# DM-3000

## *Dimensioning Unit*

### SERVICE & INSTALLATION MANUAL


Revision: 1.0 Release Date: 6/00

# INTRODUCTION

This is the Service and Installation Manual for the DM-3000. It provides details on everything you need to know to unpack, set up, install, and service your system.

This note box is used throughout this manual to indicate supplementary information important to the current topic.

## MANUAL REVISIONS

This Service and Installation Manual is under revision control. Any addenda or other documents associated with this manual are under separate revision controls. A revision number is changed by 0.1 whenever technical information is changed or added to a document. Any revision between 0.1 and 0.9 is automatically considered preliminary. Any document with a revision greater than 0.9 has been officially released by the Accu-Sort Systems ECN process. The document revision history can be found in the Revision History section at the end of this manual.

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**WARNING! The information provided in this installation and service manual is for trained service personnel only! There are no user serviceable parts inside this box! Do not attempt to open the unit or perform any service procedures unless you are a trained technician!**

## WARRANTY

Accu-Sort Systems, inc. warrants that its unit and component parts will be free from defects in material and workmanship for a period of one (1) year from the date of shipment. Unless otherwise stated, warranty for products not manufactured by ASI is limited to manufacturer's warranty. Accu-Sort's sole obligation with respect to damage (whether direct, incidental or consequential, resulting from the use or performance of the terminal) is to repair or replace the defective parts thereof.

EQUIPMENT OR COMPONENT FAILURES DUE TO MISUSE, ABUSE OR NEGLECT ON THE PART OF THE USER OR HIS AGENTS ARE NOT COVERED IN THIS WARRANTY.

There is no charge to the customer for any parts or labor required to repair equipment in warranty when the defective item has been returned to the factory for repair. On-site warranty service is available in the continental United States during the one (1) year warranty period at a price equal to 75% of the standard service charge in effect at the time of service, plus travel related expenses.

**Or**, if the equipment is installed in the continental United States by an Accu-Sort service technician and billed at the then current service rate, the on-site service during the first year is free of all charges including labor, parts and travel expenses.

Service requests due to abuse, neglect or changes in the original specifications or service calls not related to the Accu-Sort equipment, will be charged at the then current service rate plus all travel related expenses. Warranty coverage lasts for one calendar year. If the device or a part of the device is replaced, the warranty coverage does not start over; however, the replacement part or unit (no charge) is covered under warranty for the remainder of the one-year period, with a minimum time period of 90 days.

Accu-Sort Systems, inc. also offers the "Blue Ribbon Extended Service Plan" (BRES) in addition to the standard product warranty. Through this plan, equipment maintenance and repair are offered with fixed cost and fast turnaround for unexpected repairs.

Additional details on the coverage, support, and services available for your bar code scanning and automated systems equipment is available from:

**Accu-Sort Systems, inc.**

2800 Crystal Drive
Hatfield, PA 19440

511 School House Road
Telford, PA 18969

2398 North Penn Road
Hatfield, PA 19440

***Phone:*** (215) 723-0981
1-800-BAR-CODE

***FAX:***
Telford Main..... (215) 721-5551
Customer Service... (215) 723-1515
Systems..... (215) 996-8181
Sales..... (215) 996-8282
Acct/Mktg..... (215) 996-8249
TMS..... (215) 996-8787
North Penn..... (215) 997-4848

***Internet:*** www.accusort.com

## CUSTOMER SERVICE

If you have any problems or questions that require Accu-Sort's help, direct your calls to the Customer Service Department.

Accu-Sort Customer Service: phone: (215) 723-0981
1-800-BAR-CODE
(ask for Customer Service)
fax: (215) 723-1515

To ensure that Accu-Sort's response is prompt and accurate, please have the following information ready to give the Customer Service Department when calling:

- Product Serial Number
- Product Type or name
- Detailed description of the question or problem
- Customer contact name and phone number

| Product Type | Serial Number |
|---|---|
| | |
| | |
| | |
| | |
| | |


*DM-3000 Serial Tag*

Serial Number Breakdown:

**WWXXXXXX (YY...)**

**WW** - Two digit year of manufacture

**XXXXXX** - Six digit sequential build number

**Y** - Optional suffix(es) that reflect actual catalog options for the off-the shelf units

- ex: M22A would have "A" as suffix
- at least 6 digits can be placed on the tag
- if "Z" is called out, this indicates a custom unit requiring folder
- this could be used for special designations

The WWXXXXXX fields are bar coded with a Code 128 type bar code.

See Chapter One for futher information about DM-3000 Serial Numbers.

## SAFETY RECOMMENDATIONS AND PRECAUTIONS

The DM-3000 is an electronic microprocessor-based imaging unit. Please follow the safety precautions and warnings found throughout this manual in order to prevent personal injury or damage to the unit. Failure to follow these precautions may void your warranty.

**This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.**

MUST follow precautions in ASNI Z136.1 standard for safe use of lasers. These precautions include hazard evaluations of laser work areas, control measures, approval of standard operating procedures, recommended and approved safety equipment, signs, labels, and safety education.

**WARNING! The information provided in this installation and service manual is for trained service personnel only! There are no user serviceable parts inside this box! Do not attempt to open the unit or perform any service procedures unless you are a trained technician!**

The following note boxes are displayed throughout this manual to indicate safety concerns and/or warnings.

This note box is used to provide precautions and/or guidelines, warning the user that personal injury or damage to the unit may occur during the task they are performing.

This note box is used to alert the user they are about to perform an action involving a dangerous level of voltage, or to warn against an action that could cause electrical shock.

Measures must be taken to prevent Electrostatic Discharge (ESD) at all times when the cover is off the DM-3000. Circuit Boards are at the most risk. *See Safety Recommendations and Precautions - Electrostatic Discharge.*

### WHEN UNPACKING

- Do not drop the unit
- Do not touch the exit window glass

### WHEN MOUNTING

- Do not drop the unit
- Do not touch the exit window glass

**WARNING**
This is a Class A product. In a domestic environment this product can cause radio interference in which case the user may be required to take adequate measures. (ref. CISPR 22 = EN 55 022:1995)

**WARNING**
In order to maintain Electromagnetic Compatibility (EMC) Compliance interconnecting cables must be connected using a 360° shield connection of all the interface cables with a conductive strain relief for RF shielding purposes (I.e.:'metalized' 'D' sub-strain relief). This applies to all I/O cables connected through 'D' sub-connectors.

## LASER SAFETY

Class IIIb levels of laser radiation are considered to be an acute hazard to the skin and eyes from direct radiation. Exercise care to avoid any direct exposure to the eyes. Avoid exposure to the beam.

Laser power up to 25 mW could be accessible in the interior!

The DM-3000 beam divergence in the instantaneous beam is 0.03 degrees and the diameter of the emergent beam is 0.60 mm at the aperture window. The Class IIIb DM-3000 has a maximum radiant power of 23.5 mW and the pulse duration over a 7 mm aperture at 10 cm from the mirrorwheel is 506 µs. The pulse duration over a 7 mm aperture at 20 cm from the mirrorwheel is 253 µs.

The presence of laser light is indicated by several warning labels, like those shown on pages IX , X, and XI.

The DM-3000 has several laser safety features, as required by 21 CFR 1040.10(f)(3),(4),(5),(6), all of which can be found on the rear panel, where they are accessible without exposure to the laser. All units have a beam attenuator switch, a master control keyswitch, a remote interlock connector, and an emission indicator. The beam attenuator switch allows the user to turn the laser on or off. The remote interlock connector will shut off the laser if the terminals of the connector are not electrically joined. The key-actuated master control is capable of turning on or off the laser. The key is removable and the laser is not operable when the key is removed. The DM3000 also has a "LASER ON" LED to indicate that laser light is being emitted from the aperture.

To prevent possible exposure to laser light that may exceed the CDRH's Accessible Emission Limit for a Class IIIb laser, your DM-3000 has a "scanning safeguard" feature which shuts off the laser power if the motor slows down or fails to rotate. This ensures that a stationary laser beam cannot exit the scan head.

"**CAUTION!** Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure."

"**CAUTION!** The use of optical instruments with this product will increase eye hazard."

Any service should be performed so as not to violate compliance with the Code of Federal Regulations, Title 21, Part 1040, Section 10 (21 CFR 1040.10), as administered by the Center for Devices and Radiological Health, a service of the Food and Drug Administration under the Department of Health and Human Services. Do not attempt to defeat any safety provisions.

**WARNING: Do NOT attempt to open the DM-3000 housing! There are no user-serviceable parts inside!**

### GENERAL PRECAUTIONS

Please follow these precautions:

- MUST follow precautions in ASNI Z136.1 standard for safe use of lasers. These precautions include hazard evaluations of laser work areas, control measures, approval of standard operating procedures, recommended and approved safety equipment, signs, labels, and safety education.
- Do not create any obstructions of airflow to the unit. Keep the area around the unit clean to provide for cooling.
- Any service should be performed so as not to violate compliance with the Code of Federal Regulations, Title 21, Part 1040, Section 10 (21 CFR 1040.10), as administered by the Center for Devices and Radiological Health, a service of the Food and Drug Administration under the Department of Health and Human Services. Do not attempt to defeat any safety provisions.
- Learn where the disconnect switches or circuit breakers are for your area. (Ensure that others using the equipment know this also.)
- Use shielded interface cables with this product. To maintain FCC compliance, the cable shield must make a 360˚ connection to the shielded mating connector.
- Before performing any type of maintenance, turn off power to the unit and disconnect the power cord.
- Be certain your hands and the floor of your work area are dry before touching electrical equipment or connecting cords.
- Routinely check all connections to your DM-3000. If a cable is damaged in any way, replace it.
- Routinely examine all wiring and plugs for any signs of exposed wire or deteriorating insulation.
- Check mounting hardware periodically for tightness and stability.
- Do not use plasterboard or wood as a mounting surface for the DM-3000. Use mechanical or structural steel or aluminum and shock mounts must be used to prevent damage caused by excessive vibration.

### GROUNDING THE DM-3000

The system must be grounded electrically at all times. Please follow these precautions:

- Ensure your AC power outlet has a properly grounded receptacle.
- Make sure you have the appropriate power cord for your country before turning on the unit.
- Do not turn on the system until all components are properly cabled and grounded with three-conductor AC power cords. Do not use a two-prong adapter.

- Do not cut or remove the round grounding prong from the plug under any circumstances.
- Do not use an extension cord to defeat the ground.

## ELECTROSTATIC DISCHARGE

Electrostatic discharge (ESD), the transfer of static electricity from one object to another, is an often-unnoticeable hazard to electronic components. Boards and other devices with integrated circuits are particularly sensitive to ESD damage. Product failures may not occur until days or weeks after the component was damaged.

Static damage to components can take the form of upset failures or catastrophic failures (direct and latent).

An upset failure occurs when an electrostatic discharge is not significant enough to cause total failure, but may result in intermittent gate leakage, causing loss of software or incorrect storage of information.

Direct catastrophic failures occur when a component is damaged to the point where it is permanently damaged.

The following note box is displayed where ESD precautions must be followed:

Measures must be taken to prevent Electrostatic Discharge (ESD) at all times when the cover is off the DM-3000. Circuit Boards are at the most risk. *See Safety Recommendations and Precautions - Electrostatic Discharge.*

### Five Basic Rules for ESD Control

Below are some keys to effectively control unnecessary ESD damage. When working with ESD-sensitive devices:

- Define an ESD protective area and work on the ESD-sensitive devices in this area only;
- Define the sensitivity of devices to be handled in the ESD protective area;
- Establish a suitable static control program that both limits static generation to less than the damage threshold of the most sensitive device in the environment, and provides a safe, defined path for the dissipation of static charges;
- Prevent contamination of the protective area by unnecessary non-static controlled materials; and
- Audit the ESD protective area regularly to ensure that static control is maintained. Document the findings for future reference.

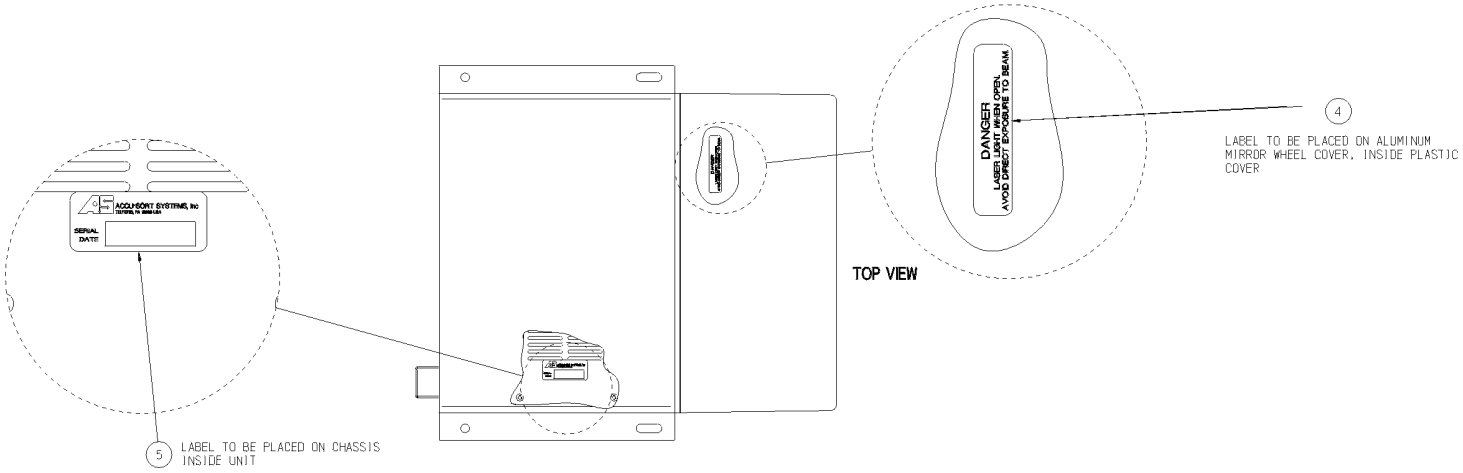
This product was designed to be installed in accordance with the Canadian Electrical Code, Part I, CSA C22.1; CSA C22.2 No. 0; and the National Electrical Code (USA), NFPA 70.

This product was also designed to comply with UL 1950 (IEC 950) standard which is applicable to equipment designed to be installed in accordance with Article 645 of the National Electrical Code, NFPA 70, and the Standard for the Protection of Electronic Computer Data-Processing Equipment, NFPA 75.

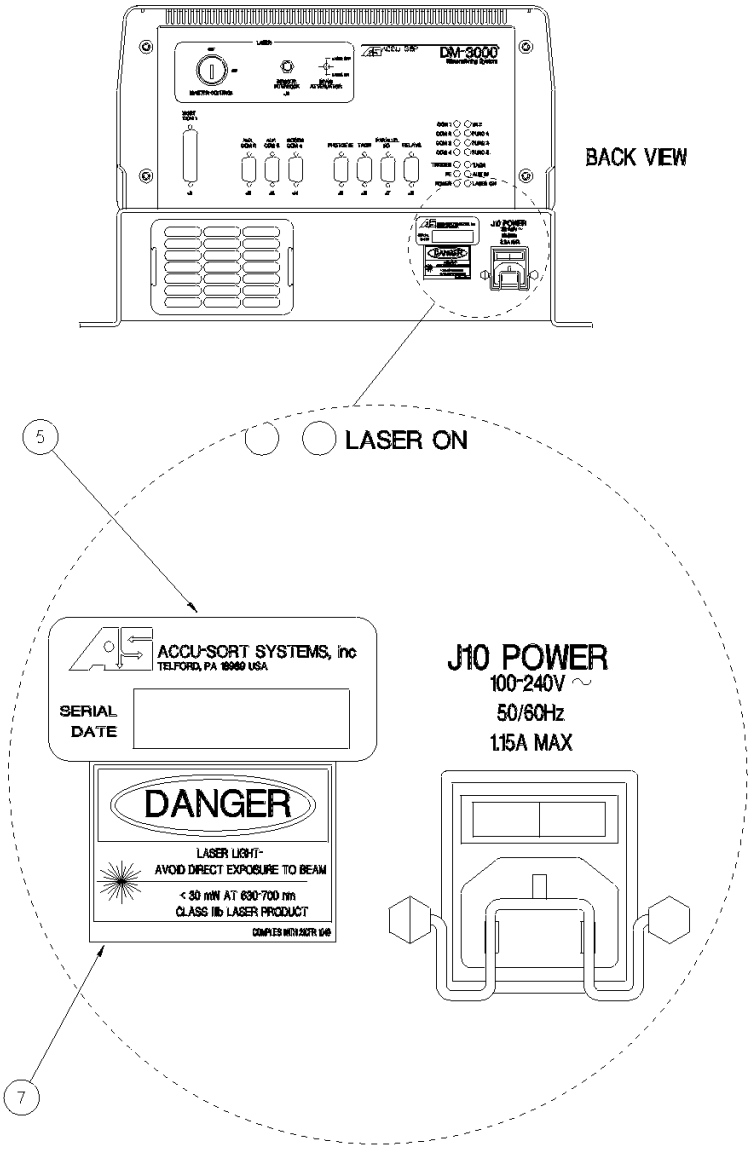
If installing in other than the above mentioned countries refer to the requirements and/or standards of the local governing authority(s) for that location.

## LABEL LOCATIONS

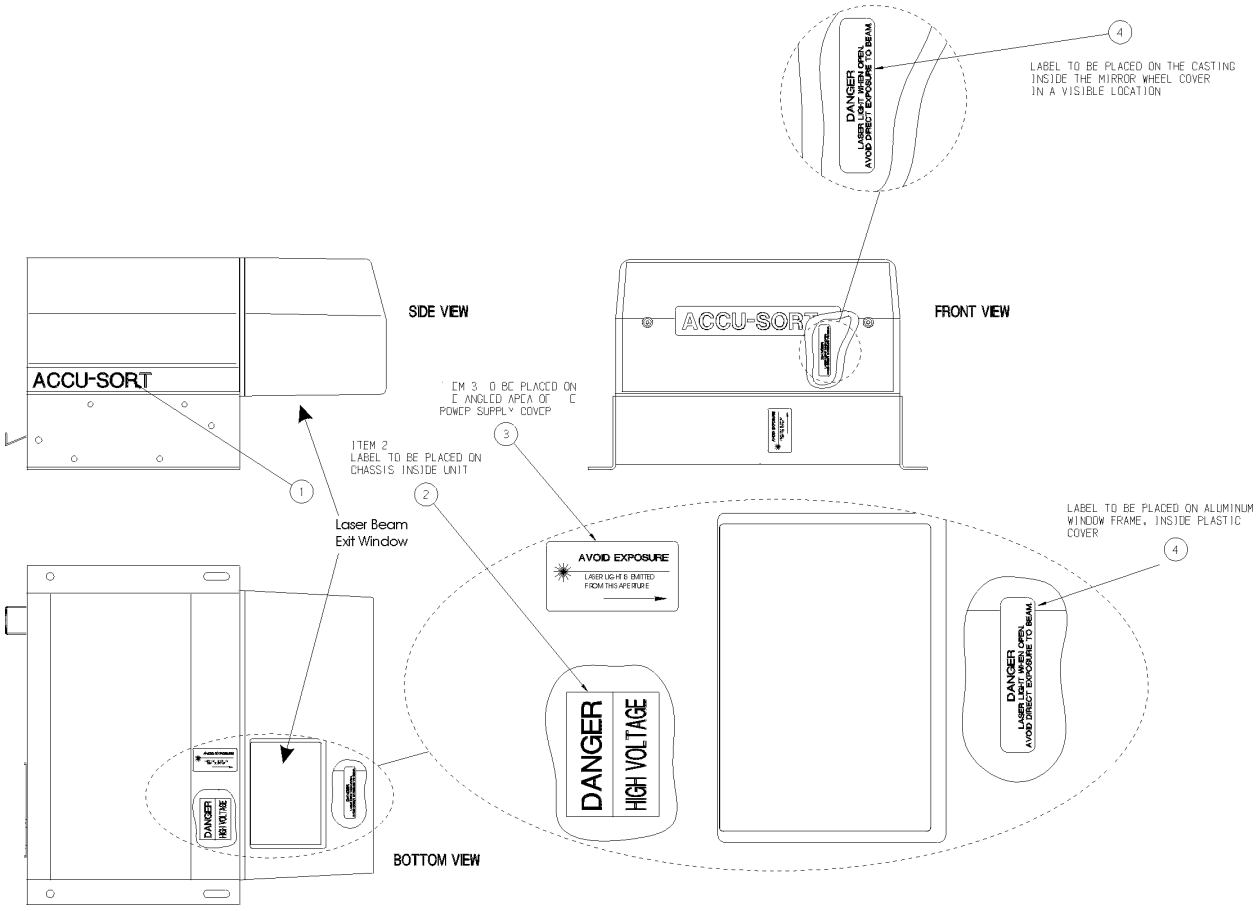
The following labels identify areas of the DM-3000 that require special precautions or handling, or provide general information.




*Top View DM-3000 Labels and Locations*




*Back View DM-3000 Labels and Locations*




*Side, Front, and Bottom View DM-3000 Labels and Locations*

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**Chapter Three**
**Software Setup, Startup and Operation**

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## Chapter One ▼ *Contents*

## GENERAL DESCRIPTION OF SYSTEM OPERATION

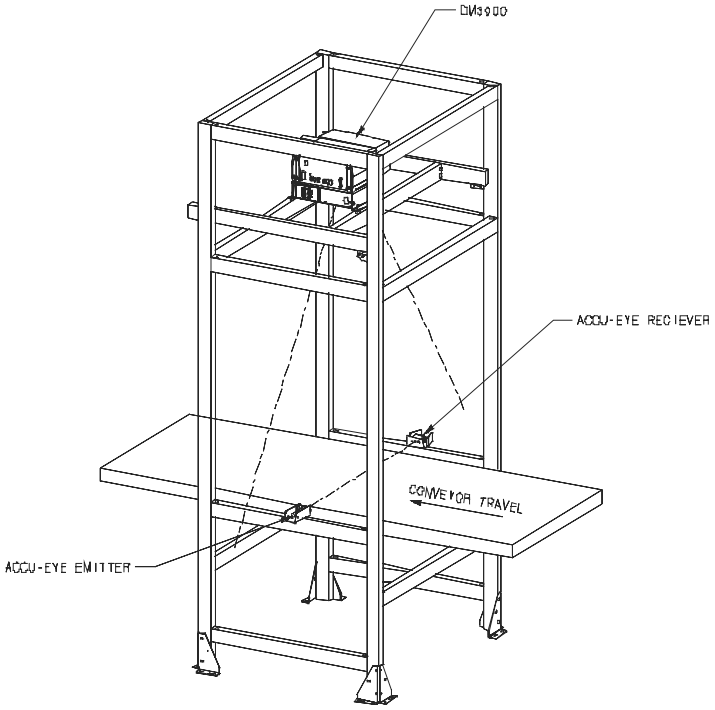
The DM-3000 is a compact overhead, automatic dimensioning unit. It measures the length, width and height of packages as they move along a conveyor. It accurately dimensions rectangular conveyable packages, which pass under the unit one at a time. Package spacing required is only three inches, and can be reduced depending upon maximum package height.

The DM-3000 is easily mounted overhead and does not require a break in the conveyor. The unit is lightweight and completely self contained. It works at conveyor belt speeds up to 600 feet per minute. It covers conveyor belts up to 36 inches wide and dimensions packages from 2 to 36 inches high. See your specifications for range of package spacing and sizes.

The system contains:

- DM-3000 Dimensioning unit which uses a triangulation algorithm to determine all of the box dimensions and sends this data to the host computer
- Solid state laser diode and linear CCD array capture the width and height data
- Tach encoder and photoeye combination measure the length of the package and determine package orientation on the conveyor.

A confidence rating can also be sent to the host computer to help identify parcels or improperly packaged products. The DM-3000 can also provide on-line diagnostics.



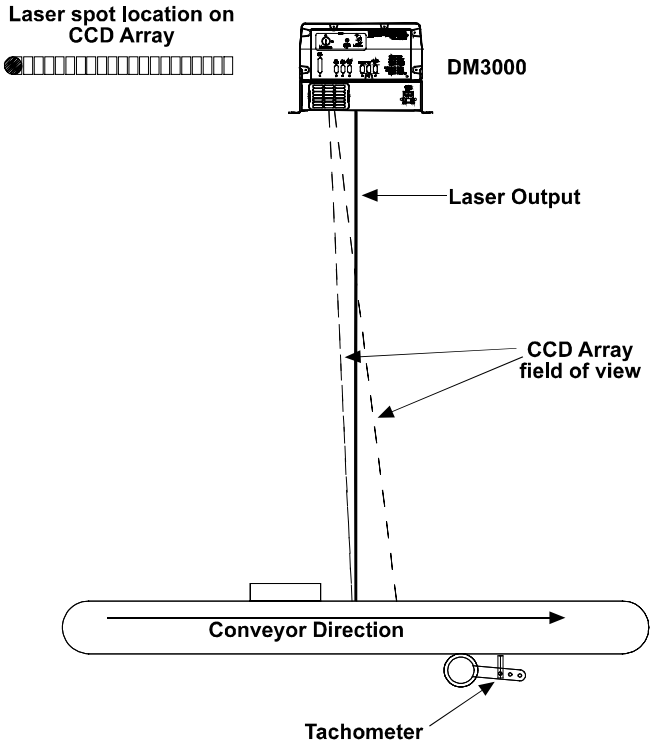

*Typical DM-3000 Installation*

## HOW THE DM-3000 WORKS

The DM-3000 uses two measuring processes simultaneously. Both are signaled to begin dimensioning packages by a laser photoeye.

- A high resolution conveyor tachometer measures the length of the package as it is oriented on the conveyor
- A scanned laser/linear CCD array measures the height and absolute orientation of the package as it passes through the scan line

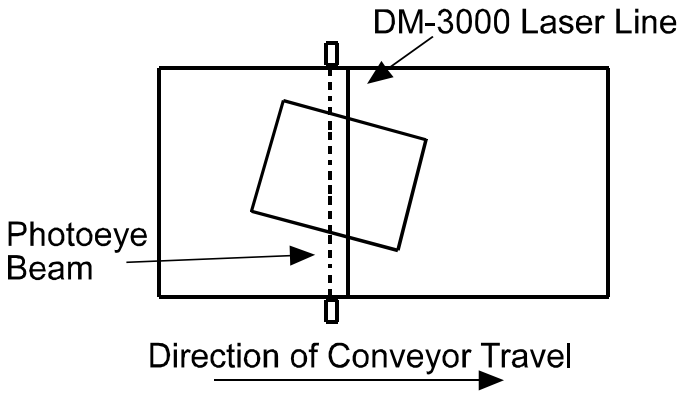
When no box is blocking the photoeye beam and no box is present in front of the CCD array, the DM-3000 sees the intersection of the laser spot and the conveyor belt in the far left portion of the array. The dimensioning unit is calibrated to cross reference the position of the light on the CCD array to an actual height via a learn function.




*Laser Spot Location When No Box Is Present*

The following steps explain how the DM-3000 dimensions packages:

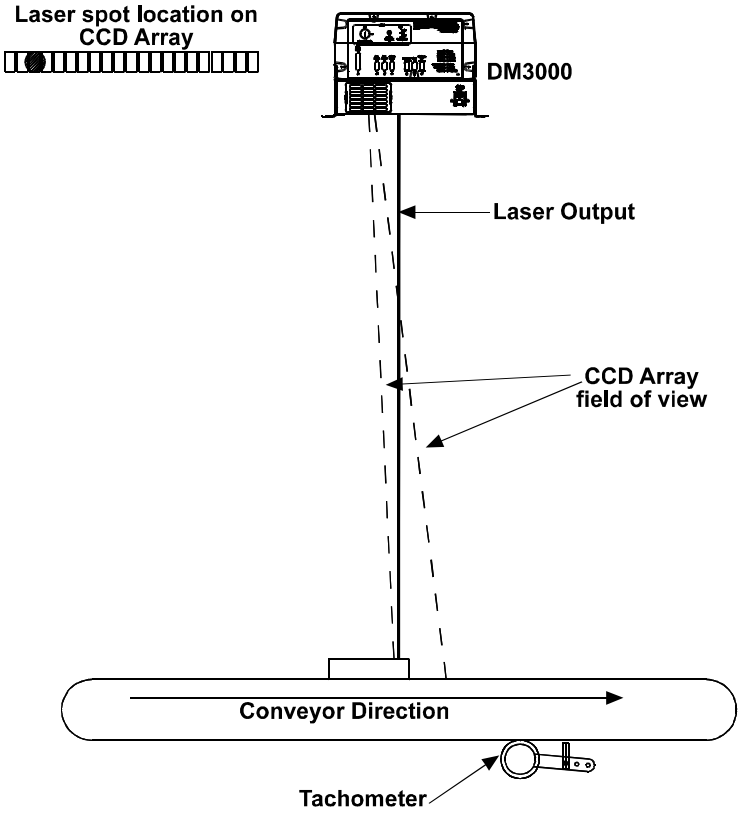
**Step 1:** As a package approaches the DM-3000, it breaks the photoeye beam. This triggers the tachometer connected to the DM-3000 to begin measuring the total length of the package by counting the duration (number of tach pulses) of the photoeye break. This length is not the actual length dimension of the package, but the space the package occupies in the direction the conveyor is traveling.




*Step 1*

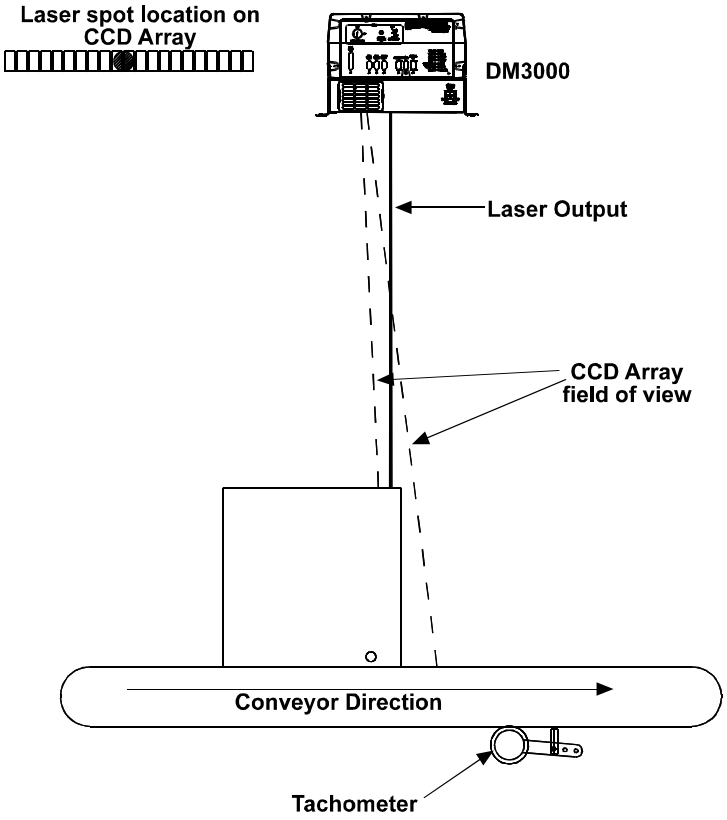
While the tachometer is determining package length, the DM-3000 is constantly scanning across the conveyor belt, taking height measurements at approximately 1/8 inch intervals. When the package intersects the laser scan line of the DM-3000, the CCD detects the beam at a unique point in the array. This point indicates the height measurement.

When a 2" box is being scanned by the CCD array, the intersection of the laser spot and the CCD field of view is now on top of the box, closer to the unit. The laser spot on the CCD array is then shifted. This new position of the illuminated portion of the array is cross-referenced to the 2" distance.



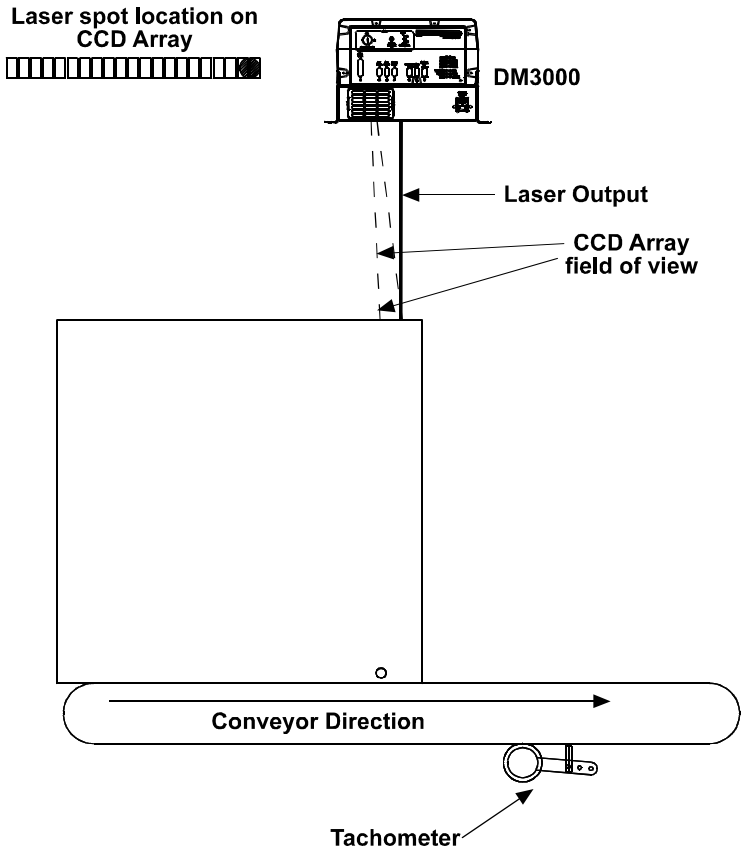

*Laser Spot Location on CCD Array for 2" Box*

When an 18” box is being scanned by the CCD array, the intersection of the laser spot and the CCD field-of-view is on top of this box. 18” is half as large as the maximum box size the DM-3000 will process. The laser spot now shifts to the midpoint on the CCD array. The position of the illuminated portion of the array is cross referenced to the 18” distance.

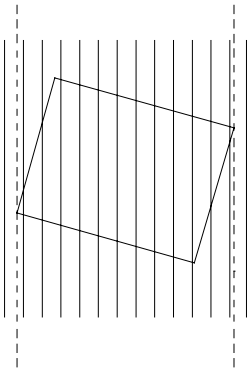



*Laser Spot Location on CCD Array for 18” Box*

When a 36” box is being scanned by the CCD array, the intersection of the laser spot is on top of this box. 36”is the maximum box size processed by the DM-3000. The laser spot has now moved to the end of the CCD array. The position of the illuminated portion of the array is cross referenced to the 36” distance.

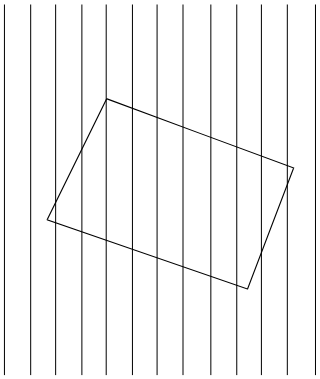



*Laser Spot Location on CCD Array for 36” Box*



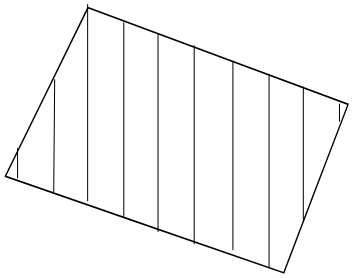
*Step 2*

**Step 2:** The height measurements taken at 1/8 inch intervals, are then repeated on successive scans as the package moves through the scan line. Each time the laser scan line intersects the package, the CCD detects the beam at a different point in the array. The resulting height data is used in conjunction with the tachometer counts to create a profile of the package.



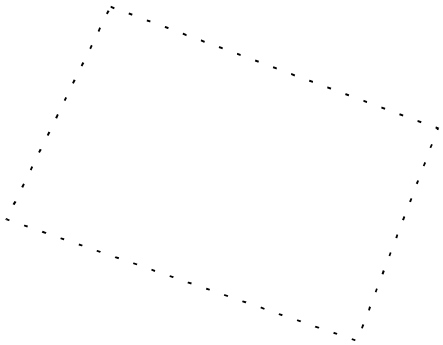
*Step 3*

**Step 3:** The DM-3000 discards the data outside the edges of the packages. The height measurement of the package is obtained by averaging all of the height sample points on top of the box.



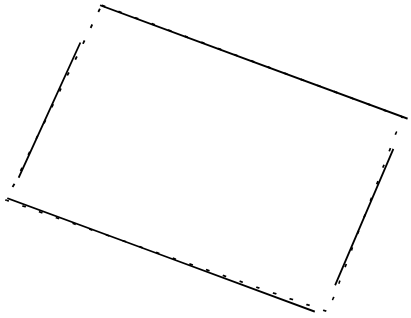
*Step 4*

**Step 4:** The edge points are then processed by an algorithm that filters and arranges them into components of four straight lines (the four sides of the package) and correlates this with the length determined by the tachometer, to determine the length, width, height and volume of the package



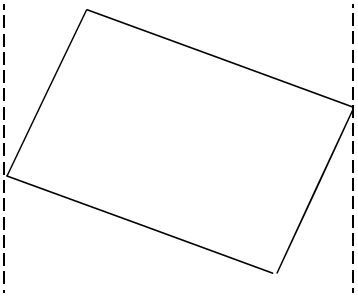
*Step 5*

**Step 5:** An algorithm connects the edge points to create the outline of the package.



*Step 6*

**Step 6:** The algorithm extends the lines to their intersection points and overlays the photoeye make/break lines to verify reconstruction. Photoeye lines stretch or shrink the box to match them.



*The Dimensioned Box*

This sequence explains the data gathered for the DM-3000 to use in determining the dimensions of a package.

## PRODUCT SPECIFICATIONS

| | |
|---|---|
| **Visual Diagnostics** | Bank of 14 LEDS<br><br>Power Idle<br>Laser On Photoeye<br>Tach Trigger Out<br>Serial Port 1-4 status<br>Auxiliary Input<br>3 Processor Status LEDs |
| **Serial Communications** | RS232, RS485, RS422, or 20mA Current Loop<br>Two aux ports selectable for RS232, RS422, or RS485<br>RS232 Modem Port<br>Baud Rate Selectable up to 115K |
| **Laser Type** | Class IIIB 30 mW<br>Visible Laser Diode 690 nM |
| **Camera Type** | linear CCD array |
| **Options** | Remote Diagnostics via modem<br>External Quad Relay Box<br>Side by Side Package Detection |
| **Connections** | Power, Photoeye, Tach input , Parallel I/O, 4 serial ports |
| **Operating Current** | 1.5A at 110 VAC |
| **Size and Weight** | 10.3"H x 17.4" Lx 16.4"W, 52 lbs.<br>26 cm. H x 44.1 cm. L x 41.6 cm. W23.6 Kilograms |
| **Temperature Range** | 32-104 F (0-40 C) |
| **Relative Humidity** | 10%-90% non-condensing |
| **Enclosure** | NEMA 12 (I.P. 54) |
| **Service Options** | Installation assistance<br>On-site training |
| **Warranty** | One-year limited, parts and labor |
| **Compliances** | FCC (Class A Device)<br>CE Compliance |

## SERIAL NUMBER IDENTIFICATION

The serial number on each DM-3000 unit specifies what kind of unit it is. Currently we have six different models of DM-3000. See the table below to help you identify what type of DM-3000 you have.

| Series 1 (Standard Boards) | | |
|---|---|---|
| **Type** | **CDRH Class** | **Power Settings** |
| A | Class 2 | 6.4 mW |
| B | Class 3B | 23.5 mW |

| Series 2 (Modified Boards) | | |
|---|---|---|
| **Type** | **CDRH Class** | **Power Settings** |
| A | Class 2 | 6.4 mW |
| B | Class 3B | 23.5 mW |

| Series 3 (Standard and Modified Boards) | | |
|---|---|---|
| **Type** | **CDRH Class** | **Power Settings** |
| A | Class 3B | 23.5 mW |
| B | Class 3B | 10.0 mW |

The serial number will look something like this:

1234 S1TA – 1234, Serial Number
S1, Series 1 (Standard)
TA, Type A = Class 2 6.4 mW

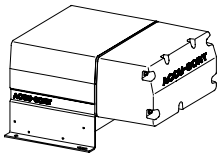
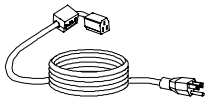
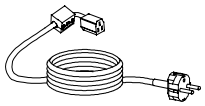
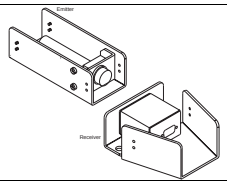
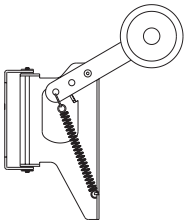
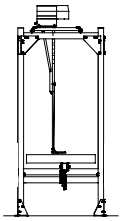
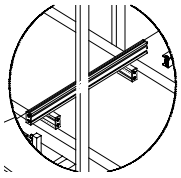
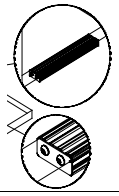
## CHECKING THE PACKING SLIP

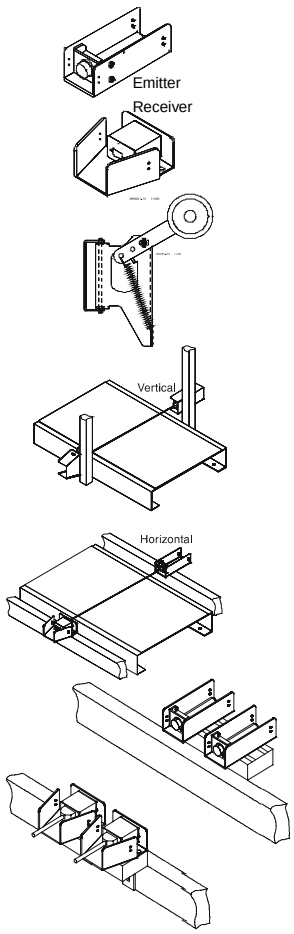
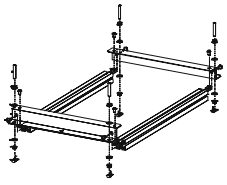
Enclosed in plastic on the outside of one of your boxes is a packing slip. The packing slip lists the parts of your order.

As soon as you open the box(es), check the equipment against the packing slip to ensure you received everything you ordered. If any equipment is missing or has been damaged during shipment, contact Accu-Sort immediately at 1-800-BAR-CODE (*refer to Customer Service*).

The DM-3000 packaging was specifically designed to protect the unit during shipment. **Do not throw it away**. Save all the packaging materials for possible future use.

Depending upon your needs, you may have one or more of the pieces of equipment shown in the following table:

| Part | Part Number | Description |
|---|---|---|
|  | DM3000-01 | DM3000 Dimensioning Unit |
|  | 532B | 110V Power Cable, U.S. Standard |
|  | C-7123-25M-G4 | 230V Power Cable, European Standard |
|  | DM3-45 | Accu-Eye Photoeye |
|  | DM3-07 | Tachometer |
|  <br>  <br>  | DM3-59 | Calibration Kit<br>Vertical Calibration Fixture DM3-68<br>Horizontal Calibration Fixture DM3-69<br>Accu-Eye Alignment Tool DM3-67 |

| | | |
|---|---|---|
|  | DM3-58 | Installation Kit<br><br>Accu-Eye Emitter/Receiver Pair<br>DM3-45<br><br>Tachometer<br>DM3-07<br><br>Accu-Eye Cross Members<br>DM3-49<br><br>Accu-Eye Tach Generator Pair<br>DM3-70 |
|  | MANDM3 | Operations and Maintenance Manual |
|  | DSKDM3 | Setup Software |
|  | DM3-64 | Mounting Cradle |

*Parts Table*

Do not turn on the system until all components are properly cabled and grounded with three-conductor AC power cords. Do not use a two-prong adapter. Do not use an extension cord to defeat the ground.

## Chapter Two ▼ *Contents*

## MOUNTING YOUR DM-3000

Because the DM-3000 is a measuring device, calibration and proper usage of this device are necessary for proper operation. The DM-3000 is shipped from Accu-Sort calibrated to the mounting specifications shown on your Installation Specification Drawing. It is therefore essential that the unit is mounted exactly as detailed on that drawing to retain proper calibration. The critical parameters are:

- Minimal vibration of unit on mounting structure - any movement of the DM-3000 due to vibration/swaying of the mounting structure will directly impact the dimensioning accuracy
- Mounting height above the conveyor
- Unit must be in the same plane as the conveyor
- Proper location of unit along the axis perpendicular to conveyor travel, to insure proper conveyor coverage
- The DM-3000 scan line must be perpendicular to conveyor travel
- The photoeye beam path must be parallel to the DM-3000 scan line
- Tachometer assembly mounted ***on the same conveyor belt*** that the DM-3000 scan line is on, to insure proper speed indication
- The DM-3000 scan line should be located at least three inches away from any other scan pattern on the conveyor belt, to eliminate the possibility of reflections interfering with dimensioning accuracy.

## CONVEYOR CONSIDERATIONS

In the process of dimensioning a package, the DM-3000 is measuring the distance between the package and itself. Therefore, any motion of the package other than that in the conveyor direction will impact dimensioning accuracy. For this reason, it is necessary to consider the following:

- The DM-3000 should be placed so that its scan line is at least the longest package length from either end of the belt, to eliminate the effect of conveyor height/speed differences and bouncing that may occur in the transition from one belt to another
- The DM-3000 should be placed so packages are not sliding, tumbling, or accelerating/decelerating when they pass under the scan line
- Belt seams that elevate packages above the normal belt surface will impact dimensioning accuracy

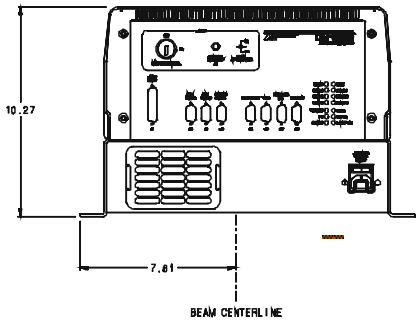
When you mount your DM-3000, make sure there is enough room (12”) around the unit for the connections to the necessary accessories. There must also be enough room for the DM-3000 to stay cool and to provide access for calibration and servicing.

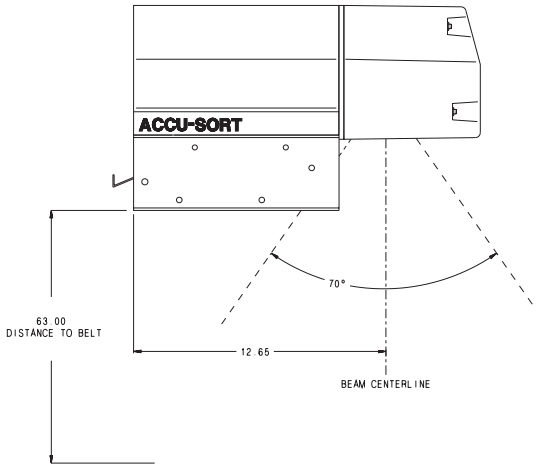
Your first task is to mount your DM-3000 unit. You can provide a mounting structure or Accu-Sort can design one for you. We recommend using an 80/20 or Unistrut® mounting structure**.**

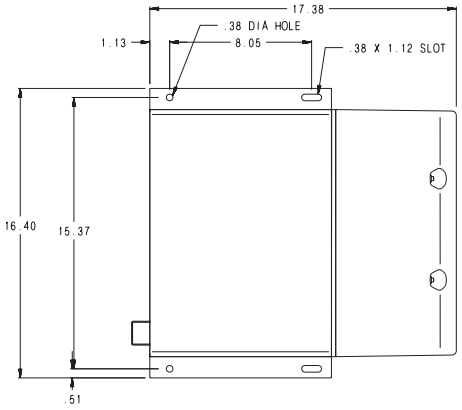
Unistrut® is a registered trademark of the Unistrut Corporation.

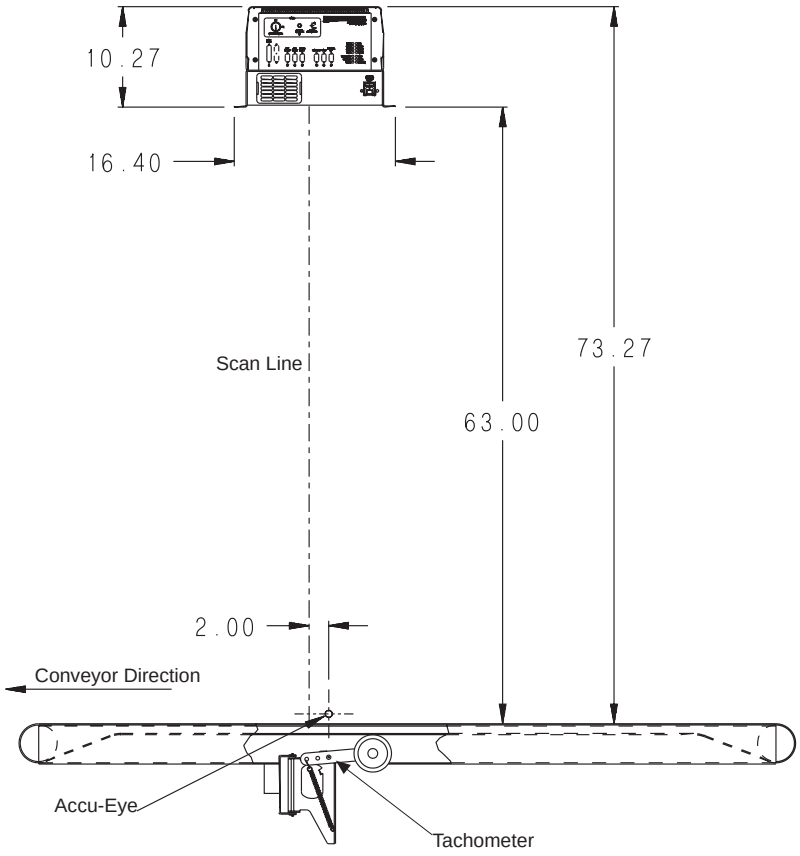
Your mounting structure must provide the following capabilities:

- It is adjustable enough for you to move your DM-3000 unit to the optimum position for proper dimensioning.
- It is able to hold 120 pounds (twice the weight of the DM-3000.)
- It allows a technician access to the DM-3000 while it is mounted.
- It must be as vibration free as possible so as not to affect the dimensioning accuracy of your DM-3000. Use the provided shock mounts to mount the DM-30000.
- It is constructed of steel or aluminum.
- It provides a required 12" minimum clearance on all sides. This clearance is necessary to provide proper ventilation, allow access to all panels of the DM-3000, and allow room for proper servicing.






*DM-3000 Mounting Dimensions* D-38685

## TYPICAL INSTALLATION

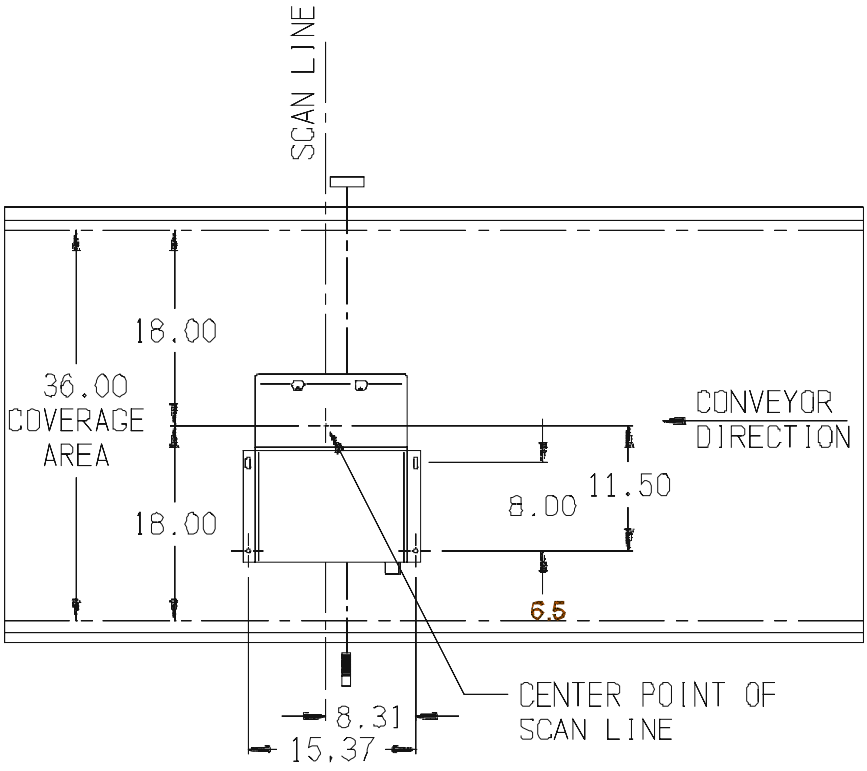
You must mount the following components of the DM-3000 system before you power it on:

- DM-30000
- Accu-Eye (*see the DM3-58 and DM3-59 Shipkit documentation*)
- Tachometer (*see theDM3-58 and DM3-59 Shipkit documentation*)

The following diagrams show different views of a typical system installation. They give you an idea of what your system will look like when you mount all your components.

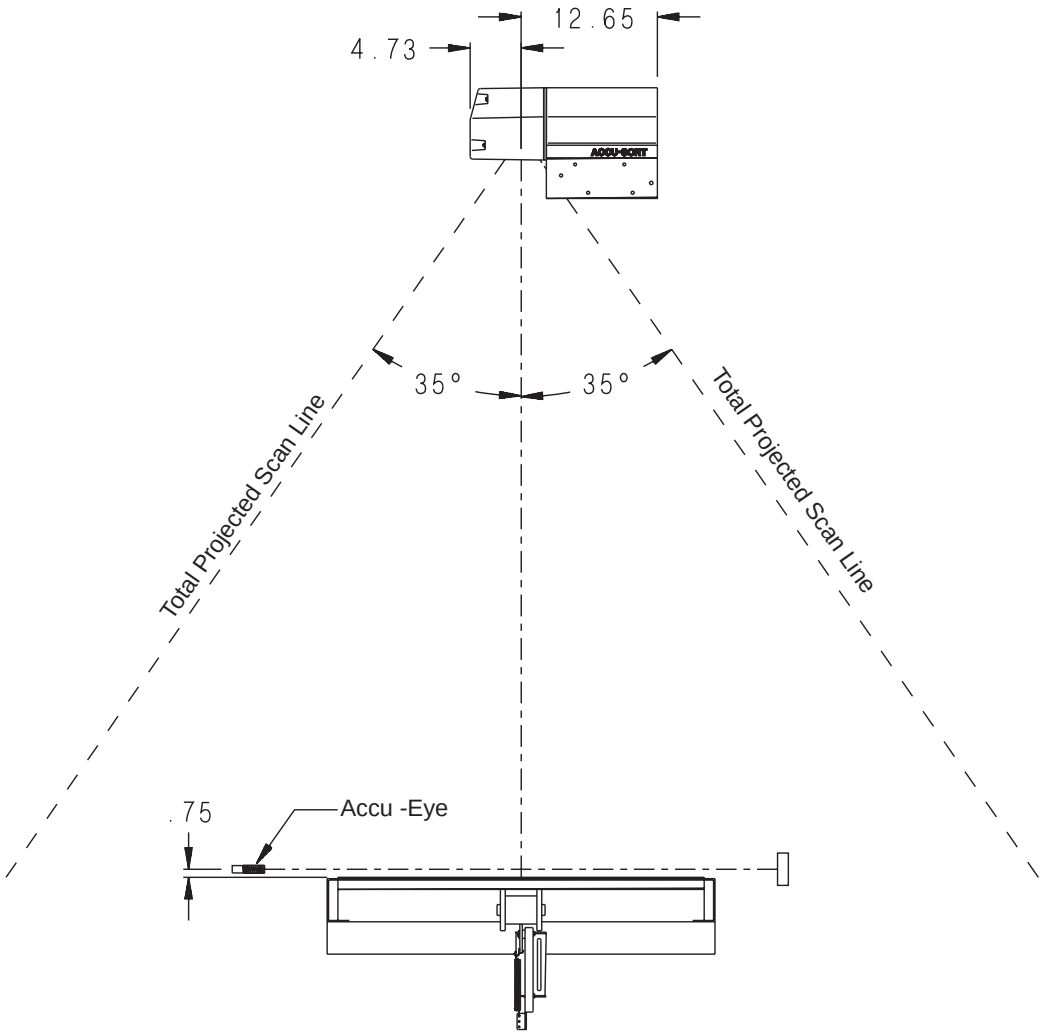
The DM-3000 must always be mounted above the conveyor. It typically uses an Accu-Eye as an object-sensing signal device, and a tachometer as a position sensing encoder (your installation may use other devices).

This diagram shows a top view.




*Top View*

The diagram below shows a side view of a typical DM-3000 installation.




*Side View*

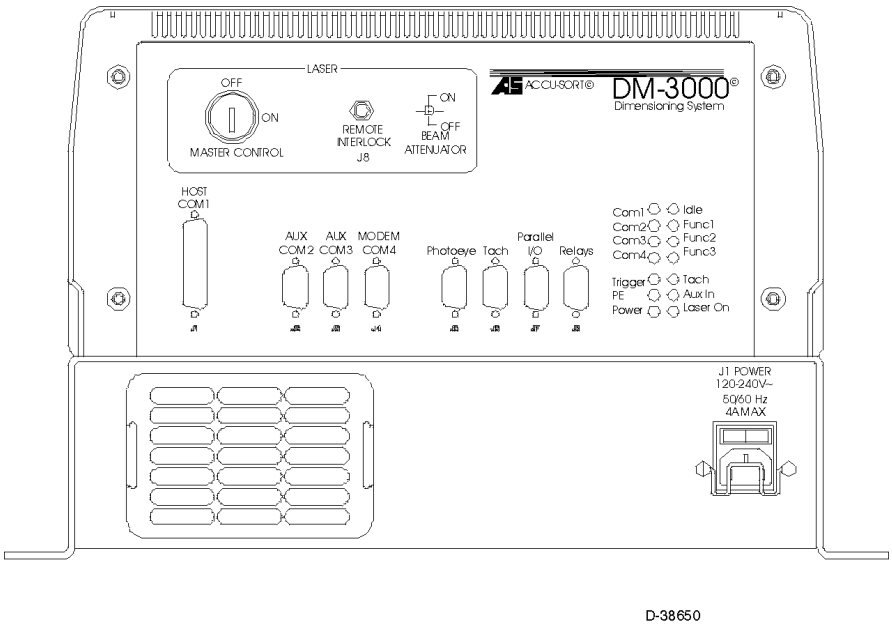
## MAKING CONNECTIONS TO YOUR DM-3000

You must run all of the required cables of your system, connect them to your DM-3000 and any other system equipment. The cables for the following connections should be in place before the arrival of your Accu-Sort Technician:

- Power
- Host
- Setup Terminal
- Photoeye
- Tachometer
- Relays (I/O)

The table below lists the ports of the DM-3000 and what they can be connected to:

| System Equipment | Port | Connector | Mating Connector | Description |
|---|---|---|---|---|
| Host Communications | J1 (Com 1) | DB-25S | DB-25P | 25 Pin "D" Subminiature Male |
| Aux Communications | J2 (Com 2) | DB-9S | DEM-9P | 9 Pin "D" Subminiature Male |
| Aux Communications | J3 (Com 3) | DB-9S | DEM-9P | 9 Pin "D" Subminiature Male |
| Modem Communications | J4 (Com 4) | DB-9S | DEM-9P | 9 Pin "D" Subminiature Male |
| Photoeye Connections | J5 Photoeye | DB-9S | DEM-9P | 9 Pin "D" Subminiature Male |
| Tachometer Connections | J6 Tach | DB-9S | DEM-9P | 9 Pin "D" Subminiature Male |
| I/O Connections | J7 Parallel I/Os | A-HDS15PP-TAXM | A-HDF15LL-T15 | 15 Pin "D" High Density |
| Relays | J8 Relays | A-HDS15PP-TAXM | A-HDF15LL-T15 | 15 Pin "D" High Density |
| AC Power | J9 | IEC320 | N/A | Industry Standard Power Receptacle |




*Connector Panel*

## CONFIGURABLE PIN-OUT OPTIONS

The complete pin configurations for each connection to the DM-3000 are provided below. Since the connection possibilities are numerous for the DM-3000, the following diagrams will allow you to address the pin configurations as needed.

### J1 HOST PORT – COM1 CONNECTIONS

HOST COM 1 (J1)

| | |
|---|---|
| 1 | C GND |
| 2 | TXD |
| 3 | RXD |
| 4 | RTS |
| 5 | CTS |
| 6 | 422T |
| 7 | S GND |
| 8 | CL ENABLE |
| 9 | +I ® |
| 10 | N/C |
| 11 | N/C |
| 12 | N/C |
| 13 | N/C |
| 14 | SD+(B) |
| 15 | SD- (A) |
| 16 | RD+(B) |
| 17 | RD- (A) |
| 18 | R+ |
| 19 | R- |
| 20 | DTR |
| 21 | T- |
| 22 | +I (T) |
| 23 | -I ® |
| 24 | -I (T) |
| 25 | T+ |

### J2 AND J3 AUX PORT – COM2 AND COM3 CONNECTIONS

COM 2 & 3 (J2 & J3)

| | |
|---|---|
| 1 | SD+ |
| 2 | RXD |
| 3 | TXD |
| 4 | SD- |
| 5 | S. GND |
| 6 | RD+ |
| 7 | T |
| 8 | CTS |
| 9 | RD- |

### J4 MODEM PORT COM4 CONNECTIONS

COM 4 (J4)

| | |
|---|---|
| 1 | DCD |
| 2 | RXD |
| 3 | TXD |
| 4 | DTR |
| 5 | D GND |
| 6 | DSR |
| 7 | RTS |
| 8 | CTS |
| 9 | RI |

### J5 AND J6 – PHOTOEYE AND TACH CONNECTIONS

PHOTOEYE (J5)

| | |
|---|---|
| 1 | -AUX1 (Optically Isolated) |
| 2 | Pe1 |
| 3 | S. GND |
| 4 | +12 VDC @ 500 ma |
| 5 | +5 VDC @ 1 Amp |
| 6 | -12 VDC @ 500 ma |
| 7 | S GND |
| 8 | AUX1 |
| 9 | +AUX1 (OpticallyIsolated) |

TACH IN (J6)

| | |
|---|---|
| 1 | TACH SYNC INPUT |
| 2 | TACH INPUT (Unisolated) |
| 3 | D GND |
| 4 | +12 VDC @ 500 mA |
| 5 | -TACH INPUT (optically isolated) |
| 6 | +TACH INPUT (optically isolated) |
| 7 | S GND |
| 8 | TACH INPUT (Unisolated) |
| 9 | S GND |

### J7 PARALLEL INPUT/OUTPUT CONNECTIONS

I/O (J7)

| | |
|---|---|
| 1 | +GP1 (OUT) |
| 2 | -GP1 (OUT) |
| 3 | +GP2 (OUT) |
| 4 | -GP2 (OUT) |
| 5 | +GP3 (OUT) |
| 6 | -GP3 (OUT) |
| 7 | +GP4 (OUT) |
| 8 | -GP4 (OUT) |
| 9 | + SENDTACH (OUT) |
| 10 | -SENDTACK (OUT) |
| 11 | +TRIGGER (OUT) |
| 12 | -TRIGGER (OUT |
| 13 | +INPUT 1 (INPUT) |
| 14 | +INPUT 2 (INPUT) |
| 15 | -INPUT 1,2 (INPUT) |

### J8 INTERNAL RELAYS

RELAYS (J8)

| | |
|---|---|
| 1 | S. GND |
| 2 | N/C |
| 3 | N/C |
| 4 | $\overline{\text{GP5}}$ |
| 5 | $\overline{\text{GP6}}$ |
| 6 | N/C |
| 7 | Normally open contact Relay #1 |
| 8 | Common Relay #1 |
| 9 | Normally closed contact Relay #1 |
| 10 | +12VDC@ 500 ma |
| 11 | D. GND |
| 12 | N/C |
| 13 | Normally open contact Relay #2 |
| 14 | Common Relay #2 |
| 15 | Normally closed contact Relay #2 |

## J1 HOST PORT - COM1 CONNECTIONS

The DM-3000 is versatile when you need to connect to other devices. The drawings that follow show all the pin connections for the DM-3000 when using serial communications on Com1. If you need to create your own cables to wire your DM-3000 to another device, use these drawings as a guide.
It is very important that you make the proper pin connections. The recommendation for the 25 pin connectors COM1 is the ITT Cannon part # DB-25P or equivalent.

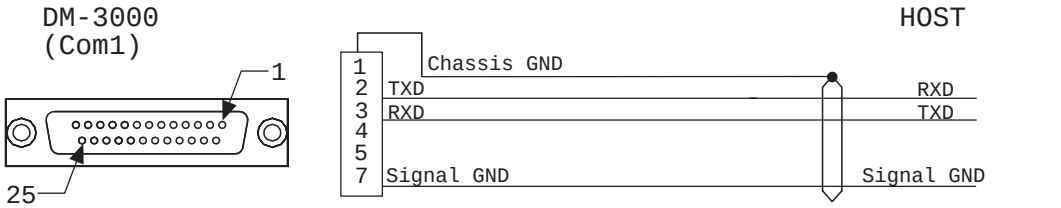
Below is a list of terms used in these drawings:

| | | | |
|---|---|---|---|
| **S. GND** | Signal Ground | **C. GND** | Chassis Ground |
| **TXD** | Transmit Data (RS232) | **RXD** | Receive Data (RS232) |
| **RTS** | Request To Send (RS232) | **CTS** | Clear To Send (RS232) |

| | | | |
|---|---|---|---|
| **RD+** | Receive Data (RS422) | **RD-** | Receive Data (RS422) |
| **SD+** | Non-inverting Line (RS485)<br>Send Data (RS422) | **SD-** | Inverting Line (RS485)<br>Send Data (RS422) |

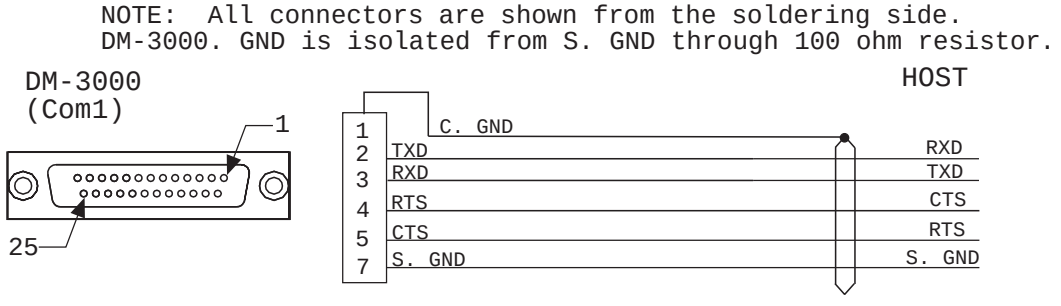
### RS232 WITH NO HANDSHAKING

Use the following drawing as a guide when you want to connect your DM-3000 to a device that is using RS232 communication with no handshaking:




### RS232 WITH RTS/CTS HANDSHAKING

Use the following drawing as a guide when you want to connect your DM-3000 to a device that is using RS232 communication with RTS/CTS handshaking:

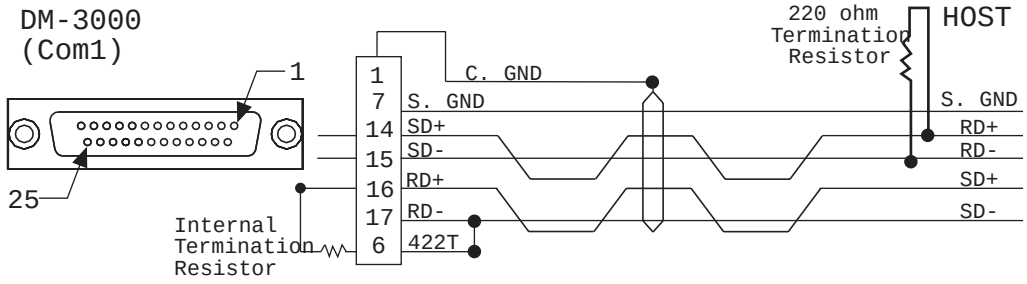


You must use shielded interface cables with this product. To maintain FCC compliance, the cable shield must make a 360 degree connection to the shielded mating connector.

### RS422 FULL DUPLEX POINT-TO-POINT (4 WIRE)

Use the following drawing as a guide when you want to connect your DM-3000 to a device that is using RS422 serial communication:

NOTE: All connectors are shown from the soldering side.
DM-3000. GND is isolated from S. GND through 100 ohm resistor.



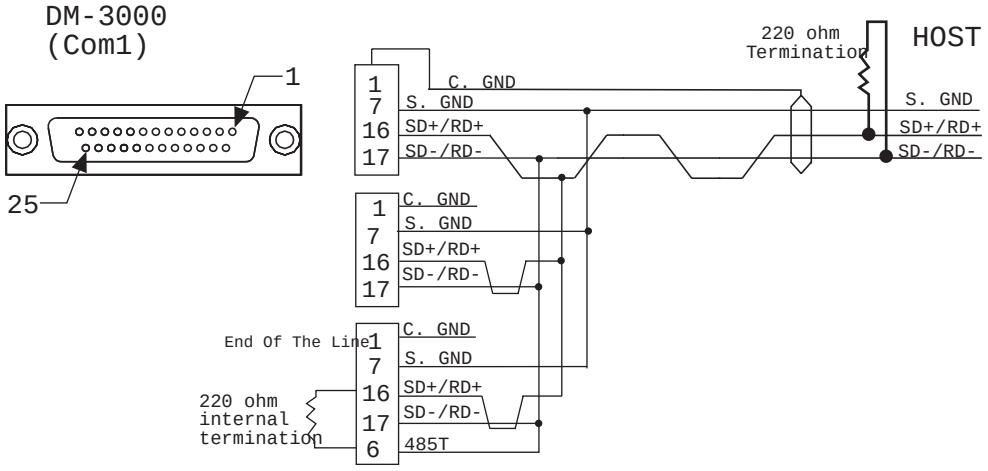

NOTE: Termination resistors may be placed inside the connector strain relief
The termination resistor value is 220 OHM 1/4 watt.
With RS-422, the receive lines on both sides must be terminated
Jumpers E13 and E14 must be removed on the DM-3000 Logic Board.
Recommended Cable Type: ALPHA #5473C or Equivalent
Maximum Cable Length: 4000 Feet

You must use shielded interface cables with this product. To maintain FCC compliance, the cable shield must make a 360 degree connection to the shielded mating connector.

### RS485 HALF DUPLEX MULTIDROP (2 WIRE)

Use the following drawing as a guide when you want to connect your DM-3000 to a device that is using RS485 Half Duplex Multidrop serial communication:

NOTE: All connectors are shown from the soldering side.
DM-3000. GND is isolated from S. GND through 100 ohm resistor



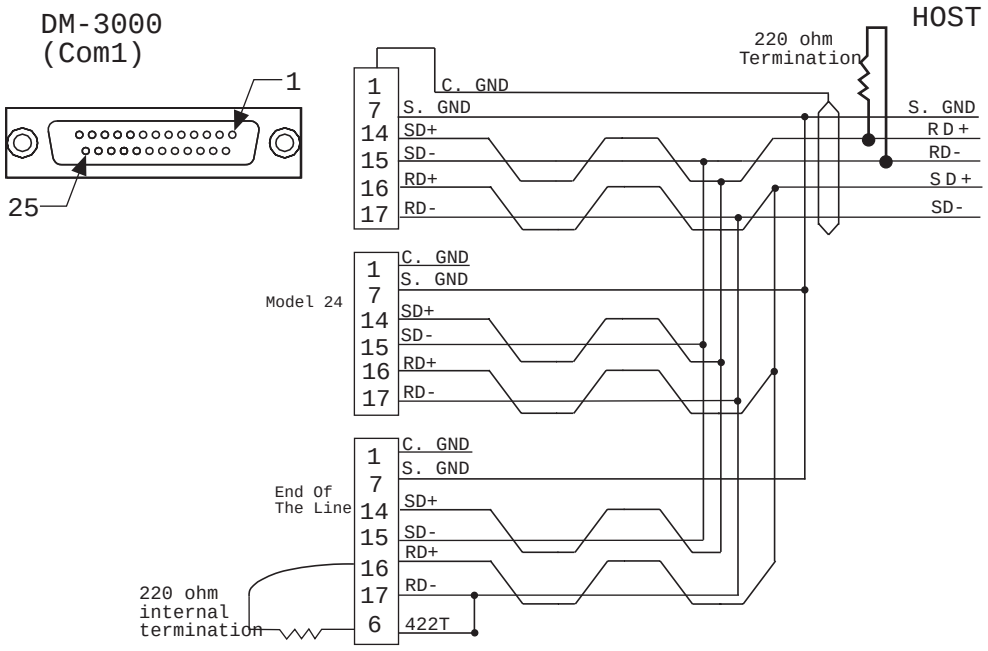

NOTE: RS485 allows for communication across the same lines
Termination resistors can be placed inside the connector
The termination resistor value is 220 OHM 1/4 watt.
The transmit-receive lines on both sides must be terminat
Jumpers E13 and E14 must be installed on the DM-3000 Log
Board.
Recommended Cable Type: ALPHA #5473C or Equivalent
Maximum Cable Length: 4000 Feet

You must use shielded interface cables with this product. To maintain FCC compliance, the cable shield must make a 360 degree connection to the shielded mating connector.

### RS422 FULL DUPLEX MULTIDROP (4 WIRE)

Use the following drawing as a guide when you want to connect your DM-3000 to a device that is using RS422 Full Duplex

NOTE: All connectors are shown from the soldering side.
DM-3000. GND is isolated from S. GND through 100 ohm resistor




NOTE: RS485 allows for communication across the same lines
Termination resistors can be placed inside the connecto
The termination resistor value is 220OHM 1/4 watt.
The transmit-receive lines on both sides must be termin
Jumpers E13 and E14 must be removed on DM-3000 Logic B

Recommended Cable Type: ALPHA #5473C or Equivalent
Maximum Cable Length: 4000 Feet

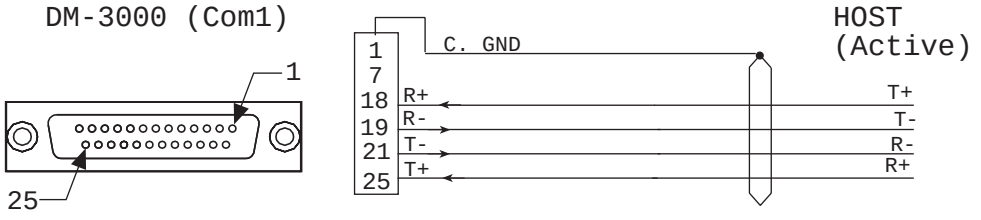
Multidrop serial communication:

You must use shielded interface cables with this product. To maintain FCC compliance, the cable shield must make a 360 degree connection to the shielded mating connector.

### 20MA CURRENT LOOP (ACTIVE AND PASSIVE)

Use the following drawing as a guide when you want to connect your DM-3000 to a device that is configured for current loop

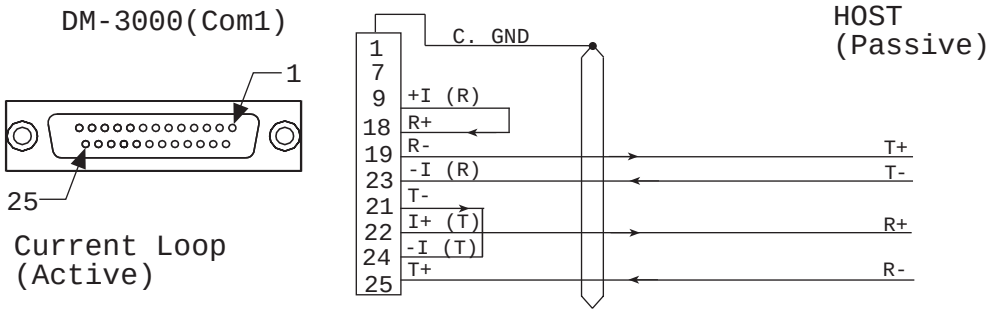
NOTE: All connectors are shown from the soldering side.
DM-3000. GND is isolated from S. GND through 100 ohm resistor




Current Loop (Passive)

Recommended Cable Type: ALPHA #5473C or Equivalent
Maximum Cable Length: 1000 Feet at 2400 Baud

NOTE: All connectors are shown from the soldering side.
DM-3000. GND is isolated from S. GND through 100 ohm resistor




Current Loop (Active)

Recommended Cable Type: ALPHA #5473C or Equivalent
Maximum Cable Length: 1000 Feet at 2400 Baud

serial communication:

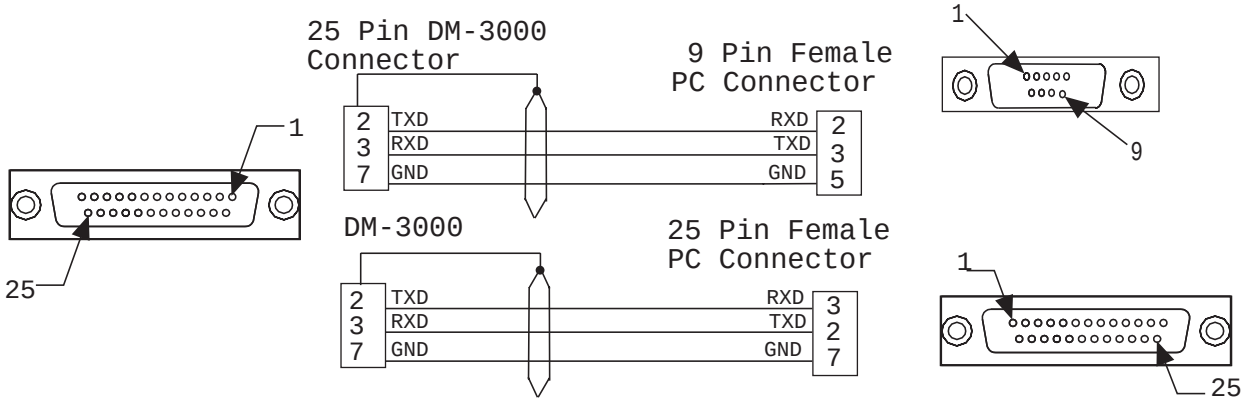
You must use shielded interface cables with this product. To maintain FCC compliance, the cable shield must make a 360 degree connection to the shielded mating connector.

## CONNECTING YOUR COM 1 TO A PC

Connect a PC to Com 2 on the back of your DM-3000. To do this, you need to make your own cables. The following pinout diagrams show typical RS232 communication cable pin connections from your PC to your DM-3000 with connector and cable specifications.

| | |
|---|---|
| 25 pin mail connector | ITT Cannot part # DB-25P or equivalent |
| 25 pin female connector | IT Cannot part #DB-25S |
| 9 pin connector | CINCH part# DEM-9S or equivalent |
| Cable | Manhattan Part # 4606 or equivalent |
| 25 pin strain relief | Keltron part #HM-25-10.5 |
| 9 pin strain relief | Keltron part # HM-09-7 ore equivalent |

NOTE: All connectors are shown from the soldering side.




Recommended Cable Type: Manhattan #4606 or Equivalent

You must use shielded interface cables with this product. To maintain FCC compliance, the cable shield must make a 360 degree connection to the shielded mating connector.

## J2 AND J3 AUX PORT - COM2 AND COM3 CONNECTIONS

The drawings below show all the pin connections for the DM-3000 when using serial communications on Com2 and Com3. If you need to create your own cables to wire your DM-3000 to another device, use these drawings as a guide. It is very important that you make the proper pin connections. The recommendation for the 9 pin connectors Com2 and Com3 is the ITT Cannon part # DEM-9P or equivalent.

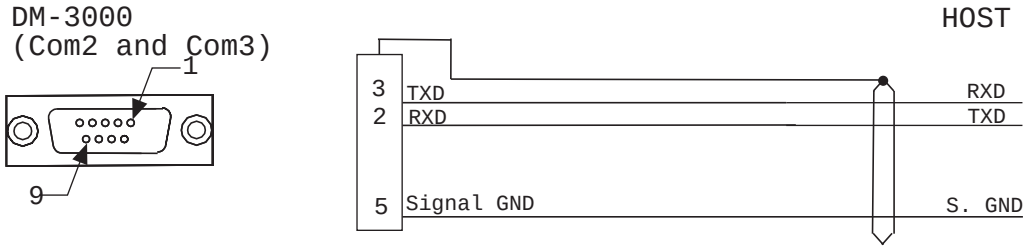
Below is a list of terms used in these drawings:

| | | | |
|---|---|---|---|
| **S. GND** | Signal Ground | **C. GND** | Chassis Ground |
| **TXD** | Transmit Data (RS232) | **RXD** | Receive Data (RS232) |
| **RTS** | Request To Send (RS232) | **CTS** | Clear To Send (RS232) |
| **RD+** | Receive Data (RS422) | **RD-** | Receive Data (RS422) |
| **SD+** | Non-inverting Line (RS485)<br>Send Data (RS422) | **SD-** | Inverting Line (RS485)<br>Send Data (RS422) |

### RS232 WITH NO HANDSHAKING

Use the following drawing as a guide when you want to connect your DM-3000 to a device that is using RS232 communication with no handshaking:

NOTE: All connectors are shown from the soldering side.
DM-3000. GND is isolated from S. GND through 100 ohm resistor.



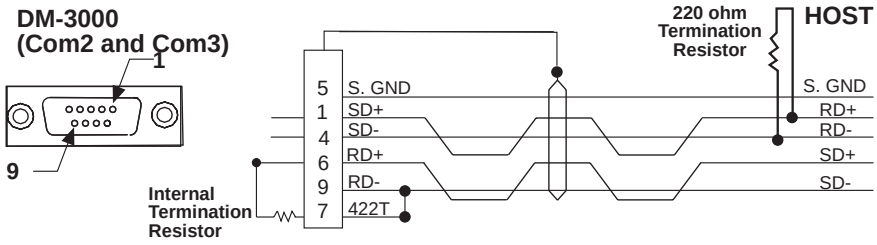

Recommended Cable Type: ALPHA # 5473C or Equivalent
Maximum Cable Length: 50 Feet

You must use shielded interface cables with this product. To maintain FCC compiance, the cable shield must make a 360 degree connection to the shielded mating connector.

### RS422 FULL DUPLEX POINT-TO-POINT (4 WIRE)

Use the following drawing as a guide when you want to connect your DM-3000 to a device that is using RS422 serial communication.

**NOTE: All connectors are shown from the soldering side.**
**DM-3000. GND is isolated from S. GND through 100 ohm resistor.**



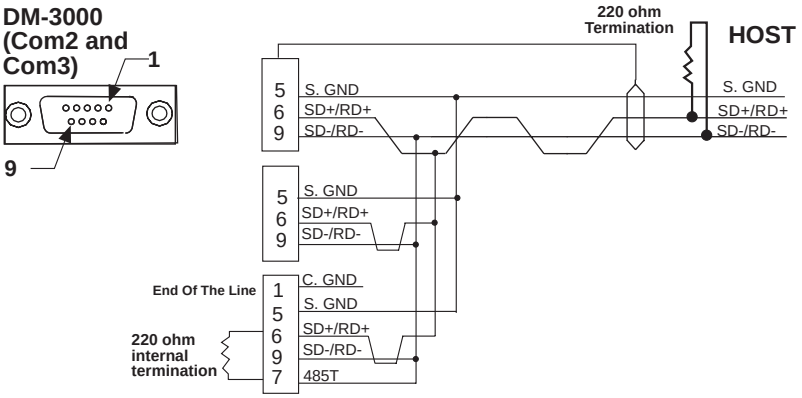

NOTE: Termination resistors may be placed inside the connector strain relief.
The termination resistor value is 220 OHM 1/4 watt.
With RS-422, the receive lines on both sides must be terminated.
Jumpers E2 and E5 on DM-3000 Logic Board must be removed.
Recommended Cable Type: ALPHA #5473C or Equivalent
Maximum Cable Length: 4000 Feet

You must use shielded interface cables with this product. To maintain FCC compliance, the cable shield must make a 360 degree connection to the shielded mating connector.

### RS485 HALF DUPLEX MULTIDROP (2 WIRE)

Use the following drawing as a guide when you want to connect your DM-3000 to a device that is using RS485 Half Duplex Multidrop serial communication:

**NOTE: All connectors are shown from the soldering side.**
**DM-3000. GND is isolated from S. GND through 100 ohm resistor**



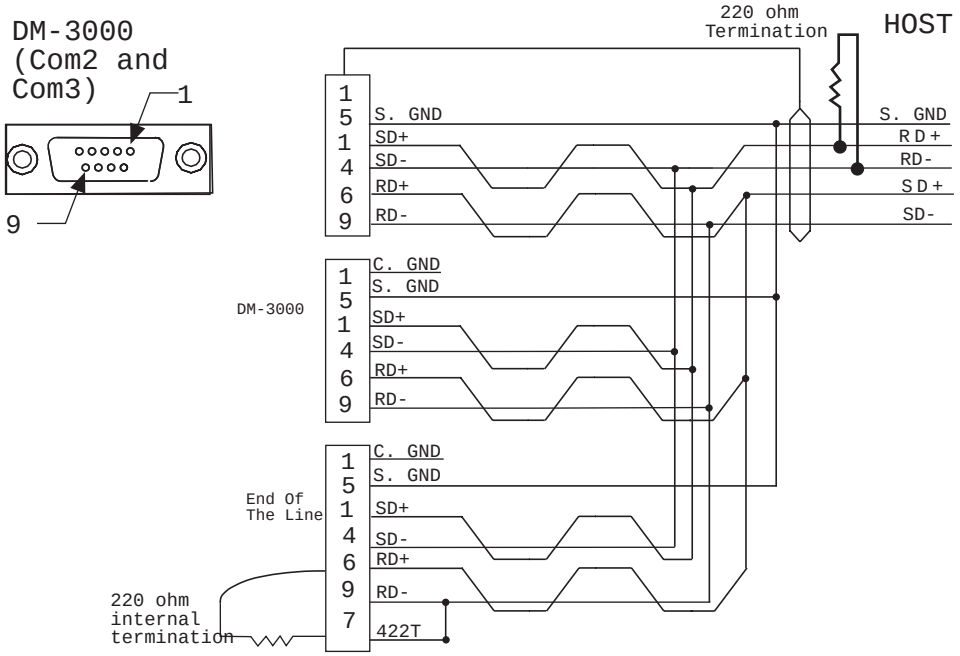

NOTE: RS485 allows for communication across the same lines
Termination resistors can be placed inside the connector strain relief.
The termination resistor value is 220 OHM 1/4 watt.
The transmit-receive lines on both sides must be terminated.
Jumpers E2 and E5 on DM-3000 Logic Board must be installed.
Recommended Cable Type: ALPHA #5473C or Equivalent
Maximum Cable Length: 4000 Feet

You must use shielded interface cables with this product. To maintain FCC compliance, the cable shield must make a 360 degree connection to the shielded mating connector.

### RS422 FULL DUPLEX MULTIDROP (4 WIRE)

Use the following drawing as a guide when you want to connect your DM-3000 to a device that is using RS422 Full Duplex

NOTE: All connectors are shown from the soldering side.
DM-3000. GND is isolated from S. GND through 100 ohm resistor




NOTE: RS422 allows for communication across the same lines
Termination resistors can be placed inside the connector

The termination resistor value is 220OHM 1/4 watt.
The transmit-receive lines on both sides must be terminat
Jumpers E2 and E5 on DM-3000 Logic Board must be removed

Recommended Cable Type: ALPHA #5473C or Equivalent
Maximum Cable Length: 4000 Feet

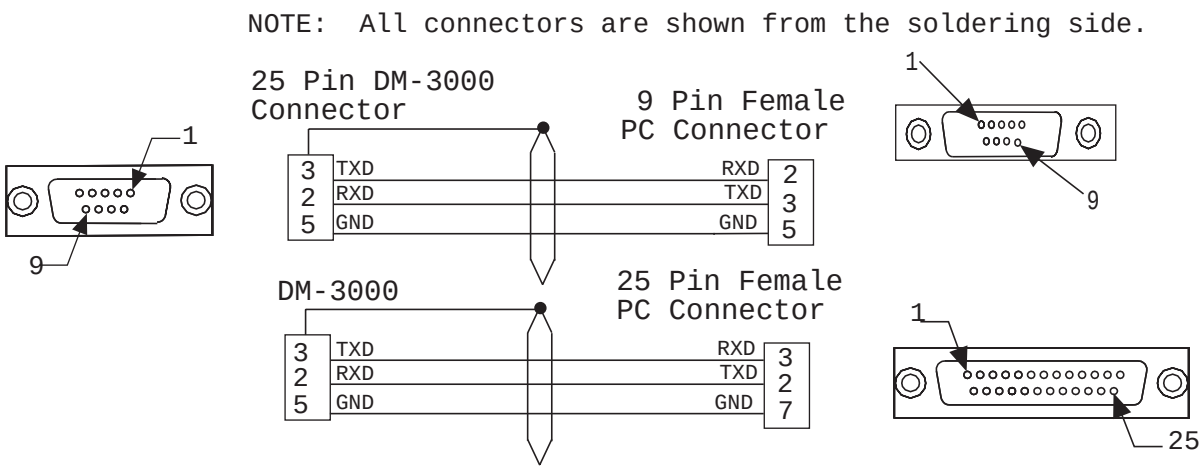
Multidrop serial communication:

You must use shielded interface cables with this product. To maintain FCC compliance, the cable shield must make a 360 degree connection to the shielded mating connector.

### CONNECTING COM 2 OR COM 3 TO A PC

To change the operating parameters of your DM-3000, it must be connected to a PC. Connect a PC to Com 2 or 3 on the back of your DM-3000. To do this, you need to make your own cables. The following pinout diagrams show typical RS232 communication cable pin connections from your PC to your DM-3000 with connector and cable specifications.

| | |
|---|---|
| 25 pin mail connector | ITT Cannot part # DB-25P or equivalent |
| 25 pin female connector | IT Cannot part #DB-25S |
| 9 pin connector | CINCH part# DEM-9S or equivalent |
| Cable | Manhattan Part # 4606 or equivalent |
| 25 pin strain relief | Keltron part #HM-25-10.5 |
| 9 pin strain relief | Keltron part # HM-09-7 ore equivalent |




You must use shielded interface cables with this product. To maintain FCC compliance, the cable shield must make a 360 degree connection to the shielded mating connector.

## J4 MODEM PORT COM4 CONNECTIONS

Use Com 4 to connect to a Modem or PC for Diagnostics or making parameter changes.

You must use shielded interface cables with this product. To maintain FCC compliance, the cable shield must make a 360 degree connection to the shielded mating connector.

## J5 AND J6 – PHOTOEYE AND TACH CONNECTIONS

See your DM-3000 Shipkit documents for information on mounting and connecting your photoeye and tach.

You must use shielded interface cables with this product. To maintain FCC compliance, the cable shield must make a 360 degree connection to the shielded mating connector.

## J7 PARALLEL INPUT/OUTPUT CONNECTIONS

### CONNECTING YOUR DM-3000 TO THE QUAD RELAY BOX

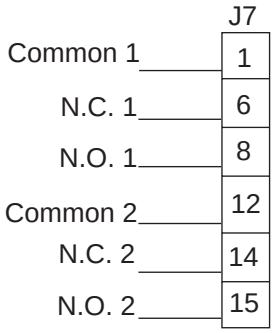
You can connect J7 to an Accu-Sort Small Scanner Quad Relay Box. If you do, it is recommended that you use the interconnect cable provided with your interface box (part #CS2H15MF-5, 5 ft., or #CS2H15MF-10, 10 ft).

This cable has two 15 pin "D" connectors. Connect the female end of the cable to the 15 pin "D" male connector (J2) on the rear of the DM-3000, and tighten the screws with a small flat head screw driver. Connect the other end of the cable to the 15 pin "D" female connector labeled SCANNER J1 on the Quad Relay Box, and tighten the screws with a small flat head screwdriver.

## USING J8 INTERNAL RELAYS

The DM-3000 is equipped with two internal Form C relays rated at
0-30V AC/DC, 0-2 amps. See below for connections.

**J8**

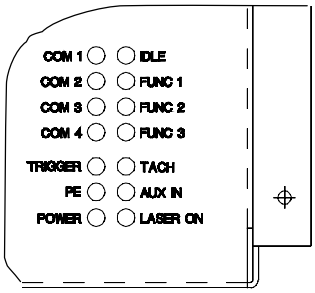


## DISPLAY PANEL

The DM-3000 has fourteen external LEDs on the front panel of the unit. These LEDs indicate certain operations of the unit are occurring. They can be used to check operation and troubleshoot problems.

| | | |
|---|---|---|
| **Idle** | Green | Normal load |
| | Yellow | Processing |
| | Red | Excessive load |
| **Func 1** | Green | Tach operational |
| | Red | Photoeye blocked |
| **Func 2** | Green | System OK |
| | Yellow | Warning |
| | Red | System Error |
| **Func 3** | Green | Non Zero surface detected |
| | Yellow | Non Zero and Console is active |
| | Red | Console is active |
| **Com 1** | Green | DM-3000 is sending characters out the port |
| | Red | DM-3000 is receiving data from the port |
| **Com 2** | Green | DM-3000 is sending characters out the port |
| | Red | DM-3000 is receiving data from the port |
| **Com 3** | Green | DM-3000 is sending characters out the port |
| | Red | DM-3000 is receiving data from the port |
| **Com 4** | Green | DM-3000 is sending characters out the port |
| | Red | DM-3000 is receiving data from the port |
| **Trigger Out** | | Photoeye output delayed by the software |
| **Photoeye** | Yellow | Photoeye is blocked |
| **Power** | | AC Power is on |
| **Tach** | | Matches the state of the tach input |
| **Aux In** | | Application Specific |
| **Laser On** | Green | Laser is enabled |

*Connector Panel LED Functionality*




*DM-3000 Status LEDs*

## START-UP TASKS

Do not turn on the system until all components are properly cabled and grounded with three-conductor AC power cords. Do not use a two-prong adapter. Do not use an extension cord to defeat the ground.

Ensure your AC power outlet has a properly grounded receptacle. Make sure you have the appropriate power cord for your country before powering the unit.

Do NOT use the DM-3000 power line to operate other equipment, especially induction motors and solenoids.

Prior to operating your DM-3000 complete all of the following tasks:

**1.** Using the provided customer-specific specifications (refer to the back pocket of this manual), verify that the mounting distances, mounting angle, and product sensing signal device (photoeye) distances are correct.

**2.** Verify that all of the necessary connections have been made correctly and that the connected equipment is functioning properly.

**3.** Apply power to the DM-3000 as described below:

**4.** Set up your software as described in the DM-3000 Software Setup Chapter of this manual.

**5.** Check the conveyor bed for bowing and flexing. The area 2-3ft plus maximum box length on each side of the scan line can effect the accuracy of the system. Any error in the bed translates directly to errors in the dimensions.

**6.** Make sure the system is mounted at least 1ft plus the longest box away from any belt transitions. This applies to entering and leaving the system. (This means the DM-3000 requires conveyor belt at least 2ft plus twice the longest box to ensure box stability under the system). The DM-3000 must be mounted over a belt and not rollers or tilt trays.

If your application uses rollers or a tilt tray, special software is required. A special addendum is written to document this software and is placed in the back pocket of this manual.

**7.** Boxes may not turn, shift, or rock while running through the system. Watch for side rails that will shift the box when moving along the conveyor.

**8.** Mount the DM-3000 at 63" (+/- 1/8") from belt to bottom mounting flange. Rear mounting hole should be 6.5" away from side of conveyor bed (reference mounting diagram). The DM-3000 should be parallel to conveyor surface in both axes. Best results are achieved by setting height at one mounting hole and using a level or angle finder to check angle along and across the belt. The DM-3000 is then adjusted at the three remaining mounting points to make it parallel to the belt. Isolating shock mounts MUST be used.

**9.** The DM-3000 should be turned on as soon as it is mounted. Best calibration results are achieved when the system has been on for at least one hour.

**10.** The DM-3000 scan line must be perpendicular to the conveyor within 1/32". Check with a square at both sides of the conveyor bed.

**11.** The tachometer must be mounted using the special bracket that comes with it. See the appropriate shipkit document for details. Tension should be set at 2/3 and adjusted to produce the maximum belt speed (measured using the BSPEED command). The tach must be allowed to caster on the belt. It must be mounted on the same belt the DM-3000 is mounted above. Any errors in tach mounting will result in incorrect lengths. The tach is part of the measuring system and is therefore very critical in dimensioning (unlike the tach for scanners).

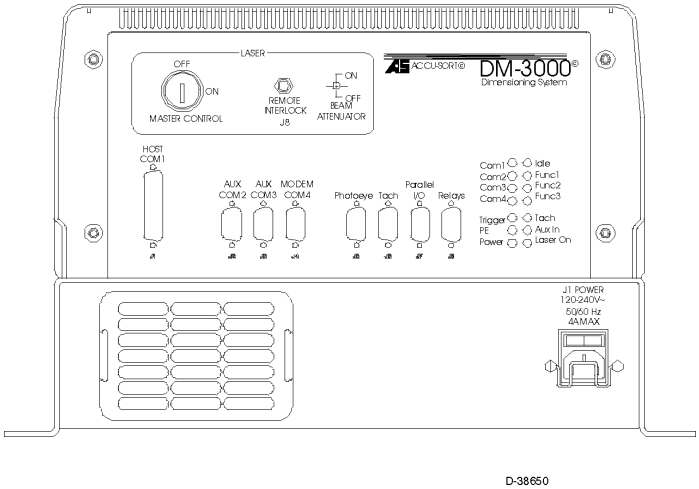
**12.** The AccuEye should be installed using the shock mounted U bracket provided. The AccuEye alignment tool is used to set the emitting laser to position. Put the alignment block with the holes on the top side and in front of the DM-3000 scan line. Align the DM-3000 scan line with any of the grooves on the extrusion. Adjust the emitter until the laser beam passes through both holes. Align the receiver (Model 20 box) so the laser is centered in the aperture.

**13.** ALL MOUNTING AND PHYSICAL ADJUSTMENTS ARE NOW COMPLETE. YOU ARE NOW READY FOR CALIBRATION.

## TURNING YOUR DM-3000 ON & OFF

The DM-3000 power connector contains a switch to turn the DM-3000 on and off.

To turn the DM-3000 on, flip the switch so I is showing.
To turn the DM-3000 off, flip the switch so O is showing.




*On/Off Switch*

## DM-3000 INITIALIZATION SEQUENCE

When you first turn on the DM-3000 unit it performs a self test to check the unit and its parts are operational. On the following pages are two screen shots showing what is displayed, how this self test appears on your PC if connected to the DM-3000. This is a typical example, yours may vary.

Throughout the self test you will see bold italicized numbers. These numbers indicate the following:

1. ASI bootloader (prom based) comes on line.
2. ASI bootloader did not find any external hosts & the flash already had valid code so it booted the code in the flash and handed control over to the flash code.

If your DM-3000 does not detect an external loader, the DM-3000 will go to flash. Flash cannot be booted, therefore it will get stuck. Use External Boot Loader. See Appendix A.

3. At this time the flash code has control and the ASI bootloader no longer resides in memory.
   ---
4. Each one of the following "Alloc" sections occurs when the individual code modules come on line and allocate their needed memory. Each one of these new memory blocks is protected its own memory barrier. This barrier is assigned the number inside the parenthesis after the "PASS"
5. The following three lines are for diagnostic/code-protection. Since the static memory locations should never change, we locate them all in the beginning of memory and keep a running CRC32 & BCC32 of the entire region in background.
6. The DM-3000 determines the number of system hours by counting the number of LASER logs in the flash. This is not very accurate, and any time can be off by as much as two hours per shutdown Set system time to 12 hours.
7. On the next line the DM-3000 generates all of the lookup tables needed to convert the raw camera data into height information.
8. Next the EEimage is checked and then loaded into the setup structure. If the image had been corrupted, default values would have been used.
9. Next the master attempts to bring the slave processor online.
10. During the next few lines the DM-3000 attempts to find a technicain using one of four com ports.
11. The system is now ready to dimension.

Once the DM-3000 is installed and the power switch is set in the "ON" position, it executes its functions automatically. To shut down the DM-3000, always be sure that the conveyor is no longer transporting products past the dimensioning unit so no packages are missed, then shut down the unit by placing the power switch in the "OFF" position.

If there are problems, error messages will display.

```
1.
ASI DIMENSIONING BOOT LOADER
BEGIN EXTERNAL RAM TESTS
ALL RAM TESTS PASSED
INITIALIZING 'C' SECTION

ASI Bootloader
Software: Date < Sep  2 1997 >, Revision 0.01
I'm up!!!
Verifying flash code:
Flash code passes CRC test (E923).
2. & 3.
POWERUP
-----------------------------------------------------------------
ASI DIMENSIONING TECHNOLOGY WITH THE RISC-TMS_320C31 DSP.
Copyright (c) 1995 Accu-Sort Systems, inc.
All rights reserved.  Patent: #5,661,561 (August 26, 1997).
Software: Date < Feb 25 1998 >,  Revision < 1.105 >, DLM.
Compatible with DM3000.EXE V1.04.
4.
Alloc[crctb] 0x    110 bytes ... PASS(0)  Handle: 0x 20E173  Free: 0x  31D7D
Alloc[miscs] 0x    4A0 bytes ... PASS(1)  Handle: 0x 20E284  Free: 0x  318DC
Alloc[crc32] 0x    110 bytes ... PASS(2)  Handle: 0x 20E725  Free: 0x  317CB
5.
Last static ERAM location :   20C8E4
CRC32 : A6339232
BCC32 : EB59B842
Alloc[xilnx] 0x   8010 bytes ... PASS(3)  Handle: 0x 20E836  Free: 0x  297BA
Alloc[boxbf] 0x   2764 bytes ... PASS(4)  Handle: 0x 216847  Free: 0x  27055
Alloc[dtach] 0xD0 bytes ... PASS(5)  Handle: 0x 218FAC  Free: 0x  26F84
Alloc[setup] 0x    42F bytes ... PASS(6)  Handle: 0x 21907D  Free: 0x  26B54
Alloc[autoc] 0x7A bytes ... PASS(7)  Handle: 0x 2194AD  Free: 0x  26AD9
Alloc[conio] 0x    D90 bytes ... PASS(8)  Handle: 0x 219528  Free: 0x  25D48
Alloc[error] 0x4E bytes ... PASS(9)  Handle: 0x 21A2B9  Free: 0x  25CF9
6.
System time set to 12 hours.
Alloc[derrb] 0x    204 bytes ... PASS(10)  Handle: 0x 21A308  Free: 0x  25AF4
Alloc[hspbf] 0x    210 bytes ... PASS(11)  Handle: 0x 21A50D  Free: 0x  258E3
Alloc[carti] 0x28 bytes ... PASS(12)  Handle: 0x 21A71E  Free: 0x  258BA
Alloc[carts] 0x    2D0 bytes ... PASS(13)  Handle: 0x 21A747  Free: 0x  255E9
Alloc[datrk] 0x   8010 bytes ... PASS(14)  Handle: 0x 21AA18  Free: 0x  1D5D8
Alloc[scanr] 0x    4FC bytes ... PASS(15)  Handle: 0x 222A29  Free: 0x  1D0DB
Alloc[xlkup] 0x    811 bytes ... PASS(16)  Handle: 0x 222F26  Free: 0x  1C8C9
Alloc[slkp0] 0x    1B4 bytes ... PASS(17)  Handle: 0x 223738  Free: 0x  1C714
Alloc[clkp0] 0x    1B4 bytes ... PASS(18)  Handle: 0x 2238ED  Free: 0x  1C55F
Alloc[slkp1] 0x    1B4 bytes ... PASS(19)  Handle: 0x 223AA2  Free: 0x  1C3AA
Alloc[clkp1] 0x    1B4 bytes ... PASS(20)  Handle: 0x 223C57  Free: 0x  1C1F5
Alloc[avgrm] 0x    232 bytes ... PASS(21)  Handle: 0x 223E0C  Free: 0x  1BFC2

7.
Generating lookup tables ... complete

Alloc[finet] 0x1E bytes ... PASS(22)  Handle: 0x 22403F  Free: 0x  1BFA3
Alloc[a2dlg] 0x18 bytes ... PASS(23)  Handle: 0x 22405E  Free: 0x  1BF8A
Alloc[messq] 0x   1010 bytes ... PASS(24)  Handle: 0x 224077  Free: 0x  1AF79
Alloc[shdow] 0x    42F bytes ... PASS(25)  Handle: 0x 225088  Free: 0x  1AB49
Alloc[eecmd] 0x25 bytes ... PASS(26)  Handle: 0x 2254B8  Free: 0x  1AB23
```

This diagram is for sample purposes, your initialization sequence may vary.

*Initialization Screen*

```
8.
Check EE1 : PASSED
Check EE2 : PASSED
New EE command: EE_READ1
EE READ 1 : PASS
Generating lookup tables ... complete
Alloc[scmux] 0x   3256 bytes ... PASS(27)  Handle: 0x 2254DE  Free: 0x  178CC
Clearing Mux Database ... Complete.
Alloc[ibuf1] 0x    410 bytes ... PASS(28)  Handle: 0x 228735  Free: 0x  174BB
Alloc[obuf1] 0x   4010 bytes ... PASS(29)  Handle: 0x 228B46  Free: 0x  134AA
Alloc[ibuf2] 0x    410 bytes ... PASS(30)  Handle: 0x 22CB57  Free: 0x  13099
Alloc[obuf2] 0x   4010 bytes ... PASS(31)  Handle: 0x 22CF68  Free: 0x   F088
Alloc[pckt1] 0x    110 bytes ... PASS(32)  Handle: 0x 230F79  Free: 0x   EF77
Alloc[pckt2] 0x    110 bytes ... PASS(33)  Handle: 0x 23108A  Free: 0x   EE66
Alloc[ibuf3] 0x    410 bytes ... PASS(34)  Handle: 0x 23119B  Free: 0x   EA55
Alloc[obuf3] 0x   4010 bytes ... PASS(35)  Handle: 0x 2315AC  Free: 0x   AA44
Alloc[ibuf4] 0x    410 bytes ... PASS(36)  Handle: 0x 2355BD  Free: 0x   A633
Alloc[obuf4] 0x   4010 bytes ... PASS(37)  Handle: 0x 2359CE  Free: 0x   6622
Alloc[pckt3] 0x    110 bytes ... PASS(38)  Handle: 0x 2399DF  Free: 0x   6511
Alloc[pckt4] 0x    110 bytes ... PASS(39)  Handle: 0x 239AF0  Free: 0x   6400
Onboard ROM CRC-16 : E2DD.
sizeof(struct setup_struct) = 0x41F, 15329 locations free.
Alloc[sysdi] 0x1D bytes ... PASS(40)  Handle: 0x 239C01  Free: 0x   63E2
Remember to check Primary bus value.
Alloc[sysog] 0x21 bytes ... PASS(41)  Handle: 0x 239C1F  Free: 0x   63C0
Alloc[sysc1] 0x21 bytes ... PASS(42)  Handle: 0x 239C41  Free: 0x   639E
Alloc[sysc2] 0x21 bytes ... PASS(43)  Handle: 0x 239C63  Free: 0x   637C
Alloc[sysc3] 0x21 bytes ... PASS(44)  Handle: 0x 239C85  Free: 0x   635A
9.
Loading Slave Interrupt Vectors.
Boot loading from   20C85C to   809FC1, 7 bytes.
Boot Loading Slave Code and Data Sections.
Boot loading from   20C33E to   809800, 346 bytes.
Jump Starting Slave.
Boot loading from   20C33E to   809800, 0 bytes.
Attempting to Regain Communications With Slave.
M->S:ReqAckS->M:Ack
M->S:ReqAckS->M:Ack
M->S:ReqAckS->M:Ack
M->S:ReqAckS->M:Ack
Setting Slave Factors.
Verify Slave Factors.
RESULT:0123456789
Slave Factors Verified
// During the next few lines the DM3000 attempts to find a technician using
// one of our four comm ports.
Attemptying Sync at 1200 baud.
Attemptying Sync at 9600 baud.
Attemptying Sync at 19200 baud.
Attemptying Sync at 38400 baud.
------------------------------------------------------------
ASI DIMENSIONING TECHNOLOGY WITH THE RISC-TMS_320C31 DSP.
Copyright (c) 1995 Accu-Sort Systems, inc.
All rights reserved.  Patent: #5,661,561 (August 26, 1997).
Software: Date < Feb 25 1998 >,  Revision < 1.105 >, DLM.
Compatible with DM3000.EXE V1.04.
Last static ERAM location :   20C8E4
CRC32 : A6339232
BCC32 : EB59B842
// The system is now ready to dimension.
Running...
```

*Initialization Screen - Cont'd*

## Chapter Three ▼ *Contents*

## DM-3000 SETUP SOFTWARE

### OVERVIEW

The DM-3000 Dimensioning unit requires some customization in order for it to work efficiently for each unique application. The DM3000.EXE is a setup program for the DM-3000 Dimensioning Unit that provides a built-in way for you to customize your DM-3000 for your system. You must run this program only in the DOS environment. You must exit Windows. Running DM3000.EXE in Windows will generate unpredictable results. A floppy disk with the DM-3000 Software Setup is provided in the front pocket of this manual.

First load the DM-3000 setup program on the PC you will be using to setup and diagnose your DM-3000. To do this:

Type: **Copy A:\ C:**

A: is typically the 3.5" floppy drive on most PCs. It may not be on your PC. Please change A: to the correct drive letter, if it is not A: on your PC.

Your DM-3000 Setup program is now loaded onto your PC. The DM-3000 Setup program provides two modes:

- Term
- MDRAW

To run any one of these modes of DM-3000 Setup, simply type the program name followed by the mode TERM or MDRAW. The basic steps for using TERM are documented in the following sections. MDRAW is documented in detail at the end of this chapter.

## TOOLS REQUIRED

The following tools are required to run the DM-3000 Setup Software:

- IBM or IBM compatible Personal Computer with MS-DOS and a 386 processor and 4M RAM
- Hard disk with 3M free disk space
- VGA graphics adapter and monitor
- 3.5" floppy disk drive
- DM-3000 Setup Software disk
- Setup cable connecting PC to DM-3000

## START UP DM-3000 SETUP

The DM-3000 must be properly mounted to its support structure above the conveyor and connected to the Tach, and Accu-Eye, before you begin using any one of these software setup programs.

Before you can begin running DM-3000 Setup mode you must connect a PC to Com 4 of the DM-3000 unit. See Chapter Two for wiring of this connector. Now follow the steps below to start up your DM-3000.

All dimensioning commands are entered by pressing <ENTER>. The password for all commands is: the first letter of the command, ASI, first letter of the command. Ex.: The password for SAVE is SASIS.

1. Plug the power cord of the unit into an AC outlet and place the power switch in the on position.

2. The terminal displays:

   RUNNING…

### EXITING DM-3000 SETUP

To exit from any one of the two modes of DM-3000 Setup, press <**ALT**> and <**X**> simultaneously. The following prompt appears:

```
Exit Terminal? [Y/N]
```

Type **Y** to exit the mode, or **N** to remain.

### USING TERM TO SETUP YOUR DM-3000

Use the DM3000.EXE software to talk to the DM-3000 system. Com4 is the setup port and is always configured for 19200 8N1. You will need a 9 pin female to 9 pin male with pins 2 and 3 swapped.

### RUNNING THE TERM PROGRAM

The TERM command in the DM-3000 Setup program automatically runs some of the commands needed to configure the DM-3000 and communicates this information to the PC and DM-3000.

**1.** To enter the TERM program, type <**DM3000 TERM**> and press <**ENTER**>.

**2.** The DM-3000 should already be powered up and running. For best results it should be running for one half hour or more.

This is for calibration only. The DM-3000 will dimension within tolerance from power-up after it is properly setup.

**3.** The PC displays the initialization sequence as shown in Chapter 1. If the unit is already running this will not display.

**4.** To Login, type <**ASI**> and press <**ENTE**R>. A D> prompt appears.

**5.** On any systems that have been calibrated before, type <**CAMERA TOTAL RESET**> to reset camera values to base levels.

**6.** Type <**LOCKLASER**> and press <**ENTER**>. This command keeps the laser on for one hour. Typically the laser shuts off when the conveyor is not running.

**7.** Place the horizontal calibration fixture on the conveyor. Type DEB_9 and F9 for graphics mode and check for obstructions within the scan line.

**8.** Mask the outgoing laser beam at the exit glass to avoid seeing anything but the calibration bar. A prompt appears to enter a password.

**9.** Type the password <**AASIA**> and press <**ENTER**>. The DM-3000 automatically runs the autocal function which will determine an approximate center Lval and the camera angle. The PC displays the angle and center Lval data as follows:

```
D>      GATHER DATA...  100
        CENTER...  210.00
        GATHER DATA...  100
        CENTER...  210.00
        ..
        .
        .
        .
        .
        .
        .
        .
        Center Lval is 209.30
        First angle is - 20.91 degrees
        Last angle is - 52.73 degrees
        Current first angle is - 37.44 degrees
```

Type DEB_9 back on and place the reference black sample on the belt. Adjust the lens height with the two 1/8" set screws until reference black returns the same raw data as kraft brown. The same adjustment affects variation which can be seen in DEB_1. Maintain the ability to see black while holding variations below 3 turn DEB_9 off.

**10.** Attach Vertical Calibration Fixture. See Shipkit document DM3-59.

**11.** Type <**CAMERA CAMSET**> and press <**ENTER**>. This command automatically configures the DM-3000 using the results of the AUTOCAL process. A password is requested.

**12.** Type the password <**CASIC**> and press <**ENTER>.**

**13.** Type <S**AVE**> and press <**ENTER**> to save the data.

**14.** Enter the password <**SASIS**> and press <**ENTER**>.
**15.** Removing masking.

**16**. Place the horizontal calibration fixture back on the conveyor and type <**FINETUNE**> and the password <**FASIF**>. The command Finetune sends out the system grade. The system grade is an evaluation of the calibration status of the unit thus far. This number must be a 6 or higher. If the grade is determined to be less than 6, it is recommended you perform the previous steps again.

**17.** If the system grade is 6 or higher, type <**SAVE**> and <**SASIS**>. Now place the medium test box in the middle of the scan line, so the height is 12".

**18.** Type <**ITELLU> <xx>** (XX=a known box height) and press <**ENTER**>. ITELLU tells the DM-3000 to adjust its measurement to the box measurement you placed in front of it. [Ex. For a 12" box it would be "ITELLU 12.0"]. Type <**SAVE**> and <S**ASIS**> to save these measurements. Verify height with DEBUG_F.

**19.** Place an object (calibration bar) at least 4" tall just off of the edge of the belt. Adjust params 9 & 10 until the object is just out of view in graphics mode of DEB_A. Type <**PARAM 9 xx**>. <**PARAM 9**> (set the ignore low count) represents one side of the conveyor that the interface connectors are on. Now type <**PARAM 10 xx**>. <**PARAM 10**> (set the ignore high count) represents the other side of the conveyor. The xx in both commands represents the count of pixels that are being masked. These commands set the DM-3000 to mask any changes in height beyond the conveyor width, so not to confuse the DM-3000 into thinking they are boxes. Param 9 starts at 0 and should be increased. Param 10 starts at 608 and should be decreased.

**20.** Run at least three different sized boxes at various angles throughout the scan window. Put the system into "DEB 8800" before starting the tests. Open a log file by pressing <**F5**> and entering a <**filename**>. When complete, close the log by pressing <**F5**> again.

**21.** Exit the term program by typing <**Alt-X**>. Then type <**DM3000 MDRAW**> <**filename**> (the filename you entered in step 20). This allows you to analyze the data that has been logged. Each entry is a box record. Each box looks like the data below:

```
0-       0: (  194,148 ) (196, 148) (  2,0   ) 29
```

| | |
|---|---|
| 0- | Mdraw programs box count |
| 0: | Cart count assigned to the box |
| 194 | Calculated Lval in 1/16 |
| 148 | Calculated Lval in 1/16 |
| 196 | Final length of the box |
| 148 | Final width of the box |
| 2 | Difference between calculated and final length |
| 0 | Difference between calculated and final width |
| 29 | Confidence Factor (Code quality is a system value between 0 and 99 that indicates the quality, 0 is not good, 99 is excellent) |

Use the up/down arrows to select a record and press <**ENTER**> to look at the box data for that record. See MDraw details later in this chapter.

Further explanations of the DIAG command and errors are found later in this chapter.

**22.** Verify the data looks correct. The data should look clean and the line segments drawn around the box should fit the data. A box run at 45 degrees should have the corners close to touching the purple lines representing the PE. If the corners are not close, recheck the PE mounting.

**23.** Type <**Alt-X**> to exit the program. Check the text log using an editor (or monitor on the screen while testing) to verify the dimensions are consistent and correct. (Longer boxes that show a short length indicate a tach mounting problem). Also check to make sure there is a host message for all box data.

**24.** If everything looks correct at this point, monitor the system with live freight for one sort. Look for strange variations in dimensions and type <**DIAG**> to look at errors.

These commands serve the same purpose as a scan window setting for a scanner.

## DM-3000 CONFIGURATION

You will need to perform different procedures to configure your DM-3000 to perform different functions.

### SETTING UP THE DM-3000 AS A MULTIPLEXER

You can set up your DM-3000 to multiplex data from several different devices. This means it will collect data from several devices and transmit it to a host in a format you define. Follow these steps to set your DM-3000 as a multiplexer.

**1.** Configure the input ports to accept scanner data. Using "PARAM xx yy" where xx is the parameter to change (15 - COM1, 16 - COM2, 17 - COM3, 18 - COM4), and yy is the scanner input number (SCANNER1 - 18, SCANNER2 - 19, or SCANNER3 - 20). [EX. To set com2 to accept a message from a single scanner, type "PARAM 16 18".]

**2.** Set the baud rate and start/stop bits for the hardware ports by following the pattern "COMMa 19200 8N1", where a is the hardware port number.

**3.** Set the framing of the message of each assigned port by following the pattern "COMMFRAME yy ss ee" where yy is as in step1, ss is the start character in hex and ee is the end character in hex. [EX. To set framing to stx data cr for scanner1 type "COMMFRAME 18 02 0D".]

### SETTING YOUR DM-3000 TRACKING

Follow these steps to set your DM-3000 as a tracking device.

**1.** Set leading or trailing edge tracking using param 11 (0 is leading edge, 1 is trailing). Set the transmit point at least 3 feet beyond the scanner transmit point to ease setup (it will be corrected after the scanner message is received in the window).

It is probably easiest to enable only one scanner at a time. This is done by setting the parameter for the other scanner ports to 0.

**2.** Start with mux offset equal to 0. Type "MUX TRACK SCANNERa 0" where a is the desired scanner number. The password is "MASIM".

**3.** Enable the mux debug level by typing "DEB 10800".

**4.** Run one box straight down the center of the belt with a valid bar code the scanner can read, then stop to analyze the data reported.

**5.** Adjust the mux offset so the scanner data is received approximately 32 tachs after the box starts. This is done by observing the following data lines from the diagnostics:

**6.** The MUXNEW line indicates the tach value that the scanner message was received. The BX_START message indicates the start of the box.

The tach resets to 0 after 8192 pulses. To make the calculation easier, make sure the tach did not roll over.0.

**7.** Calculate the rough offset by subtracting BX_START from MUXNEW (a positive number if the DM3000 is first, negative if the scanner is first).

**8.** Enter the offset by typing <**MUX TRACK SCANNER**> <**offset**>.

**9.** Type <**CLS**> to clear the screen and run the same box again. If you have calculated the offset correctly, you should get a line that starts with MUXFOUND. Included in this line is a value for TDIFF. The ideal TDIFF is 32. Adjust the mux offset and repeat the box running until TDIFF is consistently close to 32.

**10.** Test the tracking by running boxes of varying lengths and mix valid reads and no reads from the scanner.

**11.** Repeat the same process for any other scanner inputs.

**12.** After all scanners are tracked in, reset the transmit point to the desired distance (must be at least 3" after the message is received from the scanner or at least 8" after the DM3000 scan line

The distance from the PE to the scan line must be added in to find the total minimum distance.

The value should be in sixteenths of an inch measured from the photoeye. It is set with PARAM 12.

### SETTING UP THE TRANSMIT MESSAGE OF YOUR DM-3000

The transmit message must be configured, including transmit point, header, trailer, baud rate, framing and data field. The data field may consist of any and/or all of the following in any order:

- Height
- Width
- Length
- Area (product of length and width )
- QQ (Quality [ 0-99 ] affected by fit of sides, raw vs. actual area, uniformity of heights )
- Fixed characters such as, Commas, Colons, etc. to separate the fields

Each data field can contain up to nine characters, and as many fixed characters as desired may be used. Decimal points are implied. It is not possible to output a decimal in the middle of a data field.

Commands used to configure transmit message would be COMM, to set up the proper baud rate, number of bits, parity and number of stop bits.

COMMFRAME to set the start and stop characters for the message. PERSON is used to set the number of characters per field, the order of the fields, QQ, and any delimeters between fields. SCALE will set how many decimal places to take the dimension to.

The units can be configured also. The dimensions are in 1/16's of an inch but can be converted to centimeters.

The transmit point can be anywhere from 8" from the scan line to 17". The distance to transmit point is measured from the photoeye. The photoeye is typically mounted two inches in front of the scan line so the minimum transmit point is usually 10". This is done using PARAM 12. Up to 128 characters are allowed for the NODIM message. This is done using the NODIM command.

### USING THE DM-3000 AS A FOCUS CONTROLLER

When using the DM-3000 for focusing, the vertical flip output is not adjustable. The horizontal flip output has some adjustment via the POSITION OFFSET. This offset will set the first flip point, the second flip point is hardcoded in the firmware to a preset distance. When using the POSITION OFFSET, both the side mounted scanners flip together. The transmission of the flip bit is controlled with the FOCUS OFFSET parameter.

Focusing bits GP1, GP2, GP3, and GP4 are sent out opto coupled outputs through J12 on the interface board, (parallel I/O, J7 to the outside world). The focus bits are active low external and active high at logic. The first pin of the opto coupled outputs should be pulled high and the second should be tied low. The maximum current limit is 25mA.

## DM-3000 CONFIGURATION VALIDATION

Follow the steps below to verify the DM-3000 setup:

**1.** Check all hardware mounting:

- Make sure the scan line is perpendicular to the belt
- Make sure the photoeye is parallel with the scan line
- Make sure the unit is in plane parallel with the belt
- Make sure the unit is mounted at the proper height

**2.** Log into the unit and check <**DIAG**> for any system errors. Also check laser power with <**A2D**>. Run locklaser.

**3.** Place the horizontal calibration fixture on the belt and check graphics mode in DEB 9 to verify the smooth centered curve is present. If the screen shows only a scrolling flat line, a camera lens adjustment is most likely required. A blank screen (no points drawn at all) is usually an indication of a camera or logic board failure.

**4.** Check reference black as in setup. If the head can not see black, adjust the camera lens.

**5.** Remove the bar from the scan line and attach the vertical fixture. The average value reported at the far right of DEB 1 should be 220 +/- 1. If the value is outside this range, re-calibrate the unit.

**6.** Remove the vertical fixture and replace the horizontal bar. Graphics mode of DEB A should show a flat and level line across the screen. If the line is angled, go to setup and begin with the <**AUTOCAL**> step.

**7.** Place the test boxes in the scan line and check the height measurement using DEB F.

**8.** Check the setting of Ignore Low and High (PARAM 9 & 10) to verify the head can see to the edge of the belt, but not far beyond.

**9.** Run the test boxes and verify the reported dimensions are correct.

## TERM COMMAND EXPLANATIONS

To use any of the following commands, the DM-3000 must be running. Type <**DM3000 TERM**> to enter the term mode. Further explanation will follow on the MDRAW mode.

### A2D

Type <**A2D**> to dump the raw/processed A2D values from the internal logs, for example:

A2D values (*100):
+5v : 513 : (AB)
+15v : 1480 : (94)
-15v : 1450 : (91)
-5v : 504 : (A8)
Temp : 7700 : (4F)
LPWR : 2540 : (7F)
LVLT : 110 : (37)
GND : 0 : ( 0)

First column is the A2D channel, second is the value (multiplied by 100), third is the raw value from the A2D.

### ANGLE

Type <**ANGLE**> to display the current system mounting angle. See page 2-6.

### AUTOCAL

Type <**AUTOCAL**> to start the autocal process. The autocal process is used to set the pindex for the encoder, and to set the initial system mounting angle.

### AVERAGE

Type <**AVERAGE**> to dump the last group of camera averages to the console port (all values are in hex.), for example:

Dumping Average:
12 14 12 14 12 14 12 14 12 14 12 14 12 14 13 14 12 14 12 14 12 14 12 14
12 14 12 14 12 14 12 14 12 14 12 14 13 14 12 14 13 14 12 14 13 14 12 14 13 14

### BSPEED

Type <**BSPEED**> to display the current belt speed.

### CARTON

Type <**CARTON**> to display the current carton and cart counts, for example:

Current carton count is : 0
Current cart count is : 0

All of the following camera related commands make adjustments to the camera to compensate for variations.

### CAMERA HFACTORS [N] [F] ...

Type <**CAMERA HFACTORS**> to set the 4th order polynomial weights. **DO NOT USE.**

### CAMERA CAMSET

Type <**CAMERA CAMSET**> to adjust the xscale value automatically. Before using this command the vertical calibration fixture should be in place. This command adjusts the curve to a point where your DM-3000 can use the standard Hfactors.

### CAMERA THRESHOLD [N]

Type <**CAMERA THRESHOLD**> to adjust the minimum usable return light required for valid data. For recommended settings see below.

| Laser Class | Laser Type | Threshold |
|---|---|---|
| 3 | U49 = TS17 | 20 |
| 2 | U49 = TS17 | 10 |
| 2 (UPS) | U49 = UPS8 | 3 |

These are all minimum settings. Some heads may require higher thresholds to function properly.

### CAMERA SCALE [N]

Type <**CAMERA SCALE**> to modify the xscale value. **DO NOT USE.**

### CAMERA SETTINGS

Type <**CAMERA SETINGS**> to display all of the camera settings.

### CAMERA HELP

Type <**CAMERA HELP**> to display the camera help file.

### CAMERA TOTAL RESET

Type <**CAMERA TOTAL RESET**> to set the camera subsystem into the known default state after manufacture.

### CCC

Type <**CCC**> to clear carton/cart counters.

### CERT ON IN

Type <**CERT ON IN**> to turn cert mode (certification compliant with Canadian standard) on, in inch mode.

### CERT ON CM

Type <**CERT ON CM**> to turn cert mode on, in centimeter mode.

### CERT OFF

Type <**CERT OFF**> to turn off cert mode.

### CERT ENABLE

Type <**CERT ENABLE**> to turn cert modify mode on.

### CLL

Type <**CLL**> to clear the laser logs. This command should never be used until the laser log fills. The DM-3000 automatically takes a measurement every hour of the laser value. This is done to allow for diagnostic checks on the laser.

### CLEAR

Type <**CLEAR**> to clear all diagnostic counters.

### COMM <PORT> <BAUD> <SETTINGS>

Type <**PORT**><**BAUD**><**SETTINGS**> to set the hardware communication settings. Ex: comm 1 19200 8n1

### COMMFRAME <PORTNUM> <START> <STOP>

Type <**PORTNUM**> <**START**> <**STOP**> to set the virtual communication port start/stop characters.
Ex: COMMFRAME 1 2 d

1. The port number
2. Start character in hex
3. Stop character in hex

See the ASCII chart at the end of this Chapter for hex values used above.

### DEBUG <VALUE>

Type <**DEBUG**> and a debug value. The value entered after the command is a 32bit hexadecimal bitmapped value. The first four bits are a command to the pproc module. All the other bits can be set separately, with each bit turning on the diagnostics for individual modules.

**See Chapter Four for details.**

### DEFAULT

Type <**DEFAULT**> to return all setup parameters to the default values, except calibration data.

### DERROR

Type <**DERROR**> to dump the last 500 system events to the console.

**See Chapter Four for details.**

### DIAG

Type <**DIAG**> to dump all of the system diagnostic counters to the console. The first line tells the user the state of the laser and algorithm subsystem, in addition it displays the system hours. The second line shows the system grade, which is recorded during the FINETUNE command.

**See Chapter Four for details.**

### DUMPALL

Type <**DUMPALL**> to dump the setup parameters in a machine readable format to the console.

### EELL [ON|OFF]

Type <**EELL**> to set the program mode for the flash;
**ON** - Flash programming is highest priority (the system will not function correctly in this setting).
**OFF** - Flash programming is performed as a low priority background task. This command allows you to set the programming mode to off, to save the parameters to RAM until there is an opportunity to save to EEPROM.

EELL must be off for the system to properly operate.

### EXERCISE

Type <**EXERCISE**> to send random commands to the focusing subsystem. This command tells the DM-3000 random box locations to test that the focusing mechanism is working.

### FINETUNE

Type <**FINETUNE**> to start the fine tune process. The fine tune process is used to micro adjust the system mounting angle.

### FIRERELAY

Type <**FIRERELAY**> to test relay functionality.

### HALT

Type <**HALT**> to stop processing data, this disables all interrupts and sets the DM-3000 in polling mode.

### HEIGHT [HEIGHT]

Type <**HEIGHT**> <XX> to adjust system mounting height. XX=height in hundredths of inches, for example 62.44.

### INTERRUPT

Type <**INTERRUPT**> to display interrupts per second. Should be set for 35,000.

### ITELLU [HEIGHT]

Type <**ITELLU**> <XX> to automate the setting of the system height. XX = a known height of a particular package you are dimensioning.

### LOCKLASER

Type <**LOCKLASER**> to lock the laser on for one hour.

### LOCKPORT [PORT]

Type <**LOCKPORT**> to lock port in console mode until next reboot regardless of other communication parameters. This allows you to lock current settings, while you make changes to that port.

### LSTERROR

Type <**LSTERROR**> for a description of what may be wrong with the unit. The following errors can display:

000
002
003
004
005
006

### MOTOR

Type <**MOTOR**> to display various motor settings.

### MUX

Type <**MUX**> to access DM-3000 muxing capability (See section on page 3-7)..

### NODIM [MESS]

Type <**NODIM**> to set the NODIM message. You can set what you would like to display when a no dim occurs.

### NODERR

Type <**NODERR**> to disable the display of errors.

### PARAM [PARAM [SETTING]]

Type <**PARAM**> to use or display/set any of the following general system parameters. Type any of the following parameter commands to display/set the parameter.

```
 1:Height Threshhold ....   26 2:Minimum Height .......   28
 3:Minimum Lval .........    2 4:Maximum Deviation ....  480
 5:PProc Mode ...........    0 6:Maximum Break ........  192
 7:Minimum Dimension ....   60 8:Learn Active .........    0
 9:Ignore Low Count .....    0 10:Ignore High Count ....  608
11:Tracking Mode ........    1 12:TX Tach/Time ......... 2336
13:Heart Beat ...........    0 14:Watch Mark ...........  209
15:COM1 Assignment ......    0 16:COM2 Assignment ......    8
17:COM3 Assignment ......    0 18:COM4 Assignment ......    1
19:Area Tolerance .......   25 20:Focus Offset ......... 1776
21:Trigger Offset .......   16 22:PE Offset ............   22
23:PE Adjustment ........    1 24:Truness Region Pass1 .   14
25:Truness Region Pass2 .   12 26:Position Offset ......    0
27:Height Calc Mode .....    0 28:Minimum QQ Req .......    0
29:Minimum Scans Req ....    5 30:Recal Point ..........    0
```

To display a parameter, type the <**PARAM**><**X**>. X= the parameter number as listed above.

To set a parameter type <**PARAM**><**X**><**Y**>

X = Parameter number
Y = Desired value

| Parameter Command | Definition |
|---|---|
| 1 Height Threshold | Sets the minimum height of an individual lval (line value) before that lval can be used in building a line segment |
| 2 Minimum Height | Sets the minimum height of a line segment, before that line segment can be used in building a box structure |
| 3 Minimum Lval | Sets the minimum number of lvals required to make up a line segment |
| 4 Maximum Deviation | Displays the maximum deviation allowed from the tallest point in the scan line |
| 5 Pproc Mode | Should be set to zero. Turns on/off various sections of the PPROC module |
| 6 Maximum Break | |
| 7 Minimum Dimension | Displays the minimum box dimension for a valid DIM |
| 8 Learn Active | Turns the application of the LEARN settings ON/OFF |
| 9 Ignore Low Count | LVAL count with which to trim the scan line on the leading side |
| 10 Ignore High Count | LVAL count with which to trim the scan line on the trailing side |
| 11 Tracking Mode | Type this command and a value of 1 or 0 to define the point where tracking begins<br>0 = Leading edge tracking (not recommended)<br>1 = Trailing edge tracking |
| 12 TX Tach/Time | Sets the transmit point referenced from the photoeye |
| 13 Heart Beat | Sets the Host heart beat timing in msecs. |
| 14 Watch Mark | Sets the watch point for DEBUG 0x01, this value is set by AUTOCAL and should not be changed |
| 15 COM1 Assignment | |
| 16 COM2 Assignment | |
| 17 COM3 Assignment | |
| 18 COM4 Assignment | |
| 0 | Disable – port is shut off |
| 1 | Console – DM-3000 Diagnostic Display |
| 2 | Host – Personality programmable HOST port |
| 3 | Custom |
| 4 | Aux – Auxiliary non-programmable HOST ports |
| 5 | FedX |
| 6 | RPS |
| 7 | CERT |
| 8 | ADP – Advance Diagnostic Package |
| 9 | KOSAN |
| 10 | Cascade – Multiple DM-3000s over different belt |
| 11 | Vertsti – Vertical STI light curtain emulation |
| 12 | Horzsti – Horizontal STI light curtain emulation |
| 13 | Focus – Advanced stepper focusing emulation |
| 14 | Peer – DM-3000s over same location |
| 15 | Modem – Consoled through modem link |
| 16 | Link – 5400 link port |
| 17 | SLAVE – Multiple DM-3000s over same belt |
| 18 | SCANNER 1 |
| 19 | SCANNER 2 |
| 20 | SCANNER 3 – Scanner/MUX input ports |
| 19 Area Tolerance | Displays the allowable percent error in raw versus calculated areas before reprocessing |
| 20 Focus Offset | Displays the offsets from scan line to focus output transmission |
| 21 Trigger Offset | Displays offset from photoeye to virtual photoeye |
| 22 PE Offset | Displays offset from DM-3000s photoeye to its scan line |
| 23 PE Adjustment | Turns on/off PE adjustment |
| 24 Truness Region Pass1 | Allowable deviation from raw image to calculated side during pass1 of ALGO |
| 25 Truness Region Pass2 | Allowable deviation from raw image to calculated side during pass2 of ALGO |
| 26 Position Offset | Used to offset (across the belt) the focusing information. |
| 27 Height Calc Mode | Used to determine the height of the line segment from the lval data<br>0=Average of all valid lvals<br>1= Average of the top 5 lvals<br>2=Average of the top 10 lvals |
| 28 Minimum QQ Req | Minimum QQ before NODIM occurs |
| 29 Minimum Scans Req | Minimum number of scan lines before NODIM occurs |
| 30 AuxTracking | |
| 31 Aux Offset | |

## RECAL POINT

Not USED.

### PARIO

Used to display to parallel input port's data.

### PEADJ [ON|OFF]

Turns on/off the photoeye adjust feature.

### PERSON [TYPE[LEN]] [TYPE[LEN]] [TYPE[LEN]] ... -

Sets the personality of the programmable host port.

**0 PERSON_DONE -** Terminate the PERSON string.
**1 PERSON_LENGTH -** Length of box.
**2 PERSON_WIDTH -** Width of box.
**3 PERSON_HEIGHT -** Height of box.
**4 PERSON_CALC_AREA -** Calculated area of box before photoeye fit.
**5 PERSON_RAW_AREA -**Raw area of image.
**6 PERSON_CALC_VOL -** Calculated volume of box before photoeye fit.
**7 PERSON_RAW_VOL -** Raw volume of box.
**8 PERSON_FINAL_AREA -** Final area of box.
**9 PERSON_FINAL_VOL -** Final volume of box.
**A PERSON_QQ -** QQ of box.
**B PERSON_CHAR -** Single character to follow

ex:
6.16L X 5.24W X 4.07H QQ=98 SCALE = 100
PERSON = 1 3 2 3 3 3 0 0
OUTPUT = "616524407"
PERSON = 1 3 B 2C 2 3 B 2C 3 3 0 0
OUTPUT = "616,524,407"
PERSON = 1 3 B 4C B 20 2 3 B 57 B 2C 3 3 B 48 0 0
OUTPUT = "616L 524W 407H"

### PINDEX

Type <**PINDEX**> to display current setting of PINDEX, which controls the allocation of scan. This indicates how much you offset the index pulse so mirror facets synch up with the camera.

### PORTID

Type <**PORTID**> to cause each serial port to transmit its ID.

### QUIT

Type <**QUIT**> to log yourself out of the console.

### RAWTACH

Type <**RAWTACH**> to display the time between the last tach pulse.

### REBOOT

Type <**REBOOT**> to reboot the DM-3000.

### RELAY

Type <**RELAY**> to set relay polarity and duration.

### RPS

If you have an RPS DM-3000, type <**RPS**> to display custom RPS settings.

### RELOAD

Type <**RELOAD>** to reload the setup parameters from the EEPROM.

### SAVE

Type <**SAVE**> to save the setup parameters to the EEPROM.

### SCALE

Type <**SCALE**> to set the output scale of the HOST message. Sets where to round off or what to convert measurements to.

### SFACTORS

Type <**SFACTORS**> to view the slave's adjustable parameters.

### SLAVE

Type <**SLAVE**> to send raw messages over the HSP to the slave processor.

### SLVBOOT

Type <**SLVBOOT**> to reboot the slave processor.

### SPACING

Type <**SPACING**> to display information concerning the spacing of the packages.

### SYSID [""]

Type <**SYSID**> <""> to display/set the system ID. Allows you to name the unit.

### SYSTEM

Type <**SYSTEM**> to display internal background counters, to determine the system load characteristics.

### TACH

Type <**TACH**> to display the value of the internal tach counter.

### TX[PORT] [MESS]

Type <**TX> <PORT**> <**MESS**> to transmit a message out of a specified port.

### WATCH

Type <**WATCH**> to display the watch point for DEBUG 0x01, this value is set by AUTOCAL and should not be changed by the end user.

### ZLL

Type <**ZLL**> to dump the laser log to the console.

This command takes the DM-3000 off line for several seconds, and will cause xilinx overflows and lost boxes.

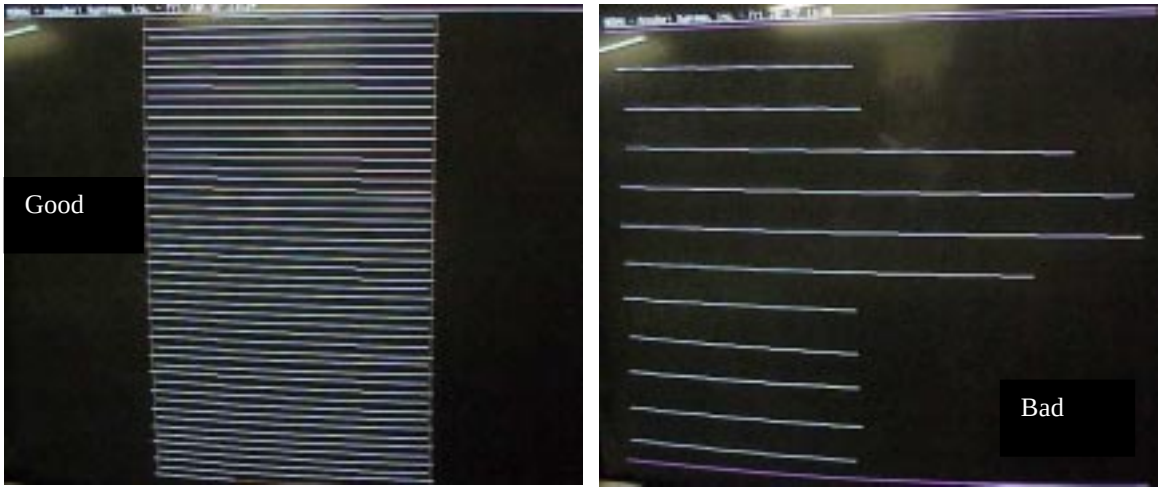
## MDRAW

The Mdraw function of the DM-3000.EXE allows you to analyze collected box data. To use Mdraw, type <**DM3000**> <**Mdraw**> <**filename**> of a file to which you have been logging box data. This allows you to analyze the data that has been logged. Each entry is a box record. Each box looks like the data below:

```
0-                  0: (  194,148 ) (196, 148) (  2,0   )  29
```

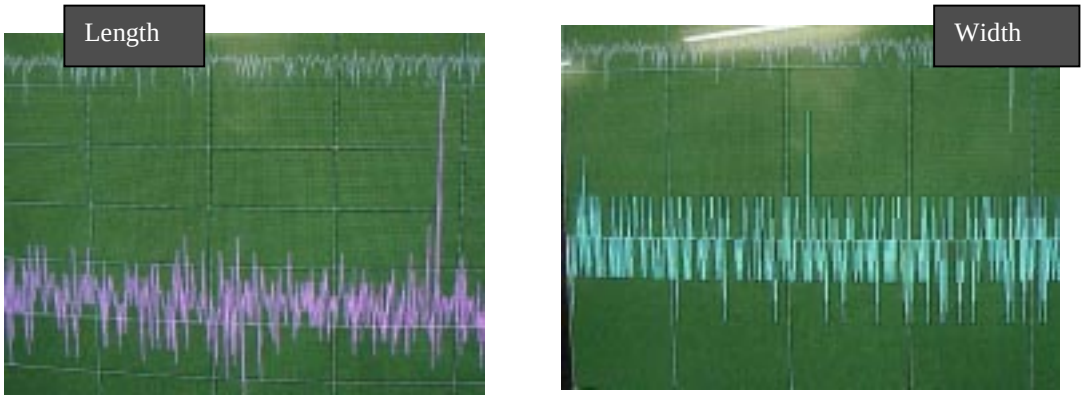
| | |
|---|---|
| 0- | Mdraw programs box count |
| 0: | Cart count assigned to the box |
| 194 | Calculated Lval in 1/16 |
| 148 | Calculated Lval in 1/16 |
| 196 | Final length of the box |
| 148 | Final width of the box |
| 2 | Difference between calculated and final length |
| 0 | Difference between caluclated and final width |
| 29 | Code Quality (Code quality is a system value between 0 and 99 that indicatees the quality, 0 is not good, 99 is excellent) |

Use the up/down arrows to select a record and press <**ENTER**> to look at the box data for that record.




Each time you press any key on the PC a clearer outline of the box appears. The box outline takes into account the Photoeye clear and brake. The image will synch with this photoeye data.

You can also view a graph of the length, and width., type <**ALT**><**L**> to display a graph of the length of the boxes, and <**ALT**><**W**> to display a graph of the width. Type <**ALT**><**G**> to display a graph showing both. The graphs will look something like the samples below:




*Length, Width or Both Illustration*

## Chapter Four ▼ *Contents*

## TROUBLESHOOTING PROCEDURES

There are two basic levels of troubleshooting the dimensioning system. After you determine the problem, follow the removal and replacement steps documented in Chapter 6.

**Level 1** - Something is wrong with the system and you need to determine which device is not working: DM-3000, Photoeye, Tachometer, other.

**Level 2** - A specific problem exists with the device and you need to determine what the cause of the problem could be.

## BASIC DM-3000 TROUBLESHOOTING

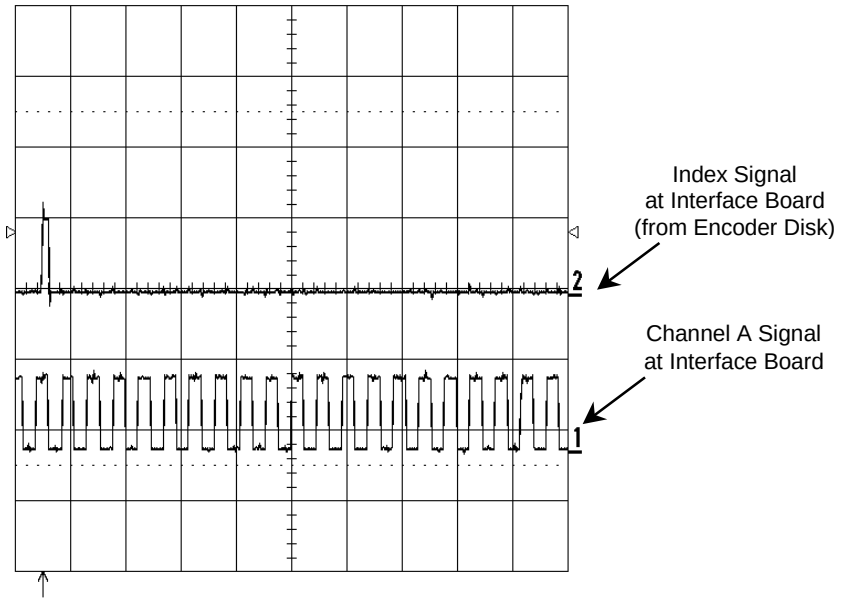
Use the table below to determine the resolution to some basic problems with your DM-3000. This table assumes that the DM-3000 is properly connected to all other necessary devices and AC power and that the unit is turned on.

| Problem | Checks | Resolutions |
|---|---|---|
| Idle LED does not blink, but the DM-3000 is running. | Check the Logic board | Replace the Logic board |
| Laser LED is not on | Look for laser beam exiting unit<br>Provide a tachometer pulse to the DM-3000<br>Enter Locklaser<br>Verify master switch is on<br>Verify beam attenuator is in place<br>Verify remote interlock is in | If all of the checks are in place, replace the VLD |
| Laser is on, but the DM-3000 is not dimensioning properly or it is receiving NODIMS | Verify Laser power, by typing < **A2D**> should be 23mW or more for Class IIIB | If laser power is not sufficient, replace VLD |
| Data is not being transmitted | Check DM-3000 is transmitting to the 5800 by typing <**DM3000**<**TERM**><**Port ID**> of the port that is connected to the 5800 (2). | If not transmitting, replace Logic board |
| PE is not working | Check alignment of Accu-Eye (follow procedure in Chapter 5)<br><br>If aligned properly, block Accu-Eye and verify PE LED toggles | If all of the checks are okay and PE is still not working, replace PE<br><br>If replace PE and still not working, replace Interface board |
| Tachometer is not working | Check belt is running<br><br>Check belt speed is correct, type <**DM3000**><**TERM**><**BSPEED**> to verify<br><br>If belt speed is too slow, make sure tach is seated properly and not turned sideways | If all of the checks are okay, check Interface board |
| No dimensioning | Type <**DEB9**>, if not parabola appears, check the HSP interrupt should be between 35 and 36K<br><br>If HSP is less than 35 or 36K, check LVAL Signal, testpoint TP14 or LVAL on Logic board (see **Figure 7-4**) | |
| No dimensioning | Check Channel A signal on Interface board<br><br>Check Index signal on Interface board<br><br>Check Exsync signal on Logic board<br><br>Check LVAL signal on Interface board | If signals are not correct, replace encoder |

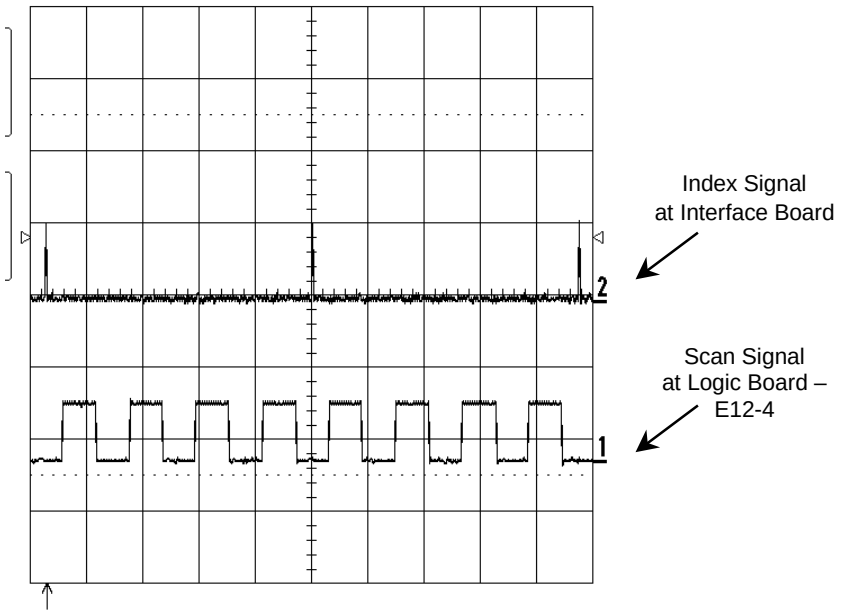
| Problem | Checks | Resolutions |
|---|---|---|
| No dimensioning | Check MCLK<br>And<br>CCLK signals on Logic board | If signals are not correct, replace encoder |

E Channel A and Index signals come from the Encoder and generate Exsync signal. Exsync signal generates LVAL in camera if MCLK is present. Camera also generates CCLK signal.

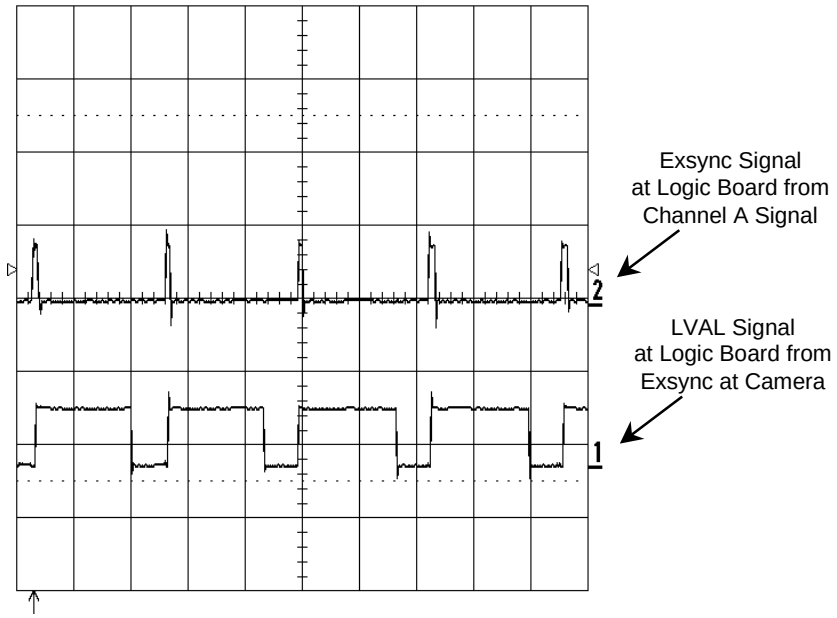
Channel A and Index signals from encoder generate SCAN in Xilinx.



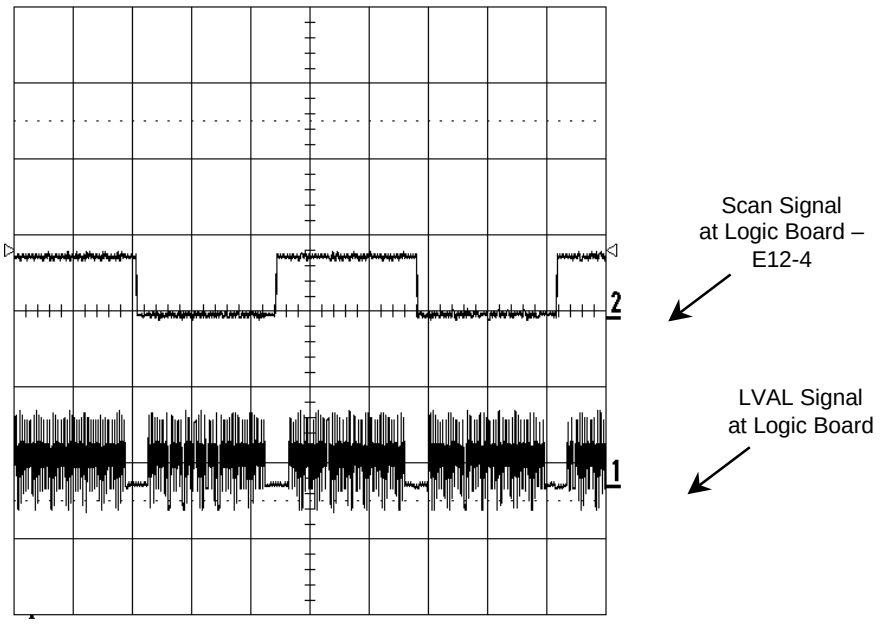

*Index/Channel A Signals*
*Both of these signals are generated by the encoder.*




*Index/Scan Signals*
*Index generates Scan in Xilinx*




*Exsync/LVAL Signals Xilinx creates Exsync from CH.A*
*Camera responds to Exsync with LVAL*




*Scan/LVAL Signals*
*The DM-3000 requires SCAN, LVAL and camera data to output dimensions to the console port.*

## DM-3000 SCAN SIGNAL AND OTHER DIAGNOSTICS

### DEBUG <VALUE>

Type <**DEBUG**> and a debug value. The value entered after the command is a 32bit hexadecimal bitmapped value. The first four bits are a command to the pproc module. All the other bits can be set separately, with each bit turning on the diagnostics for individual modules. Here is a list:

XXXX XXXX XXXX XQYU MRQL HFBA ESGT DDDD
DDDD - PreProc Diagnostics

| | |
|---|---|
| 0000 | preproc diagnostics off |
| 0001 | Watch mark enable |
| 0010 | raw scan to text screen |
| 0011 | normalized/thresholded scan to text screen |
| 0100 | learned scan to text screen |
| 0101 | rethresholded/filtered scan to text screen |
| 0110 | SBS scan to text screen |
| 0111 | processed lines to text screen |
| 1000 | normalized scan to graphics screen |
| 1001 | raw scan to graphics screen |
| 1010 | normalized/thresholded scan to graphics screen |
| 1011 | learned scan to graphics screen |
| 1100 | rethresholded/filtered scan to graphics screen |
| 1101 | SBS scan to graphics screen |
| 1110 | processed lines to graphics screen |
| 1111 | log lines data |

| | |
|---|---|
| T | Turn background counters off |
| G | Gathering diagnostics |
| S | Box state diagnostics |
| E | Algo error diagnostics |
| A | Algo indicators |
| B | Break Box and photo eye diagnostics |
| F | Focus Diagnostics |
| H | Host Diagnostics |
| L | Link Diagnostics |
| Q | Dump All |
| R | Best fit, and pe |
| M | Output Machine Readable Data |
| U | Scanner Mux diagnostics |
| Y | Raw AccuEye Image dump |
| Q | QQ diagnostics |

### DERROR

Type <**DERROR**> to display the last 500 events that have occurred within the system.

DERR output is in the following format:
TTTT CCCC EVENT

TTTT - is the number of seconds since powerup.
CCCC - is the diagnostic count of the event.
EVENT - is ascii representation of the event.

## DEBUG SHORTCUT FOR MOST COMMON LEVELS

1 = Used to check variation /calibration
9 = Used to check raw data (F9 for graphics)
A = Used to check processed data
F = Used to check height/width accuracy
200 = Used for photoeye diagnostics
800 = Used for host diagnostics
8800 = Mdraw log
10000 = MUX diagnostics

| EVENTS: | |
|---|---|
| PWRUP | Powerup |
| STACK | stack overflow |
| MXBOX | no free box slots when a new box was started |
| ROVR1 | receive overflow on port 1 |
| ROVR2 | receive overflow on port 2 |
| ROVR3 | receive overflow on port 3 |
| ROVR4 | receive overflow on port 4 |
| RP1ER | receive packet error on port 1 |
| RP2ER | receive packet error on port 2 |
| RP3ER | receive packet error on port 3 |
| RP4ER | receive packet error on port 4 |
| PFRM1 | receive packet framing error on port 1 |
| PFRM2 | receive packet framing error on port 2 |
| PFRM3 | receive packet framing error on port 3 |
| PFRM4 | receive packet framing error on port 4 |
| B2BIG | box size was in violation of expected |
| B2SML | box size was too small |
| ERSCN | incorrect scan count |
| BARRR | Check pointer barrier violation |
| NVIRT | box did not have a virtual line |
| LFPER | a box line was made from a single point |
| CARTO | cart overflow |
| CARTS | cart too small |
| CARTE | cart error |
| CARTD | cart double |
| ALGOL | algo late error |
| TAXED | over use of processor |
| MSMIS | slave missed an ack |
| INTSL | initializing slave |
| HSPTM | high speed serial link to slave timedout |
| SFACT | slave factors failed to load |
| SLBDI | slave bad interrupt |
| SLSTK | slave stack overflow |
| SLTXO | slave transmit overflow |
| SLINV | slave invalid command |
| XILXO | xilinx overflow |
| BDAVG | bad average |
| LZRON | laser on |
| LZOFF | laser off |
| SQOV1 | Scanner1 queue overflow |
| SQLG1 | Scanner1 packet too large |
| SQMT1 | Scanner1 packet did not mate with box |
| SQNM1 | Scanner1 no message |
| SQOV2 | Scanner2 queue overflow |
| SQLG2 | Scanner2 packet too large |
| SQMT2 | Scanner2 packet did not mate with box |
| SQNM2 | Scanner1 no message |
| SQOV3 | Scanner3 queue overflow |
| SQLG3 | Scanner3 packet too large |
| SQMT3 | Scanner3 packet did not mate with box |
| SQNM3 | Scanner1 no message |
| MINQQ | QQ too small |
| MINSC | Not enough scans |
| NODIM | No dimensions at tx |
| EEFAL | Last command didn't pass |
| LLFUL | Laser log is full |
| LZFAL | Laser Failure |
| STATE | System state change |
| PENOZ | Photoeye Noise |
| MOTOR | Motor failure |
| MQOVR | Message queue overflow |

## DIAG

Type <**DIAG**> to dump all of the system diagnostic counters to the console. The first line tells the user the state of the laser and algorithm subsystem, in addition it displays the system hours. The second line shows the system grade, which is recorded during the FINETUNE command.

Below is a list of all of the DM-3000 system messages and a definition for each.

| | |
|---|---|
| SCC Buffer Overruns | Number of times an incoming character was lost due to the buffer being full, displayed for each port. |
| SCC Packet Errors | Number of packet start errors for each port. A packet is a set of data for a box. This error is logged when box data is not framed. |
| SCC Packet Framing | Number of unframed characters that came in for each port. |
| Max Boxes | Number of times the ALGO subsystem attempted to start a new box, but no unused box_structures were available. this may occur when there are too many different heights for system to dimension a box. |
| Box Too Large | Number of times incoming images exceeded the max size. |
| Box Too Small | Number of times incoming images violated the min. size. |
| Xilinx FIFO Overflows | Number of times the xilinx buffer overflowed. Too much data. |
| Wrong Scan Count | Number of times the slave/xilinx sent improperly formatted scans to the master. |
| Corrupt Code Count | Number of times the static code/data sections failed CRC/BCC checks. |
| Barrier Violation Count | Number of times corrupt data was found between our malloc (memory allocation) memory sections. |
| Stack Error Count | Number of times the master overran its stack |
| FVIRT Error Count | Number of times no photoeye data was available for a box. |
| BVIRT Error Count | Number of times invalid data was entered for the read photoeye break. Something blocked the PE, but there is nothing to dimension |
| Cart Queue Overflow | Number of times new cart images were thrown away due to the internal queue being full. |
| Cart too small | Number of times cart images violated the minimum size. CART was blocked, but not long enough to be a box |
| General Cart Error | Number of times ALGO requests a transmit of a nonexisting cart image. If you see a box, but nothing blocked the PE. |
| Late Dimensions | Number of times ALGO requests a transmit of a carton which was already transmitted. Tracking is out of sync. |
| Slave Bad Interrupts | Number of interrupts the slave could not interpret. Slave processor may be overloaded. |
| Slave Stack Overflows | Number of times the slave stack overflowed |
| Slave Transmit Overflows | Number of times the slave transmit buffers were full, when it was time to transmit another LVAL. |
| Slave Invalid Commands | Number of invalid commands the slave received from the master. |
| Slave Missed Acks | Number of times the slave did not respond to an REQACK (Request for ACK). |
| HSP Timeouts | Number of times the slave did not pickup a serial word (chunk of data) from the master via the HSP serial link. |
| Failed Slave Factors | Number of times the master could not verify the slave's adjustable parameters |
| Bad Averages form Xilinx | Number of times the slave/xilinx reported bad camera averages. |
| Software Errors | Number of times invalid software conditions occurred |
| NODIM's | Number of NODIM transmits. |
| Minimum Quality Errors | Number of Min QQ NODIMS. |
| Minimum Scan Errors | Number of Min Scan NODIMS. Acceptable number of good scans |
| Stack Used in Percent | Percent of the stack used on the master processor. |
| Double Cart Errors | Number of mismatched cart/box images. This error may occur when two boxes are too close together and may<br>appear to the DM-3000 as one long box. |
| Xilinx Load | Current count of unprocessed LVAL words. At a certain point in time a single digit value of unprocessed Xilinx data. |
| Bad Interrupts | Number of unrecognized interrupts. |
| Xilinx Load Height | Highest amount of unprocessed LVAL words since DM-3000 was turned on |

ex:

```
   DM-3000 DIAG:  1.21 hours (2 syshours),  Laser Locked,  On,. Algo.
Inactive.
   System Grade : 0
   SCC Buffer Overruns ...... 0  0  0  0
   SCC Packet Errors ........ 0  0  0  0
   SCC Packet Framing ....... 0  0  0  0
   Max Boxes ................ 0   Box Too Large ............ 0
   Box Too Small ............ 0   Xilinx FIFO Overflows .... 0
   Wrong Scan Count ......... 0   Corrupt Code Count ....... 0
   Barrier Violation Count .. 0   Stack Error Count ........ 0
   NVIRT Error Count ........ 0   LFPER Error Count ........ 0
   Cart Queue Overflow ...... 0   Cart too small ........... 0
   General Cart Error ....... 0   Late Dimensions .......... 0
   Slave Bad Interrupts ..... 0   Slave Stack Overflows .... 0
   Slave Transmit Overflows . 0   Slave Invalid Commands ... 0
   Slave Missed Acks ........ 0   HSP Timeouts ............. 0
   Failed Slave Factors ..... 0   Bad Averages from Xilinx . 9
   Software Errors .......... 0   NODIM's .................. 0
   Minimum Quality Errors ... 0   Minimum Scan Errors ...... 0
   Stack Used in Percent ....12   Double Cart Errors ....... 0
   Bad Interrupts.............0   Unmated Aux Images ....... 0
   Unmated PE Images..........0   Aux Server Overflows ..... 0
```

## Chapter Five ▼ *Contents*

## REPLACING/ADJUSTING PARTS

These procedures should be performed by a trained technician. Technical Training is provided by Accu-Sort Systems.

Measures must be taken to prevent Electrostatic Discharge (ESD) at all times when the cover is off theDM-3000. Circuit Boards are at the most risk. *See Safety Recommendations and Precautions - Electrostatic Discharge.*

Based on any troubleshooting or regular maintenance you perform, the following parts may need to be replaced:

| Qty | Component |
|---|---|
| 1 | Motor Controller |
| 1 | Motors and Mirror Wheels |
| 2 | Switching Power Supply |
| 1 | Encoder Sensor |
| 1 | Camera |
| 1 | VLDs |
| 1 | Interface Board |
| 1 | Logic Board |

**WARNING! The information provided in this installation and service manual is for trained service personnel only! There are no user serviceable parts inside this box! Do not attempt to open the unit or perform any service procedures unless you are a trained technician!**

Each of these components is discussed in more detail later in this chapter.

## SPECIAL TOOLS REQUIRED

Special tools are required to perform the DM-3000 removal, replacement and adjustment procedures. They are listed below:

- Digital Multimeter with frequency counter
- Oscilloscope
- Laser Power Meter
- Portable PC
- Radio Frequency Alignment Tool (Tweeker)
- Basic hand tools - Needle Nose Pliers
  Phillips Head and Flat Head Screwdrivers
  Socket wrench, etc.
  Allen Key
- Mechanical Trigger Switch
- ESD equipment - Antistatic Mat
  Antistatic Bags
  Wrist Strap

## DM-3000 REMOVAL AND REPLACEMENT

If after troubleshooting the system, you determine the need to remove and replace a DM-3000 unit, follow the procedure below:

**WARNING! The information provided in this installation and service manual is for trained service personnel only! There are no user serviceable parts inside this box! Do not attempt to open the unit or perform any service procedures unless you are a trained technician!**

Injury or death to personnel may occur due to electrocution or moving parts on the equipment. To prevent such an occurrence, perform the safety lockout procedure before attempting any procedures that require power to be removed from the system.

1. First perform the Safety Lockout Procedure.
2. Disconnect all of the connectors from the DM-3000 Unit.
3. Using a 1/4" wrench to remove the four nuts holding the DM-3000 to the rubber shock mounts. Also remove the flat and lock washers located under each nut.

Do not loosen or move the shock mounts, as the replacement unit will not drop into place properly, if you do.

Injury or death to personnel may occur due to electrocution or moving parts on the equipment. To prevent such an occurrence, check the area for personnel before restoring power.

4. Remove the unit.
5. Re-install the new or repaired DM-3000 unit onto the shock mounts. Make sure the dimensioning unit is parallel to the belt and the scan line is perpendicular to the conveyor.
6. Re-install the four sets of hardware in the following order: flat washers, lock washers, and nuts.
7. Tighten the nuts firmly with a 1/4" wrench.
8. Reconnect all of the connectors to the DM-3000 Unit.
9. Perform the calibration procedure as documented in the shipkit document.

## GETTING TO THE COMPONENTS OF THE DM-3000

There are three compartments in the DM-3000, they are as follows:

- Board Compartment
- Power Supply Compartment
- Optics Compartment

How to get into each of these compartments is described in the following sections. Before performing any of the following procedures, perform your safety lockout steps, turn the power off and remove the power cord from the back of the unit.

### OPENING THE BOARD COMPARTMENT

The board compartment contains the DM-3000 Logic board, the Interface board, the Laser Power Meter board and the camera and laser diodes. Follow these steps:

1. Remove the four Phillips head screws that surround the interface panel on the back of the DM-3000.
2. Remove the top cover of the DM-3000.
3. Loosen the two flat head screws on the logic assembly and fold up the Logic board.

You now have access to all of the circuit boards of the DM-3000.

### OPENING THE POWER SUPPLY COMPARTMENT

You must have access to the bottom of the DM-3000 in order to get to the Power Supply.

1. Remove the seven cap flat head screws from the bottom covering of the DM-3000.
2. Remove the bottom covering.

You can now check or remove the Power Supply.

### OPENING THE OPTICS COMPARTMENT

To get to the optics of the DM-3000 you must gain access to the front of the unit (opposite the connector panel).

1. Now remove the two cap button head screws from the front cover of the unit.
2. Pull the cover towards you to remove it.

Use caution when working with the optics.

### REMOVAL AND REPLACEMENT OF THE ENCODER SENSOR

Follow these steps to replace the Encoder:

1. Turn power to the DM-3000 off and disconnect from the AC outlet.
2. Remove the front cover.
3. Remove the top cover.
4. Disconnect P1 from the Interface board. It may be necessary to lift the logic assembly to gain access to the Interface board. To do this, undo the two flat head screws holding the logic assembly in place.
5. Loosen the screw in the coupling that tightens the coupling onto the encoder shaft.
6. Remove the four screws that hold the encoder in place.
7. Gently remove the encoder from the casting. There may be some resistance in removing it from the coupling. Try not to wiggle the encoder.
8. Replace with new encoder. Make sure that the encoder is on as far as it will go.
9. Re-attach the encoder with the four screws that were taken out in step 5.
10. Tighten the screw on the encoder.
11. String the cable labeled P1 in through the casting and attach it to the Interface board.
12. Plug power into the unit and turn the DM-3000 on.
13. Connect Console port of the DM-3000 to a PC. Run the TERM program by typing <**DM3000**><**TERM**>.
14. Type <**LOCKLASER**> to turn the laser on for one hour.
15. Place a long flat object with a reflective surface and length of 40 inches under the unit.
16. Type <**AUTOCAL**>. The password for this command is <**AASIA**>.
17. Type <**SAVE**>. The password for this command is <**SASIS**>.
18. Type <**FINETUNE**>. The password for this command is <**FASIF**>.
19. Type <**SAVE**>. The password for this command is <**SASIS**>.

### REMOVAL AND REPLACEMENT OF THE DM-3000 VLDS

To replace the Laser Diode on the DM-3000 follow these steps:

MUST follow precautions in ASNI Z136.1 standard for safe use of lasers. These precautions include hazard evaluations of laser work areas, control measures, approval of standard operating procedures, recommended and approved safety equipment, signs, labels, and safety education.

1. Turn the power off to the DM-3000 and unplug from the AC outlet.
2. Remove the back and top cover of the DM-3000.
3. Loosen the two Flat Head screws that hold down the Logic Plate Support for the Logic Assembly. Now lift up the logic assembly until it locks in position.
4. Remove the cable from the Laser Diode Assembly. Do this by applying equal pressure to all four wires of the cable.
5. Remove the two or three screws from the Laser Diode Block (depending on when your unit was built). You cannot just remove the board. The whole assembly must be removed.
6. Now replace with the new Laser Diode Assembly.
7. Re-attach with the screws removed in Step 5.
8. Re-attach the cable to the Laser Diode Assembly.

**9.** Remove the seven screws holding the bottom cover in place.
**10.** Remove the bottom cover.
**11.** Plug in power and turn on the DM-3000.
**12.** Log in to the unit using the Term program.
**13.** Type <**LOCKLASER**> to lock the laser on for one hour.
**14.** Place a long, flat, reflective surface underneath the scanline.
**15.** Type <**DEB 9**>.
**16.** Press <**F9**> to enter graphics mode. There should be a parabola present on the screen. It should be a solid green line. If any points drop out, adjust the two 5/64 screws located on the top and bottom of the casting directly in front of the camera. This is a very small adjustment.
**17.** Next, place a dark color such as black or dark blue towards the edge of the scan line. If any points drop out, make the adjustments in step 17.
**18.** Turn power off and remove the power cord.
**19.** Lower the Logic Assembly and tighten the 2 flat head screws into place.
**20.** Put the top cover on and tighten the 4 Phillips screws into place.
**21.** Assemble the lower cover to the unit using the 7 screws previously removed.

### MOTOR CONTROLLER BOARDS

To replace the Copley Motor Controller board, follow the steps below:

**1.** Turn off the power to the DM3000 and unplug from AC outlet.
**2.** Remove the front cover.
**3.** Remove the following cables from the Motor Controller: P1, P2, P3.
**4.** Loosen the screw closest to the inside of the unit, holding the Motor Controller. It is not necessary to remove this screw.
**5.** Remove the screw holding the Motor Controller in that is closest to the front of the unit.
**6.** Place new Copley board into the unit.
**7.** Put the front screw in and tighten the other screw.
**8.** Attach cables P1 to J1
P2 to J2
P3 to J3
**9.** Replace the front cover and attach with the two screws that were removed earlier.
**10.** Turn on and plug AC power in.

### MOTORS AND MIRROR WHEELS

To replace the mirror wheel, follow the steps below:

MUST follow precautions in ASNI Z136.1 standard for safe use of lasers. These precautions include hazard evaluations of laser work areas, control measures, approval of standard operating procedures, recommended and approved safety equipment, signs, labels, and safety education.

**1.** Turn off the DM3000 and unplug AC power.
**2.** Remove the front cover.
**3.** Loosen the set screw on the coupling that connects the encoder shaft to the mirror wheel shaft.
**4.** Remove the four screws holding the encoder in place.
**5.** Pull the encoder out gently. It may be necessary to gently wiggle the encoder.
**6.** Remove the four Phillips head screws from the encoder mounting plate.

1. Unplug J1 and J2 from the Copley motor controller.
2. Remove the orange wire from pin 4, J1.
3. Remove the white/black wire from pin 5, J1.
4. Slide the encoder mounting plate off.
5. Gently pull the Stator Motor Housing from the unit. Please take note that the Rotor part of the Stator Motor Housing is magnetized. The Rotor being magnetized tends to draw the Stator towards the casting quickly.
6. Loosen, but do not remove, the two screws on the Rotor.
7. You should now be able to remove the Rotor. Carefully slide it off the mirror wheel shaft.
8. Remove the eight screws from the mirror wheel cover.
9. Carefully slide the mirror wheel cover off.
10. Do not remove the window plate that is located under the mirror wheel.
11. Remove the three side screws from the mirror wheel shaft support. This is located on the side of the mirror wheel housing.
12. While holding onto the mirror wheel shaft support, slowly, carefully, and gently slide the mirror wheel out of the casting.

### 13. REPLACING THE CAMERA

14. Follow these steps below to remove and replace the DM-3000 Camera.

15. Turn power off and disconnect the DM-3000 from AC input.
16. Remove the top cover to the board compartment.
17. Remove the bottom cover to the power supply compartment.
18. Mark the current position of the camera by drawing or scoring a line along the camera bracket.
19. Remove blue ribbon cable from the top of the camera.
20. Remove the two shoulder bolts from the camera bracket.
21. Lift the camera gently away from the casting.
22. Loosen the two screws on the metallic connector located at the back, bottom part of the camera.
23. Replace with a new camera by attaching the metallic connector (camera to logic assembly) to the camera.
24. Remount the camera assembly by lining up the line on the casting. Put in and tighten the two shoulder bolts.
25. Affix the blue ribbon cable to the camera observing the pin 1 located toward the outside of the unit.
26. Reconnect power to the DM-3000 and turn the unit on.

### ADJUSTING THE CAMERA AFTER REPLACEMENT

1. Place a long, flat, reflective surface under the unit.
2. From the term program, log into the unit.
3. Type <**LOCKLASER**> to lock the laser on for one hour.
4. Type <**DEB 1**>.
5. Shift the camera left and right until the number at the far left (Xilinx count) is between 125 and 300.
6. Type <**DEB 9**>.
7. Press <**F9**> to enter graphics mode. There should be a parabola present on the screen. It should be a solid green line. If any points drop out, adjust the two 1/8 screws located on the top and bottom of the casting directly in front of the camera.

8. Place a dark color such as black or dark blue towards the edge of the scan line. If any points drop out, make the adjustments in step 20.
9. When the camera lens is fully aligned, remove the dark colors from the scan line. Press <**F9**> to exit the graphics mode.
10. Type <**DEB 0**>.
11. Type <**AUTOCAL**>. The password for this command is <**AASIA**>.
12. Type <**SAVE**>. The password for this command is <**SASIS**>.
13. Attach the vertical calibration fixture (DM3-68) to the unit.
14. Type <**CAMERA CAMSET**>. The password for this command is <**CASIC**>.
15. Type <**SAVE**>. The password for this command is <**SASIS**>.
16. Place a long, flat, reflective surface under the unit.
17. Type <**FINETUNE**>. The password for this command is <**FASIF**>.
18. Type <**SAVE**>. The password for this command is <**SASIS**>.
19. Turn the unit off and remove the power plug.
20. Put the bottom cover onto the unit, securing it in place with the seven screws taken out earlier.
21. Lock the logic assembly back into place and secure the two flat head screws.
22. Put the top cover back on and secure it with the four screws located on the back of the cover.
23. Reconnect power to the DM-3000.

### REPLACING THE SWITCHING POWER SUPPLY

Parts involved: NFS110-7604P Power Supply, 100-240VAC

1. Unplug the power cord from the DM-3000.
2. Remove the bottom cover of the DM-3000 by removing the seven screws that hold it into place. Now remove the cover.
3. Disconnect the cables labeled P1 and P2
4. Remove the four screws holding the power supply in place.
5. Replace with the new power supply. Make sure that the connectors are facing the center of the unit.
6. Now insert and tighten the four screws that hold the power supply in place.
7. Re-connect the cable labeled P1 to the connector labeled J1and the cable labeled P2 to the connector labeled J2.
8. Replace the bottom cover and secure it with the seven screws.
9. Plug in power and test the unit's functionality.

### REPLACING THE POWER DISTRIBUTION BOARD

Parts Involved: DIMEN008A Power Distribution Board

1. Unplug power from the DM-3000.
2. Remove the bottom cover of the DM-3000 by removing the seven screws holding it in place.
3. Disconnect cables P1 and P2 from the board.
4. Remove the six screws holding the Power Distribution Board onto the rear panel of the DM-3000.
5. Put the new board in its place and attach the Power Distribution Board to the rear panel. Make sure that the lockwashers are placed under the screws on ground pads. These are located on the two right hand corners of the board.
6. Plug cable P1 onto connector labeled J1and cable P2 onto connector labeled J2.

7. Replace the bottom cover.
8. Re-attach the power cord to the DM3000 and power up and verify unit operation.

### REPLACING THE INTERFACE BOARD

Parts Involved: DIMEN012 Dimension Interface Board

1. Disconnect the power cord from the DM-3000.
2. Remove the top cover by loosening the four Phillips head screws and sliding the cover off in the direction of the interface board.
3. Loosen the two flat head screws that hold the Logic board Assembly in place.
4. Lift up the Logic board assembly.
5. Remove the connectors.

### REPLACING THE LOGIC BOARD

Follow these steps to remove and replace your DM-3000 Logic board.

1. While the DM-3000 is on and logged into DM-3000 TERM, press <**F6**> followed by <**2**>. This will download the settings from the unit to a file on your PC. You are prompted to name the file the settings are loaded into.
2. Type an appropriate filename and press <**ENTER**>. If the old logic board is causing the unit not to initialize, ignore this step.
3. Turn power off and disconnect the power cable from the DM-3000.
4. Open the circuit board compartment.
5. Disconnect the following cables from the logic board:
6. P5 (comm cable)
7. P6 (comm cable)
8. P7 (comm cable)
9. P8 (comm cable)
10. P100 (camera to logic cable)
11. P200 (logic to interface cable)
12. P251 (camera to logic cable)
13. P252 (camera to logic cable)
14. P110 (logic to laser power board)
15. Remove the six screws that hold the logic board in place.
16. Replace with a new logic board.
17. Re-insert the six screws in the logic board.
18. Reconnect all of the cables to the logic board:
19. P5 (comm cable)
20. P6 (comm cable)
21. P7 (comm cable)
22. P8 (comm cable)
23. P100 (camera to logic cable)
24. P200 (logic to interface cable)
25. P251 (camera to logic cable)
26. P252 (camera to logic cable)
27. P110 (logic to laser power board)
28. Plug the power cable back into the DM-3000.
29. Power up the unit and make sure that it initializes properly.
30. Log into the unit setup software by typing <**DM-3000**><**TERM**>.

**31.** If you were able to download parameters and settings as described in Step 1, press <**F6**> and <**1**> to upload them back into the unit.

### REPLACING THE DM-3000 FAN

Parts needed:DM3-08 DM3000 fan assembly

**1.** Unplug the power cord from the back of the unit.
**2.** Remove the bottom cover by removing the seven screws that hold it in place.
**3.** Loosen the four screws on the top cover and remove it.
**4.** Detach the wire labeled P9 from the interface board.
**5.** Remove the four screws from the fan assembly itself.
**6.** Now remove the fan.
**7.** Replace with new fan and the four screws.
**8.** String the wire labeled P9 through the hole in the base plate and attach to J9 on the interface board.
**9.** Replace the top cover.
**10.** Replace the bottom cover.
**11.** Plug power cord into DM-3000.
**12.** Turn unit on and verify fan operation.

## RECOMMENDED SPARE PARTS LIST

To order spare parts, contact the Accu-Sort Customer Service Department between 8 a.m. - 4:30 p.m. (EST) Monday - Friday, at:

***Phone:*** 1-800-BAR-CODE (ask for spare parts coordinator)
***Fax:*** (215) 723-1515

When ordering spare parts, ask for them by the following descriptions.

Italicized items are components of the non-italicized items directly above them.

| Part Number | Description | Recommended | Ref. Dwg. | Item # | Skill level |
|---|---|---|---|---|---|
| DIMEN008A | ASSY,PWR DISTRIBUTION BRD | Yes | 38749 | 8 | customer tech |
| DIMEN011 | ASSY, DM3000 LOGIC BRD | Yes | 38764 | 25 | asi tech |
| DIMEN012 | ASSY, DM3000 INTERFACE BRD | Yes | 38761 | 4 | customer tech |
| DIMEN013 | ASSY, LASER PWR METER BRD | Yes | 38764 | 26 | customer tech |
| 800-327 | BOARD,MOTOR CONTROL | Yes | 38764 | 23 | customer tech |
| 38748 | ASSY, DM-3000 VLD | Yes | 38760 | 17 | asi tech |
| CL-C9-0512A402M | DALSA LINE CAMERA | Yes | 38760 | 16 | asi tech |
| DM3-08 | ASSY, DM-3000 FAN | Yes | 38749 | 9 | customer tech |
| C-29819 | COVER, MX LC AIR FILTER | | 38749 | 7 | customer tech |
| A-29798 | FILTER, MX LC AIR | Yes | 38749 | 5 | customer tech |
| NFS40-7624 | 24V 40W SWITCHING PS | Yes | 38750 | 15 | customer tech |
| *2263.15* | *40W PS FUSE* | *Yes* | | | customer tech |
| NFS110-7604P | 110W SWITCHING PS | Yes | 38750 | 14 | customer tech |
| *313005* | *110W PS FUSE* | *Yes* | | | customer tech |
| DM3-40A | ASSY, MOTOR | | 38764 | 39 | return to factory |
| 38637 | MIRRORWHEEL,8-SIDED | | 38764 | 9 | return to factory |
| SR8SSG6-7 | BEARING | | 38764 | 45 | return to factory |
| MP2501 | PLUG,2.5MM CDRH | | 38764 | 43 | customer tech |
| 115140126 | KEY, CDRH | | | | customer tech |
| DM3-53 | ASSY, LPM SENSOR | Yes | 38764 | 40 | asi tech |
| DM3-03A | ASSY, DM3000 WINDOW FRAME | | 38764 | 27 | customer tech |
| DM3-07 | ASSY,DM3000 TACH | | | | customer tech |
| *RH-192/12C* | *DM-3000 TACHOMETER* | *Yes* | | | customer tech |
| *DM3-60* | *ASSY, DM-3000 TACH CABLE* | *Yes* | | | customer tech |
| DM3-45 | KIT,ACCU-EYE SHIP | | | | customer tech |
| *DM3-44* | *ASSY,ACCU-EYE RECEIVER* | *Yes* | | | customer tech |
| *DM3-42* | *ASSY,ACCU-EYE/EMITTER/CBL* | *Yes* | | | customer tech |
| 532B | CABLE, 110V POWER CORD | Yes | | | customer tech |
| C-7123-25M-GY | CABLE,220V POWER CORD | Yes | | | customer tech |
| DM3-50 | SHOCK MOUNT KIT | | | | customer tech |
| 41995 | SHIP KIT, PHOTOEYE TACH GEN. | | | | customer tech |
| *DM3-44* | *ASSY,ACCU-EYE RECEIVER* | *Yes* | | | customer tech |
| *DM3-42* | *ASSY,ACCU-EYE/EMITTER/CBL* | *Yes* | | | customer tech |
| *41542* | *CONTROLLER, PE TACH GEN.* | *Yes* | | | customer tech |
| *LDC15F* | *POWER SUPPLY* | | | | customer tech |
| *GP058* | *BOARD, PE TACH GEN.* | | | | customer tech |

## Chapter Six ▼ *Contents*

## MAINTENANCE TASKS

This chapter contains the information you need to service your unit properly.

The DM-3000 was specifically designed for a tough industrial environment. It is NEMA 12 rated, which means it is intended for indoor use primarily to provide a degree of protection against dust, falling dirt, and dripping non-corrosive liquids.

If the tasks outlined below are performed as recommended, the DM-3000 will continue to provide reliable operation. If you have followed all of the steps and your unit needs to be serviced, contact the Accu-Sort Customer Service Department (*refer to Customer Service in the front of this manual*).

## RECOMMENDED SUPPLIES

The following basic cleaning supplies are needed to perform proper preventive maintenance on the DM-3000.

| | |
|---|---|
| 1 Case | Acetone, technical |
| 1 Case | Alcohol, denatured |
| 1 Box | Bag, plastic, conductive envelope 12 in. |
| 1 Gross | Brush, solder |
| 1 Gross | Cloth, cotton, lint-free |
| 1 Case | Cotton swabs |
| 1 Case | Detergent, liquid |
| 1 Each | Faceshield |
| 1 Pkg. | Gasket material |
| 1 Each | Gloves, rubber |
| 1 Each | Goggle, safety |
| 1 Pkg | Labels, ESD package sealing (3M-7101) |
| 1 Each | Latch, Vise-action |
| 1 Kit | Lockout kit, safety |
| 5 gal | Mineral Spirits |
| Each | Pail, utility |
| Can | Solder |
| Spool | Tape, electrical, ½ in. wide |
| 1 Spool | Tape, reflective (3M-7900) |
| 1 Case | Towel, machinery wiping, lint-free |
| 1 Case | Towel, machinery wiping |
| 1 Case | Towel, paper, lint-free |

*Cleaning Supplies*

Do not use harsh cleaning solvents on scanner. They can cause damage to exit window or other parts of scanner.

## SPECIAL TOOLS REQUIRED

The following tools are required to inspect and perform basic preventive maintenance on the DM-3000.

- Digital Multimeter with Frequency Counter
- Radio Frequency Alignment Tool (Tweeker)
- Laser Power Meter
- Basic hand tools - Needle Nose Pliers
- Phillips Head and Flat Head Screwdrivers
- Socket wrench, etc.\
- Allen Key
- Canned Air

## DM-3000 PREVENTIVE MAINTENANCE TIME CYCLES

Perform the following preventive maintenance to your DM-3000 as indicated below:

| Time Cycle | Maintenance to Perform |
|---|---|
| Daily | Clean the exit window |
| | Check the LEDs are clean and working |
| | Check the power switch is connected properly and the wire clamp is in place |
| | Check the DM-3000 mounting connections are tight and the unit is relatively vibration free |
| Weekly | Check fan filter and clean if necessary |
| Monthly | Check error screens |
| | Check DM-3000 Diag or Derror |
| | Check the fan |
| | Check AC input voltage |
| Quarterly | Validate DM-3000 Calibration |

*PM Time Cycles*

## DM-3000 ADVANCED PREVENTIVE MAINTENANCE PROCEDURES

### DAILY

**Clean the exit window**
Wipe the dimensioning unit exit window with a mixture of 3/4 water and 1/4 alcohol using tissue paper or lint free towel.

This mixture should evaporate quickly so do not rub excessively to dry or you may scratch the exit window or display.

**Check LEDs are clean and working**

1. Using canned air, blow debris from the surface of the LEDs. Be careful to get in between each LED.
2. Wipe the surface of the LEDs with 3/4 water and 1/4 alcohol using tissue paper or lint free towel.

**Check the power switch is connected properly and the wire clamp is in place**

1. Flip the Power Cord Clamp up. Check to make sure it is connected properly to the DM-3000.
2. Insert the three prong connector in connection J1.
3. Pull the wire clamp down again to hold the power cable in place.
4. Check that all other connections are properly connected
5. Check the connections are tight and made to the ports of the DM-3000 as required.

It is strongly recommended that when performing troubleshooting or maintenance, you are running DM-3000 TERM.

**Check the DM-3000 mounting connections are tight and the unit is relatively vibration free**

1. Check the mounting structure of the DM-3000 is sound.
2. Check that all connections to the mounting structure are tight.

## WEEKLY

**Check Fan Filter and Clean**

Parts Involved: A-29798 MX LC Air Filter, C-29819 Air Filter Cover

1. Squeeze the sides of the Air Filter Cover. Pull back and the cover should
2. come off. If it doesn't, wiggle gently.
3. Remove the filter from the cover.
4. Wash the filter with water. No detergent.
5. Allow filter to dry.
6. Place filter back into cover.
7. Put assembly back into place.

## MONTHLY

**Check the Diagnostic Logs. Refer to Chapter Four for information.**

**Check the Error Screens**

1. Connect a portable PC to Port J4 of the DM-3000
2. Type <**DIAG**> or <**DERROR**> to display system errors
3. Review the Error Table in Chapter Four

**Check the Fan**

1. Remove the Fan and Filter assembly cover
2. Verify the fan is spinning
3. Replace the cover

**Check AC Input Voltage**

1. Unplug the DM-300 from the AC outlet.
2. Measure the voltages at the power connector.
3. You can also type <**A2D**> to view lists of power supply voltages.

### QUARTERLY

Validate the calibration by following the steps below to verify the DM-3000 setup:

1. Check all hardware mounting:
2. Make sure the scan line is perpendicular to belt
3. Make sure the photoeye is parallel with the scan line
4. Make sure the unit is in plane parallel with the belt
5. Make sure the unit is mounted at the proper height
6. Log into the unit and check <**DIAG**> for any system errors. Also check laser power with <**A2D**>. Run locklaser.
7. Place the horizontal calibration fixture on the belt and check graphics mode in DEB 9 to verify the smooth centered curve is present. If the screen shows only a scrolling flat line, a camera lens adjustment is most likely required. A blank screen (no points drawn at all) is usually an indication of a camera or logic board failure.
8. Check reference black as in setup. If the head can not see black, adjust the camera lens.
9. Remove the bar from the scan line and attach the vertical fixture. The average value reported at the far right of DEB 1 should be 220 +/- 1. If the value is outside this range, re-calibrate the unit.
10. Remove the vertical fixture and replace the horizontal bar. Graphics mode of DEB A should show a flat and level line across the screen. If the line is angled, go to setup and begin with the <**AUTOCAL**> step.
11. Place the test boxes in the scan line and check the height measurement using DEB F.
12. Check the setting of Ignore Low and High (PARAM 9 & 10) to verify the head can see to the edge of the belt, but not far beyond.
13. Run the test boxes and verify the reported dimensions are correct.

## Appendix A ▼ *Contents*

## EXTERNAL PC LOADER (LOADER.EXE):

Loader.exe is designed to run on a DOS based PC-compatible. It communicates with the DIMBOOT stub on the DM-3000, and allows the user to Load, Burn Flash, Download, and Verify code image files.

```
Output of 'loader /?':
---------------------------------------
Handles DM3000 flash functions.

LOADER [drive:][path][filename] [/S:baud] [/X] [/B] [/L] [/V]

[drive:][path][filename]   Specifies drive, directory, and/or files to
list.
        /S      Sets the communication baud rate (default is 115200).
          baud    Specifies the baud rate.
          /X      Extract the flash code from a DM3000 unit to the
          filename.
        /B      Send filename to DM3000 and burn the flash.
          /L      Serial bootload of filename
          /V      Verify filename is a DM3000 image file
        -----------------------------------
```

VERIFY IMAGE FILE (loader /V file.img):
The loader will verify that the file.img is a valid DM-3000 image file.

LOAD IMAGE FILE (loader /L file.img):
The loader will load the file.img in the DM-3000's external ram.
This feature allows the user to test new software without committing to burning the flash.

DOWNLOAD IMAGE FILE (loader /X file.img):
The loader will download the DM-3000's flash file and save the contents to the file file.img.

BURN FLASH (loader /B file.img):
The loader will upload file.img, and burn the image into the DM-3000's flash.

**NOTES:**
1. LOADER.EXE must never be used from ANY shell (this includes: DOS SUB-SHELLS, WIN3.1, WIN95, WIN-NT, OS2, etc).
2. Try to stay with the default baud rate, only on very old PC's will the user need to step down to a slower baud.
3. When the loader runs it creates a file called loader.log in the current directory. Please include this file when communicating a problem to ASI.
4. While the loader does attempt to place the DM-3000 in a know state before attempting download, it is still possible for the user to place the DM3000 into a mode at which the loader cannot take control. During the pre-powerup time before the flash image is booted is the only SURE way to sync the loader.exe program with the DIMBOOT module.

## INTERNAL BOOT LOADER

On powerup or reset the DIMBOOT program, which resides in eprom on the system's mother board, loads two program stubs into memory. One stub into internal memory, and another into external memory.

The first stub (internal) is run to validate that external memory is functioning. If memory passes all checks, the second stub (external) is booted. If memory fails then the system will lock, dump diagnostics out of com4:, and flash the LED's RED.

The second stub initializes com4: for 19200 8n1 and attempts to establish a communications link with the outside world.

At the end of a ten second timeout the second stub will validate the code contained in the flash and attempt to boot the image store there. If a valid image is not found the second stub will continue to attempt to establish an external communications link.

If the second stub does establish a link, the external logic then controls the boot sequence. If the link is ever lost the stub will attempt to validate and boot the internal flash image.

# Glossary ▼

**ACK**
A control character sent to acknowledge that a transmission block has been received.

**Active/Passive Device**
In 20mA current loop communications, a device capable of providing the current for the loop (active) and a device that draws the current from the equipment it is connected to (passive).

**Address**
A unique designation for the location of data or the identity of a smart device; allows each device on a single communications line to respond to its own message.

**AEL (Accessible Emission Limit)**
The average power limitations of electronic radiation from a laser light source as defined by the CDRH.

**AIM**
Automatic Identification Manufacturers, Inc.

**Alignment**
The position of a scanner or light source in relation to the target of a receiving element.

**Alphanumeric**
Consisting of letters, numbers, and symbols.

**Ambient Light**
The lighting conditions in the scanning area. Ambient light can interfere with successful scanning of bar codes.

**ANSI (American National Standards Institute)**
The principle standards development group in the U.S. A non-profit, non-governmental group supported by over 1000 trade organizations, professional societies, and companies. Member body to the ISO (International Standards Organization).

**Aperture**
Term used on the required CDRH warning labels to describe the laser exit window.

**Application**
A use to which something is put, or how it is used.

**APM Protocol**
Acronym for Application Protocol Messages. A protocol used by system integrators who want to design system applications without AdaptaScan Software.

**ASCII (American Standard Code for Information Interchange)**
Pronounced *as-kee*. A standard seven bit plus parity code, representing 256 characters, established by ANSI to achieve compatibility between data services.

**Aspect Ratio**
The ratio of height to width of a bar code symbol. A code twice as high as wide would have an aspect ratio of 2; a code twice as wide as high would have an aspect ratio of ½ or 0.5.

**Asynchronous Transmission**
Transmission in which the time intervals between transmitted characters may be of unequal length. Transmission is controlled by start and stop bits at the beginning and end of each character.

**Autodiscrimination**
The ability of bar code reading equipment to recognize and correctly decode more than one bar code symbology.

**Autodistinguish**
The ability of a scanner to recognize a selectable number of different symbologies and process the data without operator intervention; this is a prerequisite feature of linear bar code scanners employed in open systems.

**Autoload**
The process of automatically transferring scanned character strings and the symbology type into a match entry value.

**Bar**
The dark elements of a printed bar code symbol.

**Bar Code**
An array of rectangular bars and spaces arranged in a predefined pattern to represent elements of data referred to as characters.

**Bar Code Character**
A single group of bars and spaces that represent an individual number, letter, or other symbol.

**Bar Code Density**
The number of characters that can be represented in a linear unit of measure. Bar code density is often referred to in characters per inch (CPI).

**Bar Code Label**
A label that carries a bar code and can be affixed to an article.

**Bar Code Reader**
A device that examines a printed spacial pattern and decodes the encoded data.

**Bar code symbol**
A group of bars that represent a character or group of characters whose width and spacing is determined by a set of rules. In most cases, human readable characters are printed below the bars.

**Bar Height**
The height of the shortest bar in a bar code.

**Bar Length**
The bar dimension perpendicular to the bar width.

**Bar Width**
The thickness of a bar measured from the edge closest to the symbol start character to the trailing edge of the same bar.

**Baud Rate**
A unit used to measure communications speed or data transfer rate; represents the number of discrete conditions or events per second.

**BCC (Block Check Character)**
Used to check transmission accuracy, a character transmitted by the sender after each message block and compared with a block check character computed by the receiver.

**Bed Width**
The width of the conveyor bed measured in inches.

**BEL**
A control character that is used when there is a need to call for attention; it may control alarm or attention devices.

**Belt Width**
The width of the conveyor belt measured in inches.

**Bidirectional**
A bar code symbol capable of being read successfully independent of scanning direction.

**Bit (Binary Digit)**
The contraction of binary digit, the smallest unit of information in the binary system; a one or zero condition.

**Bottom Read**
When the scanner is mounted under the conveyor to read codes on the bottom of the boxes or on the front or back of the boxes. If used there is not enough clearance for a standard front or back read.

**BPS (Bits per Second)**
Unit of data transmission rate. *See baud rate.*

**Bridge**
An interface between links in a communication network that routes messages from one link to another when a station on one link addresses a message to a station on another link.

**Buffer**
A temporary storage device used to compensate for a difference in data rate and data flow between two devices (typically M).

**Bus**
An internal pathway along which electronic signals travel between the components of an electronic device.

**Byte**
A binary element string functioning as a unit, usually shorter than a computer "word". Eight-bit bytes are most common. Also called a "character".

**CART**
(Also known as trigger) A signal, typically provided by a photoeye or proximity switch, that informs the scan head of the presence of an object within its reading zone.

**CCD (Charge Coupled Device)**
Used in scanners to sense the light and dark areas of a symbol.

**CDRH (Center for Devices and Radiological Health)**
This organization (a service of the Food and Drug Administration) is responsible for the safety regulations governing acceptable limitations on electronic radiation from laser devices. Accu-Sort is in compliance with the CDRH regulations.

**Capture count**
The number of consecutive identical valid decodes that result in a valid read.

**Character**
A single group of bars and spaces in a code that represent an individual number, letter, punctuation mark or other graphic element. Used as part of the organization, control, or representation of data.

**Character self-checking**
The feature which allows a bar code reader to determine if a scanned group of elements is a valid symbol character. If a symbology is described as character self-checking, a single printed defect (edge error) in any symbol character does not produce a valid character.

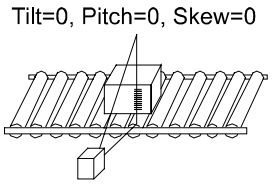
**Character set**
Those characters available for encodation in a particular automatic identification technology.

**Check Character**
A character (usually at the end of the code) that is used to perform a mathematical check to ensure the accuracy of a scan of the bar code.

**Code Length**
The length of the bar code measured from the start of the first bar to the end of last bar.

**Code Orientation**
The relationship of the bar code with reference to the scan head's reading zone. Typical code orientations are Ladder and Picket Fence.

**Code Placement**
Variation in code placement affects the ability of a scanner to read a code. The terms Tilt, Pitch, and Skew deal with the angular variations of code placement in the X, Y and Z axes. Variations in code placement affect the pulse width and therefore the decoding of the code. Pulse width is defined as a change from the leading edge of a bar or space to the trailing edge of a bar or space over time. Pulse width is also referred to as a transition. Tilt, pitch, and skew impact the pulse width of the code.




Changes to this code presentation cause the bar codes to appear smaller to the scanner which results in a smaller pulse width. Each of these variation has a different effect on a scanner reading these codes and the combination of the variations leads to more complicated effects.

**Code Quality**
The number of scans successfully decoded during a read cycle.

**Code set**
The specific assignment of data characters to symbol characters.

**Communications Protocol**
The rules governing exchange of information between devices connected together on the same communications line.

**Configuration**
The arrangement and interconnection of hardware components within a system, and the hardware (switch and jumper) and software selections that determine the operating characteristics of the system.

**Configuration file**
The set of attributes which belongs to and defines the operation of a single physical device.

**Continuous code**
A bar code symbology where all spaces within the symbol are parts of the characters (Interleaved 2 of 5). There is no interactive gap in a continuous bar code symbology.

**Conveyor Speed**
The speed that the conveyor is moving measured in feet per minute. Conveyor speed directly impacts the time that the code is in front of the scanner; therefore, it affects the number of reads that are possible.

**CPI**
Characters per inch. See density.

**CR (Carriage Return)**
An ASCII or EBCDIC control character that moves the cursor or print mechanism to the left margin.

**CRT (Cathode-Ray Tube)**
Device similar to a television screen for sending, receiving, and displaying serial data. Also known as Dumb Terminal, Display screen, or Monitor.

**CTS (Clear to Send)**
The Modem interface signal that indicates to the DTE device to begin transmission.

**Current Loop**
Method of interconnecting terminals and transmitting signals, whereby a mark (binary 1) is represented by current on the line and a space (binary 0) is represented by the absence of current.

**Decode**
The process of translating a bar code into data characters using a specific set of rules for each symbology.

**Decoder**
As part of a bar code reading system, the electronic package which receives the signals from the scanner, performs the algorithm to interpret the signals into meaningful data and provides the interface to other devices.

**Decoder Logic**
The electronic package that receives signals from the scan head, interprets the signals into useful data, and provides the interface to other devices.

**Depth of Field**
The distance between the maximum and minimum plane in which a symbol can be read. This range is from the specified optical throw to the far reading distance.

**Density**
The number of data characters which can be represented in a linear unit of measure. Bar code density is often expressed in characters per inch (CPI).

**DIP Switches**
Switches that are the approximate size of an integrated circuit.

**Discrete code**
A bar code or symbol where the space between characters, intercharacter gap, are not part of the code as with Code 39. See continuous code.

**Dot Matrix Printer**
A dot matrix printer is an impact printer that consists of a series of pins arranged in an array. The pins strike an inked ribbon against the label stock to form the bar code and characters. This is the most common type of printer used to print labels on-demand. Some dot matrix printers use a moving print head and stationary stock. The print head moves across the label, printing one dot at a time, to complete one line. The print head then begins printing the next line. Other dot matrix printers use a stationary print head. These printers typically print one line at a time and are therefore much quicker than a printer with a moving print head.

Common Problems with dot matrix printing
The printed ink (bars) tends to expand or "bleed". This causes the size of the bars of a code to expand while shrinking the spaces. There tends to be small gaps between pins of a dot matrix printed bar. This can lead to problems with scanners because these gaps can appear as spaces. Ribbon wear is a factor when printing dot matrix codes. If a printer uses a circular type ribbon (ribbon is used over and over again) the contrast of the bar code diminishes over time. A bar code printed with an old ribbon can be more difficult to read than one printed with a new ribbon.

Benefits of dot matrix printing
It is inexpensive to print bar codes using dot matrix printers.

**Downloading**
The process of sending configuration parameters, operating software or related data from a central source to remote stations.

**DSR (Data Set Ready)**
An RS232 modem interface control signal which indicates that the terminal is ready for transmission.

**DSR (Data Terminal Ready)**
Modem interface signal which alerts the modem that the DTE device is ready for transmission.

**Duplex Transmission**
*See Full and Half Duplex.*

**EAN**
European Article Number System. The international standard bar code for retail food packages.

**EDI (Electronic Data Interchange)**
A method by which data is electronically transmitted from one point to another.

**EIA-232**
Interface between data terminal equipment and data communication equipment employing serial binary data interchange.

**EIA-422**
Electrical characteristics of balanced-voltage digital interface circuits.

**EIA-485**
The recommended standard of the Electronic Industry Association that specifies the electrical characters of generators and receivers for use in balanced digital multipoint systems.

**Element**
Dimensionally the narrowest width in a character - bar or space.

**Element width**
The thickness of an element measured from the edge closest to the symbol start character to the trailing edge of the same element.

**Encoded area**
The total linear dimension consisting of all the characters of a code pattern, including start and stop characters and data.

**ENQ (Enquiry)**
A transmission control character used as a request for a response from a remote station. (^E)

**ESC (Escape)**
A control character which is used to provide additional control functions. It alters the meaning of a limited number of continuously following bit combinations. (^[)

**Error**

A discrepancy between a computed, observed or measured value or condition and the true, specified or theoretically correct value or condition.

**ETX (End of Text)**
A transmission control character that terminates a text.

**Even Parity**
A data verification method in which each character must have an even number of on bits.

**Expansion Bus**
Allows the microprocessor to communicate with controllers for peripheral devices, such as a network card or an internal modem.

**Far Distance**
The distance (in inches) from the face of the scanner to the farthest point at which a code can be successfully scanned.

**Flying Lead**
A lead that exits the back of the connector hood on the outside of the cable jacket. It is normally attached to the drain wire or shield and connected to the chassis of the switch, modem, etc. It can also be a hardware control lead.

**Front Read**
The scanner is mounted to read bar codes on the leading edge of a box as it passes the scanner. In a front read application, the scanner can be mounted above or on the side of the conveyor.

**Full Duplex (FDX)**
Simultaneous, two-way, independent transmission in both directions.

**Guard bars**
1) The bars at the ends and center of a UPC and EAN symbol that ensure a complete scan of the bar code. 2) The optional bars outside the quiet zone of an Interleaved 2 of 5 symbol that ensure a complete scan of the bar code.

**Half Duplex (HDX)**
Transmission in either direction, but not simultaneous.

**Handshaking**
Exchange of predetermined signals between two devices establishing a connection. Usually part of a communications protocol.

**Height of Scan**
The maximum vertical scanning dimension of a moving beam scanner at a specific distance from the face of the scanner.

**Helium Neon Laser**
A type of laser commonly used in bar code scanning. Because the laser beam is bright red, bars must not be printed with red ink since they would be indistinguishable from the code's background.

**Hexadecimal**
A base-16 numbering system that uses the symbols 0,1,2,3,4,5,6,7,8,9,A,B,C,D,E,F.

**Host**
1) A central controlling computer in a network system. 2) Any device on a network system that provides a controlling function to another device on the network. 3) Any intelligent device for which another device is providing a communication interface to a network.

**Ink Jet Printing**
Ink jet is a non-contact printer that projects drops of ink at a printing surface. The sprayed drops are controlled electronically to form a bar code.

Common Problems with ink jet printing
Its main restriction is that ink jet printing is usually capable of printing only low density codes.

Benefits of ink jet printing
Because ink-jet printers are non-contact and non-impact, they can print bar codes on a variety of contoured, rough, and delicate surfaces. Capable of printing random or sequential information on labels. Ink jet printers can print directly on cartons and avoid the cost of label stock.

**Input/Output Modules**

Since many scanners are operating in environments that have electrical noise problems, it is helpful to have equipment electrically isolated from other equipment. The standard method for isolating inputs and outputs is through the use of OPTICALLY ISOLATED INPUT/OUTPUT MODULES. These flexible modules allow the scanner to control high voltage outputs that are susceptible to noise. Since they are isolated from each other the noise is not picked up in the scanner.

The modules come in both input and output versions. The output versions are controlled by a 5VDC input. The output of the modules can range from 24VAC - 140VAC or 3VDC - 200VDC. Foreign voltage ranges are available. The maximum current that the modules can supply is limited by the output voltage and the module type. The input versions are controlled by either a DC or AC input ranging from 3VDC - 32VDC or 90VAC - 140VAC. Foreign voltage ranges are available. The output of the modules is a 5VDC level. The maximum current is limited by the input modules. These output modules are commonly used to control diverters, alarms, external relays, etc. The input modules can be used for photoeye inputs.

**Intercharacter Gap**
The space between two adjacent bar code characters in a discrete code.

**Interface**
A shared boundary defined by common physical interconnection characteristics, signal characteristics and meanings of interchanged signals.

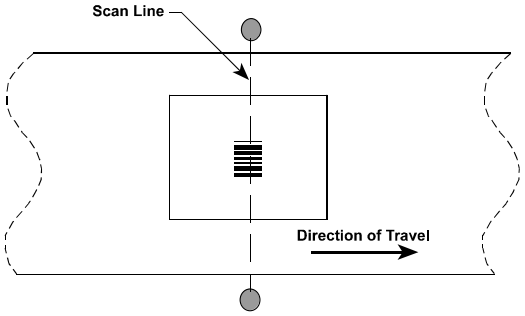
**Interleaved Bar Code**
A bar code in which characters are paired together using bars to represent the first character and spaces to represent the second.

**Inter-symbol no-read count**
The minimum number of no-reads that must occur between symbols scanned when Self-Triggered (continuous decode) is selected as the decode trigger. Symbols that are not preceeded by the minimum nuber of no-reads are ignored.

**I/O**
The abbreviation for input/output. The keyboard and a printer, are examples of I/O devices. I/O activity is different from computational activity. When a program sends a document to the printer, it is engaging in I/O activity; when the program sorts a list of terms, it is engaging in computational activity.

**Jumper**
A wire that connects a number of pins on one end of a cable only, such as looping back Request to Send from Clear to Send pins 4 and 5.

**Ladder Orientation**
When the bar code's bars are positioned horizontally on the product, causing them to appear as a ladder. The ends of all bars will enter the scan window first.




**LAN**
The acronym for local area network. A LAN system is usually confined to the same building or a few nearby buildings, with all equipment linked by wiring dedicated specifically to the LAN.

**Laser Gun**
A hand-held non-contact laser scanner that is usually activated with a trigger.

**Laser Scanner**
An optical bar code reading device using a low energy laser light beam as its source of illumination.

**Laser Printing**
Laser printers use a pulsed or rastered laser light source to positively charge an image on a dielectric cylinder of an electrostatic printing mechanism. Toner used in the laser printing process adheres to the charged portion of the cylinder. This toner is then transferred to paper using heat.

Common Problems with laser printing

The labels are more expensive than those used in dot matrix printers.

Benefits of laser printing
Labels can be printed at various speeds. Laser printed bar code labels are high quality and very accurate.

**LCD (Liquid Crystal Display)**
A low-power display often used for notebook computers. An LCD consists of a liquid crystal solution between two sheets of polarizing material. An electric current causes each crystal to act like a shutter that can open to allow light past or close to block the light.

**LDI (Lamp Driver Interface Board)**

**LED (Light Emitting Diode)**
A semiconductor generally made from gallium arsenide, that can serve as a visible or near infrared light source when voltage is applied continuously or in pulses. LEDs have extremely long lifetimes when properly operated.

**LF (Line Feed)**
An ASCII control character that moves the cursor or print mechanism to the next line. (^J)

**LMM (Light Monitoring Module)**

**mA**
The abbreviation for milliampere(s).

**Match**
A condition in which decoded data matches data in the match entry.

**Match entry**
An output condition in which decoded data matches and the data in a match entry configuration.

**Memory**
A computer can contain several different forms of memory, such as RAM, ROM, and video memory. The term *memory* is generally used to define RAM. When a computer has 8 MB of memory, it actually has 8 MB of RAM.

**Memory Address**
A specific location, usually expressed as a hexadecimal number, in the computer's RAM.

**Message**
1) A meaningful combination of alphanumeric characters that establishes the content and format of a report. 2) In a communication network, the unit of exchange at the application layer.

**Message buffer**
Storage register for the temporary storage of data that allows decoding to continue while the host is retrieving data from the serial port.

**Message buffer warning**
An output condition that occurs when the message buffer has used a defined amount of the message buffer.

**MHz**
The abbreviation for megahertz.

**Microprocessor**
The primary computational chip inside the computer, referred to as the "brain". The microprocessor contains an arithmetic processing unit and a control unit. Software written for one microprocessor must usually be revised to run on another microprocessor.

**Mil**
One thousandth of an inch (0.001 inch). Bars and spaces of codes are commonly referred to as being a certain number of mils wide.

**Misread**
The scanner incorrectly decodes a bar code as it passes through the scan zone.

**Modulo check digit or character**
A calculated character within a data field used for error detection. The calculated character is determined by a modulus calculation on the sum or the weighted sum of the data field contents.

**Mouse**
A pointing device that controls the movement of the cursor on a screen. Mouse-aware software allows the user to activate commands by clicking a mouse button while pointing at objects displayed on the screen.

**Moving-Beam**
Rather than using a stationary laser beam and relying on product movement for a single scan, a multi-facet mirror wheel and motor is used to 'move' the beam across the code several times while in motion itself.

**Moving-Beam Bar Code Scanner**
A device that dynamically searches for a bar code symbol by sweeping a moving optical beam through a field of view called the scanning zone. Automatic bar code reader that reads codes by sweeping a moving optical beam through a field of view. Moving-beam scanners are usually mounted in a fixed position and read codes as they pass by.

**MTBF**
The abbreviation for mean time between failures.

**Multidrop Line**
A single communications circuit that interconnects many stations, each of which contains terminal devices. *See EIA-485.*

**NAK (Negative Acknowledgment)**
A control character used to indicate that the previous transmission block was in error and the receiver is ready to accept retransmissions.

**Narrow Bar (NB)/Narrow Space (NS)**
Smallest code element, bar or space, in the bar code symbol. Also known as the X dimension.

**NCDRH (National Center for Devices and Radiological Health)**
This organization (a service of the Food and Drug Administration) is responsible for the safety regulations governing acceptable limitations on electronic radiation from laser devices. Accu-Sort is in compliance with the NCDRH regulations.

**Near Distance**
The distance (in inches) from the face of the scanner to the closest point at which a code can be successfully scanned.

**NEMA**
In order to rate the quality of an enclosure the National Electrical Manufacturers Association (NEMA) has developed a system for rating all enclosures. A partial list of the NEMA enclosures is shown below along with what particles it is designed to restrict.

Ratings
**3** Enclosures are intended for indoor or outdoor use primarily to provide protection against windblown dust, rain, and sleet, and is undamaged by the formation of ice on the enclosure.
**4** Enclosures are intended for indoor or outdoor use primarily to provide protection against windblown dust and rain, splashing water, and hose-directed water; undamaged by the formation of ice on the enclosure.
**4X** Enclosures are intended for indoor or outdoor use primarily to provide protection against corrosion windblown dust and rain, splashing water, and hose directed water; undamaged by the formation of ice on the enclosure.
**6** Enclosures are intended for use indoors or outdoors where occasional submersion is encountered.
**12** Enclosures are intended for indoor use primarily to provide a degree of protection against dust, falling dirt, and dripping non-corrosive liquids.
**13** Enclosures are intended for indoor use primarily to provide a degree of protection against dust, spraying of water, oil, non-corrosive coolant.

**Network**
A series of stations (nodes) connected by some type of communication medium. A network may be made up of a single link or multiple links.

**NVC**
The acronym for non-valid code. Defines the condition that occurs when an object has been scanned and no bar code could be decoded. Usually, this indicates that either no code was on the object or the code was badly damaged and could not be decoded.

**Node**
The connection point at which media access is provided.

**No-match**
An output condition in which decoded data does not match an entry in the match code table.

**No-Read**
When the scanner is unable to decode a bar code as it passes through the scan zone.

**Non-Read**
The absence of data at the scanner output after an attempted scan due to no code, defective code, scanner failure or operator error.

**Odd Parity**
A data verification method in which each character must have an odd number of on bits.

**Omnidirectional**
Orientation is unpredictable and can be ladder, picket fence, or any angle in between. A single scan line is not sufficient to scan bar codes oriented omnidirectionally.

**Operating Range**
The sum of the scanner's optical throw and depth-of-field.

**Optical Throw**
Measured distance from the scanner's window to the near reading distance of the depth of field. Typically, this is the closest a bar code can be to the scanner's window and still be properly decoded.

**Optimum Reading Distance**
Typically, the center of the depth of field.

**OCR**
Optical Character Recognition.

**Orientation**
The alignment of the code's bars and spaces to the scan head. Often referred to as vertical (picket fence) and horizontal (ladder).

**Output counter**
A counter that is associated with each output condition. The counter increments by 1 each time the condition occurs.

**Oversquare**
Used to describe bar codes that are taller (from top to bottom of the bars) than they are wide (from first to last bar).

**Trigger or Cart**
The standard abbreviation for a signal indicating that an object is passing by the scanner is called Cart. This signal indicates to the scanner to start or stop reading.

**Trigger or Cart Cycle**
The time during which the scanner is attempting to read the bar code.

**Hardware Cart**
This is an electrical signal from a relay, photoeye, or proximity switch indicating that an object is passing by the scanner.

**Start and End of Cart Photoeyes**
The cart cycle begins when the start of cart photoeye is blocked and continues until the end of cart photoeye is unblocked. Relay decisions and data communication take place after the end of cart photoeye is unbroken. The diagram below shows start and end of cart photoeye placement.

**Induct Photoeyes**
The cart cycle begins when the start of cart photoeye is blocked and continues until the cart photoeye is unblocked. Blocking the INDUCT photoeye causes relay decisions and data communication. For this placement the distance between the CART and INDUCT photoeyes must be less than the minimum box size plus the minimum box spacing.

**Software Cart**
A serial message from an external device that controls the cart cycle.

**Self Cart**
This form of cart requires no input signal. The scanner is continuously attempting to decode bar codes. When a scanner is in self cart, there is no way of determining if there is a package present or a NO-READ.

**Flip Lens**
A moveable lens inside a scanner that increases Depth of Field.

**Package Spacing**

This is the spacing between items on a conveyor. Package spacing is measured one of two ways: Leading edge of one box to leading edge of the next or trailing edge of one box to trailing edge of the next. Package spacing is critical to system operations.

**Parameter**
A value or opinion that you specify to a program. A parameter is sometimes called a *switch* or an *argument*.

**Parity Bit**
A bit that is set at "0" or "1" in a character to ensure that the total number of 1 bits in the data field is even or odd.

**Percent good reads**
The number of successful reads per refresh period. This is valid only when the refresh period is set to 0.

**Performance indicator**
A bar code decoder function that counts the number of decodes during a trigger period. When the period = 0, the performance indicator provides the number of decodes (up to 100 attempts). Use the performance indicator to provide a general indication of bar code symbol quality or verify proper setup of the scanner.

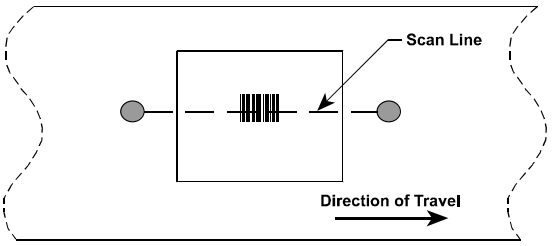
**Performance indicator limit**
A set point that will produce a discrete output if the performance indicator falls below the set point value.

**Pen Scanner**
A pen-like device either connected by wire to a device, or self-contained, used to read bar codes. Requires direct contact with the symbol.

**Peripheral Device**
An internal or external device, such as a printer, a disk drive, or a keyboard, connected to a computer.

**Photoeye**
Used as a presence detector to identify objects in the scanner's reading zone. The photoeye emits a beam and is used with a reflector to create a photoelectric circuit. When the beam is blocked by an object, breaking the circuit, a signal called CART is sent to the scanner.

**Picket Fence Orientation**
When the bar code's bars are positioned vertically on the product, causing them to appear as a picket fence. The first bar will enter the scan window first.




**Pitch**
Rotation of a code pattern about the X-axis. The normal distance between center line or adjacent characters.

**Polarized Laser**
A specialized laser source used in high glare environments.

**Polling**
A means of controlling devices on a multipoint line.

**Protocol**
A formal set of conventions governing the formatting and relative timing of message exchange between two communicating systems.

**Pulse Width**
A change from the leading edge of a bar or space to the trailing edge of a bar or space over time. Pulse width is also referred to as a transition.

**Queue**
A buffer used to hold data in order until it is used or transmitted.

**Quiet Zone**

Required distance before the first bar and after the last bar of the code that must be free of marks or printing.

**Radio Frequency**
Non-optical automatic identification devices that use radio waves to transmit data.

**Raster**
The process of projecting the laser beam at varied angles spaced evenly from each other. Typically, the mirror wheel surfaces are angled to create multiple scan lines instead of a single beam.

**Raster Mirror Wheel**
The standard mirror wheel forms the laser line that is projected from the scanner. Although the mirror wheel projects 8 separate lines (for an 8-sided mirror wheel), the speed of the sweep makes it appear that it is actually one line. This type of mirror wheel is adequate for a ladder orientation because the laser line will pass from the bottom to the top of the code. For a picket fence orientation the standard mirror wheel is not always adequate. One problem facing the picket fence orientation is that the same portion of the code is being repeatedly scanned. If the printing quality at this point is not good the label may not be scanned even though other parts of the label are good. Another problem for a picket fence orientation is the placement of the label. If the placement is off enough a single scan line will not read all the bar codes presented to the scanner.

**Read-only**
A read-only file is one that you are prohibited from editing or deleting. A file can have read-only status if:
- Its read-only attribute is enabled.
- It resides on a physically write-protected diskette.
- It is located on a network in a directory to which the system administrator has assigned read-only rights to you.

**Read Zone**
Area in front of the scanner's window in which the bar code should appear for scanning. This zone consists of the scan window and the raster width (if used).

**Reflectance**
The amount of light returned from an illuminated surface.

**Relay**
Relays are simply electrical switches that are typically used to control external diverts, alarms, etc. Relay types available are FORM A and FORM C. FORM C type relays have both normally open and normally closed contacts available while FORM A type relays have only normally open contacts available.

**Relay Output Duration**
This is the time (in seconds) after the relay is energized that it should be turned off.

**Relay Output Delay**
The time lapse between an event and the energizing of the relay.

**Request To Send (RTS)**
An RS232 modem interface signal which indicates that the DTE has data to transmit.

**Resolution**
The narrowest element dimension which can be distinguished by a particular reading device or printed with a particular device or method.

**Response Time**
The elapsed time between the generation of the last character of a message at a terminal and the receipt of the first character of the reply. It includes terminal delay and network delay.

**ROM**
The acronym for read-only memory. The computer contains programs essential to its operation in ROM. A ROM chip retains its contents even after you turn off your computer.

**RPM**
The abbreviation for revolutions per minute.

**RS-232**
Interface between data terminal equipment and data communication equipment employing serial binary data interchange.

**RS422**
The Electronic Industries Association standard that specifies the electrical characteristics of balanced voltage digital interface circuits.

**RS485**

The Electronic Industries Association standard that specifies the electrical characters of generators and receivers for use in balanced digital multipoint systems.

**Scan**
A single pass of the laser beam over the code or a portion of the code. The search for a bar code symbol that is to be optically recognized.

**Scan Area**
The area intended to contain a symbol.

**Scan Window**
The usable length of the scanning beam that may detect the bar codes. The scan window is perpendicular to the depth of field.

**Scanner**
An electronic device that optically converts printed information into electrical signals. These signals are sent to the decoder logic.

**Scanner Orientation**
Relationship of the scan head with reference to the bar code's location on products. The scan head must be set up to insure that all code bars and spaces are bisected at the same time. Typically, either side read or top read is used for picket fence or ladder code orientations.

**SCSI**
The acronym for small computer system interface. An I/O but interface with faster data transmission rates than standard ports. The user can connect up to seven devices to one SCSI interface.

**Self-checking**
A bar code or symbol using a checking algorithm which can be independently applied to each character to guard against undetected errors.

**Sensor**
A device that detects or measures something and generates a corresponding electrical signal to an input circuit of a controller.

**Serial Port**
An I/O port used most often to connect a modem or a mouse to your computer, identifiable by its 9-pin connector.

**Serial Transmission**
The most common transmission mode; serial, information bits are sent sequentially on a single data channel.

**Serial Asynchronous Transmission Of Data**
The following are common communications interfaces: RS232, RS422, RS485, 20mA current loop and RS423.

When data is transmitted serially from a communications port, the information is transferred between the two devices one data bit at a time. The data flow can follow one of three different communications modes: simplex, half duplex, or full duplex. Each character of data within the data flow is transported in a binary bit frame called the asynchronous data frame.

The start bit begins each frame. A low voltage signal on the data communications line marks the beginning of the start bit, at which point the receiving device begins looking for binary zeros and ones (0's and 1's).The following five to eight data bits (the number depends on the format used) comprise the binary character. For error detection, an optional parity bit can define whether the total number of zeros or ones was even or odd. There are five different parity selections as shown below:

ODD
last data bit is a logical 0 if the total number of logical 1's in the first seven data bits is odd.

EVEN
last data bit is a logical 0 if the total number of logical 1's in the first seven data bits is even.

MARK
last data bit is always a logical 1 (i.e.: high/mark).

SPACE
last data bit is always a logical 0 (i.e.: low/space).

OFF (NONE)
last data bit is not present.

The method used to catch errors by using parity bits is as follows: When the transmitter frames a character, it tallies the number of 0's and 1's within the frame and attaches a parity bit. (The parity bit varies according to whether the total is even or odd.) The receiving end then counts the 0's and 1's and compares the total to the odd or even recorded by the parity bit. If a discrepancy is noticed by the receiving end, it can flag the error and request a retransmission of the data.

A stop bit is used to signal the end of the character. (Stop bits are typically one or two bits in length. The slower the transmission speed, the more stop bits required for recognition of the end of the data frame.)

In addition to the direction of data flow and the data framing, there are other considerations to insure uniform transmissions. Certain operating parameters must be followed to prevent the loss of valuable data.

The first consideration is the speed of transmission, known as baud rate. Serial data transmission is measured in bits per second (BPS). The baud rate selections typically available are: 110, 300, 1200, 2400, 4800, 9600 and 19200. To enable two devices to interact, they must both be transmitting/receiving data at the same baud rate. If it is not possible to do this, there must be a buffer (typically additional storage memory) that accommodates the differences in communications speed.

Many serial communications links also use a flow control system to handle data transmission in addition to memory buffers.

X-ON/X-OFF Protocol
A common type of flow control is the X-ON/X-OFF protocol. When a receive buffer nears its memory capacity, the receiving device sends an ASCII X-OFF signal to the transmitting device, telling it to stop sending data. When the memory buffer has enough space to handle more data, the X-ON signal is sent to the transmitting device, telling it to start sending data again.

ACK/NAK Protocol
Another common protocol is ACK/NAK protocol. When the device transmits a message to the host, the host responds with either an ACK (06H) or a NAK (15H). If the host transmits an ACK to the device, the device deletes its transmit message and the communication sequence is complete. If the host transmits a NAK, the device will retransmit. The device resends data a maximum of three times. Optionally this may be changed to 1, 2, 3, or infinite retransmits by the user. If the device receives a fourth NAK, it will delete the data in its transmit buffer and display "MAX REXMITS".
A transmitting device ignores ACK and NAK characters received during data transmission. If, for example, a device receives a NAK during a data transmission, it will not resend the data at the completion of the transmission.

The device also has a retransmit timer. This timer is activated each time the device transmits data to the host. If the timer runs for two seconds (this is also changeable) and the device does not receive an ACK or NAK from the host, a timeout occurs and the device retransmits its data. Each time the device retransmits because of a timeout, it treats the timeout the same as receiving a NAK from the host computer. If the device does not receive an ACK before the end of the fourth timeout, it will delete the data in its transmit buffer and display "MAX REXMITS". The device deletes data in its transmit buffer and displays the error message when any combination of four timeouts and NAKs from the host occurs.

When the device receives a message from the host, it calculates the BCC for the message and compares the calculated BCC to the received BCC. If the two values match, the device transmits an ACK, ending the communication. If the values do not match, the device transmits a NAK to the host and waits for the host to retransmit the message. The host, like the device, should retransmit a maximum of three times.

The sequence number starts at zero (30H) and is incremented each time a device transmits a new message. When the sequence number reaches nine (39H), it wraps around to one (31H). If the sequence number skips a number, the receiving device knows that a message was lost. If the same sequence number is received on two sequential messages, the second message is responded to with an ACK or NAK (as appropriate) and ignored.

**Shielding**
Protective covering that eliminates electromagnetic and radio frequency interference.

**Side Read**
The scanner is mounted to read the side of a box as it passes by the head.

**Signal**
An impulse or fluctuating electrical quantity (i.e.: a voltage or current) the variations of which represent changes in information.

**Skew**
Rotation about the Y-axis. Rotational deviation from correct horizontal and vertical orientation; may apply to single character, line or entire encoded item.

**Space**
The lighter elements of a bar code symbol formed by the background between bars.

**Specular Reflections**
A condition when the laser light is reflected back from the code's surface at an angle equal, or nearly equal, to the angle of incidence of the laser light. This condition makes it difficult for the scan head to detect the differences in light variation caused by the code's bars and spaces.

**Spot**
The undesirable presence of an area of low reflectance in a space.
start and stop characters

**Stacked Codes**
16K and Code 49 are examples where a long symbol is broken into sections and "stacked" one upon another similar to sentences in a paragraph. Extremely compact codes.

**Start Bit**
In asynchronous transmission, the first bit or element in each character, normally a space, that prepares the receiving equipment for the reception and registration of the character.

**Stop Bit**
The last bit in an asynchronous transmission, used to indicate the end of a character, normally a mark condition, that serves to return the line to its idle or rest state.

**STX (Start of Text)**
A transmission control character that precedes a text and is used to terminate a heading. (^B)

**Symbol**
A combination of characters including start/stop and checksum characters, as required, that form a complete scannable bar code.

**Symbologies**
Code 39
A bar code with a full alphanumeric character set, a unique start and stop character, and three other characters. The name is derived from its code structure, which is 3 wide elements out of a total of 9 elements. The nine elements consist of five bars and four spaces.

Code 128
A bar code symbology capable of encoding the full ASCII 128 character set. It encodes these characters using fewer code elements per character resulting in a more compact code. It features a unique start and stop character for bidirectional and variable length decoding, both bar and space character parity for character integrity, a check character for symbol integrity, a function character for symbol linking, and spare function characters for unique application definition and/or future expansion.

Interleaved 2 of 5 (I 2of5)
A bar code with a numeric character set with different start and stop characters. The name is derived from the method used to encode two characters. In the symbol, two characters are paired together using bars to represent the first character and the spaces to represent the second. This interleaved structure allows information to be encoded in both the bars and the spaces. A start character, bar and space arrangement, at one end, and a different stop character bar and space arrangement at the other end, provide for bidirectional decoding of this symbol.

**Syntax**
The rules dictating how you must type a command or instruction so the computer will understand it.

***System.ini* file**
When you start Windows, it consults the system.ini file to determine a variety of options for the Windows operating environment. Among other things, the system.ini file records which video, mouse, and keyboard drivers are installed for Windows. Running the Control Panel or Windows Setup program may change options in the system.ini file.

**Tag**
A collection of information associated with a single variable or I/O point.

**Two-width symbology**
A bar code symbology whose bar and spaces are characterized simply as wide or narrow. Codabar, Code 39, and Interleaved 2 of 5 are examples of two-width symbologies.

**Terminal Program**
Computer software that sends, receives, and displays serial data.

**Thermal Printing**
Thermal printers use heated print heads and special heat activated paper. There are two types of thermal printers. One uses a method similar to the dot matrix printer where an array of heated dots move along the paper and form the character or bar code. The other method uses a heated bar and the paper moves across the bar. Another type of thermal printer is called a Thermal Transfer printer. The main difference between this type of printer and a thermal printer is the use of heat sensitive ribbons as opposed to heat sensitive paper. This type of printing is permanent on label stock.

Common Problems with thermal printing
Since the paper used is heat activated the labels will deteriorate over time in a warm environment. Infrared scanners cannot detect the bar codes and consequently a visible red light laser must be used to scan these codes.

Benefits of thermal printing
Thermal printers are quiet and inexpensive.

**Thermal Transfer**
A printing system like thermal except a one-time ribbon is used and common paper is used as a substrate. Eliminates the problems of fading or changing color inherent in thermal printing.

**Tilt**
Rotation around the Z axis. Used to describe the position of the bar code with respect to the laser scan line.

**Trigger**
(Also known as cart) A signal, typically provided by a photoeye or proximity switch, that informs the scan head of the presence of an object within its reading zone.

**UCC (Uniform Code Council)**
The organization which administers the UPC and other retail standards.

**Undersquare**
Used to describe bar codes that are longer (from the first to last bar) than they are high (from the top to bottom of the bars).

**UPC**
Acronym for Universal Product Code. The standard bar code type for retail food packaging in the United States.

**V**

**UPS**
The abbreviation for uninterruptible power supply. A battery-powered unit that automatically supplies power to your computer in the event of an electrical failure.

**Utility**
A program used to manage system resources including memory, disk drives, and printers.

**Vane Raster**
Decreases the amount of scans possible due to a smaller percentage of scans bisecting the code.

**Verifier**
A device that makes measurements of the bars, spaces, quiet zones and optical characteristics of a symbol to determine if the symbol meets the requirements of a specification or standard.

**Vibrating Vane**
A variable raster that can have an unlimited number of raster lines. It covers a larger area and is adjustable.

**Visible Laser Diode**
A light source used in scanners to illuminate the bar code symbol. Generates visible red light at wavelengths between 660 and 700 nM. Replaced Helium-Neon tubes in most scanners because they are small and consume less power.

**Void**
The undesirable presence of an area of high reflectance in a bar.

**W**

**Wand Scanner**
A hand-held contact laser scanner that an operator guides across the bar code.

**Wedge**
A device that plugs in between a keyboard and a terminal. It allows data to be entered either by keyboard or by various types of scanners.

**Wide Bar (WB)/Wide Space (WS)**
Widest code element, bar or space, in the bar code symbol.

**Wide to Narrow Ratio**
Dividing the size of the wide elements by the size of the narrow elements of a bar code yields the bar and space ratios. Bar and space ratios can differ. NOTE: If the narrow bar and narrow space are equal and the wide bar and wide space are equal then you calculate only one ratio.

**Window**
A display area that the users interacts with to operate a tool.

**Word**
A unit of data which contains two bytes (16 bits).

**Write-protected**
Read-only files are said to be *write-protected*. You can write-protect a 3.5-inch diskette by sliding its write-protect tab to the open position and a 5.25-inch diskette by placing an adhesive label over its write-protect notch.

**"X" Dimension**
The dimension of the narrowest bar and narrowest space in a bar code.

**XON**
A control character sent by the receiving device to signal the transmitting device to begin sending data.

**XOFF**
A control character sent by the receiving device to signal the transmitting device to stop sending data.

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## Revision History ▼

| Document Revision Number | ECN Number | Date | Changes Made |
|---|---|---|---|
| 0.1 | None | 07/98 | 1st draft for preliminary release |
| 0.2 | None | 08/98 | 2nd draft for first walkthrough |
| 0.3 | None | 12/98 | 3rd draft (No valid index) |
| 0.3 | 4580 | 10/22/99 | Minor correction to VLD procedure |
| 0.4 | 3241 | 11/18/99 | Caution Label changes |
| 0.5 | None | 11/30/99 | Updated and corrected preliminary release |
| 1.0 | 5483 | 6/2000 | First release of version 1.0 of DM-3000 Service and Installation Manual |
| 1.1 | 5522 | 8/2/00 | Remove volume reference |
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