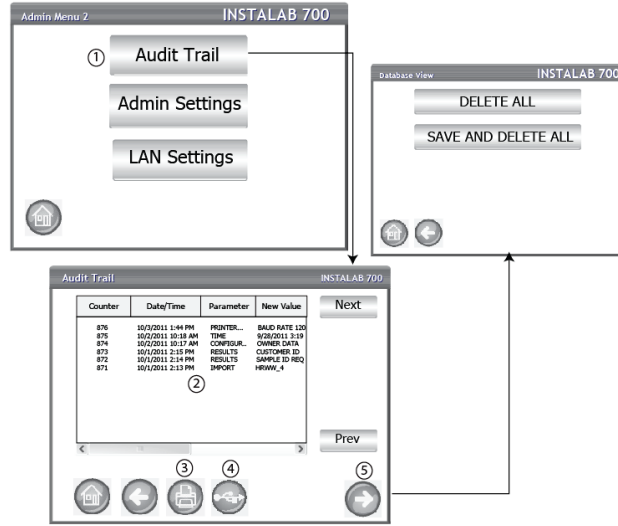
- Counter (number assigned to a change)
 - Date and Time of the occurrence
 - Parameter (where the change occurred)
 - New Value (what changed within the parameter)
2. Press the **Print** button to print results as displayed on the Audit Trail screen. If the printer output format is PRN80 or CSV01, the output format is CSV. All other formats print in strip.



3. Insert a USB memory device and press the **USB** button to transfer Audit Trail results as displayed on the Audit Trail screen to a file for transfer to a computer.
4. Audit Trail records can be deleted by pressing the **More** button. Records can be saved to a USB memory device or deleted with no save.

Figure 50

Audit Trail Screens



LAN SETTINGS

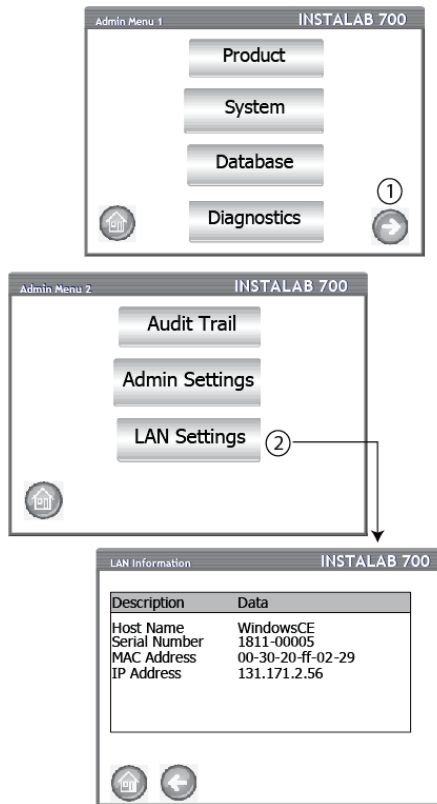
LAN Settings screen provides required information necessary for Ethernet connectivity between the IL700 and a network.

To View LAN Information Screen:

1. At the Admin Menu 1 screen, press the **More** button to display the **LAN Settings** button.



Figure 51
LAN Settings Screens





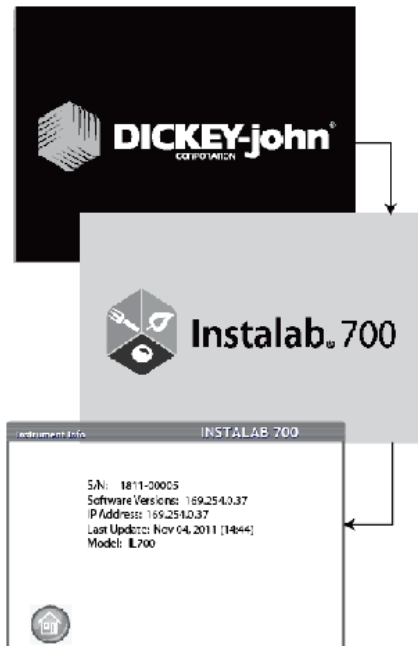
STARTUP

The Instalab™ 700 is powered on by pressing the on/off switch located on the front panel. A series of Startup screens load after the system is turned on. A status bar will indicate a loading of forms are occurring and upon completion, the Instrument Information screen is displayed for several seconds before the Main Menu screen displays.

IMPORTANT

The unit is designed to remain on and not be turned off. If turned off, the unit should be powered on for 3 hours before measurements are taken. It is highly recommended that NO analysis is performed until the temperature bar is consistently green. Stabilization can take a minimum of 30 minutes but is recommended that the unit be on for 3 hours before performing an analysis.

Figure 52
Startup Screens



POWER DOWN

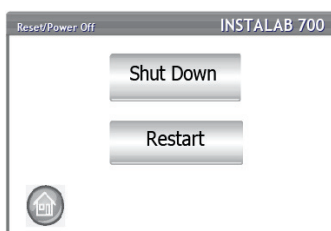
The unit can be powered down from any screen by pressing the **On/Off** button located on the front panel.



A virtual **Shut Down** button is also available on the Home screen that will power down the unit in the same manner as the on/off switch. A Power Down screen must be acknowledged before the unit will shut down. The **On/Off** button must be pressed again to power the unit on.

Pressing the **Restart** button powers down the unit and then restarts automatically after temporarily shutting down.

Figure 53
Power Down Screen



ANALYZING PRODUCT

NOTE

Daily and weekly maintenance routines are recommended for optimum unit performance. Refer to the Maintenance section for details.

The Main Menu screen appears after all Startup screens have loaded. The “Home” menu is the main screen that all other screens are accessed.

At the Main Menu screen, three functions are available:

1. To analyze grain
2. To access test results
3. To setup/customize the unit

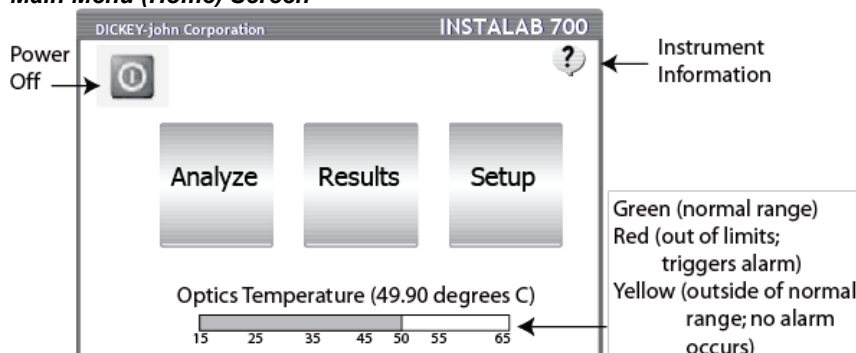
IMPORTANT

The unit is designed to remain on and not be turned off. If turned off, the unit should be powered on for 3 hours before measurements are taken. It is recommended that NO analysis is performed until the temperature bar is consistently green. Stabilization can take a minimum of 30 minutes but is recommended that the unit be on for 3 hours before performing an analysis.



Figure 54

Main Menu (Home) Screen



OPTICS TEMPERATURE THERMOMETER BAR

An optics temperature thermometer displays the temperature of the optics chamber. The bar is red until the temperature reading is within +/- .50 degrees C of the optimum set point of 50.00 degrees C. The bar turns green when the temperature is within +/- .10 degrees C of the set point. A temperature warning appears when the bar is red but analysis can still occur. Any analysis performed when the bar is red is flagged with a symbol (+ high temperature and - low temperature) indicating a suspect result.

Upon power up of the unit, the temperature will climb to 50.00 degrees C and likely overshoot. Some oscillation will occur before stabilizing.

Optics Temp Bar Status	Operating Temperature Limits
Green	Within normal range for analysis +/- .10 degrees C of set point.
Yellow	Optics temperature is within +/- .50 degrees C of set point. Grain analysis is not inhibited but not recommended.
Red	Optics temperature is greater than +/- .50 degrees C of set point. Prediction analysis is not prohibited but not recommended. Data collection is prohibited.

SAMPLE DRAWER

The sample drawer has two sections:

- Sample section
- Ceramic Reference Disk section



When the sample drawer is open between analyses, all optical filters are successively positioned over the ceramic reference disk. The gathered reflectance data, at each of the selected wavelengths, is stored and available for the next analysis.

When the drawer is closed, the light reflected from the sample at each of these wavelengths is measured again. The machine logarithms used in the regression equation are measurements of the ratio of sample reflectance data to the reflectance data gathered from the ceramic reference disk.

NOTE

Manual entry of a Sample ID can be avoided by enabling the Automatic ID at the Results Settings screen.

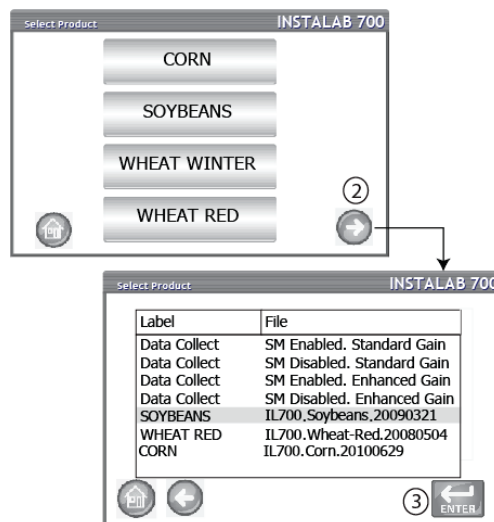
SELECTING PRODUCT

To select a product for testing:

1. At the Main Menu screen, press the **Analyze** button. A pre-defined list of the 4 most recent products tested appears on the Select Product screen. Products are saved in a "last used" order. Press the desired **Product** button to begin analyzing.
2. To view additional products, press the **More** button.
3. Highlight the desired product and press **Enter** to select.

Figure 55

Select Product





NOTE

Manual entry of a Sample ID can be avoided by enabling the Automatic ID at the Results Settings screen.

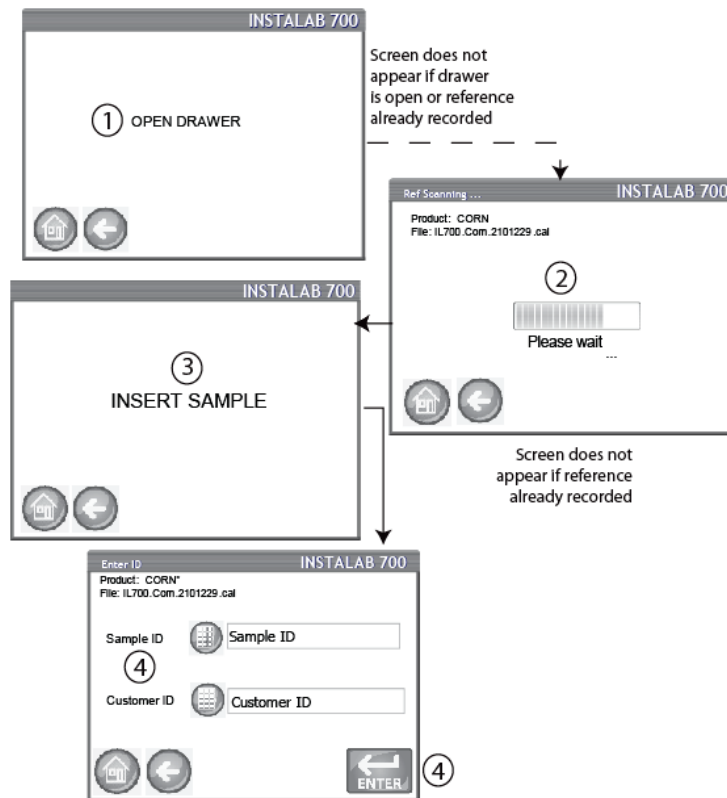
ANALYZING PRODUCT

1. A screen may prompt to open the drawer to prepare for analysis if the door is not already open or if a recent reference has not been recorded.
2. Open drawer to complete open position and insert sample. A reference scan will not start if drawer is not in the complete open position.
 - A status bar indicates progress if a scanning reference is required.
3. Close drawer at screen prompt to begin analysis.
4. The Enter ID screen appears only if a sample ID and/or a customer ID is required. Press the **Enter** button to proceed.
 - When enabled, Auto Sequencing will automatically enter the next sample ID number.
 - When enabled, Last Enabled Customer ID will continue loading a Customer ID until the next power cycle occurs.
 - If neither is required, this screen is skipped.
5. During analysis, a testing status bar indicates progress.

NOTE

If a minus/dash (-) symbol is used before a numeric digit, the auto sequence sample ID will auto sequence to the next lower number (ABC-123 will auto advance to ABC-122). A dash (-) symbol used within alpha characters will not affect auto sequencing.

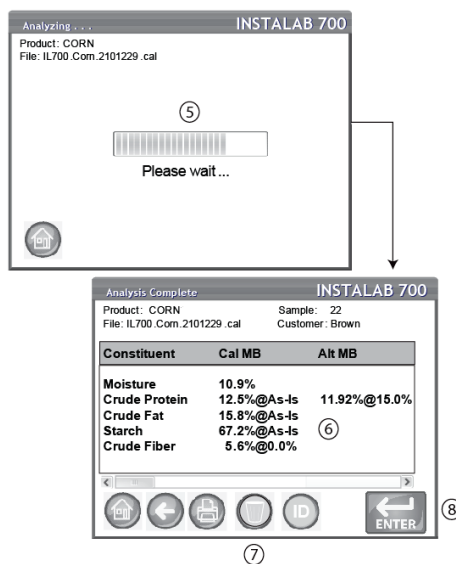
Figure 56
Analysis Screens



6. The Analysis Results screen displays:
 - Product tested
 - Sample ID, if enabled
 - File name
 - Customer ID, if enabled
 - Constituent results (An alternate moisture basis reading displays when required by the calibration)
7. Test results are automatically saved to the unit unless the **Clear** button is pressed.
8. Press the **Enter** button to analyze another sample or open the drawer.



Figure 57
Analysis Results Screen



ANALYSIS READINGS DEFINED

Reading	
As-Is	Actual sample moisture is moisture basis
Out of Limits (*)	A reading that is above or below calibration limits. Example: 12.5% @ As-Is*
Cal MB	Native moisture basis of calibration
Alt MB	Alternate moisture basis
Temp Out of Limits +/-	A reading taken when the optics temperature is too high (+) or too low (-)

Other Actions:

Home button returns to the Main Menu screen.

Print button sends test results to a local printer.

Clear button removes the current test results and exits the screen without saving to the database.

ID button displays the ID screen for entry of Sample ID and/or Customer ID.

Refer to the Error Message section for probable causes and corrective actions if errors occur during analysis.



LOG DATA COLLECTION

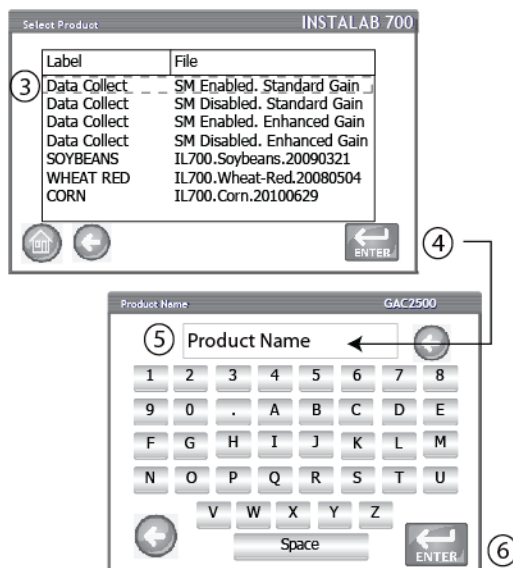
Log Data Collection is used for developing calibrations and is necessary to collect log values on training set samples. Performing a Log Data Collection is similar to the product Analysis process. All results settings apply and a Sample ID is required. The Results screen displays log values instead of predictions.

Perform a Log Data Collection:

1. At the Main Menu screen, press the **Analyze** button.
2. To view the Data Collect options, press the **More** button.
3. At the Select Product screen, highlight the appropriate Data Collect label and file name.
 - Sample motor enabled/disabled
 - Standard or enhanced gain
4. Press the **Enter** button.
5. Enter a product name.
6. Press the **Enter** button to proceed.

Figure 58

Select Log Data Collection



7. A screen may prompt to open the drawer if the door is not already open or if a recent reference has not been recorded. Open drawer to complete open position and insert sample. A reference scan will not start if drawer is not in the complete open position.
 - A status bar indicates progress if a scanning reference is required.
8. Close drawer at screen prompt to begin analysis.
9. At the Enter ID screen, enter a sample ID.

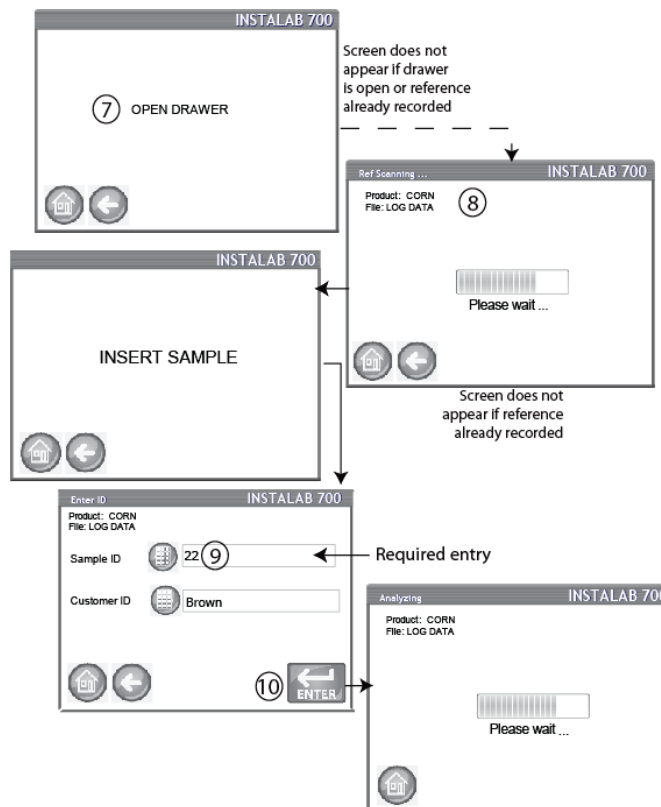


10. Press the **Enter** button to proceed. A testing status bar indicates progress.

- Press the **Enter** button to perform another Log Data Collection
- Press the **Home** button to return to the Main Menu screen

Figure 59

Log Data Collection

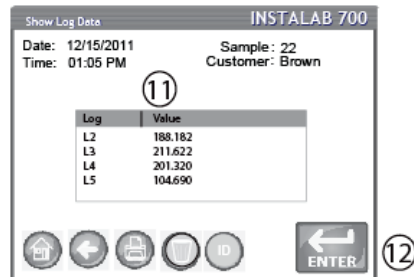


11. The Log Data Collection screen displays the Log label and its value.

12. Press the **Enter** button to perform another log data collection or press the **Home** button to return to the Main menu screen.

Figure 60

Log Data Results





RESULTS

The Results screen displays a listing of grain test results and date relevant to a specific test:

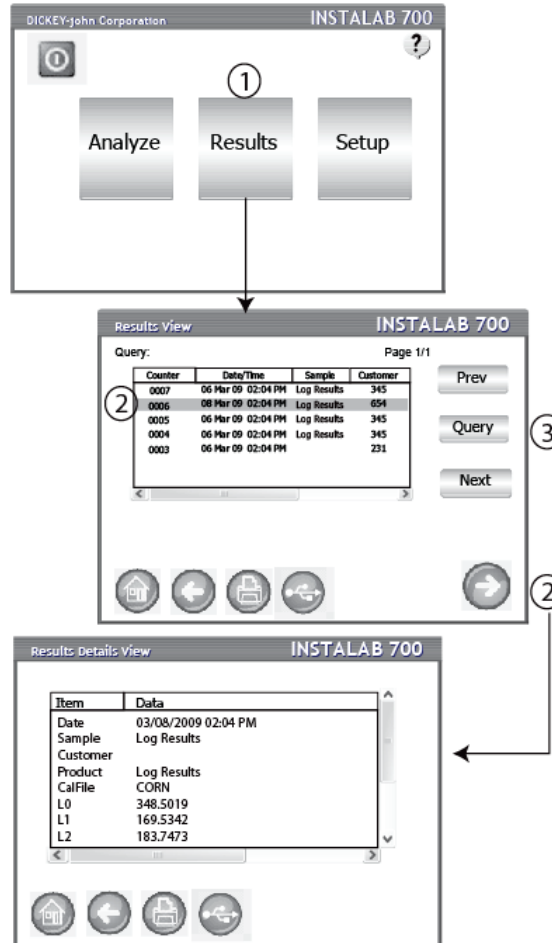
- Counter
- Date and time
- Sample ID
- Customer ID

To display Results:

1. At the Main Menu screen, press the **Results** button. The Results View screen default displays all stored test results.
2. Press the **Previous** and **Next** buttons to scroll up and down the window to view additional results.
3. Highlight a product and press the **More** button to view that product's specific results details.
4. Press the **Back** button to return to the Results view screen.



Figure 63
Results Screen



Other functions:

- Press the **Print** button to print results as displayed in the table on the Results screen.
- Insert USB memory device and press the **USB** button to transfer product results to a computer. All results are transferred to USB regardless of Filter setting. Any exported results via USB for either screen are appended to an existing database of today's date. If no file exists with today's date, a file is created. The format is the same for exported data from the Results Details View screen as it is from the Results View screen.



To refine Query Options:

At the Results View screen, press the **Query** button to display the Refine Query screen.

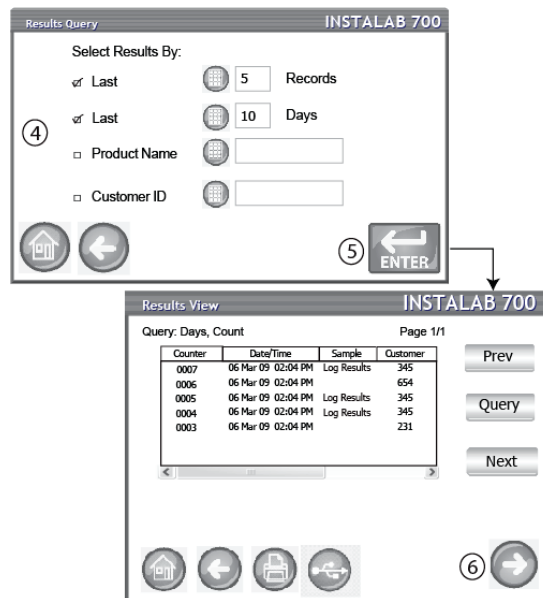
A query of records can be performed by selecting a check box to enable:

- last number of records
 - last number of days
 - by product name
 - by customer id
1. Press the **Enter** button to display query results. At the Results View screen, the table displays the results based on enabled queries.
 2. To view a sample's specific details, press the **More** button as shown in (Figure 63).

NOTE

Selected queries will only clear at a power cycle or by manually disabling at the Refine Query screen.

Figure 64
Query Screen



REFINE QUERY OPTIONS

Results can be filtered to display based on one or all of the following criteria:



LAST NUMBER OF RECORDS

Allows entry of a specified number of records to display or print starting with the last sample taken, such as printing the last 5 samples.

LAST NUMBER OF DAYS

Allows entry of a specified number of days to display or print starting with the most current date.

PRODUCT NAME

Allows entry of a product name to perform a product search. Exact product name must be entered to find results but is not case sensitive.

CUSTOMER ID

Allows entry of a specific customer ID to view or print.



DATABASE STORAGE AND RECORD DELETION

The unit is capable of storing 3,000 test results. When the unit has reached 83% capacity (2500 results) of storing test results, a Database Warning screen appears to recommend a backup and deletion of records during the testing process. If the database reaches full capacity, further testing will be prevented until the database is cleared.

IMPORTANT

The exporting of records could take several minutes if a large quantity of records are being backed up. Do not interrupt the transfer until a File Write Complete message appears.

NOTE

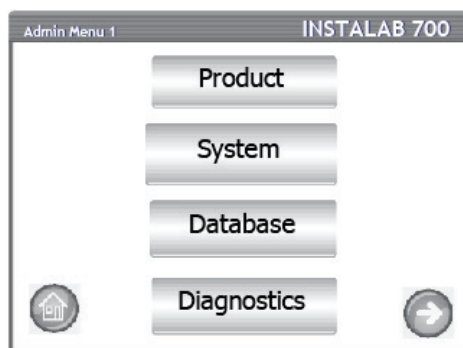
Files are exported as an .xls file.

To Delete Test Results:

1. At the Main Menu screen, press the **Setup** button.
2. Enter password, if required, and press **Enter**.
3. At the Admin Menu screen, press the **Database** button.

Figure 65

System Setup Screen



4. Select the method to delete stored records:
 - Delete all stored records without saving (Delete All button)
 - Save all stored records prior to deletion (Save and Delete All button)
5. Follow onscreen instructions for deleting records.



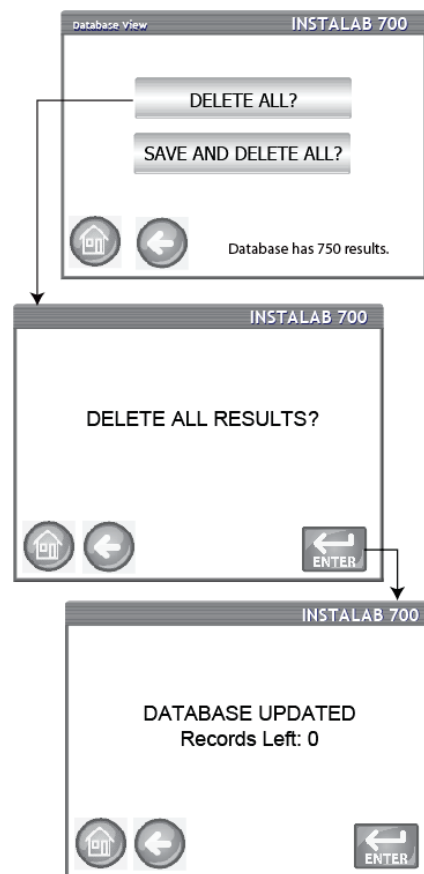
DELETE ALL RECORDS

The Delete All Records function removes all stored files from the unit without saving to a USB memory device.

1. At the Database View screen, press the **Delete All** button.
2. Press the **Delete All** button to initiate deletion of records.
3. Press **Enter** to confirm and begin record deletion.
A confirmation screen displays indicating files are removed and database is updated.

Figure 66

Delete All Records





SAVE AND DELETE ALL

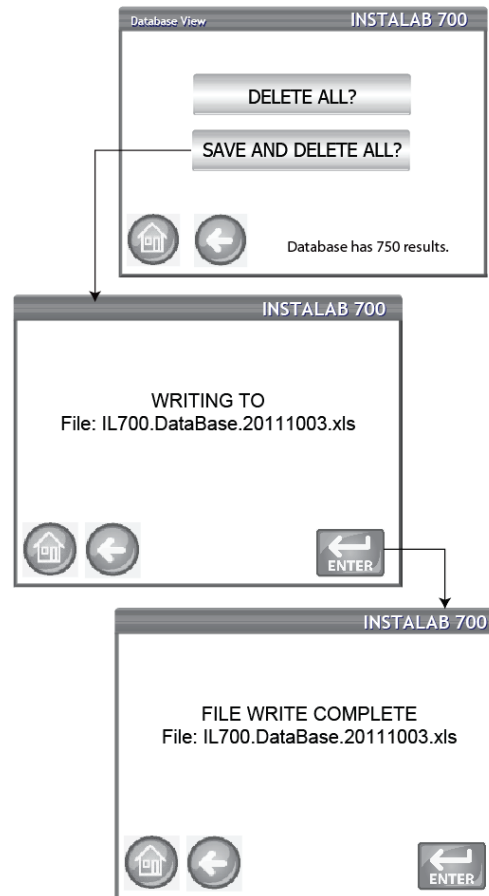
The Save and Delete All function saves all records prior to deletion from the unit.

To Save prior to Record Deletion:

1. Insert a USB memory device into unit.
2. At the Database View screen, press the **Save and Delete All** button.
3. A File Write Complete screen indicates files have been exported and deleted.

Figure 67

Save and Delete All Records





DIAGNOSTICS

Diagnostic screens provide crucial system information regarding the functionality of the unit and to aid in troubleshooting.

Diagnostics provide details regarding the following:

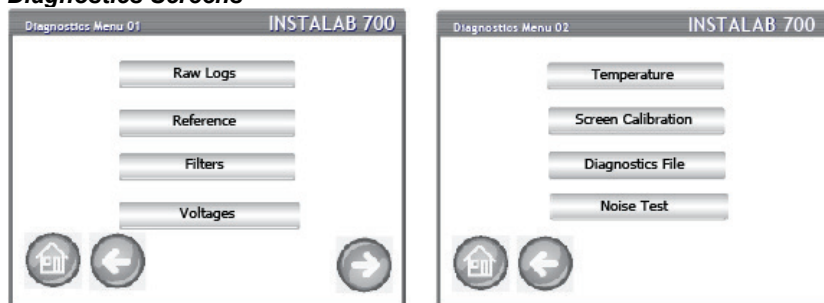
- Raw Logs
- Reference Drift
- Filters
- Voltages
- Temperature
- Screen Calibration
- Diagnostics File
- Noise Test

To view Diagnostic screens:

1. At the Main Menu screen, press the **Setup** button.
2. At the System Setup screen, press the **Diagnostics** button.

Figure 68

Diagnostics Screens



RAW LOGS

Raw Log values identify the intensity of the reflected light for each filter, the optimum mode value, and the respective Raw Log value. Raw Log measurements can be conducted on a sample or on the reference disk.

To perform a Raw Log Measurement:

1. At the Diagnostic Menu 01 screen, press the **Raw Logs** button.
2. At the Mode Gain Form screen, press the **On** checkbox to run the sample motor or **Off** checkbox to keep motor off while performing the Mode Gain.
3. Select the Mode Gain value as either:



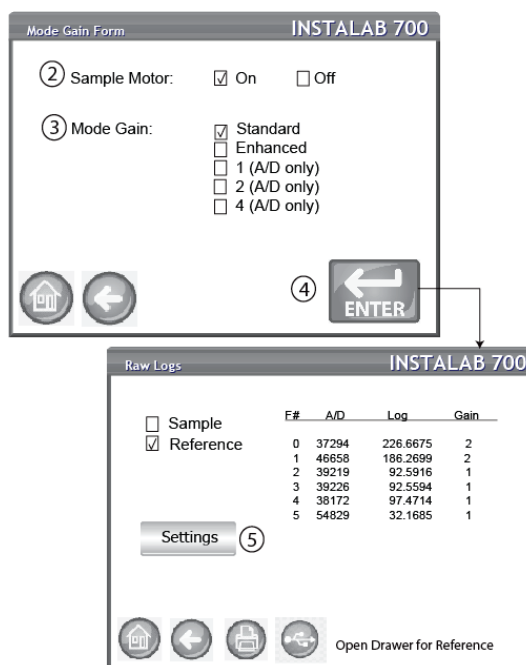
- Standard (Sample and reference raw logs normalized to a gain of 1)
- Enhanced (Reference logs normalized to a gain of 1 and sample logs normalized to a gain of 2)
- 1 (A/D only) (no raw logs)
- 2 (A/D only) (no raw logs)
- 4 (A/D only) (no raw logs)

This selection forces the machine to run a mode gain at this setting for Diagnostic purposes only.

4. Press the **Enter** button to start the Raw Log analysis.
 - A sample analysis requires the drawer to be closed.
 - A reference analysis requires the drawer to be open and will automatically start if the drawer is opened from the Raw Logs screen.
5. Press the **Settings** button to return to the Mode Gain Form and change settings.
 - Press the **Print** button to print results.
 - Press the **USB** button to save results to a USB memory device.
 - Press the **Back** button to return to the main Diagnostics menu.



Figure 69
Raw Logs Screen



In Standard Gain mode, all raw logs displayed are normalized to a gain of 1 for both sample and reference. In Enhanced Gain mode, all reference raw logs are normalized to a gain of 1. All sample raw logs are normalized to a gain of 2. No raw logs (only A/D values) display when forcing a gain of 1, 2, or 4 for both reference and sample readings.

REFERENCE DRIFT

Raw reference log values tend to drift over time. It is recommended to track this drift periodically. Tracking can be performed by storing the current values and checking drift at a later time. Each filter's drift can be observed (absolute drift) as well as the range of all the filters' drift (relative drift).

To perform a Reference Drift check:

1. Verify the ceramic reference disk inside the sample drawer is clean.
2. Leave the sample drawer open.

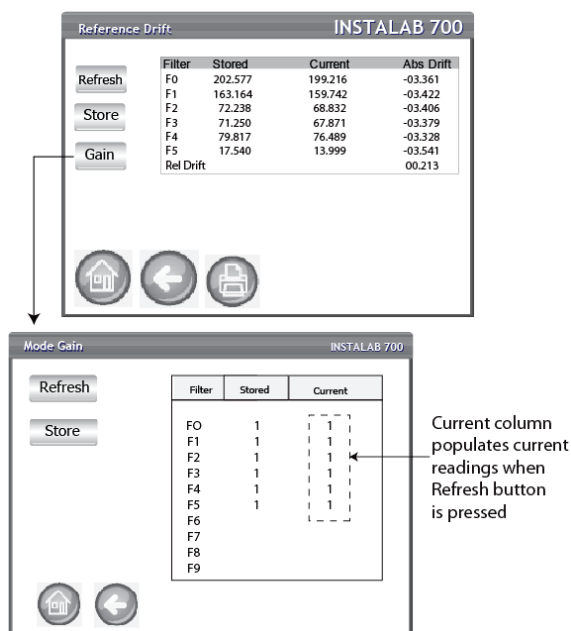
IMPORTANT

Perform only if the unit is powered on and well stabilized (preferably powered ON continuously for several days).



3. At the Diagnostics Menu 01 screen, press the **Reference** button. The Reference Drift check begins as soon as the **Reference** button is pressed. Values will populate on the Reference Drift screen in approximately 5 to 10 seconds.
4. Press the **Refresh** button to perform additional tests.
5. Press the **Print** button to print screen results.
6. Press the **Store** button to save the current value as the reference for future comparisons. Store is typically not used unless changes are made to the unit or long-term drift has been an issue.
7. Press the **Gain** button to view stored and current recommended filter mode gains.

Figure 70
Reference Drift Screen



MODE GAIN

The **Gain** button displays the Mode Gain screen showing stored and current recommended filter mode gains. The Current column is the suggested gain to be used in reading the reference disk. The Stored column indicates the actual gain used.

STORED GAIN VALUES

The **Store** button saves the current recommended value for future use. Storing new gain values is typically done when some changes have been made to the unit.



IMPORTANT

Perform only if the unit is powered on and well stabilized (preferably powered ON continuous for several days).

RAW LOGS STORAGE

Storage of the current raw reference logs can be performed at any time. Limits for absolute and relative drift flag potential problems with drift.

IMPORTANT

The Store function should only be performed if an ERROR 6 message persists during normal operation and limited to an average of no more than once every six months or a maximum of four times in two years. This Store mode is used by the factory to initialize the unit and should never be used indiscriminately. If these restrictions cannot be maintained, contact DICKEY-john® at 1-800-637-3302 for assistance.

FILTERS

A total of 10 filters can be installed. Typically the first six filters (F0-F5) are fixed in wavelength. Four more filters can be selected with the wavelengths defined by the user. The Filters screen identifies the wavelength of the installed filters.

1. At the Diagnostics Menu 01 screen, press the **Filter** button.

Figure 71
Filters Screen

Filter	Wavelength
F0	2310
F1	2230
F2	2180
F3	2100
F4	1940
F5	1680
F6	
F7	
F8	
F9	

SYSTEM VOLTAGES

The System Voltages screen indicates current machine voltage values for troubleshooting purposes.

1. At the Diagnostics Menu 01 screen, press the **Voltages** button.



Figure 72
System Voltages Screen

System Voltages		INSTALAB 700	
Voltage		Value	
Logic		4.97	
USB		5.00	
Sensor Positive		14.84	
Sensor Negative		-15.00	
Battery		2.98	
Filter Heater		1.64	
Detector Cooler		1.32	
Motor Supply		23.90	
Main Supply		14.87	
Lamp		5.16	

SYSTEM TEMPERATURE

The System Temperature screen indicates temperature of the filter compartment and detector typically used for troubleshooting.

1. At the Diagnostics Menu 01 screen, press the **More** button to display the Diagnostics Menu 02 screen.
2. Press the **Temperature** button to display system temperature values.

Figure 73
System Temperature Screens

System Temperatures		INSTALAB 700	
Temperature		Value (C)	
Filter		49.98	
Detector		-1.52	

SCREEN CALIBRATION

The LCD display touch screen may not respond as it should with a finger touch or stylus after a period of time or if subjected to extreme temperature changes. The display can be re-calibrated to improve responsiveness.

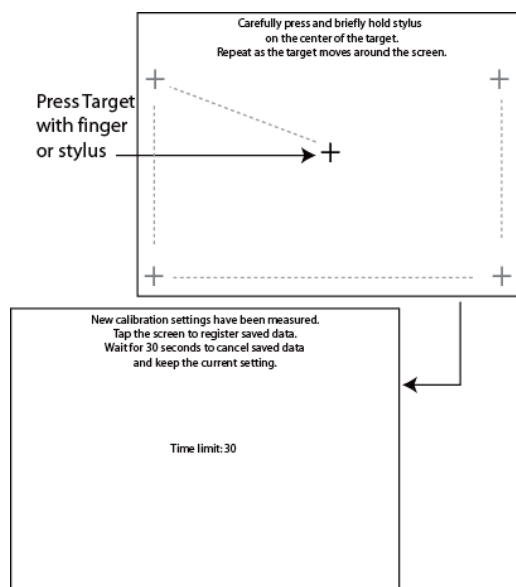
1. At the Diagnostics Menu 01 screen, press the **More** button to display the Diagnostics Menu 02 screen.
2. Press the **Screen Calibration** button and follow onscreen instructions.
3. Carefully press and hold finger on the center of the target.
4. Repeat as the target moves around the screen.



5. With a keyboard attached, press the **Enter** button to accept new settings or the **Esc** button to keep previous settings. Without an attached keyboard, press anywhere on the screen to accept.

Figure 74

Screen Calibration



DIAGNOSTICS FILE

The Diagnostics File screen is a collection of all data contained on all Diagnostic screens. This screen is helpful for troubleshooting purposes.

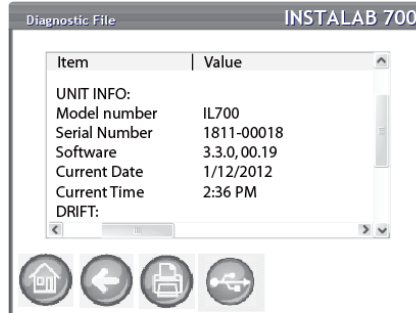
NOTE

To include current raw reference log values for long-term drift evaluation, the Reference Drift screen must be cycled through and current values displayed before initiating the Diagnostic file.

1. At the Diagnostics Menu 01 screen, press the **More** button to display the Diagnostics Menu 02 screen. Press the **Diagnostic File** button.



Figure 75
Diagnostics Screen

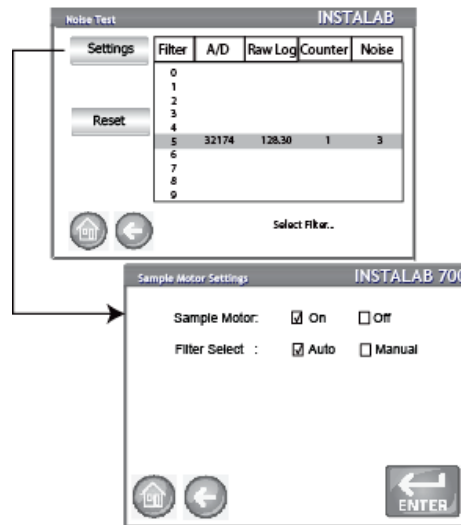


NOISE TEST

A Noise Test is used by a repair technician for troubleshooting purposes.

1. At the Diagnostics Menu 02 screen, press the **Noise Test** button.

Figure 76
Noise Test Screen

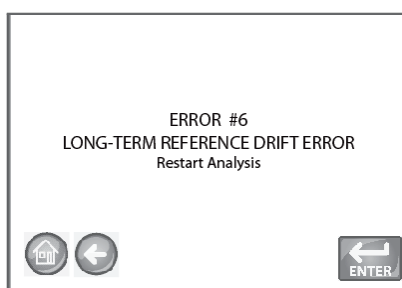




TROUBLESHOOTING

If the system locks, press and hold the **On/Off** button on the front of machine until the system turns off or unplug instrument power. Wait a few seconds and then power on. The IL700 performs a number of self-checks to verify proper unit operation. If a fault is detected due to an operator procedural error, a machine error, or a problem with the sample, an error code occurs with a possible cause and resolution.

Figure 77
Error Screen Example



Troubleshooting		
Error	Probable Cause	Corrective Action
0	Sample is not reflective and below the instrument limit.	Clean sample cup or change the sample.
1	Sample is too reflective and above the instrument limit.	Clean sample cup or change the sample.
6	Long-term Reference Drift Error	If error does not self-correct, clean the reference disk and aperture glass. If error continues, perform a Reference Log and Base Gain Setting. This error is informational only and does not inhibit operation.
7	Short-term Reference Drift Error	Possibly a one-time noise disturbance that will not occur again. Retry analysis. If error persists, could indicate an unstable instrument or a noisy environment.
8	Sample Analysis Error	The filter wheel has lost timing sync. Reselect product and retry analysis.
9	Reference Analysis Error	An error occurred during the stepping of the filter disk and lost timing sync. Reselect product and retry analysis.
17	Required filters are not installed	Wavelengths required for a calibration file is not available on the unit. The file can be loaded but no analysis is permitted until suitable wavelengths are installed.
22	Duplicate product labels	Product labels must be unique. Use a different product label name.
	Sample ID and/or Customer ID required	Result settings has been setup to require an ID. Enter required ID or change the Results setting requirements.
31	Enhanced gain mode limited	Gain limit reached on one or more filters. Any required filter that has a reference gain of X4 will use X4 in measuring the

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		sample in Enhanced Gain Mode. This provides an answer but may be compromised in resolution.
	Customer ID is required	Customer ID must be entered before proceeding.
	Flash drive required	A flash drive must be inserted before proceeding.
	Invalid file name	An IL700.[PROD].[YYYYMMDD].cal file is created using the coefficients from the regression program. PROD describes the product while YYYYMMDD provides dating of the file. Refer to the Calibration Development section (calibration file) for additional information.
47	Optics Bay Error	Temperature of 4444 indicates hot temperature and could indicate that the chopper motor is not functioning and the heater is turned off. Temperature of 5555 indicates a cold temperature and suggests a temperature control problem. Both conditions must be resolved before analysis can occur.

Contact DICKEY-john® Technical Support at 1-800-637-3302 for persistent operator errors.



MAINTENANCE

Preventative maintenance procedures are necessary to maintain optimum performance.

Simple cleaning and maintenance can be done by the customer using the directions on the following pages.

NOTE

Materials being ground and prepped for sampling with this unit may present a breathable dust hazard. Cleaning of the unit may create loose dust or airborne particles from the samples. Always follow any regulatory requirements and your designated procedures for personal protection of airborne particles.

CHECKING THE AIR FILTER

The air filter is used to minimize the accumulation of dirt inside the unit for maximum operating efficiency. An excessively dirty filter could reduce machine air pressure and allow dust to accumulate in the unit. Check the air filter as needed based on surrounding environmental conditions.

To Check the Air Filter:

1. Remove the filter cover located on the back of the unit to gain access to the filter. Filter cover can be removed by grabbing two sides and pulling.

NOTE

Unit does not have to be powered off to check the air filter.

Figure 78
Checking Air Filter





2. A mesh screen and filter cover are contained within the filter cover. Separate the mesh screen from the filter. Check filter for dirt consistency.
3. Minor dirt accumulation can be removed by cleaning the filter with mild soap and water.

IMPORTANT

Filter should be completely dry before installing.

- If the filter is significantly soiled that it appears to inhibit air flow, it must be replaced.

Figure 79

Remove Mesh Screen and Check Filter



4. Place clean dry filter onto filter cover first and then place mesh screen onto filter.
5. Snap cover back onto the unit.



CLEANING REFERENCE DISK AND SAMPLE DRAWER

The reference disk and the sample drawer must be cleaned periodically based on surrounding environmental conditions for effective operation.

To Access the Reference Disk:

1. Open the sample drawer completely.

Figure 80

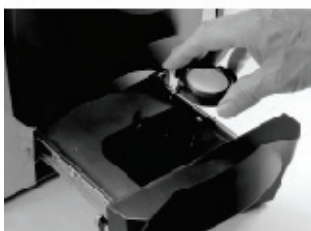
Open Sample Drawer



2. Remove the sample cup, if in the unit.

Figure 81

Remove Sample Cup



3. Push the drawer stop levers inward on both sides and pull the drawer to the full open position.

Figure 82

Push In On Levers

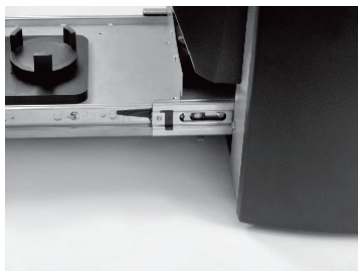




4. Pull the drawer out to gain access to the (2) black levers on the left and right side of the drawer.

Figure 83

Pull Drawer Out



5. Simultaneously press up on the left lever and down on the right lever and pull out drawer from track until the reference disk is exposed. Avoid pulling drawer out further than required to gain access to the reference disk.

Figure 84

Exposing Reference Disk



6. Clean surface of reference disk with a lint-free cloth or soft brush.

NOTICE

NOTICE

Do not touch the surface of the reference disk with bare fingers. Allowed unit to cool.
Unit is hot to the touch. (~30-35 C°)

IMPORTANT

In conditions where the reference disk has an oily residue, alcohol on a cotton swab should be used to remove the residue. After the alcohol is completely dry, use a cloth to clean the reference disk to ensure any trace of alcohol is removed. Use of other cleaning products is not recommended.



Figure 85

Clean Reference Disk Surface



7. When cleaning is complete, close the drawer ensuring the cord (attached to the drawer inside of unit) is not crimped or pinched when closing. If the aperture glass requires cleaning, refer to the Cleaning Aperture Glass section.

CLEANING APERTURE GLASS

The aperture glass should be cleaned as needed based on surrounding environmental conditions. The aperture glass is located above the reference disk when the sample drawer is in its normal open position.

WARNING

WARNING

Unplug power from wall and remove detachable power cord from the unit before proceeding. **DO NOT ATTEMPT CLEANING UNTIL POWER HAS BEEN REMOVED FROM THE UNIT.**

NOTICE

NOTICE

The unit's measurement area is hot to touch, approximately 30 to 35 C°. Always allow time to cool before cleaning begins.

To Clean the Aperture Glass:

1. Turn the unit power OFF.
2. Unplug power cord and all cables from the unit.
3. Allow the unit to cool for 10 minutes.
4. Place the unit on its back side.



Figure 86

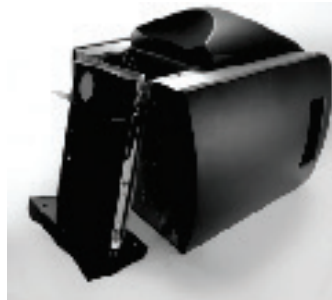
Place Unit on Back Side



5. The sample drawer must be removed to gain access to the aperture glass. Open the sample drawer and follow steps 1 through 5 in the Clean Reference Disk and Sample Drawer section.
6. Remove drawer and place on surface next to unit.

Figure 87

Place Drawer on Surface



7. Use a flashlight to illuminate the area and use a Q-tip or a clean soft cloth to carefully clean any dust accumulation from the glass surface.



Figure 88
Cleaning Aperture Glass

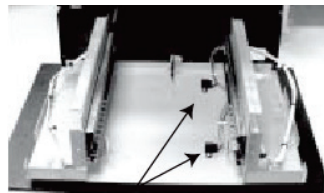


IMPORTANT

In conditions where the sample glass has an oily residue, alcohol on a cotton swab should be used to remove the residue. After the alcohol is completely dry, use a clean soft cloth to clean the sample glass to ensure any trace of alcohol is removed.

8. When cleaning is complete, align the 2 metal tracks on each side of the drawer and insert into the track grooves. Check door location sensor alignment.

Figure 89
Drawer Tab and Drawer Sensor Alignment



Drawer sensors
inside unit.

Inspect drawer tab before
inserting into tracks. Tab
should clear upper and
lower sensor housing.

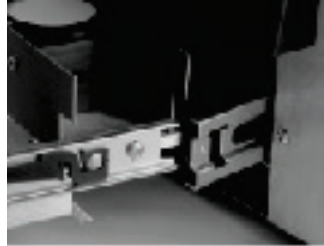


IMPORTANT

Inspect the drawer on the back right side for a bent tab. A bent tab should be straightened to eliminate interference and potential damage to the door sensors located inside the unit.



Figure 90
Insert Drawer



9. Upon determining sensor alignment is correct, carefully close drawer and ensure that the drawer tab slides between the upper and lower portion of the door sensor and that the cord (attached to the drawer and unit) is free of crimps and is not pinched by the drawer when the drawer is in the complete closed position.

IMPORTANT

Listen for drawer stop tabs to click back in position, check to see they function and allow drawer to only open to sample position once drawer is fully re-installed.

10. Place the unit back to its upright position.
11. Re-attach power cord to unit, plug into power socket, and turn unit on with main switch.
12. Screen will provide indications when ready for use.



APPENDIX A

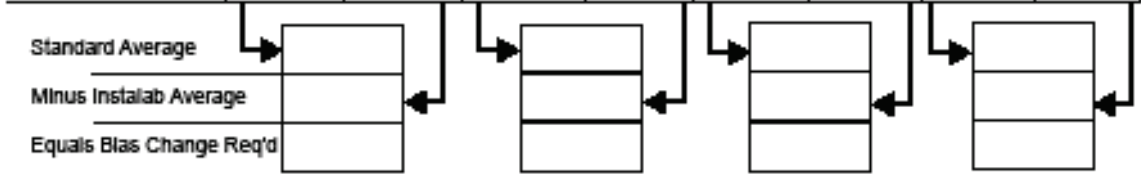
Instalab Bias Adjustment Worksheet



Date: _____ Instalab Serial #: _____

Product: _____ Grinder Serial #: _____

Sample # (N)	CONSTITUENT _____		CONSTITUENT _____		CONSTITUENT _____		CONSTITUENT _____	
	Standard Analysis (%)	Instalab Analysis (%)	Standard Analysis (%)	Instalab Analysis (%)	Standard Analysis (%)	Instalab Analysis (%)	Standard Analysis (%)	Instalab Analysis (%)
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
Sum								
Average <small>(Sum/N)</small>								





Instalab Bias Adjustment Worksheet



Date: _____ Instalab Serial #: _____

Product: _____ Grinder Serial #: _____

Sample # (N)	CONSTITUENT		CONSTITUENT		CONSTITUENT		CONSTITUENT	
	Standard Analysis (%)	Instalab Analysis (%)	Standard Analysis (%)	Instalab Analysis (%)	Standard Analysis (%)	Instalab Analysis (%)	Standard Analysis (%)	Instalab Analysis (%)
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
Sum								
Average <small>(Sum/N)</small>								

Standard Average	→	□	→	□	→	□	→	□
Minus Instalab Average		←	□	←	□	←	□	←
Equals Bias Change Req'd								



APPENDIX B

MOISTURE BASIS

Understanding moisture basis is key when working with NIR calibrations on samples that contain moisture. This applies to almost all of the common agricultural materials that are measured on NIR instruments. Industry has established general practices when dealing with some products and constituents. Other products and constituents have generally no accepted moisture basis. Therefore, it is imperative to clearly articulate the moisture basis for a calibration and how to resolve the ramifications in a knowledgeable manner.

MOISTURE BASIS IN NIR CALIBRATIONS

- An NIR constituent calibration pertaining to a granular agricultural product that contains moisture generally has one of the following moisture basis selections:
- As-Is
- Fixed % Moisture (typically a recognized standard moisture value)
- Dry basis (a subset of fixed % moisture)

Example: Wheat protein can be measured on an NIR instrument using As-Is moisture basis. It can be traded using a fixed 12% moisture basis or dry basis.

REVIEW OF BASICS

The diagrams below represent three methods of expressing protein.

Assume that we start with a 100 gm sample of material.

- Diagram A shows the sample as it is received. The As-Is protein is given as 25% since the weight of the protein is indeed 25% of the total sample weight including the moisture.

Assume one customer of this product wants the protein expressed on a 12% moisture basis.

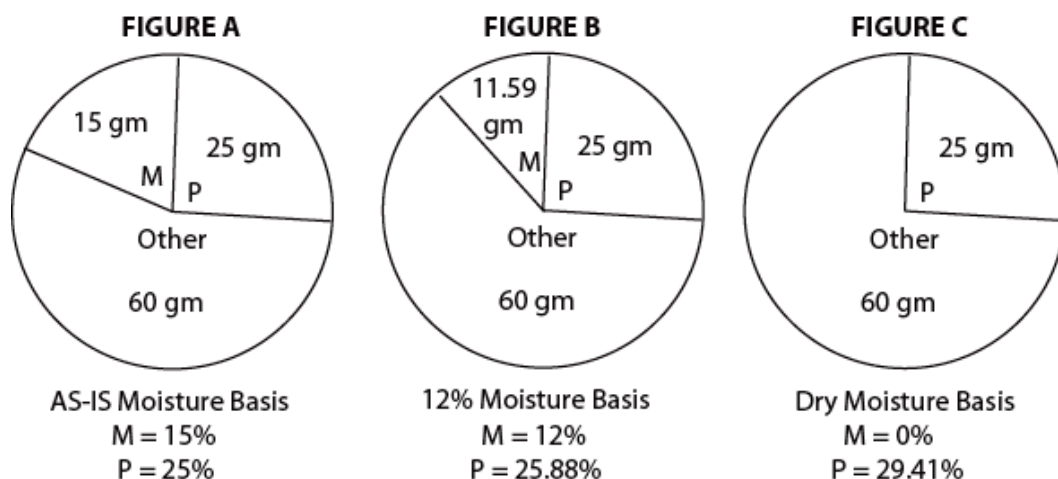
- Diagram B shows the adjustment made in moving from 15% moisture to 12% moisture. Only the water content is removed from our initial 100 gram sample.

Assume another customer wants protein expressed on a Dry Basis.

- Diagram C shows all moisture removed from the sample and the corresponding protein value.



Figure 91
Three Methods of Expressing Protein



CONSTITUENT/MOISTURE RELATIONSHIP

Define P₁ and M₁ as initial protein and moisture conditions in a sample. This could represent “As-Is” protein level with the actual moisture read as M₁.

Define P₂ as the protein level in the same sample as above but at a different moisture level (M₂). This could be an actual change in moisture level of the sample (moisture level changed from above) or it could be an arbitrary moisture level that has been set as a reference

$$\%P_2 = \%P_1 [(100-\%M_2) / (100 - \%M_1)]$$

NIR CALIBRATIONS

NIR calibrations can be developed for either of the following formats:

- As-Is
- A given fixed %M value (dry basis is a subset of this having 0%M)

The constituent calibration has a “native” moisture basis supported by the calibration. Post processing can allow another moisture basis to be used. For As-Is native moisture basis, the moisture must explicitly be determined to allow such conversions to another moisture basis.

When obtaining lab analysis, it is important to be aware of the moisture basis used.

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For example, if a calibration is to be As-Is, it would be prudent to obtain a moisture value at the time of log collection on the IL700 as well as from the lab providing the As-Is value on the constituent of interest. If any moisture is lost from the time of NIR log collection to the lab analysis, a correction can be made to the As-Is lab value to return it to the original moisture value that existed during log collection.

The calibration file for the IL700 provides the following parameters related to the moisture basis:

MB =	
A	As-Is
XX.X	Value for fixed %M basis including 0 for dry
[blank]	if moisture constituent (no basis involved for moisture)
	MB specifies the "native" moisture basis for the calibration
AMB =	
XX.X	Value for alternate moisture basis
A	As-Is
[blank]	not required
	AMB allows for an alternate moisture basis to be used in addition to the native moisture basis
	To calculate an AMB, the following requirements must be met:
	MC_Basis = N
	AND
	MB=XX.X or [(MB = A or AMB = A) AND MC_Basis = Y]
	<i>This logic merely states that an AMB can only be calculated if the constituent of interest is not moisture (MC_Basis = N) and if As-Is is used in either native or alternate case, there must be a moisture constituent calibration in the calibration file that can provide a moisture value (MC_Basis = Y must exist somewhere in the calibration file)</i>



APPENDIX C

SYSTEM GAIN

The System Gain in the IL700 is automatically set using a software algorithm. This system gain is an overall signal gain that is set at the factory and most often never changes unless field technician activity is performed that might require adjustment. This gain is essentially in series with the mode gains and sets the overall signal level into the analog-to-digital converter for the most transmissive optical filter with the mode gain set to X1.

MODE GAINS

Mode gains can be adjusted by advanced users when necessary. Mode gains are under software control and offer three selections (X1, X2, and X4). At the factory, and occasionally in the field on an as needed basis (such as optical filter replacement), a Diagnostics screen allows scanning of the reference signal level for all optical filters installed in the unit. This Diagnostics screen shows the recommended gains for each filter. Typically, a couple of the optical filters may be X2 gain while most show X1. These recommended gains can be manually stored and used thereafter for all reference measurements.

With the reference gains established per above, the gains used for sample measurements will be addressed. Every calibration file is based on either a "Standard" gain selection or an "Enhanced" gain selection. The choice between these two gain selections are made at calibration development.

- Most granular agriculture products use "Standard" gain
- Low reflectance products use "Enhanced" gain

During calibration development, the designer of the calibration will decide if the "Enhanced" gain is warranted. For example, if all the difference log values for all filters of interest are greater than 400, the "Enhanced" gain selection most often is selected. In all cases, the gain selection is embedded in the calibration file and is invisible to the end user.

The "Standard" gain selection uses the same gain as the reference (stored value) for all sample measurements.

- Example: If filter F0 calls for X2 gain in measuring the reference, X2 will also be used when F0 measures the sample. All raw log values for reference and sample are adjusted for a unity gain.



The “Enhanced” gain selection uses the stored reference gain similar to the “Standard” gain except the gain is increased by a factor of two for the sample measurement.

In the above example where X2 gain was used for both reference and sample for F0, the “Enhanced” gain selection would use X2 for the reference but X4 for the sample.

Unlike the “Standard” gain selection, the “Enhanced” gain selection uses a sample raw log value that is adjusted for X2 gain (not unity gain). No matter whether a X2 gain is used or a X4 gain, the raw log value is normalized to X2 gain.

A special case may exist on the “Enhanced” gain selection when a stored reference gain for a filter may be X4. This typically does not happen on standard wavelength optical filters; however, a special filter can be used that has lower transmittance and a X4 gain can be selected as the reference measurement.

In the “Enhanced” gain selection, this condition calls for a X8 gain on the sample. A X8 gain is not available. In this unique case, a X4 gain is used and the raw log value is still normalized to X2. This gives a raw log value theoretically equal to that of a X8 gain; but does suffer some in lower resolution due to a lower signal level in the analog-to-digital converter. Normalizing to X2 gain corrects the overall gain shift from X8 to X4.



Dealers have the responsibility of calling to the attention of their customers the following warranty prior to acceptance of an order from their customer for any DICKEY-john® product.

DICKEY-john® WARRANTY

DICKEY-john® warrants to the original purchaser for use that, if any part of the product proves to be defective in material or workmanship within one year from date of original installation, and is returned to DICKEY-john within 30 days after such defect is discovered, DICKEY-john will (at our option) either replace or repair said part. This warranty does not apply to damage resulting from misuse, neglect, accident, or improper installation or maintenance; any expenses or liability for repairs made by outside parties without DICKEY-john's written consent; damage to any associated equipment; or lost profits or special damages. Said part will not be considered defective if it substantially fulfills the performance expectations. THE FOREGOING WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES OF MERCHANTABILITY, FITNESS FOR PURPOSE, AND OF ANY OTHER TYPE, WHETHER EXPRESS OR IMPLIED. DICKEY-john neither assumes nor authorizes anyone to assume for it any other obligation or liability in connection with said part and will not be liable for consequential damages. Purchaser accepts these terms and warranty limitations unless the product is returned within fifteen days for full refund of purchase price.

**For DICKEY-john Service Department, call
1-800-637-3302 in either the U.S.A. or Canada**



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Operator's Manual

INSTALAB™ 700

NIR Analyzer

