



INTEGRA 9100 Operator's Manual Version 4.28



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Computer, Touch Screen Monitor, and Light Tower Interface Unit and Read Head.

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INTRODUCTION

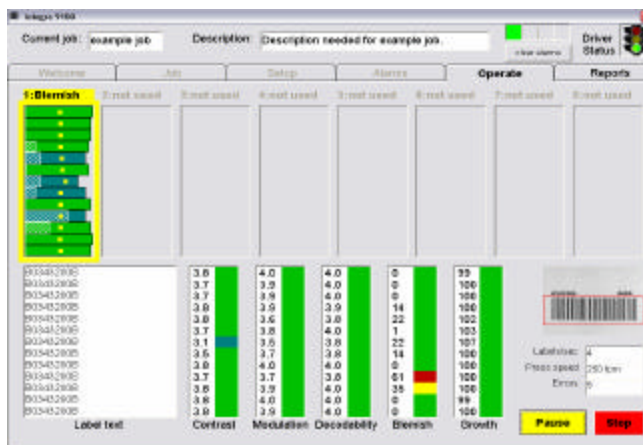
The INTEGRA-9100 is a vision based “on-line” bar code verification system. There are 4 main parts to the system: The Computer, Read Head, Light Tower Interface Unit, and Photo-eye. These components combine to verify the quality of up to 240 different bar code labels per second, at any speed, and in any orientation. Every .006 inch of bar height is analyzed for quality. From this data, an overall grade point average is established for each label and the results are sent to a reporting program.

The individual overall grade point average reported by the system will correlate to the ISO/IEC 15416:2000(E) standards within +/- 0,2 . The Read Head is correlated to the standards by using the included Contrast Calibration Label. This calibration label was created by a company called Axicon, Inc. located in Bicester, England. A letter of authenticity is supplied with each Contrast Calibration Label.

At the end of this manual is a chapter called “**Static and Dynamic Certification**”. This chapter will explain the processes for correlation to the standards.

The system is also designed to check for mis-matches, sequential checking, check-sum verification, bar growth / shrinkage, real world blemishes, and no-duplicates checking.

INTEGRA-9100 Operate Screen



UNPACKING

Each system is shipped as 8 main sub-assemblies: Computer, Monitor, Light Tower, Read Head, Registration Trigger kit, Cables, Mounting poles, and Manual. Unpack all packaging carefully and verify that all sections have been received. If there is something missing, call LVS at 1-800-432-9430 as soon as possible.

The following is a list of all items shipped with a system:

- 1. Computer:** Since the INTEGRA-9100 is a computer based system, the type and make of the computer will change as necessary to reflect the variances in customer requirements, availability, technological advances, and cost effectiveness.
- 2. Monitor:** Similar to the computer, the type and make of the monitor will change as necessary to reflect variances in customer requirements, availability, technology, and cost effectiveness.
- 3. Light Tower:** The Light Tower Interface Unit not only incorporates 4 colors of warning lights, but also houses the STOP MOTION relay. It can be identified by looking for a set of 4 lights that are connected via a pole to a small black interface box. It is 26.5" tall.
- 4. Read Head:** There are two types of Read Heads: Single-lane and Multi-lane Read Heads. Most Read Head are specifically designed for each customer. Typically, the Multi-lane Read Heads come in 4 different widths: 12", 16", 18", and 20". They are 10 inches deep and 14 inches high. The Single-lane Read Head has a foot-print of 5" by 5" by 12"
- 5. Mounting Poles with Brackets:** Each system is sent with a universal mounting bracket. The Multi-lane kit will include the following: 2 mounting plates, 4 x 10" poles, 2 x 6' poles, 4 x T brackets, 4 x right angle brackets, 8 x screws, and 12 set screws.
- 6. Registration Trigger Kit:** The INTEGRA-9100 is designed to check 100% of the label stock. In order to accomplish this, an electronic signal called a Registration Trigger must be generated. There are two ways to generate this signal: By using an encoder or using a photo-eye. The kit that will come with your system will be one of these two. The brackets needed to mount the photo-eye or encoder is customer specific.
- 7. Cables:** All cables will come packaged together. They are all clearly marked so that the installer will know where they go.

8. **Manual:** Included in the manual is a Contrast Calibration Label, backup software, and a Certificate of Compliance used to certify the systems verification process.

SAFETY PRECAUTIONS

All components used to create this vision system are UL and CE approved. All circuits were designed to incorporate maximum safety. However, any equipment using electrical voltages may cause personal injury if improperly handled.

**DO NOT ATTEMPT TO WORK ON THIS SYSTEM
WITH THE MAIN POWER LINES CONNECTED.**

The Computer, Monitor, Read Head, and Light Tower incorporate internal fuses designed to protect against catastrophic failures. They are not accessible to any unauthorized personnel. In the event that a system appears to have lost its power, check to make sure the main AC power is on. Check to make sure all cables are plugged in. If the problem still exists, call the LVS factory at 1-800-432-9430.

SETUP and INSTALLATION

POWER REQUIREMENTS

3 Standard AC outlets 100 to 130 VAC Combined Watts = 500
Used for the Computer, Read Head, and Strobe.

2 Standard AC to DC Converters. 12 VDC at 1000ma. Physical size is: width = 2.5",
length = 4", height = 2.5" (13 watts each)
Used for the Light Tower Interface Unit and Touch Screen Monitor.

MOUNTING LOCATION

Computer location:

The computer must be located in a position that is away from any AC or DC motors or solenoids. Failure to do so may result in unwanted noise being emitted into the computer system. It is recommended that the computer system be located at least 3 feet away from these types of sources.

The computer must also be placed in a position that is accessible to the operator.

Monitor location:

Similar to the computer, a monitor should be located in a position which is away from any AC or DC motors or solenoids. Since this is a touch screen monitor, it needs to be mounted in such a way that the operator can see it while adjust the read head. If the operator cannot see the monitor while adjusting the read head, they will not be able to adjust the read head correctly.

Light Tower placement:

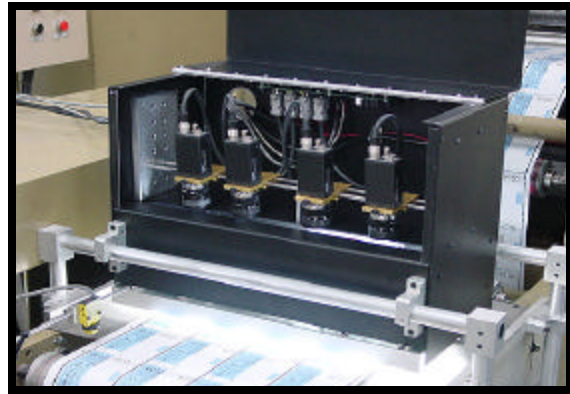
The Light Tower Interface Unit must be positioned in a way that the operator can see the four warning lights when they turn "on".

Read Head placement:

The location of the read head is the most critical part of the installation. It is best to mount it as close to the “finished roll” as possible.

There is another feature that can be purchased with the system that is designed to automatically “park” any errors at a specific location on the rewinder. (Usually at the splicing table.) When this feature is purchased, the read head must be placed before the splicing table so that the machine has time to stop when an error occurs.

Label Orientation is how the industry describes the relationship of the bar code “bars” with the scanner or reader. There are two ways of orientation: LADDER and PICKET-FENCE. The INTEGRA-9100 does not care which orientation is required providing the labels enter the camera’s field of view so that the “bars” of the bar code symbol are straight up and down as observed on the monitor.



These pictures show a typical installation of a Multi-lane Read Head. The picture to the right shows the Read Head cover opened exposing the 4 video cameras mounted on its slide.

MULTI-LANE READ HEADS. LVS0200 SERIES

Each video camera located within the Read Head is mounted on a slide. The slide is designed to allow the operator to change the cameras orientation so that the bars of the label are vertical within the monitor’s field of view.

Avoid placing the Read Head near a high vibration area.

If the Read Head is placed where the label stock can flutter, the system will not grade the labels with any consistency. A roller or support plate may need to be installed to reduce the flutter.

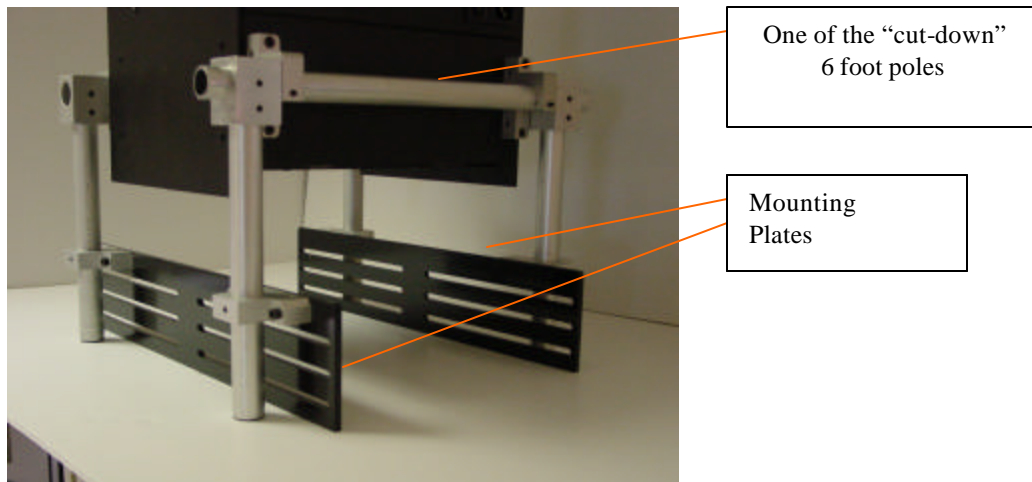
Read Head Placement continued

Basically, by adjusting the mounting pole brackets, the lowest portion of the Read Head should be placed 1" away from the bar code label surface.

Specular Reflection coming from the surface of a label can blind bar code scanners. This system was designed to eliminate most specular reflection with the Read Head parallel to the label surface. If an irregular surface needs to be scanned, the Read Head may have to be tilted 5 or 10 degrees to eliminate the reflection.

Location for Mounting Poles with Brackets:

Each system has two mounting plates designed to fit across any size web. The two 6 foot poles, sent with the system, are then cut to fit the exact distance across the web. (See below Figure) With the bottom of the read head positioned 1" away from the web, the mounting brackets are designed to adjust in all appropriate directions very easily. As with most things, common sense is the key to success. Mount the brackets in such a way that it is easy for the operator to adjust the Read Head when necessary.



Mounting Brackets with Read Head.

Read Head Placement continued

SINGLE -LANE READ HEAD. LNT-92A SERIES

The Single Lane Read Head uses a swivel pole joint which can be locked down at a specific angle and object distance.

The object distance refers to the distance between the bottom of the read head bezel and the surface of the label. This distance will vary from job to job depending on the width of the bar code label.

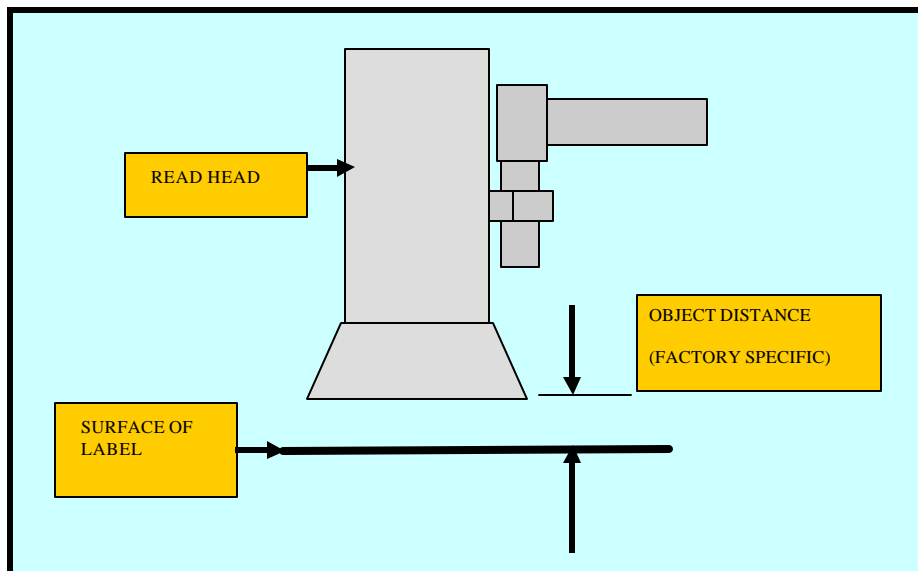
The read head should be mounted away from any solenoids, motors, relays, or AC lines. Also, it should be mounted away from overhead fluorescent lights.



LNT-92A Single Lane Read Head

WARNING:

An overhead fluorescent light source, if allowed to illuminate any part of the label surface, will induce a 60 hertz error signal into the INTEGRA system. This may cause errors in ISO/IEC grading.

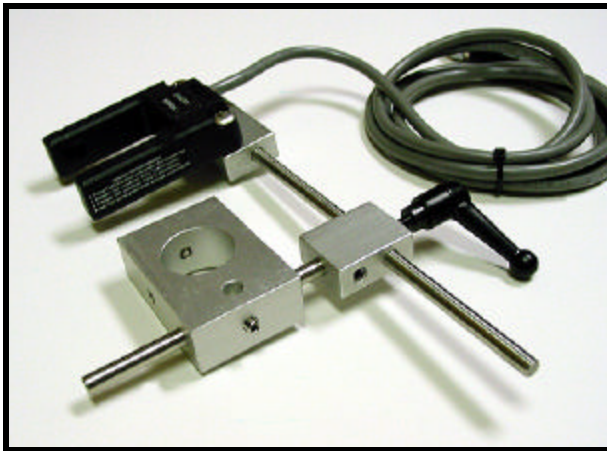


Object distance using the LNT-92A read head

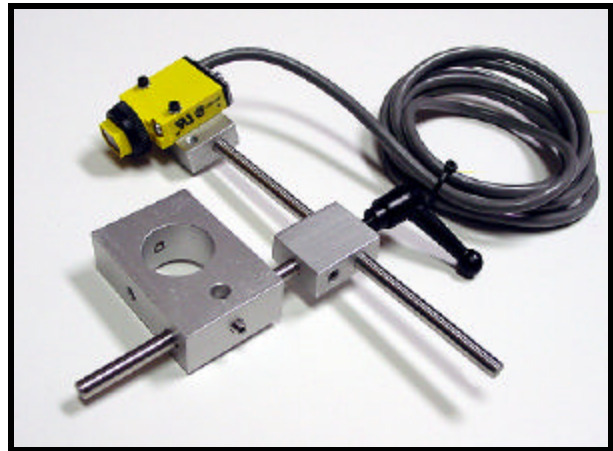
PHOTO-EYE LOCATION and TYPE

The photo-eye is sent already connected to a bracket which can be mounted anywhere that allows the operator the ability to adjust its position easily. The operator may need to adjust the photo-eye position many times during a day.

There are two types of Photo-eyes used with this system: **Through the Web** and **Reflective**. Through the Web type detects the gap between labels. The Reflective type requires the photo-eye to detect a printed registration mark. See pictures below.



1. This is a picture of a **Through-the- web** Photo-eye mounted on its bracket.



2. This is a picture of a **Reflective** Photo-eye mounted on its bracket.

1. Through the Web

Many printers die cut the labels and then removes the unwanted portion of the matrix created by the die cut. This creates a separation of the labels, which can be seen by a “through the web” photo eye. Thus, the photo eye at the start of every label generates a registration signal.

2. Reflective

A reflective photo eye is designed to see contrast changes on the web surface. A registration mark can be printed on the edge of the web. When the photo eye sees the registration mark, a registration signal is generated in conjunction with the presence of a bar code symbol.

ENCODER LOCATION (ENCODER IS OPTIONAL)

An encoder is an option that can be used in place of a photo-eye. The encoder will automatically generate a Registration trigger for each label. The advantage of using an encoder instead of a photo-eye is that a photo-eye needs to be adjusted for every JOB. With a photo-eye, it may also be necessary to change from a “Through the Web” type to a “Reflective” type.

The encoder comes with a mounting kit. See below picture. It needs to be mounted on any “gear driven” idler found along the path of the label stock. All necessary mounting brackets are supplied.



Encoder with Mounting Hardware

Software Rebuilds and Upgrades

The system is delivered with software fully installed. In the event a major software failure occurs, call the LVS factory at 1-800-432-9430. If recommended, a Software Rebuild may be necessary to solve the problem. The Software Rebuild CD contains all programs and all drivers necessary to return the INTEGRA-9100 back to factory specifications.

Also, throughout the course of time, various Software Upgrades may be supplied. Upgrades are used to enhance the system or perhaps to solve software glitches.

SOFTWARE UPGRADES

Software Upgrades are supplied to you on a CD. To upgrade a system the following steps are taken:

1. Insert the Upgrade CD into the DVD driver. It will automatically load.
2. A pop-up window will prompt you to upgrade the existing software. Choose **yes**.
3. Remove the CD and restart your computer.

SOFTWARE REBUILD

Each system has a CD, which contains the entire build program. To rebuild systems software the following steps are taken:

1. Insert the Rebuild CD into the DVD drive. Press **[Ctrl] + [Alt] + [Del]** to restart the system.
2. The automatic restore program will ask, "Will you use the changer drive? **[Y / N]**. Type **N**.
3. Input the number corresponding to where the backed up data is to be restored in **[SELECT NO.1]**, then press **ENTER**.
4. The following message appears when restoration is complete: **Restore complete, press any key**.
5. Press **Enter** key to return to MS-DOS.
6. Eject the CD backup disk, and then restart the system.

WARNING: WHEN IT IS NECESSARY TO REBUILD THE SOFTWARE, ALL EXISTING JOB REPORTS AND RUN REPORTS WILL BE LOST. IT MAY BE NECESSARY TO ARCHIVE THESE FILES TO ANOTHER CD PRIOR TO THE REBUILD COMMAND.

PREVENTIVE MAINTENANCE

Maintenance will consist of monthly and annual duties. Since there are no moving parts within this system, there are no parts that wear out.

MONTHLY Preventive Maintenance schedule:

1. Remove the read head cover. Using an air hose (50 to 80 psi), blow out the inside of the read head. This should remove any paper dust that might have settled on the lens, glass window, or fluorescent lights. **WARNING: NEVER REMOVE THE LENS FROM THE VIDEO CAMERA.**
2. Clean the outside of the glass window with a glass cleaner and a soft paper towel.
3. Clean the 8 fluorescent lights, located on the read head bezel, with a cotton swab and window cleaner.
4. There are two optical windows on the photo-eye. Clean them with a cotton swab and window cleaner.

ANNUAL Preventive Maintenance schedule:

1. Clean or replace the filters on the computer. Follow manufacturer guidelines.
2. Remove the read head cover. Clean the outside lens of the video camera. **WARNING: NEVER REMOVE THE LENS FROM THE VIDEO CAMERA. There is nothing to clean inside.**
3. Replace the Contrast Calibration Label.
4. Clean the inside and outside of the read head glass window with window cleaner and a soft paper towel.

BI-ANNUAL Preventive Maintenance schedule:

1. Replace the light bezel on the read head.

SPARE PARTS LIST

<u>PART NUMBER</u>	<u>PART DESCRIPTION</u>	<u>AVERAGE LIFE</u>
LIG0030	LOL-10.0 strobe lamp	2 years
LIG0006	LOL-2.5 strobe lamp	2 years
LIG0031	LOL-5.0 strobe lamp	2 years
VID0030	12" DC Fluorescent assembly	30000 hours
VID0031	16" DC Fluorescent assembly	30000 hours
VID0032	18" DC Fluorescent assembly	30000 hours
VID0033	20" DC Fluorescent assembly	25000 hours
LAB0008	Contrast Calibration Label	1 year
LIG1025	LNT-92A Light bezel	2 years
LIG1026	LNT-93A Light bezel	2 years

DESCRIPTION OF OPERATIONS

The video signal from the read head is sent to firmware and software located inside the computer. The Windows based software program processes the many functions necessary to track the trends of print quality for the bar code image.

A matrix of error detections are available to shut down the machine or simply sound an alarm. If an error is detected, the operator can program the INTEGRA 9100 / 9100Q to shut down the press or rewinder. A final report is generated which contains the ISO/IEC overall grade point average for each label.

The *OPERATE Screen* has a real-time graph for ISO/IEC overall label grade as well as individual ISO/IEC grades for Decodability, Modulation, and Contrast. There is also a real time graph for bar growth and blemishes. This will help the operator to monitor specific changes in bar code quality *before* they become a problem. All levels of quality can be preset by the operator to sound an alarm if preset conditions are exceeded.

The special blemish detector is used to detect ink spots or voids. It can be set to sound an alarm on blemishes as small as 5% of the total bar height. A real time graph for blemish detection is displayed on the Operate Screen.

The INTEGRA 9100 / 9100Q uses a Windows based software operating system. All functions are divided into 6 screens:

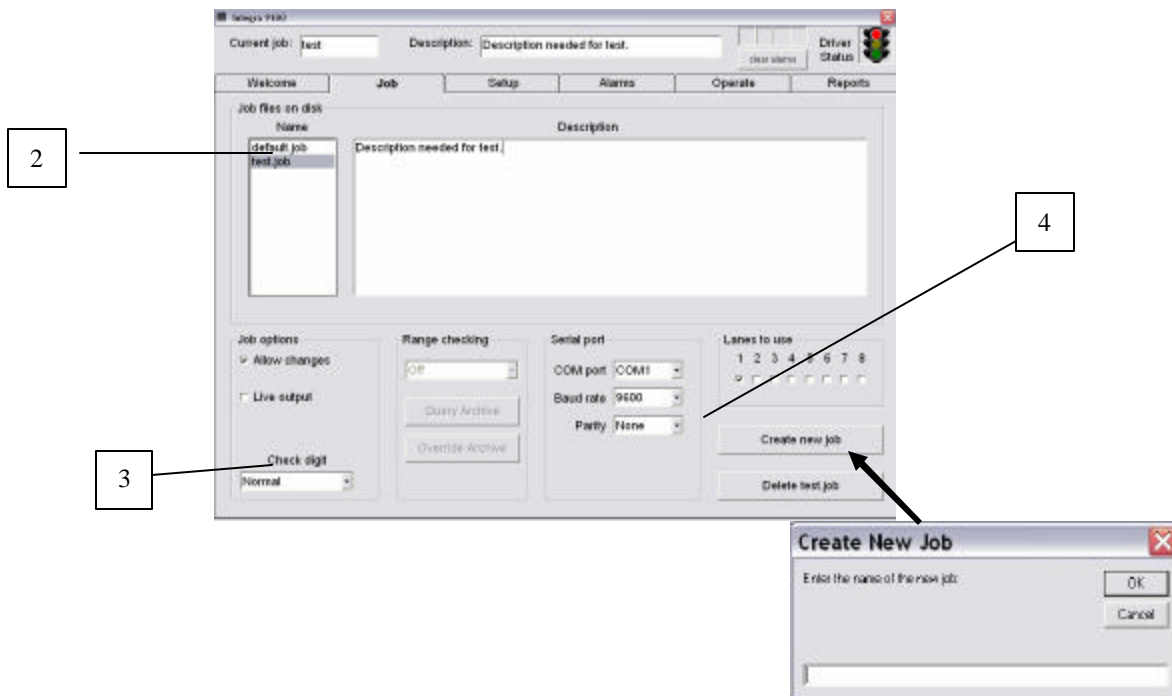
1. **Welcome Screen**- This screen displays the operating systems serial number and run number.
2. **Job Screen**- This screen is used to create files to store important information concerning previous jobs. It can update the operator as to what kind of label they use, the last job summary, sequence information and video setup from the last job.
3. **Setup Screen**- All automatic controls necessary to align the bar code symbol to the **INTEGRA 9100 / 9100Q** are on this screen. This is where all calibration functions occur.
4. **Alarm Screen**- This screen enables the user to define what error conditions will activate the relay contacts out and/ or activate one of three warning light outputs.
5. **Operate Screen**- This screen displays a graph for various conditions necessary to track trends in print quality. Bar growth, bar shrinkage, blemish detection, label grade, web speed, decoded data and more. This screen is generally what the operator would monitor during a job of label inspection.
6. **Reports Screen**- This screen gives a summary or log of all labels read during a **RUN** or during a **JOB**. These reports can be outputted to a printer.

WELCOME SCREEN



The Welcome Screen is important when problems occur and you need technical support. The technician will need to know what run and what serial number is being used. It is found on this screen.

JOB FUNCTION SCREEN



1.0 JOB SCREEN

The Job Screen has many functions. The main functions are: choosing a job, password protection, choosing a Check digit routine, and Range checking.

The operator can choose an existing job or start a new one. To start a new job, push the **Create new job** button. The operator proceeds by typing in a new job name. Software will then ask the operator to choose between the **default** settings or the previous job settings. Most operators will choose the **default** settings providing the default parameters were set up correctly.

1.1 Setting Default parameters

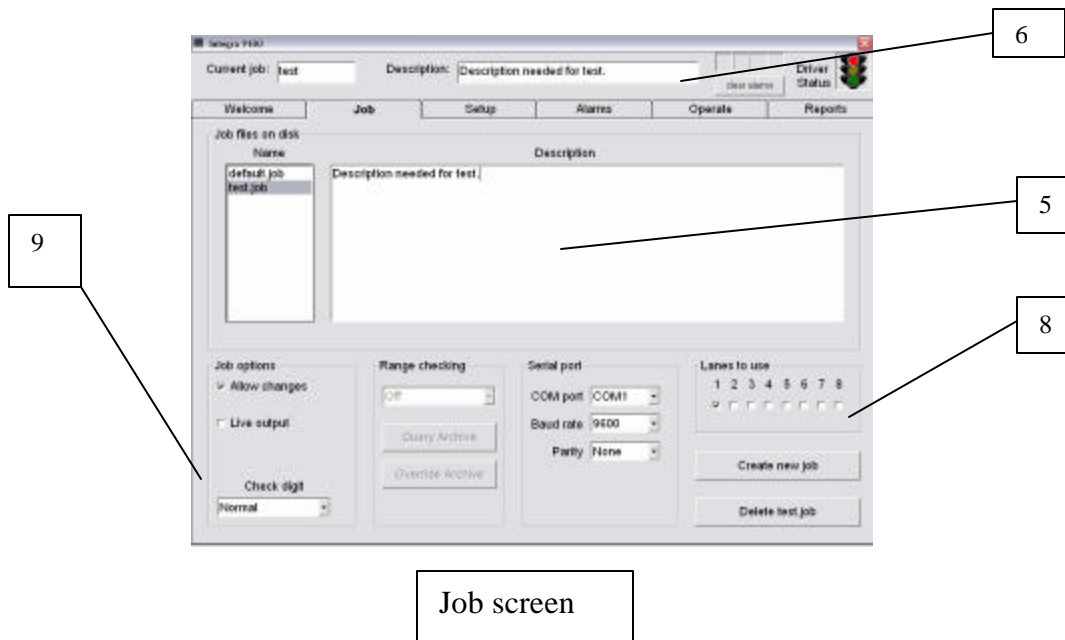
There is a file listed on the Job screen called “default.job”. This file is what the operator uses to set up all variable parameters located within the INTEGRA 9100 / 9100Q software. The operator should take the time to choose the “default.job”. (2) Then, review all screens. The values you choose while in the “default.job” file will become the Default parameters for all new jobs. Pay particular attention to the alarm screen.

1.2 Password protection

There is a box titled “Allow changes” under the Job options section. Removing the check mark will cause the current job to be password protected.

1.3 Live output

Within the “Job options” box there is a box titled “Live output”. This feature allows the operator to send all reported bar code verification information directly to a printer or any other RS-232 product via the serial port. This would occur during the “Operate mode” only. Serial port communications are set up by changing the parameters listed in the “Serial port” box.



Job screen

1.4 Check digit (9)

This system always performs the MOD 103 check digit algorithm on code 128. If the hidden check character is wrong, the label won't be read at all. There are many special check digit routines. Currently, this system supports 3131 weighting algorithm providing the symbol starts at the most significant digit and Mod 11.

1.5 The Description box

The description box can contain a short or long message. (5) Place the cursor inside the box and enter. The operator can type any length of message. Remember that the first

line of the description box (6) is displayed on all screens. Data critical to a given job should be entered on the first line.

1.6 Read head detection or lanes to use

The read head (8) indicator is designed to display a check mark for every read head you have selected. Each lane has a specific channel number. The operator must choose which lanes are to be used by clicking on the individual boxes.

1.7 Range checking (Duplicate checking)

To enable Range checking, the operator must select from a drop-down list. The list will appear on the JOB SCREEN, and will be labeled **Range error** on the Alarm Screen. The choices will be, **“Off”**, **“Individual lanes”**, and **“All lanes”**. If the operator selects **“Individual lanes”**, then each lane is checked independently of all others. In other words, a label may appear in lane 1, and then appear in lane 3 at some other time. If the operator selects **“All lanes”**, then a label may only appear once during the life of the job.

Selecting either **“Individual lanes** or **“All lanes”** enables the “range error checking” feature. When enabled, the computer will maintain an archive file for that job. The archive file will contain one line for each lane for each run. This file will be unlimited in length. It will not be subject to the 50-run limit all other jobs have. Each line will contain the date, time, lane number, the smallest label in the range, and the largest label in the range. Here is an example of an archive file. (The examples will show numbers incrementing by 1. It is important to understand that this feature will work equally well for decrementing numbers, or if the offset is a value other than 1.)

EXAMPLE ARCHIVE FILE				
Date	Time	Gate	Lane 1	Lane 2
09/06/1999	11:01am	1	100001	152183
09/06/1999	11:01am	2	200001	252183
09/06/1999	11:01am	3	300001	352183
09/06/1999	11:01am	4	400001	452183
09/07/1999	2:36pm	1	170001	199777
09/07/1999	2:36pm	2	270001	299777
09/07/1999	2:36pm	3	370001	399777
09/07/1999	2:36pm	4	470001	499777

When the operator pushes the Start Button to begin a run, the computer will check to see if the Range checking is enabled. If it is, software will then check to make sure the operator also selected “*Ascending*” or “*Descending*”. If the operator selected either “*Fixed*” or “*Variable*”, then the run will not start and the following error message will be displayed:

Range checking has been enabled.
This requires either Ascending or Descending.

If Range checking is enabled, then software will perform extra processing after reading the first row of labels. If “*All lanes*” was selected (instead of “*Individual lanes*”), and if a label appears in more than one lane, the operator will be warned:

Label ##### appeared in more than one lane.

If all of the labels are unique, or if the operator selected “*Individual lanes*”, the computer then checks that none of them fall within a range listed in the archive file. If the operator selected “*Individual lanes*”, then only those ranges for the same lane are checked. If the operator selected “*All lanes*”, then all lanes are checked. If a label falls within a previous range, then the following message is displayed:

Label ##### overlaps ##### - ##### that was used on date / time.

If a range error is detected in the first row of labels, then all labels in that lane (or lanes) will be flagged as a range error for the remainder of the run. These errors will continue until the operator stops the job and corrects the problem.

If no range errors are found, software is trained to use the archive file to determine which range comes before the label read, and which range comes after the label read. These two ranges determine the acceptable range for that lane. For example, suppose the operator selected “*All lanes*” and the following labels were read as the first row:

160001 260001 360001 460001

Using the EXAMPLE ARCHIVE FILE as listed at the beginning of this section, lane 1’s range is from 152184 to 200000, lane 2’s range is from 252184 to 3000000, and so on.

Not only must software scan the archive file, but it must use all of the labels in the first row as well. This is necessary in order to catch duplicates from one row to another.

During a run, any type of Range error will continue to be flagged and reported indefinitely. This is because software determined the limits at the beginning of the run. There is insufficient processing available to re-compute this information after each label. Here is an example that illustrates this. The archive file would contain the following:

09/07/1999 5:10pm 1 200 299

The operator then begins the following run of labels:

100
101
102
103
Etc.

When 200 is read, a sequence error will be reported. In fact, labels 200 through 299 all will generate sequence errors. In fact, 300 and higher will also generate sequence errors. This is because, after the first row, software determined that the upper limit for lane 1 was 200. That is all it knows. Since 300 is beyond 200, it is an error.

When a run is stopped, software will record the smallest and the largest label for each lane in the archive file. Any labels between the smallest and the largest label that were not included in the run will no longer be available for that job.

Range checking assumes that a standard ASCII order is used. In other words, 0 through 9 precede A through Z.

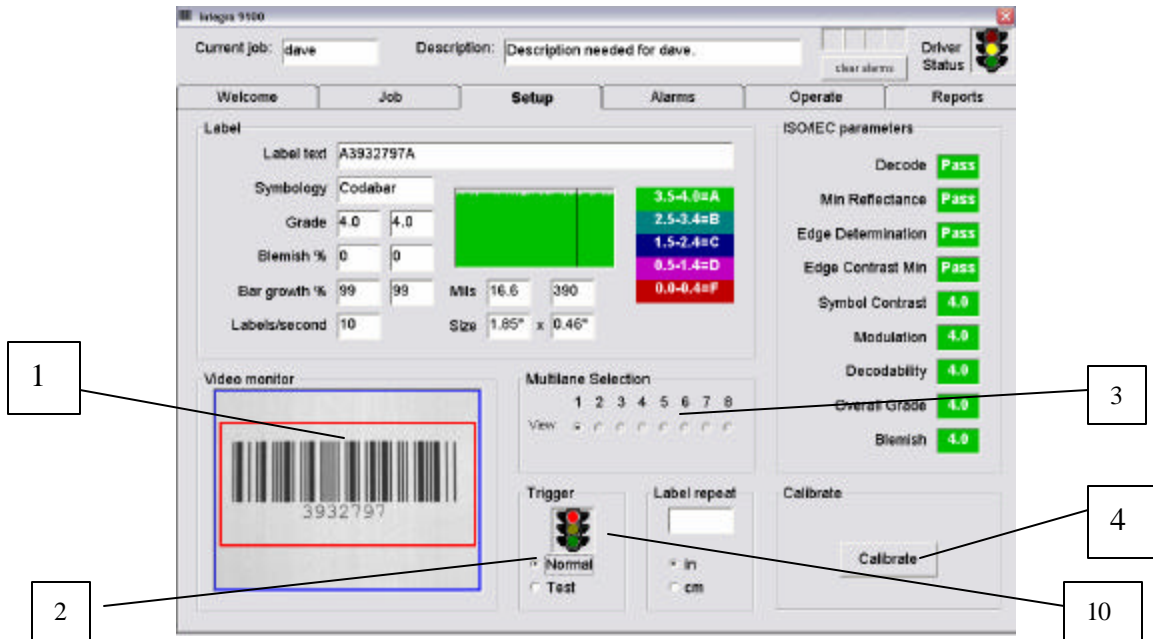
If Range Checking is selected, then a new button will appear on the job screen. This button will be labeled "***Override Archive***". When activated, the archive file will be shown on the screen. The operator will be able to double-click on any line to disable that line (and all other lines for the same date and time) from being included in the override checking. There will be an area for the operator to enter a comment as to why the run should be ignored. The default value will be "***No Reason Given***". A button will also appear allowing the operator to manually add new ranges to the archive file. This makes it possible to exclude ranges that were run prior to enabling this feature.

Another button that will appear on the JOB SCREEN is "***Query Archive***". Pressing this button allows the operator to test a number against the archive file. If an overlap is detected, the following message is displayed:

Label ##### overlaps ##### - ##### that was used on date / time.

The operator may choose to use this feature on every lane prior to starting the press, rather than wait for the Integra to flag an error on the first row.

SETUP FUNCTION SCREEN



2.0 Setup screen

The Setup Screen is used to teach software what type of symbol and what parameters are being presented to the read head. All calibration functions are accomplished on the Setup Screen.

2.1 Video monitor

A bar code label is placed into the read head's field of view and can be seen in the **Video monitor** box. (1) Double clicking anywhere inside the **Video monitor** box (1) will cause the bar code image to magnify to a full screen display. Double clicking again anywhere on the magnified image will return it to the original size.

2.2 Multilane selection

The box marked "**Multilane Selection**" (3) gives the operator an indication of which lane is being viewed. A "dot" under a specific lane number 1 thru 8 indicates which lane is in **View**.

2.3 Trigger

In order to evaluate the quality of a bar code video image in motion, the *photo eye* must send software a signal which indicates that a bar code label is present or within the camera’s “field of view”.(10) The Traffic light located in the **Trigger** box will turn green when the photo eye is aligned properly to the video image. The **Trigger** box has two choices (2) “*Normal*” and “*Test*”. Choosing “*Test*” will allow the read head to fire at 10LPS (labels per second). This will allow the operator to see a live video bar code image within the **Video monitor** box. (1).

2.4 System Calibration

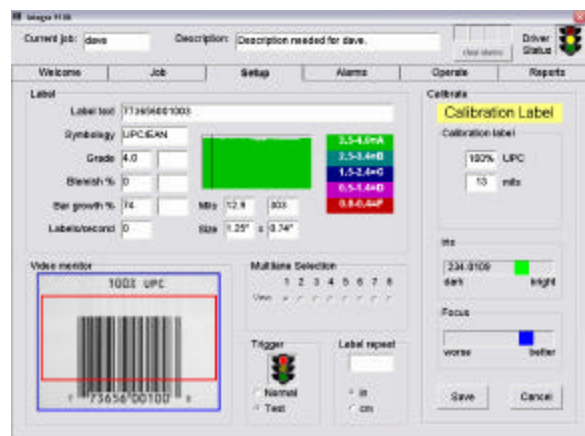
Calibration is used to ensure correlation to the ISO/IEC standards. It is based on the Certified Contrast Calibration label, which is located in the back of this manual. The calibration label is coded to work with this software. No other bar code label can be used. The following is a step-by-step method of how to calibrate.

Step 1: Make sure the read head is placed at the correct distance from the label. This distance is determined according to the type of read head and the size of the Job label. The distance is determined at the factory.

Step 2: Place the Certified Contrast Calibration Label into the field of view as seen within the Video monitor window. Ignore the red box located within the Video monitor window. (The red box is used to set up the Job label only.) There are three sizes of bar codes printed on the calibration label. They are titled 80%, 100% and 150%. Since a Job label can be any size between .5 inches and 3 inches, the operator must use the size that comes closest to filling 80% of the field of view.

Step 3: Push the **Calibrate** Button (4). The Screen will change to the Calibration mode. The top of the Setup box will turn yellow and say “*Calibration label*” .

Step 4: Take the cover off of the read head to expose the video camera. With the Certified Contrast Calibration Label centered within the field of view, adjust the iris and focus on the video camera.



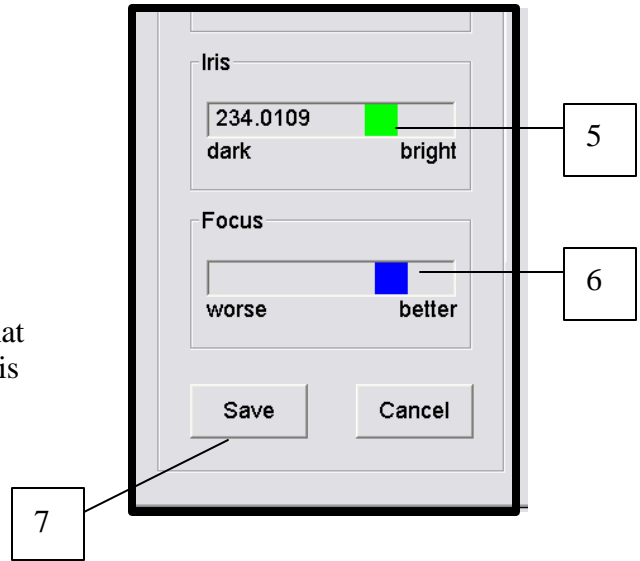
Calibration mode

Iris adjustment:

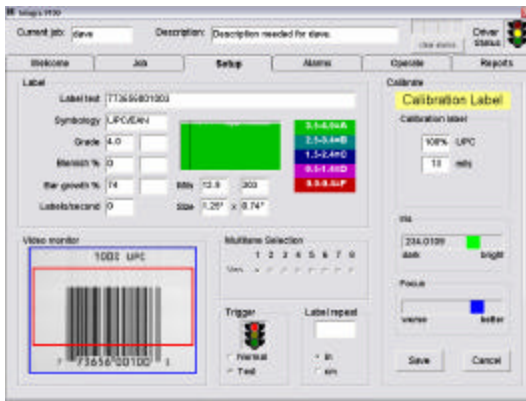
The Iris on the video camera is adjusted so that the moving box within the Iris indicator (5) is centered and is green. If the Iris is not set correctly, the moving box will turn to the color of red.

Focus adjustment:

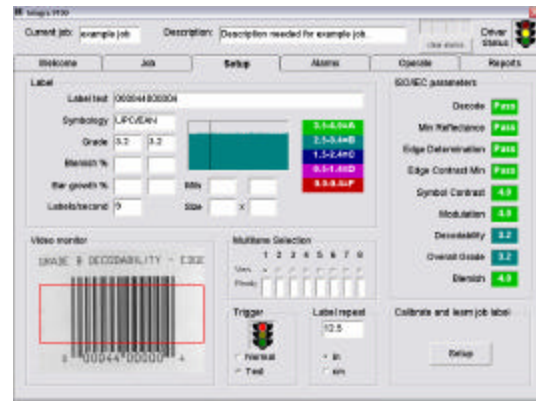
Focus, located on the video camera, is adjusted so that The moving blue box within the Focus indicator (6) is “peaked” moving to the right as indicated on the Setup box.



Step 5: Push the “Save” button (7). The normal Setup screen will then re-appear. The system is now calibrated to ISO/IEC specifications. Replace the cover on the read head. Software now needs to learn the Job label.



Calibration Mode



Normal Setup Screen

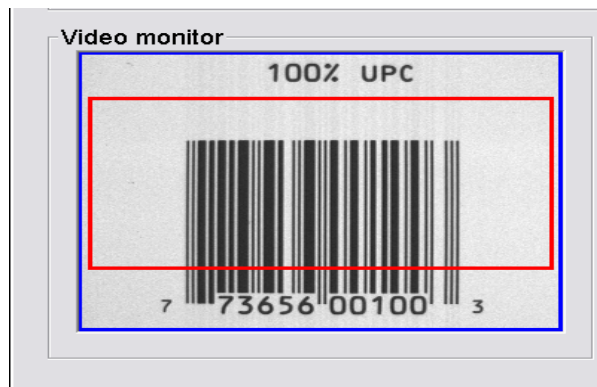
The Setup Screen goes back to normal after Calibration

This system will remember the calibration settings for all new jobs. Care should be taken to never adjust the iris (found within the read head) after the system has been calibrated. If the iris is adjusted, or the read head position is changed, the operator must re-calibrate. Calibration levels should be checked at least once a week.

2.5 Job Label Calibration

At the start of any old or a new Job, the operator must draw a red square around the bar code label. Allow for a maximum quiet zone on each side of the label. Pointing on the red square and dragging it across the image will re-draw the red square. When a new label is being verified or the current Job label is positioned differently, the operator must re-draw the red square. Software will not see any part of the label if positioned outside the red square.

The red square is not recognized during the system Calibration process.



2.6 Label box

The **Decode rate window** (16) is a real time graph indicating label quality. A different color is used for each of the verification grade ranges. Next to the **Decode rate window** is a list of additional bar code symbol data.

- Label text.** The decoded alpha / numeric message.
- Symbology.** What symbology is being detected.
- Grade** The first box will shows the **ISO/IEC** grade as detected in real time. The second box will show the average **ISO/IEC** grade.
- Blemish %** This is an indication of what percent of total bar height contains blemishes or printing errors. The first box will show the blemish percent in real time. The second box will show the average blemish percentage
- Bar Growth %** Indicates Bar growth and shrinkage in percentages. The first box will show the blemish percent in real time. The second box will show the average blemish percentage.

Labels / second Indicates how many bar code images are being analyzed per second.

Xdim This is a number that represents the microprocessor count for the smallest element found within a bar code image.

Height Every bar code image is being measured for bar code height.

Mils There are two boxes under this heading. The first box states the measurement of the smallest bar/space element found within the bar code image. It is stated in inches (mils). The second box will indicate the microprocessor count size for this smallest bar/space element. This is commonly called the “minimum X-dimension” for a bar code image (Xdim).

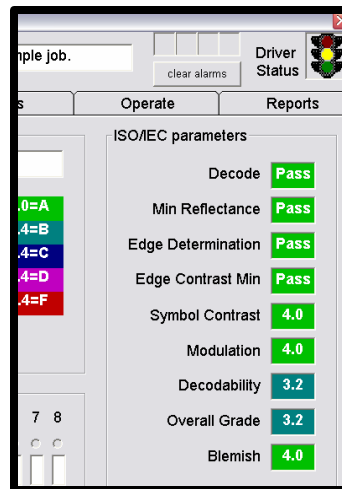
Size There are two boxes under this heading. It is an indication (in inches) of the bar code symbols overall width and height.

2.6 ISO / IEC Parameters

The Setup screen on the INTEGRA-9100 will list 9 different parameters measured according to the ISO / IEC Bar Code Verification Standards. Each parameter will indicate a numeric number as well as a visual color change.

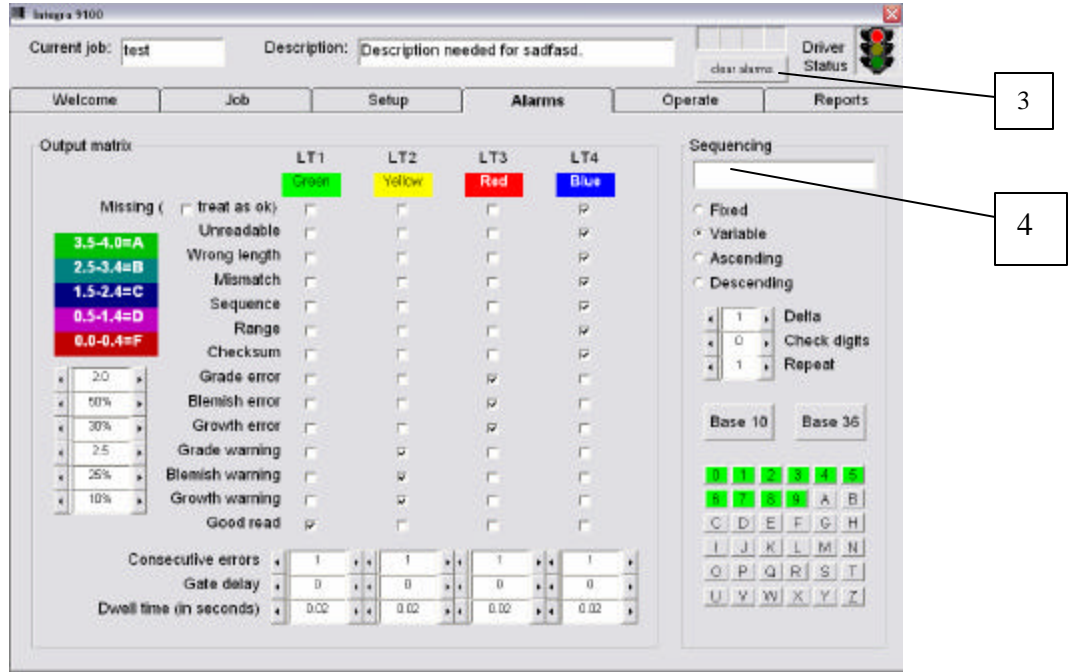


Color codes for ISO/IEC Grading.



Reported ISO/IEC Verification parameters.

Alarm Function Screen



3.1 Output Matrix

The *Alarm Screen* is used to set up specific alarm conditions. Choose the error conditions you want by checking a box listed under any of 3 outputs: LT2, LT3, LT4. These output signals are directly connected to individual relays located within the Light Tower Interface Unit. (See chapter on Light Tower Interface Unit.) Relays are used to interface with parts kickers, error markers or connected to the STOP MOTION of a press or re-winder.

LT1 is generally dedicated to the green light “Good Read” indicator located on the Light Tower Interface Unit. This allows the operator to have a visual indication when software has read a bar code label correctly.

Checking a box under a specific column will activate the relay for the listed error conditions: Missing label, Unreadable label, Wrong message length, Mismatch, Sequence, Out of Range, Checksum, Grade error, Blemish error, Growth error, Grade warning, Blemish warning, Growth warning, and Good read. If an error condition box is not checked for any of the three outputs, then that error condition is not being checked. All error conditions used to turn “on” one of the 3 outputs are reported to the Reports screen.



Alarm Screen

3.2 Available error conditions explained.

Missing:

There are two ways to treat a “missing” bar code: ignore it or report it. If the box is checked “treat as OK” then a missing bar code will be ignored and it will not be counted in the final report. If the box is not checked, then any time a bar code is determined to be “missing” software will report it as an error condition.

Unreadable:

An unreadable bar code means software has determined there is substantial evidence that a bar code is actually present (in contrast to missing) but was totally unreadable. To detect the difference between “missing” and “unreadable” bar code is designed to help the operator ignore printing conditions (especially at the beginning of a job) where a missing label is normal and should not be reported as an error.

Wrong length:

This is referring to the message length of the encoded bar code data. When checked, software will report an error for any detected bar code which does not contain the same number of digits as originally set up for that specific job.

Mismatch:

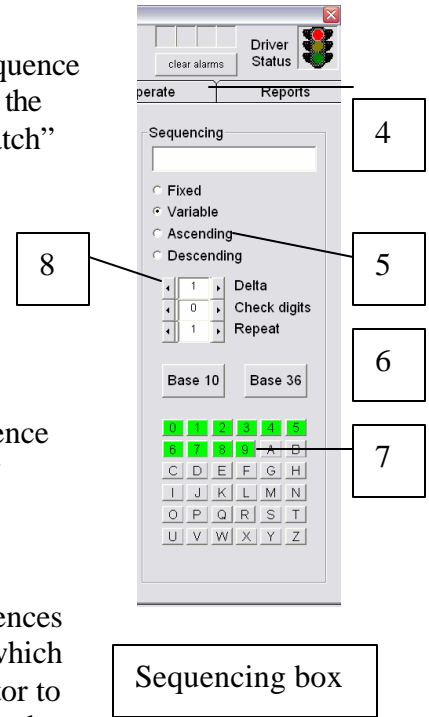
There is a box on the Alarms screen titled “**Sequencing**”. When “**Fixed**” is chosen, the operator will type in a number into the Sequence box (4). This teaches software to accept all bar codes containing the same message. If any other character string is detected a “mismatch” error will be reported.

Sequence:

Bar code can be sequentially checked. The *ascending* or the *descending* box needs to be selected.

Reading columns or rows of symbols might cause a natural sequence order to jump by a set number of digits. This can be arranged by selecting “*delta*” (6). A range of numbers is presented to you. Choose the right delta sequence number.

The operator also has the ability to check all numeric-alpha sequences from base 10 to base 36. A green background box (7) indicates which character is part of the sequence. Software also allows the operator to create any base numbering system by clicking the base 36 button, then



“remove” or “add” characters as required. Typically, operators will choose to remove vowels from the character string.

Remember that this is only for numeric/alpha sequences. It will not work for alpha/numeric.

Up to 4 “**Check digits**” (8) can be turned off so as to not interfere with sequential checking.

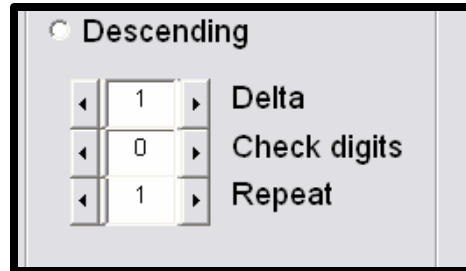
Inside the Sequence area is a box called **Variable**. This box must be checked if the job calls for labels that are neither fixed nor sequential. Failure to do so will cause the system to report every different label as an error.

Range:

Some jobs require that there are no duplicates within a set of bar codes. **Range checking** performs this function. (See Section 1.5.) Basically, software will check the bar code numbers of a “run” to make sure it was never duplicated within that specific “job”. (A “job” is made up of many “runs”.) This data is then archived in a “range” format.

Software will remember the first and the last number of all “runs”. Software will then check new “runs” within a “job” against these stored ranges.

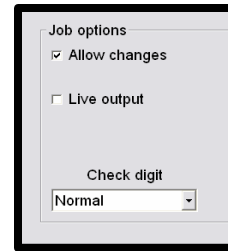
Some jobs require the operator to create “sets” of numbers. And, at the same time, not allow any duplicates between the “sets”. This is allowed by locating the “Repeat” number box within the **Sequencing** section and selecting a number equal to how many times a specific bar code number is to be repeated within a “set”.



Duplicating checking with Repeat numbers.

Checksum:

Checksum is a mathematical trick added to a bar code data string whose value is used to check the validity of the bar code data. From 1 to 4 digits are added to the original bar code data. There are various routines on the market. The Check digit routines supported by the INTEGRA-9100 are Modulus 11, and 3131. If the operator checked this box on the Alarm matrix, then an alarm will be activated if the checksum does not add up correctly.



Located on the Job Screen

Grade Error:

To the left of the **Grade Error** row is a software dial which allows the operator to pre-select when to activate a grade error signal. These levels are according to the ISO/IEC standards.

Also, trends in grade quality are displayed as a histogram on the **Operate Screen**. This means that the operator can observe trends in grade quality as it is being printed.

Blemish Error:

Each bar code symbol is checked every .006 inch (.15mm) for bar height. A spot, void, or blemish greater than .006 inch of bar height will be deducted from the expected total bar height. This is reported to the operator as a percent of failure. The percent of blemish error detection can be entered from 5% to 95%. Factory default is set to 50%.

Also, blemish trends are displayed as a histogram on the **Operate Screen**.



Growth error:

Various methods of printing bar code symbols can create uneven widths of bars and spaces due to uneven print plate pressure or deviations in ink viscosity. The industry standard for bar growth tolerances is 75% and 125%. To the left of the **Grade Error** row is a software dial that allows the operator to pre-select when to activate a bar growth error signal.

Bar growth and shrinkage trends are also displayed as a histogram on the *Operate Screen*.

Grade warning:

To the left of the **Grade warning** row is a software dial that allows the operator to pre-select when to activate a grade warning signal. This feature is one of the most important features of this system. Properly set, software will warn the operator when the quality of the bar code is slipping. The operator can then adjust his printing process to improve on the grade quality often without the need to stop the printing process.

Trends in grade quality for Contrast, Modulation, Decodability, are displayed as a histogram on the *Operate Screen*. This means that the operator can observe trends in grade quality as it is being printed.

Blemish warning:

Each bar code symbol is checked every .006 inch (.15mm) for bar height. A spot, void, or blemish greater than .006 inch of bar height will be deducted from the expected total bar height. This is reported to the operator as a percent of failure. The percent of allowable blemish detection can be entered from 5% to 95%. Factory default is set to 50%.

Also, blemish trends are displayed as a histogram on the *Operate Screen*.

Growth warning:

Various methods of printing bar code symbols can create uneven widths of bars and spaces due to uneven print plate pressure or deviations in ink viscosity. The industry standard for bar growth tolerances is 75% and 125%. To the left of the **Grade warning** row is a software dial that allows the operator to pre-select when to activate a grade warning signal.

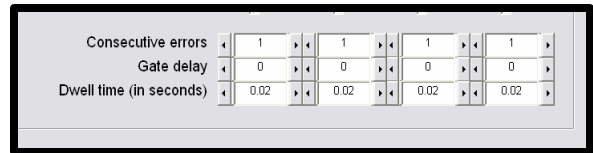
Bar growth and shrinkage trends are displayed as a histogram on the *Operate Screen*.

Good read:

The Good read signal is not an error condition. It is used to give the operator an indication when a bar code label has passed the verification test. Typically, it is set up to activate the green light tower.

3.3.0 Output signal timing.

At the bottom of the Alarm matrix are some boxes marked **Consecutive errors, Gate delay, and Dwell time** :



Bottom of Alarm matrix

Consecutive errors:

An operator may not wish to activate STOP MOTION when a single error occurs. This box allows the operator to set up a certain number of consecutive errors before an error condition will activate a relay.

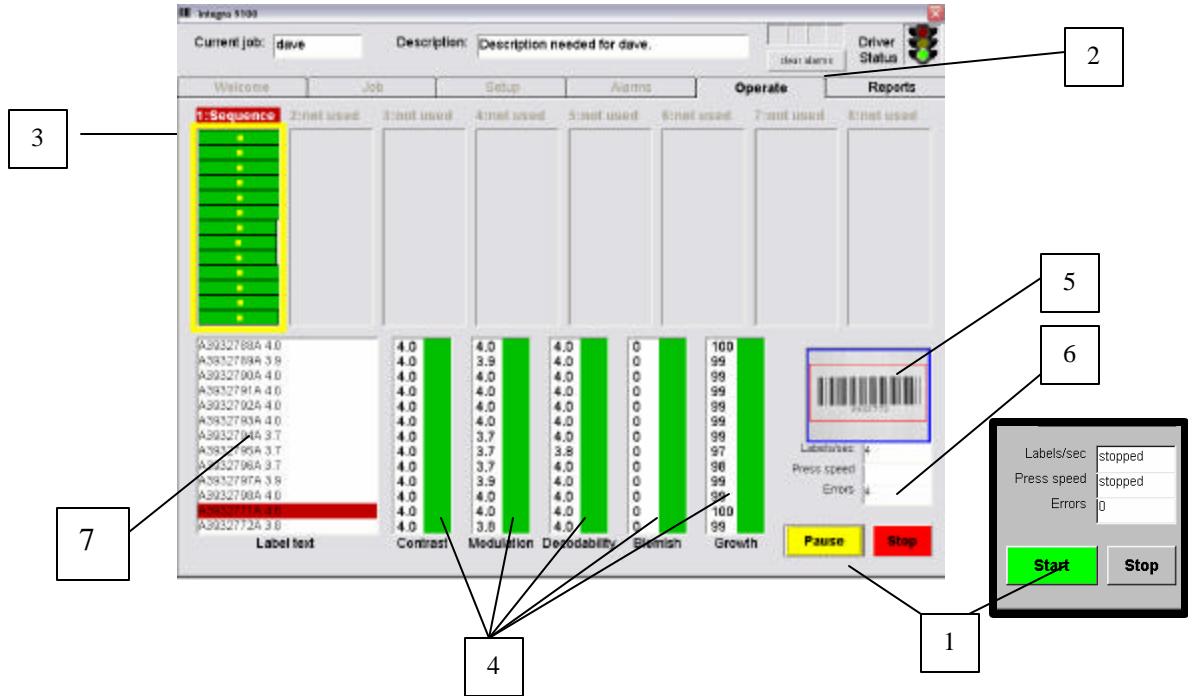
Gate delay:

This feature allows the operator to activate a parts kicker, error marker, or STOP MOTION at a different position along the path of the label matrix. Since “errors” are reported immediately, this feature allows the operator to delay the error signal until the label reaches a specific location. The distance between the beginning of a label and the beginning the very next label is called the “label repeat”. One Gate delay is equal to this distance.

Dwell time:

When software detects an error condition, it reports the error to the Light Tower Interface Unit. The Dwell time allows the operator to set the amount of time the error condition is allowed to stay “on”. Four different “on” times are available: .02 sec. .1 sec., 1.0 sec., 5.0 sec., and “hold”. When the “hold” dwell time is chosen, the operator must push the “clear” button (3) that is located at the top of every screen.

Operate Function Screen



4.0 Operate screen

There are several functions on the Operate screen. At the bottom right is a **Start / Pause** button (1). The **Start** button is color green. Once the **Start** button is pushed, it will change to a yellow color and will be titled **Pause**. The **Start** button is used to begin the dynamic verification process. This is called a “run”.

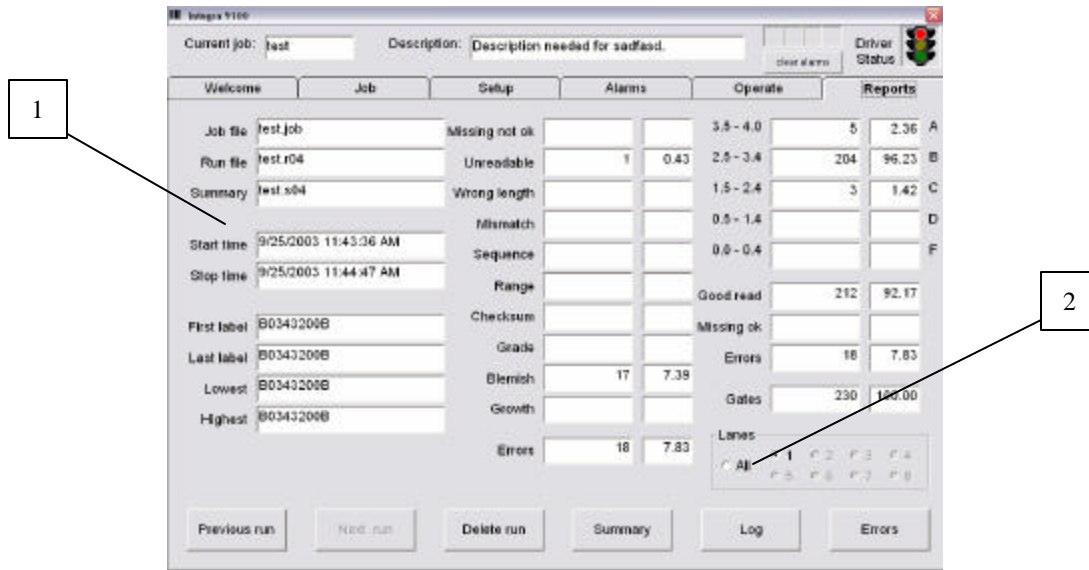
The **Pause** button is used to pause a “run”. There is no reporting while the system is “paused”. This feature is used when the operator needs to stop the press or rewinder to make adjustments. Once the adjustments are made, the same “run” is continued. There is no gap in the reporting process.

The **Stop** button is used to stop a “run”. In contrast to the **Pause** feature, pushing the **Stop** button will cause software to end that “run” and report the results. If the operator starts again, software will begin collect data within a new “run”.

At the top of the Operate screen is a **clear alarms** button. (2) When any alarm matrix function is placed into the “hold” position, this button will clear the alarm being held.

The Overall ISO/IEC grade is displayed in the Label text window next to the decoded data (7).

Reports Function Screen



5.0 Reports screen

The *Reports* screen is a visual collection of all data analyzed by the system for one “run” within a “job”. A “job” can have up to 50 different “runs”. Each “run” has a start time and a stop time indicated. (1). The Reports screen can be accessed during a “run”.

The Report screen will visually display bar code quality as well as all reported errors (2) for any individual lane or show all lanes collectively.

5.1 Viewing or printing a “run”.

At the bottom of the *Reports Screen* is a series of buttons used to activate specific features as defined here:

Previous run:

This allows the operator to view the log for any of the previous “runs” within that “job”.

Next run:

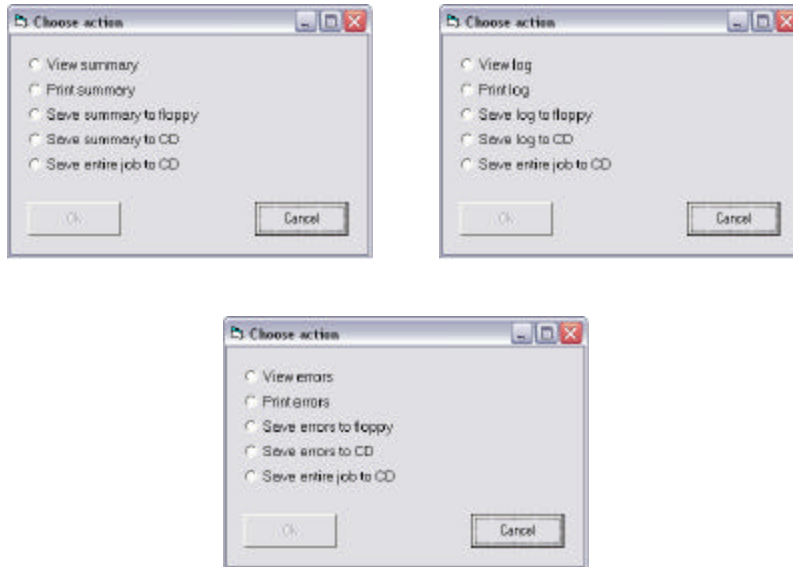
While viewing a previous “run”, this allows the operator to toggle to the next “run”.

Delete run:

This allows the operator to delete a specific “run”.

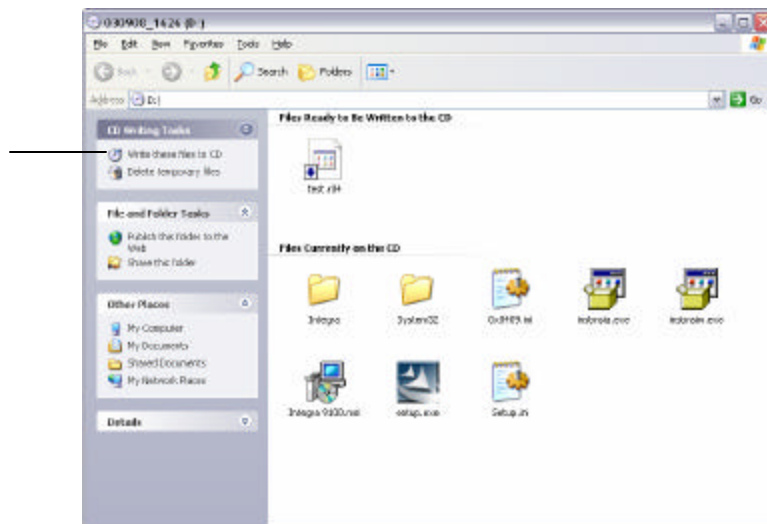
Summary, Log, Errors:

When any of these three boxes are activated, a pop-up menu will be displayed. They will look like this:



The operator can then choose an action. They can view a summary report, a log report, or an errors only report. Or, they can choose to save a summary, or a log, or errors only to a floppy or CD.

All systems come with a Read/write CD burner. When the operator requires a report to be saved to a CD, the following pop-up window will be displayed:



Press the appropriate task required.

5.2 Reports

This is what a typical report looks like for one lane.



The report will list each row of bar code labels with a “gate” number. Next to that is the date when data was collected followed by the time of day.

Next is the encoded bar code data followed by the ISO/IEC verification grade.

Finally, printed after the verification grade is a two-digit error code. When an error is detected a two-digit code is listed according to the Output matrix listed on the Alarm screen. Only one error condition is reported in a hierarchy. The top error condition (missing labels) has the highest priority.

APPLICATIONS AND GUIDELINES

Here are a few questions you need to ask yourself when determining if an **INTEGRA 9100 / 9100Q** will work in your application.

1. How fast can I go?

A. Frequency of labels

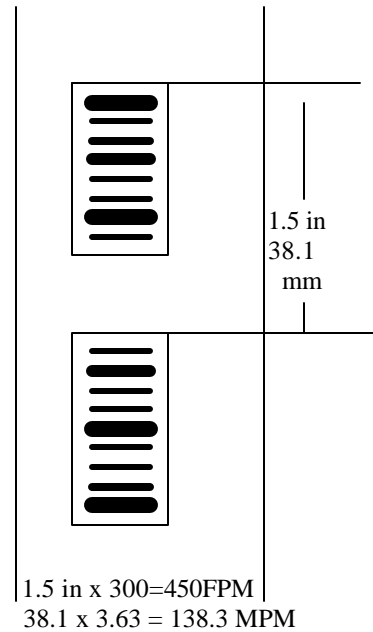
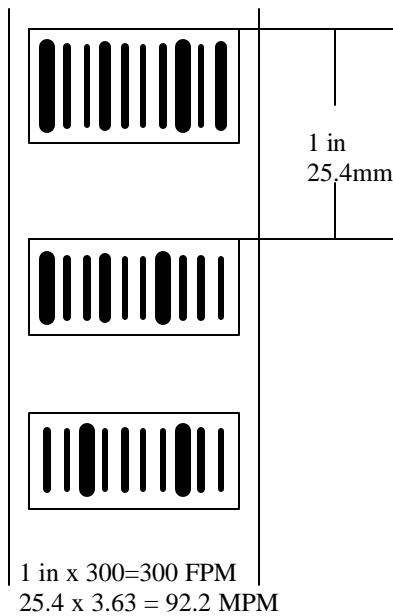
The **INTEGRA 9100 / 9100Q** systems verify up to 30 bar codes per second per lane.

B. Web Speed

The following formula will enable you to determine your maximum web speed for a given job.

$$\text{BAR CODE REPEAT (in)} \times 300 = \text{F/M (FEET per minute)}$$

Example of Label Repeat:



Applications and Guidelines – continued

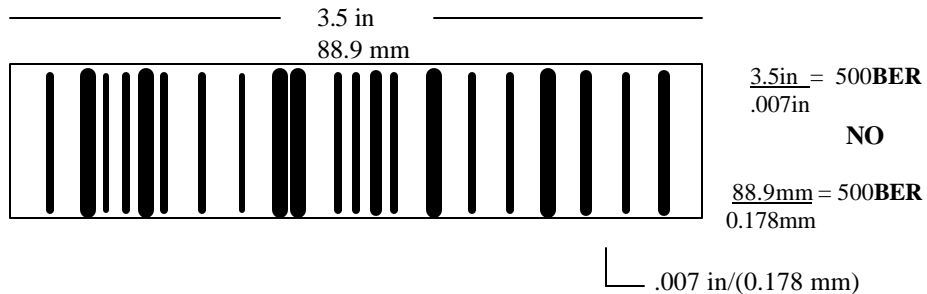
2. What size bar code can I grade?

A. Width

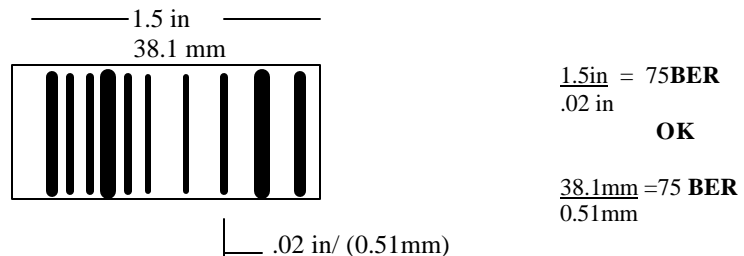
Bar code symbols vary in width. A formula called the ‘**BAR ELEMENT RESOLUTION**’ (**BER**) is used to determine if the bar code symbol is too wide to be verified by an **INTEGRA 9100 / 9100Q**. The **BER** should be less than 200. The formula for **BER** is as follows:

$$\mathbf{BER} = \frac{\mathbf{WIDTH\ OF\ BAR\ CODE\ (in\ or\ mm)}}{\mathbf{NARROW\ BAR\ WIDTH\ (in\ or\ mm)}}$$

Example of a bar code symbol which can not be verified by the **INTEGRA 9100 / 9100Q** :



Example of a bar code symbol which can be verified by the **INTEGRA 9000 / 9000Q** :



B. Height:

If the height of the bars in your bar code is .25in/ (6.35 mm) or less, the **INTEGRA 9100 / 9100Q** may not be able to provide an accurate ISO/IEC/ANSI grade.

Applications and Guidelines – continued

3. How far can the system controller be from the readhead(s)?

The maximum cable length cannot exceed 25ft/ (13m)

4. How does the INTEGRA 9100 / 9100Q know when the bar code is in the camera's field of view?

The **INTEGRA 9100 / 9100Q** must be 'told' that a bar code is in the field of view. You must provide a consistent registration mark. Various types of equipment can be used to detect the registration mark, they include 'through the web sensors', 'reflective sensors', 'a proximity switch', or a computer generated signal. You must decide which method is best for your application. (SEE CHAPTER ON REGISTRATION MARK TRIGGER)

5. How does the INTEGRA 9100 / 9100Q 'see' the bar code when it is moving at high speeds?

A. Web Direction

Bar codes in motion can be horizontally or vertically inserted in the 'field of view'. A strobe unit is used to eliminate the effects of motion. It is important that ambient light is controlled so that it does not over power the strobe light.

B. Orientation

The bar codes on the web may be in a picket fence or ladder orientation. However the read head must be positioned so that the bar code appears on the monitor to be in a picket fence orientation. The bar code must be perpendicular in the field of view.

Applications and Guidelines – continued

C. Bounce

At times the vibration of the web will cause the bar code to ‘bounce’ up and down. ‘Bounce’ changes the distance from the camera lens to the surface of the bar code, or ‘depth of focus’. Changes in the depth of focus may result in variations in the **ISO/CEN/ANSI** grade of the bar code symbol. It is mandatory that this bounce deviation does not exceed a + or - .125 in (3.175mm).

7. Does the web have to be flat?

As the bar code passes under the readhead it is important that it be flat and parallel to the readhead. If one side of the code is closer to the readhead, or a portion of the bar code is curved it will change the depth of focus. Changes in the depth of focus may result in variations in the **ISO/CEN/ANSI** grade of the bar code symbol.

8. How will the label stock affect the ISO/IEC grading?

A. Reflectivity

If your label stock is highly reflective, the position of your read head must be positioned so that the strobe light does not create a ‘hot spot’ or reflection on the bar code surface.

B. Opacity

You must take into consideration the opacity of the label stock. If you can ‘see through’ the label stock, a background plate may need to be installed, which is designed to be a color consistent with the intended final use of the bar code.

9. If I do not meet the guidelines can I still use the INTEGRA 9100 / 9100Q?

Maybe. It is our recommendation that actual production samples be tested as part of the decision process to determine if the **INTEGRA 9100 / 9100Q** can be used in your application.

10. The Final INTEGRA-9100 grade. What does it tell you?

The **INTEGRA 9100 / 9100Q** gives you an overall **ISO/CEN/ANSI** grade out. It does not report what part of the specifications is wrong. An off-line certified verifier needs to be used to establish what is wrong.

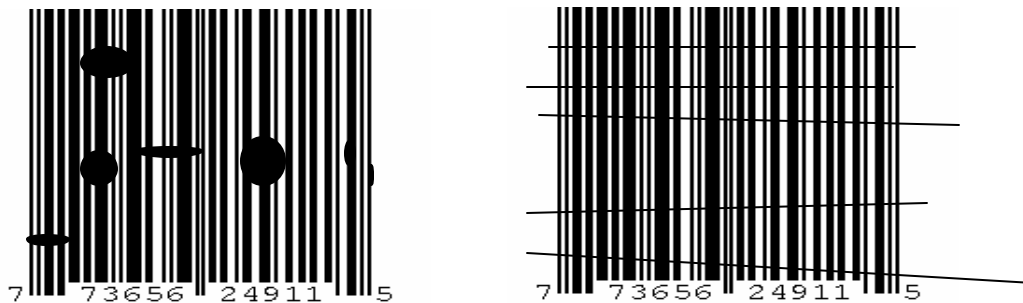
Applications and Guidelines – continued

11. Why does the INTEGRA-9100 grade Spots and Voids differently?

According to the standards, spots and voids are measured as a ratio between the deviation of non-uniformity found within bars / spaces, and symbol contrast. It is stated as a measurement of signal amplitude as evaluated within the Scan Reflectance Profile (SRP). Any non-uniformity mark which decreases the symbol contrast within a bar or space element by 30% is considered to be an “F GRADE DEFECT”. Here are some problems encountered when using these rules:

Problem A: The Primary Calibration Standard labels for Spots and Voids created by Applied Image are made by drawing an “error line” through a bar or through a space vertically. This was done in order for a wand or laser to “see” the blemish on all scans. But, it is not a true representation of a Spot or Void. It is a streak. A very narrow streak. The Primary Calibration Standard label made by Applied Image for an A to F GRADE Spot/ Void’s inserts this “error line” vertically. For an F GRADE label, this “error line” measures 20 microns in width. This is less than the width of a human hair. In inches this is equal to .0008 “ wide. When a verifier scans over this small of a line, it sees only a slight reduction or addition in contrast. Normal scanners used in the retail market cannot see this small of an error.

Problem B: The sample bar code images below demonstrate yet another problem with other verifiers. Both of these examples are A GRADE labels according to the ISO/IEC Standards. This is because a verifier cannot see these two-dimensional “real” spots and voids.



Both examples of spots and voids are detected by the INTEGRA-9100. Typical verifiers using the ISO/IEC Standards cannot detect these types of errors.

The INTEGRA-9100 verification system is designed to grade every .006 inch of bar height. The blemishes and streaks represented above would be detected and reported as an error. This goes against the Standards. Label Vision Systems, Inc., however, believe that this is a better way to detect Spots and Voids.

Applications and Guidelines – continued

12. The INTEGRA-9100 uses a white light source. How can it verify correctly?

The ISO/ANSI standards state that the wavelength of a diffuse light source must be suited to the intended scanning environment. The INTEGRA-9100 will use a DC Fluorescent white light source or a xenon strobe white light along with the addition of a Wratten 26 red filter when necessary. Each customer will be different depending on their needs.

According to the ISO/IEC Standards, using a Wratten 26 red filter with a white light source is an acceptable way to correlate to the Standards.

Verification equipment needs to be certified according to the ISO/CEN/ANSI standards. There is a company located in Rochester, New York where a set of black and white Primary Calibration Standards for UPC/EAN symbols can be purchased. This set of standards will certify whether a verifier is calibrated correctly and would therefore be recognized by ANSI, UCC, and NIST. But this is only for symbols made of black bars and white background. They do not have a set of standards for various color combinations.

According to the standards, the best color combination for maximum contrast is black bars on a white background. Other color combinations can be used providing the bars are black, blue, or green and the background is white, red, or yellow. These color combinations were created because most scanners and verifiers cannot detect anything printed in red. The INTEGRA 9100 / 9100Q can and will detect the color of red. This means that a bar code label which uses red bars on a black background can be graded with this system. Other verifiers may not be able to detect the red bars.

Static and Dynamic Bar Code Verifier Conformance Specifications

INTRODUCTION

Printed bar code quality was first addressed by the Uniform Code Council (UCC) using UPC symbols. Then in 1990 the American National Standard Institute (ANSI) published the first manual for Bar Code Print Quality (ANSI X3.182-1990). This document outlines the parameters of bar code print quality based upon the optics of a bar code scanning system. These parameters were now to be tested with respect to the analog electronic signal generated by the optical image detector found within all scanners. This analog electronic signal was now to be called a Scan Reflectance Profile (SRP). Grade quality for any given label would now be based upon formulas surrounding the SRP.

ANSI updated their document in 1995. At the same time, the Committee for European Normalization (CEN) and the International Standards Organizations (ISO) published their version of printed bar code quality. (Document number: EN 1635)

In the year 2000, ANSI, CEN, and ISO decided to publish one document designed to unify all bar code verifier conformance specifications throughout the world. The document number is: ISO/IEC 15416:2000(E). This document titled “Bar Code Verifier Conformance Specifications” is how the INTEGRA-9100 is certified and is recognized by UCC, AIAG, HIBCC, and EAN.

Part of the Bar Code Verifier Conformance Specifications titled:

INTERNATIONAL STANDARD ISO/IEC 15426-1:2000(E)

Part 1: Section 2 titled “Conformance” states the following:

The instrument shall be considered to conform with this part of ISO/IEC 15426 if it performs the functions defined in 6.3 and if the results of measurements of primary reference test symbols carried out in accordance with clause 8 meet the following conditions:

- a) the measured overall symbol grade, to one decimal place, is within +/- 0,2 of the overall symbol grade declared by the supplier of the primary reference test symbol, and*
- b) the arithmetic means of the ten measurements of individual reported parameters are within the tolerances shown in Table 1 below, and*

continued

c) *the ten measured grades for the individual reported parameters, rounded to the nearest whole number, are the same as the grade declared by the supplier of the primary reference test symbol.*

Table 1

Parameter	Tolerance
Rmax	+/- 5% reflectance
Rmin	+/- 3% reflectance
Decodability	+/- 0,08
Defects	+/- 0,08
NOTE: The tolerances are additional to any tolerances stated by the supplier of the primary reference test symbols.	

Section 6.3 Mandatory functions

A bar code verifier, in accordance with ISO/IEC 15416, shall be capable of:

_collecting reflectance measurements from points along one or more scan paths across a bar code symbol;

_establishing a scan reflectance profile from these measurements;

_analyze the scan reflectance profile;

_reporting individual scan reflectance profile parameter grades;

_determining and reporting overall symbol grade (including aperture diameter and peak wave length of light used);

_reporting the decoded data;

_reporting all encoded symbol characters.

The method of reporting is not specified but may be by means of, for example, a display screen in the instrument, a printed report, or electronic communication with another device such as a computer.

End of quoted section

SCANS PER LABEL AND LABEL ORIENTATION:

The INTEGRA-9100 scans a 100% UPC bar code symbol around 145 times, static or dynamic, ladder or picket fence orientation, creating a Scan Reflectance Profile for each of the 145 scan lines. The standards state that at least 10 scans are required.

OVERALL SYMBOL GRADE AVERAGE:

The INTEGRA-9100 does not report individual parameter grades. It reports the overall symbol grade average only. An external verifier is required to evaluate why the grade is low.

When reporting the overall grade average, the ISO/IEC standards will round off that number to the nearest whole number. The INTEGRA-9000 will not do this. It will report the overall grade out to one decimal point. This is done so the operator can measure the difference between a low value within a grade and a high value within that same grade. In other words, it will report a low B GRADE as a 2.6 and a high B grade as a 3.4. The ISO/IEC standards would report both of these grades as a 3.0 B GRADE.

STATIC versus. DYNAMIC VERIFICATION

There are two kinds of verifiers, static and dynamic. A “static” verifier is one that is used to verify the quality of a bar code symbol which is not in motion. In other words, it is being checked “off-line”. A “dynamic” verifier is one that is used to verify the quality of a bar code symbol while it is in motion or “on-line”.

The INTEGRA-9100 is a dynamic verification system. It is used to check the quality of bar code symbols as they are being printed. Speeds greater than 1000 feet per minute have been achieved. It is capable of grading 480 different bar code symbols per second in any orientation. A “real-time” (See Figure: 1) graph is displayed on a computer monitor that gives the operator full knowledge of over-all grade quality as they are being printed. If and when the printing process begins to deviate in quality, the INTEGRA-9100 reports this trend as it happens. The operator can then make an adjustment to the printing process.....correct the problem....and continue to print quality labels.....with little or no “downtime”.

The INTEGRA-9100 software does not recognize motion. Bar code label images are collected as a whole. The number of scans it uses to determine a grade depends on the height of bar code. A typical 100% UPC label will be scanned 150 times at any speed and in any orientation providing the bars of the code are perpendicular to the field of view. Every .006” of bar height is checked for quality. This system identifies the quality of labels in motion as if it was being done “statically”.

LIGHT SOURCE and APERTURE

Vision based systems use a diffuse light source and then use an array of tightly spaced horizontal pixels mounted on a chip (CCD CHIP) to examine the reflected image. And, with vision, the aperture is called by a different name. It is called the iris. The iris controls the amount of light entering the CCD chip. The iris must be adjusted according to a Contrast Calibration Label supplied with the system. This teaches the INTEGRA-9100 system to correlate light intensity to the established Standards according to the measured bar width. This aperture adjustment is done manually during the SETUP of all jobs.

The ISO/ANSI standards state that the wavelength of a diffuse light source must be suited to the intended scanning environment. The INTEGRA-9100 will use a DC Fluorescent white light source, a xenon strobe white light, with a Wratten 26 red filter. Each customer will be different depending on their needs.

A xenon strobe is used to eliminate the effects of motion for high speed applications which might exceed 300 feet per minute. A DC Fluorescent light source is used in applications where the web speed is less than 300 feet per minute.

The SCAN REFLECTANCE PROFILE

The bar code image is focused on the video camera's array of horizontal pixels. These small pixels (12 microns square) create a string of DC levels that represent the bars and spaces of the bar code image. Wand based systems would call this string of data a Scan Reflectance Profile (SRP). In the world of vision it is called a Video Signal Profile (VSP). The SRP and the VSP are the same thing.

The video camera should have a horizontal pixel count greater than 760 pixels in order to obtain data resolute enough to measure high density bar code labels.

With a camera, lens, and linear light source, a VSP is generated for every .006 inch of bar height. The VSP is then sent to the microprocessor for decoding. With vision, the actual x-dimension (smallest bar width in a bar code image) for a given label does not really change. By using different lenses a 2 mil label is no different than a 20 mil label. Since laser based systems are limited in their resolution, certain attention must be given to the measured x-dimension with respect to the resolution of the intended scanning environment. In other words, the INTEGRA-9100 system can correlate any size bar width label, but that doesn't mean the intended reading device has the resolution capable of seeing it.

The SRP is what all verification software uses to inspect quality. With a wand based system, the SRP is obtained by moving the wand (called scanning) somewhat quickly through the bar and spaces of the bar code image. This presents many challenges to operators who are trying to understand bar code quality since no two scans are alike. No

two operators will scan the same. Too fast, too slow, too much of an angle, or too much of a jerky motion are some of many problems associated with wand based verification. It is also impossible for a wand based verifier to scan bar code labels as it would be scanned at the grocery store. Nearly all retail stores now use vision (CCD) or laser technology. With the addition of two-dimensional coding, verifiers of the future will all be vision based.

A Scan Reflectance Profile (SRP) can be represented as an X-Y graph. X would represent a measurement of time while Y would represent the amplitude of reflected light. Points and distances along the X-axis are completely relative.

The Y-axis of the SRP is a measurement of reflectivity. A wand based system will measure the highest possible point (white) as 100% reflectivity. The lowest possible point is 0% reflectivity (black). The points and distances along the Y-axis are absolute, not relative.

ISO/ANSI established the following list of measurements to determine bar code symbol quality. Next to the measurement indicates which axis (X-Y chart) of the Scan Reflectance Profile is being measured.

1. Edge determination
2. Reflectance minimum (Y-axis)
3. Edge contrast minimum (Y-axis)
4. Symbol contrast (Y-axis)
5. Modulation (Y-axis)
6. Defects (Y-axis)
7. Decodability (X-axis)
8. Decode
9. Overall grade

EDGE DETERMINATION

The ISO/ANSI formula for Edge Determination is directly related to the placement of the Global Threshold. The Global Threshold (GT) is defined as a DC voltage level positioned on a SRP or a VSP half way between the highest reflectance DC level and the lowest reflectance DC level. Software for the INTEGRA-9000 modulates the GT in order to establish an absolute level of reflectance. We call this a Managed Global Threshold (MGT) and is the heartbeat of the LVS system. MGT is better explained later.

The Global Threshold is placed at a DC position to this formula.

$$GT = Rmin + SC/2$$

If the GT is at this position and the bar code label image meets the decodability requirements then it is decodable and considered to PASS the Edge Determination test.

Software evaluates Edge Determination every .006 inch of bar height

MINIMUM REFLECTANCE

The ISO/ANSI formula for Minimum Reflectance is based on the DC amplitude difference between the greatest value of reflectance (spaces) and the smallest value of reflectance (bars) as observed in a SRP. It passes if the smallest value of reflectance is less than or equal to 50% of the greatest value. LVS software uses a MANAGED GLOBAL THRESHOLD (MGT) as established during SETUP.

Any reflectance value deviation from “normal” will be detected and, consequently, will vary the Symbol Grade Score. “Normal” is defined as the level of reflectance obtained from the ISO/ANSI verified TARGET LABEL during SETUP. The INTEGRA-9000 does not grade Minimum Reflectance as a PASS or FAIL, it is reported as a defect when software compares it to what is “normal”. This is a Y-axis measurement. But, if a label degraded to where the minimum reflectance is greater than half of maximum reflectance, then the VSP could never duplicate what was measured during SETUP, and therefore report an “F” GRADE.

Software checks for minimum reflectance every .006 inch of bar height.

MANAGED GLOBAL THRESHOLD (MGT)

The Managed Global Threshold is the key to the INTEGRA-9100 process of verification. This method allows software to monitor the Y-axis positive and negative peaks of the VSP and reports any changes from what was determined as “normal” during SETUP. Another name for MGT is SWEEP. When a bar code symbol begins to have problems (Y-axis problems), it is first to show at the extreme peaks, both positive and negative, of the VSP. Software spends most of its time monitoring these peaks.

MINIMUM EDGE CONTRAST

The ISO/ANSI formula for Minimum Edge Contrast is based on the smallest DC amplitude of a bar/space

Transition as observed in a SRP/VSP. It is a Y-axis measurement. If the deviation is greater than 15% it is considered a PASS. Our system will report an “F” grade for any edge contrast level less than 15%. The “Managed Global Threshold” (MGT) method of measurement is used to establish edge contrast deviation percentages.

Software checks for Minimum Edge Contrast every .006 inch of bar height.

SYMBOL CONTRAST

Symbol contrast is measured the same way Minimum Edge Contrast was measured. It is a Y-axis measurement and is based on the absolute measurement established during SETUP. The amount of sweep measured on the “target label” is how symbol contrast is defined. Any minute change in symbol contrast will be detected at the positive and negative peaks of the SRP then deducted from the symbol grade score. The percentage of undecodable lines caused by the reduced amplitude of the SRP will follow ISO/ANSI’s contrast grade percentages very closely.

Software checks for deviations in Symbol Contrast every .006 inch of bar height.

MODULATION

Modulation is ratio of the minimum edge contrast to Symbol contrast inside an SRP. The grade scale for modulation was established during SETUP. It is a Y-axis measurement. Modulations changes are first noticed at the positive and negative peaks of the SRP. This is very similar to Symbol Contrast. Symbol contrast errors will change a multitude of peak amplitudes, where as when Modulation errors occur, only one or two peaks are effected. Software is trained to monitor both types of errors. These changes in modulation affect the overall percentages very close to the ISO modulation percentages. Due to the differences in scales used to determine the ISO/ANSI grades, Modulation errors will be reported slightly higher than actuality.

Software checks for deviations in Modulation every .006 inch of bar height. It will grade according to specifications about 10% harder than recommended. This condition is created because software is trying to follow Symbol contrast, Decodability, and Modulation at the same time.

DECODE

Decode is a Pass / Fail measurement. This rule applies to not only making sure that a bar code symbol can be decoded but also whether the check digit routine is consistent with the rules set up for standard check digits or specially developed check digit routines.

Software checks for Decode every .006 inch of bar height.

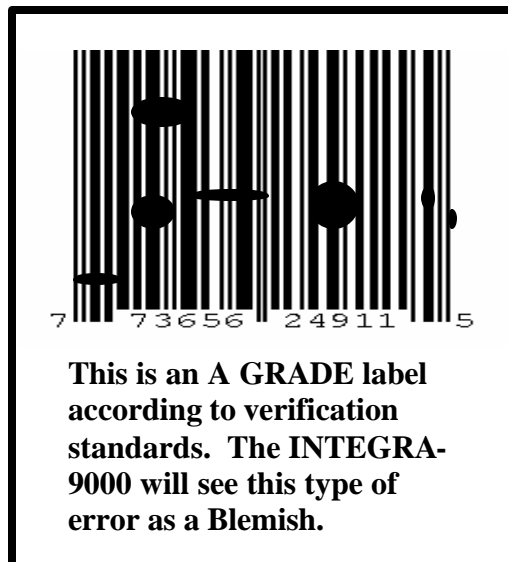
DEFECTS

Another unique quality for the INTEGRA-9100 is in its ability to detect all types of blemishes large or small that affect the decode rate of a given label. It is a Y-axis measurement. If the TARGET label used during setup of the INTEGRA-9100 software indicates that there should be 200 decodes per label, then any blemish defect larger than .006 inch would decrease the decode rate by a percentage equal to the height of the defect.

The ISO/ANSI GRADE labels made by Applied Images contain calibrated labels that help define what is an acceptable “spot” or “void” defect size. The INTEGRA-9100 does not use this scale of measurement and will not grade the Primary Calibration Standards according to a sliding scale from A (4.0) to F (.5). Instead, software is trained to sound an alarm on “any” defect level detected that is greater than 5% of the bar height. The actual level is set up by the operator during the SETUP process.

The Primary Calibration labels made by Applied Image for “spots” and “voids” were made by creating a “spot” or “void” as a line along the entire bar height of the symbol. In this way, no matter where the operator would scan across the calibration label, a “spot” or “void” error would be found. Due to this one-dimensional approach to ISO/ANSI verification that wands inherently have, it is easy to see why the “spot” and “void” calibration standards were made in this manner. But, a traditional wand or laser based verifier cannot detect a “real” spot or void. A “real” spot or void would cause that line of bar code data to be undecodable. A standard verifier will not report whether the scanned line was good or bad. It doesn’t even know it exists. Vision based verification is a two-dimensional process. In the two-dimensional world of vision, “real” spots or voids are called “blemishes”. Vision systems look at bar code data contiguously and will know when a line of bar code data is “not” decodable.

The INTEGRA-9100 system checks every .006 inch of bar height for blemishes. The acceptable size for a blemish error is defined during SETUP.



DECODABILITY

Decodability is a measure of how close the bar and space widths match ideal values and is an X-axis measurement. ISO/ANSI specifies a different algorithm for each symbology. The INTEGRA 9100 measures the decodability from the sums of adjacent bars and spaces, and implement special algorithms for UPC digits 1,2,7, and 8.

The lookup table used to convert a microprocessor count to an element width will also includes 5 bits (32 possible values) for decodability. The INTEGRA 9100 remembers the worst decodability seen for the entire scan line.

Code 39 and CodaBar have a space called the inter-character gap. The ISO/ANSI specification for decodability does not look at the gap, but the INTEGRA 9100 does. If the gap is more than 1X, then the system will give the symbol a lower grade.

The measurement of Decodability is checked every .006 inch of bar height.

QUIET ZONES

Quiet Zones are a measurement of uniform light contrast, adjacent to the outer edges of the left and right guard bars. This is a Pass / Fail measurement and is an intricate part of what software needs to see in order to decode a particular symbology.

Software checks for presence of a Quiet Zone every .006 inch of bar height.

OVERALL SYMBOL GRADE

The INTEGRA 9100 system cannot define individual problems associated with the SRP/VSP for a given label. It can only determine that its overall Symbol Grade is not how the “target symbol” measured. A line score is determined for each scan line. The line score is a number between 0 and 32. Undecoded scan lines get a line score of 0. Decoded scan lines get a score between 1 (worst) and 32 (best). This is a linear scale and correlates to the ISO/ANSI standards.

The sum of all line scores is called the “symbol score”. If a symbol was perfect, it would be equal to 32 times the height of the symbol. Typically, the number is somewhere between 15 and 20 times the height of the symbol.

The INTEGRA-9100 software will see a 100% U.P.C. bar code symbol about 150 times. Since software checks for bar code quality every .006 inch of bar height, we can multiply 150 times .006 inch. This equals to .9 inch which is what a 100% U.P.C. label should measure. This means that software will see this label 150 times at 10 feet per minute or at 1000 feet per minute. It will see the label this many times whether it is in a “ladder” or “picket fence” orientation. According to ISO specifications a verifier needs to scan a bar code symbol 10 times in order to get an accurate picture of bar code quality. The INTEGRA-9100 goes well beyond ISO requirements. Even a truncated UPC label measuring .25 inches would be scanned over 40 times, at any press speed, and in any orientation.

TRUNCATION / BAR HEIGHT

The INTEGRA-9100 measures and checks for the presence of a bar code symbol every .006 inch of bar height. During SETUP, software determines the height of a bar code label by counting how many lines were decoded. A truncated problem will show up as a “blemish”. Software can be set to sound an alarm when a bar code label becomes truncated by more than 5%.

OPACITY

For the printing industry OPACITY is defined as the property of a material which allows you to see through a printed label substrate. The INTEGRA 9100 can be used to check for OPACITY by placing a half black and half white background behind the “job label”. Any changes in OPACITY would then be detected as a change in contrast.

A background plate could also be made to appear like the product the label is being used on. SETUP would see the different looking background due to OPACITY and the operator would determine what level of decode rate would be acceptable. Any deviation from “normal” due to OPACITY issues would be tracked.

This type of check cannot be done with wand or laser based verifiers at press speeds. It is an area of neglect that deserves some mention. Opacity is one of the most common reasons for a bar code label to not be read at the retail store. This is due to printers checking for bar code quality without placing it onto the final product.

The INTEGRA-9100 verifies problems with Opacity every .006 inch of bar height.

The INTEGRA-9100 “Operations Screen” will show the Label Text and trend analysis for ISO/ANSI Grade, Blemish Percent, and Bar Growth / Shrinkage Percent for up to 8 different bar code symbols on one computer screen. Software is set to handle up to 60 different bar code symbols per second, per lane.

Alarms can be set for the following:

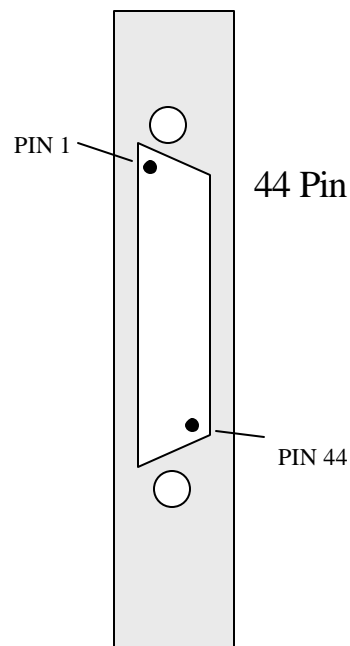
- No dup licates
- Mismatch errors
- Checksum errors
- Sequence errors
- ISO/ANSI grade errors
- Blemish errors
- Bar shrinkage errors
- Bar growth errors
- Missing label errors
- Good read indicator

Software maintains a REPORTS LOG for all symbols read. It will list the Job number, Job start / stop time, what the ISO/ANSI grade was for every label and what kind of error was detected, and each line of data is date and time stamped.

3 LANE AND 8 LANE SYSTEM BOARD INPUT / OUTPUT PINS

Pin 1 GND
Pin 2 CAMERA A SHIELD
Pin 3 GND
Pin 4 CAMERA C SHIELD
Pin 5 GND
Pin 6 PXC SHIELD – BNC
Pin 7 GND
Pin 8 MUX 1 IN
Pin 9 GND
Pin 10 STROBE TRIGGER
Pin 11
Pin 12 ACK RESET IN
Pin 13 XTRA OUT 1
Pin 14 SPARE OUT 2
Pin 15 GND
Pin 16 GND
Pin 17 CAMERA A VIDEO
Pin 18 CAMERA B VIDEO
Pin 19 CAMERA C VIDEO
Pin 20 CAMERA D VIDEO
Pin 21 PCX VIDEO
Pin 22 MONITOR A VIDEO
Pin 23 GND
Pin 24 XTRA IN 1
Pin 25 SPARE IN 2
Pin 26 PHOTO-EYE IN
Pin 27 FRAME SYNC
Pin 28 GND
Pin 29 LIGHT TOWER 1 OUT
Pin 30 LIGHT TOWER OUT 2
Pin 31 GND
Pin 32 CAMERA B SHIELD
Pin 33 GND

4 AND 8 INTEGRA
9000 COMPUTER
BOARD

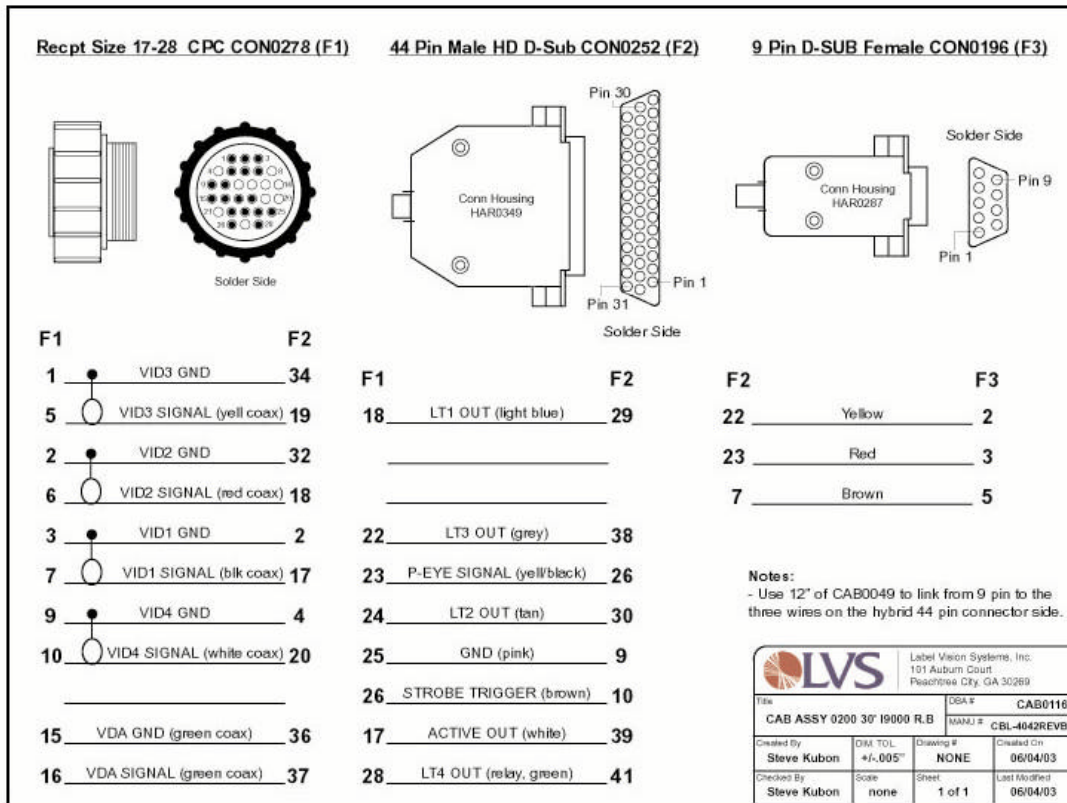


Pin 36 MONITOR A SHIELD
Pin 37 GND
Pin 38 LIGHT TOWER OUT 3
Pin 39 ACTIVE OUT
Pin 40 GND
Pin 41 RELAY COIL
Pin 42 GND

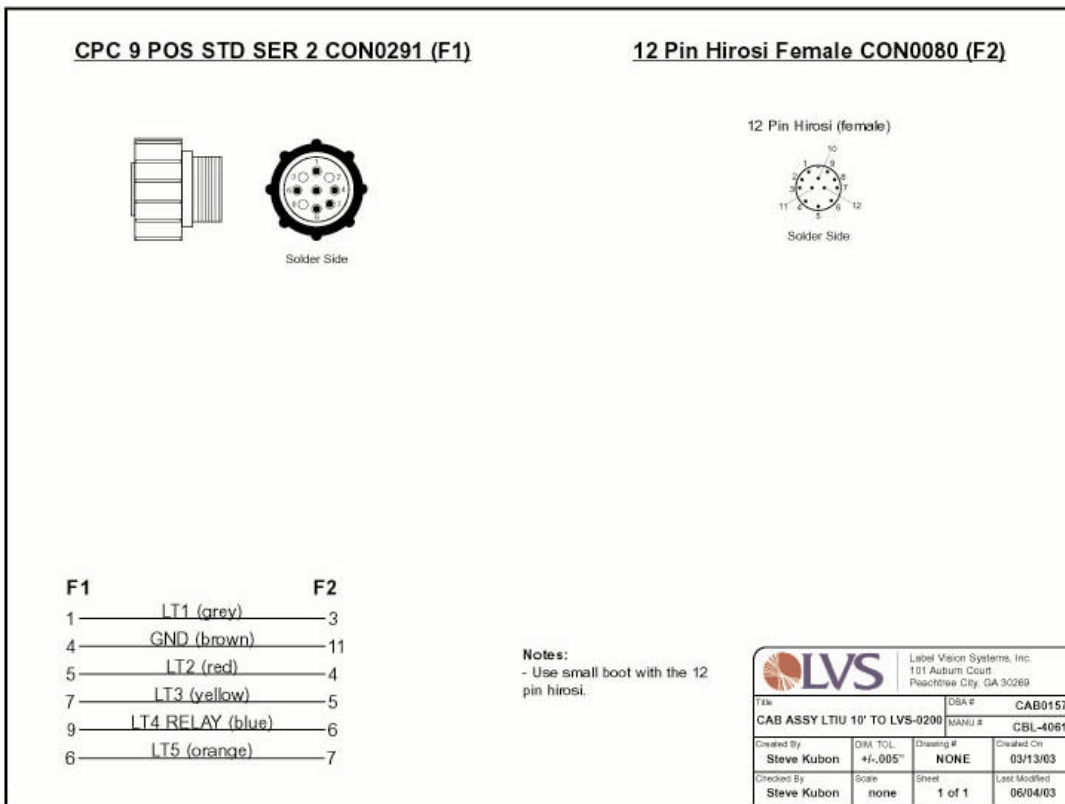
Pin 34 CAMERA D SHIELD
Pin 35 GND

Pin 43 GND
Pin 44

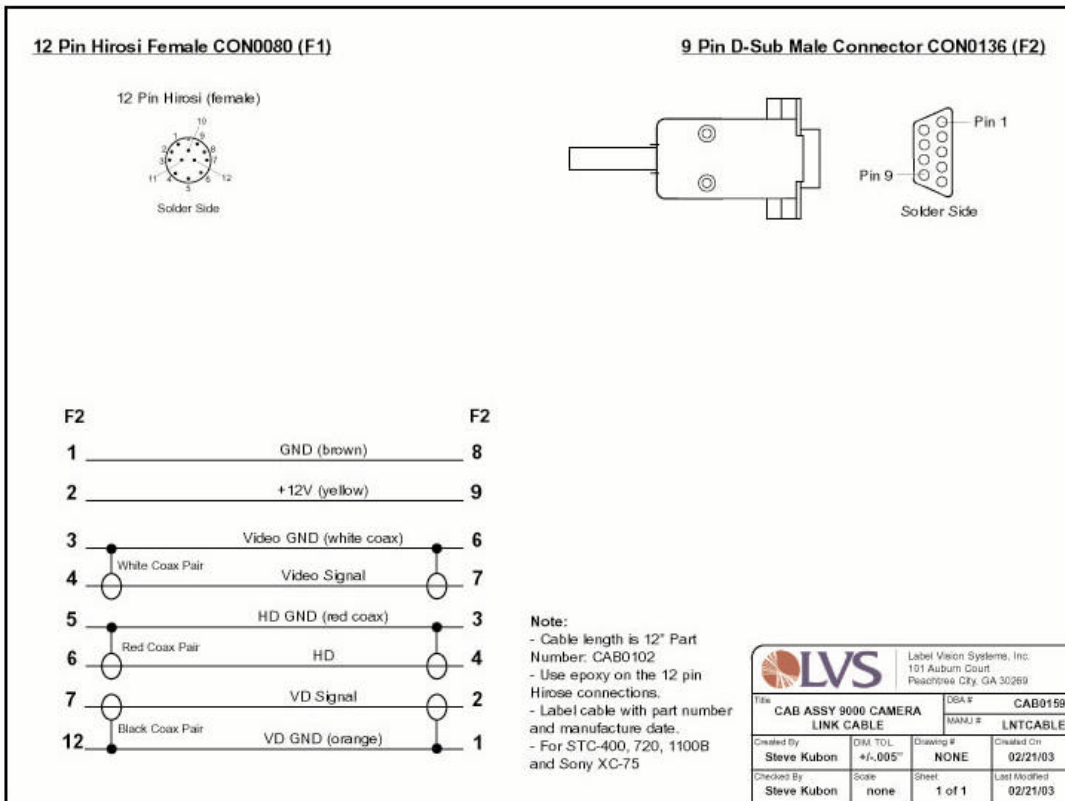
Cable Assembly CAB0120 (10 feet). Cable Assembly CAB0116 (30 feet). From the Read Head to the Computer with 1 to 4 lane system.



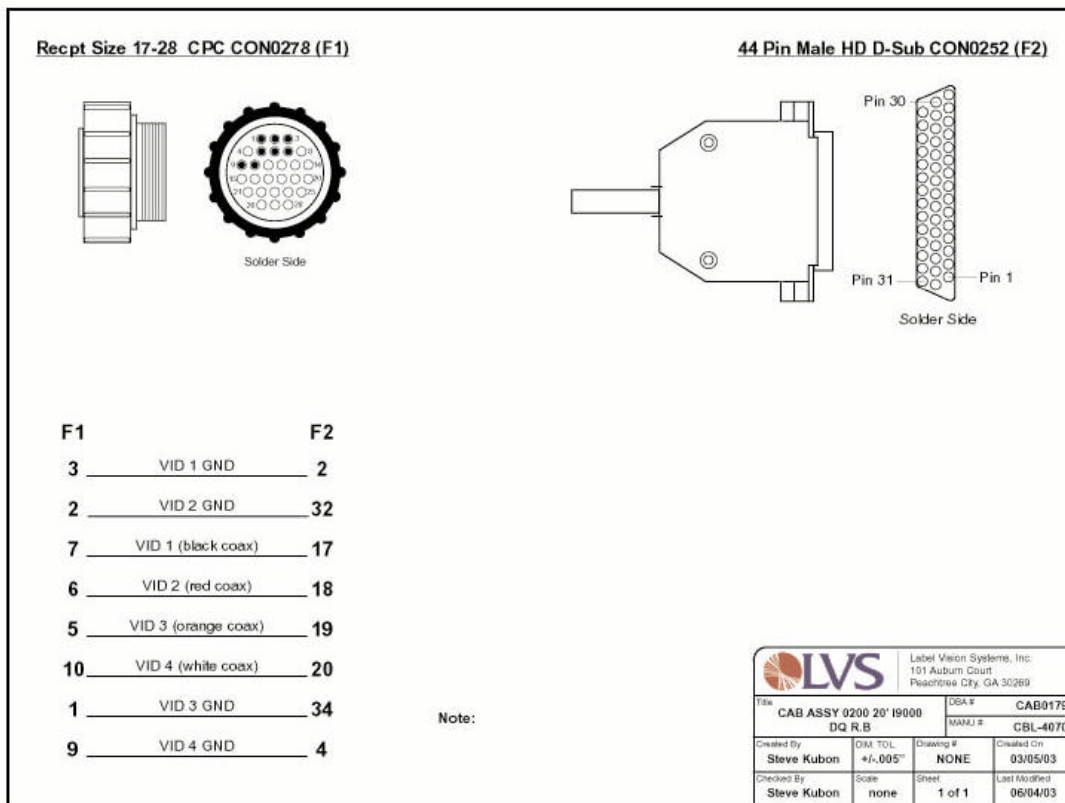
Cable Assembly CAB0157 (10 feet). From the Light Tower to the Read Head.



Cable Assembly CAB0159 (18 inches). From the Camera to the Camera Interface Board.

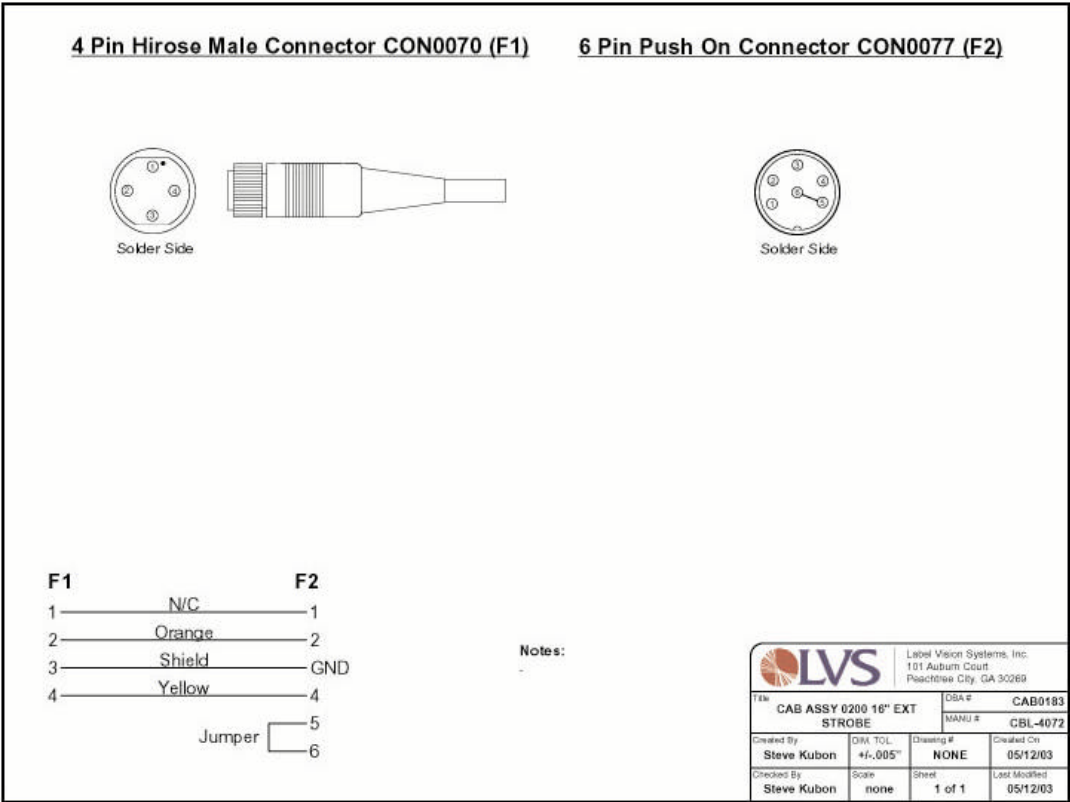


Cable Assembly CAB0179 (20 feet).
 Cable Assembly CAB0145 (30 feet).
 Cable Assembly CAB0143 (10 feet).
 From the Read Head to the Computer for lane
 5 thru 8.



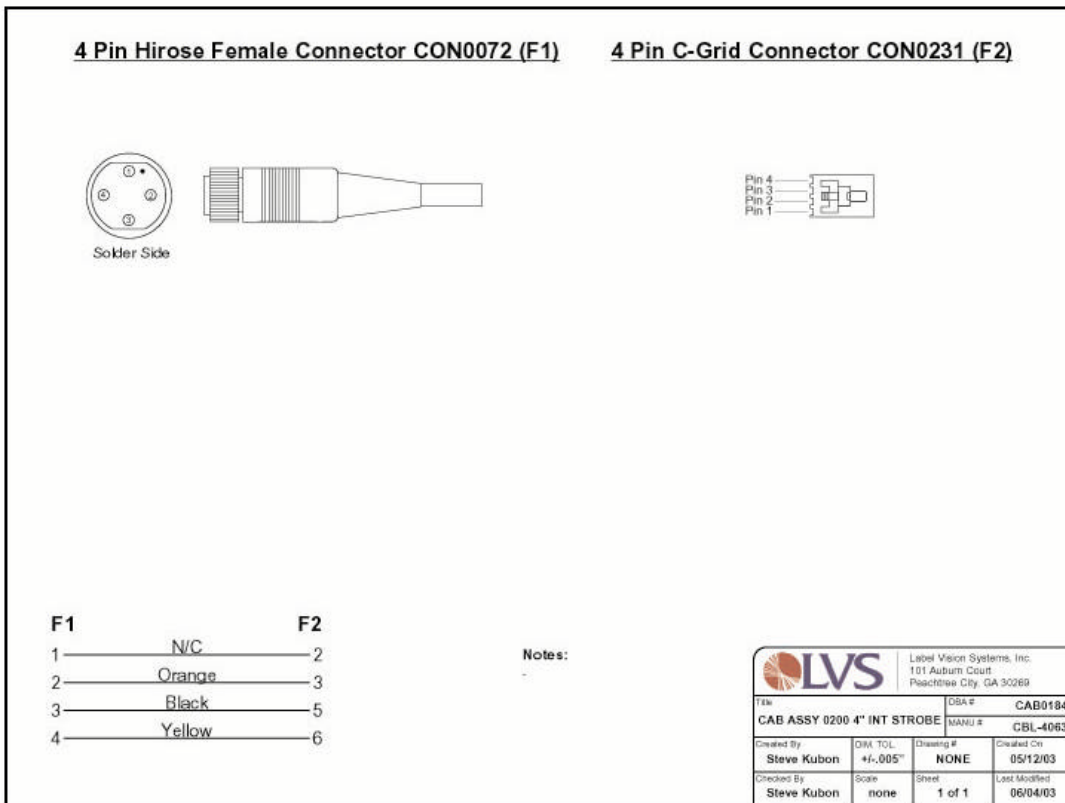
Cable Assembly CAB0183

LOL-10 Strobe Cable

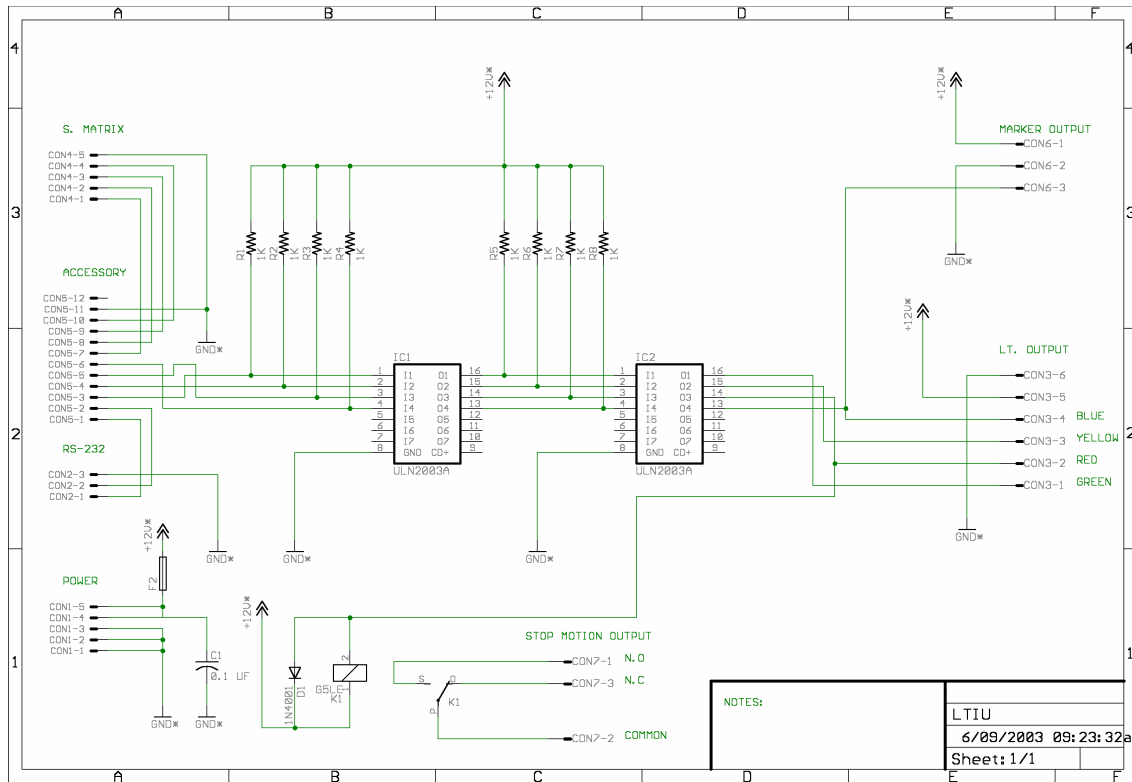


Cable Assembly CAB0184

Internal LOL-10 Strobe Cable (4 inches)



LIGHT TOWER INTERFACE UNIT



GLOSSARY OF TERMS

Vmin This number indicates a value for the lowest point of reflectivity in the image of a bar code label. The blackest black would have a value of 0. This value can be found on the SETUP SCREEN.

Vmax This number indicates a value for the highest point of reflectivity in the image of a bar code. The whitest white would have a value of 255. This value can be found on the SETUP SCREEN.

Iris [Vmax – Vmin = Iris] This number is an indication of how much light is being allowed onto the surface of the CCD element of the video camera. It is always equal to Vmax minus Vmin. It can be found on the SETUP SCREEN.

Ideal This is referring to a value on the SETUP SCREEN. It is a number, which indicates the ideal IRIS setting. This number is chosen and entered into the system as a DEFAULT PARAMETER on the JOB SCREEN.

Int. parameters These are found on the SETUP SCREEN. They are a group of numbers, which indicate what values were chosen to verify a bar code label.

Target This number correlates vision bar code data to wand bar code data. It can be found on the SETUP SCREEN. A TARGET value will increase or decrease due to differences in X dimensions, bar heights, or electronic noise. A full size UPC label will have a target of 190.

Xdim The narrowest element of a barcode image. It is measured in nanoseconds. If the X dimension is specified to be 400, then a 1X bar should be 400ns in length. The narrowest bar or space that the **INTEGRA 9100 / 9100Q** can identify is 200ns. This value can be found on the SETUP SCREEN.

Height This number indicates how many horizontal scan lines of the video camera detected bar code data. It is figured out by determining the difference between the lowest scan line number ever decoded and the highest scan line ever decoded. A standard UPC label will have a height of 140. This figure can be found on the SETUP SCREEN.

GT Abbreviation for Global Threshold. The global threshold number represents a DC position located half way between the highest recorded reflectance and the lowest recorded reflectance. DECODABILITY is measured at this DC position. This number can be found on the SETUP SCREEN.

Global Threshold See definition of GT

Sweep A number found on the SETUP SCREEN, which indicates how much relative CONTRAST, and MODULATION a bar code label has. Sweeps greater than 30 are good. Sweeps less than 10 are not good.

GLOSSARY OF TERMS - continued

Label Repeat The distance between the top of a bar code image to the top of the next bar code image. Setting this number on the SETUP SCREEN will allow the operator to see how fast the web is going when on the OPERATE SCREEN.

Grade % The overall ISO/IEC/ANSI grade. It is found on the SETUP SCREEN and the OPERATE SCREEN.

Blemish % The BLEMISH % is an indication of what percent of the total measured bar height has spots or voids. It can be set to sound an alarm if a certain percent of error is reached. It is displayed on the SETUP SCREEN and can be set on the ALARM SCREEN.

Ratio This is the ratio between wide elements and narrow elements. It is used to measure DECODABILITY properly. This applies to symbologies Code 39, Codabar, and 1 2 of 5. It is found on the SETUP SCREEN.

Narrow bar An indication of the bar width in nanoseconds. This is located on the SETUP width SCREEN and is displayed in real time.

Cloaking A term used to describe placing an electrical mask over a bar code label. It is used when there is more than one bar code image in the field of view at the same time.

Job File A JOB FILE starts when a job is entered on the JOB SCREEN. It is updated on the REPORTS SCREEN.

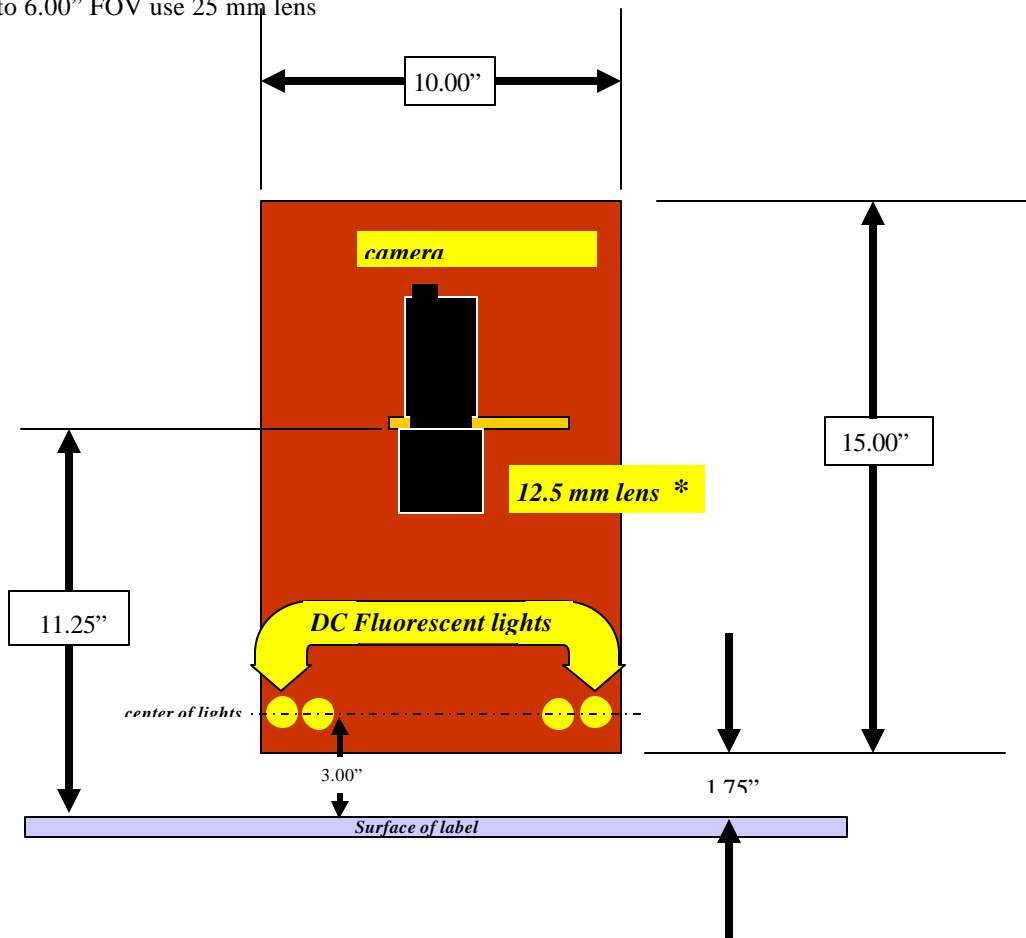
Run File A RUN FILE is started and ended with the START RUN and STOP RUN function of the OPERATE SCREEN. You can have up to 50 RUNS inside of one JOB FILE. After that, it deletes the oldest run and adds the newest run.

Multi-Lane Read Heads Points of Measurement

*

- 1 to 16 video cameras
- .75" to 2.0" horiz. FOV use 12.5 mm lens @ 11.25" Obj dist.
- 1.75" to 3.75" FOV use 16.00mm lens
- 3.00" to 6.00" FOV use 25 mm lens

Side view

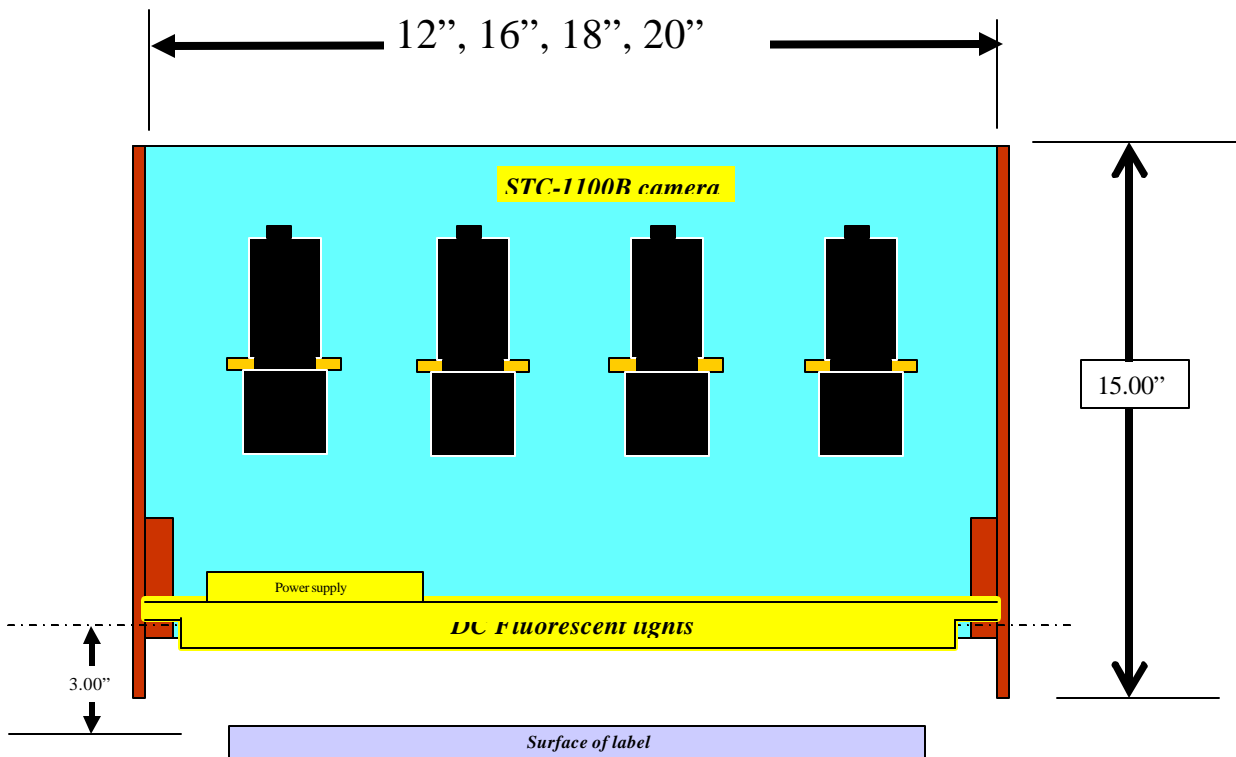


Multi-Lane Read Heads Points of Measurement

For a 16" web only

- 1 to 16 video cameras
- .75" to 2.0" horiz. FOV use 12.5 mm lens @ 11.25" Obj. dist.
- 1.75" to 3.75" FOV use 16.00mm lens
- 3.00" to 6.00" FOV use 25 mm lens

Front view



Certificate of Compliance

CERTIFICATE OF COMPLIANCE

After Setup and Installation has been completed, the installer will use a set of Primary Calibration Standard labels purchased from Applied Image, Rochester, NY. to document that the system is performing correctly according to the factory specifications.

Static Verification:

These Primary Calibration Standard labels are certified by Applied Image, in Rochester, NY to be correct. They contain various grade variations for various quality issues. At the end of this manual is a certificate which will be filled out by the installer indicating grade levels achieved and the allowable range of variations.

Dynamic verification:

Dynamic verification using the Primary Calibration Standard labels is done at the factory. It would be very difficult to perform this test at the customers site. Instead, a TEST ROLL of labels is created using sequential bar code labels. Specific labels will be marked with various problems. The test roll will then be inspected by the INTEGRA-9100 at a high rate of speed. When the TEST ROLL is done all expected variations in quality will be recorded on the reports. The results must be consistent within a +/- 0,2 Overall Grade Point Average.

Certificate of Compliance

Per ISO/IEC Verification Standards ISO/IEC 15416:2000(E)



Certification Method:
 Applied Image U.P.C. Primary Verification Calibration Standards Serial No. 1020
 APPLIED IMAGE, INC. 1653 East Main Street, Rochester, New York 14609 USA (716)482-0300

Date: _____ Model Verifier: _____ Mfg: _____ Serial No.: _____

Test	Name	%	GR.	GPA	Acceptable Range	Measured Pass/Fail	Test	Name	%	GR.	GPA	Acceptable Range	Measured Pass/Fail
3	Contrast	81.1	A	4.0	3.8 to 4.0		18	Voids	11.8	A	4.0	3.8 to 4.0	
4	Contrast	64.4	B	3.3	3.1 to 3.5		19	Voids	17.4	B	3.0	2.8 to 3.0	
5	Contrast	47.7	C	1.9	1.7 to 2.1		20	Voids	22.2	C	2.1	1.9 to 2.3	
6	Contrast	32.6	D	1.0	.80 to 1.2		21	Voids	28.9	D	0.7	0.5 to 0.9	
7	Contrast	17.9	F	0.3	0.1 to 0.5		22	Voids	33.8	F	0.2	0.0 to 0.4	
8	Modulation	71.5	A	3.5	3.3 to 3.7		23	Edge-Decode	96.0	A	4.0	3.8 to 4.0	
9	Modulation	62.0	B	2.5	2.3 to 2.7		24	Edge-Decode	55.8	B	3.2	3.0 to 3.4	
10	Modulation	53.3	C	1.8	1.6 to 2.0		25	Edge-Decode	43.2	C	2.0	1.8 to 2.2	
11	Modulation	38.8	D	1.3	1.1 to 1.5		26	Edge-Decode	29.6	D	1.0	0.8 to 1.2	
12	Modulation	28.5	F	0.4	0.2 to 0.6		27	Edge-Decode	14.3	F	0.0	0.0 to 0.2	
13	Spots	10.5	A	4.0	3.8 to 4.0		28	Bar-Decode	72.8	A	4.0	3.8 to 4.0	
14	Spots	17.5	B	3.0	2.8 to 3.2		29	Bar-Decode	57.7	B	2.6	2.4 to 2.8	
15	Spots	22.3	C	2.0	1.8 to 2.2		30	Bar-Decode	45.7	C	1.8	1.6 to 2.0	
16	Spots	28.0	D	0.9	0.7 to 1.1		31	Bar-Decode	35.1	D	0.9	0.7 to 1.1	
17	Spots	31.1	F	0.3	0.1 to 0.5		32	Bar-Decode	20.9	F	0.0	0.0 to 0.2	

Tested By: _____ Remarks: _____

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