



MD70-X



Manual Micro Milling & Drilling System
Cameron MD70-X with Flat Panel & Optional Programmable Z Axis

User & Technical Manual

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1. ABOUT THIS MANUAL

What you will find:

OPERATION

All the information necessary to safely and predictably operate the system is included. Operators should be familiar with the information in this manual before operating the system.

INSTALLATION

Detailed installation procedures for the system and its accessories, including power and space requirements.

SAFETY

The proper and safe operation of this machine, safety tips and concerns.

MAINTENANCE

Maintenance and adjustment sections are included for ease of maintenance and periodic adjustment scheduling.

TROUBLESHOOTING

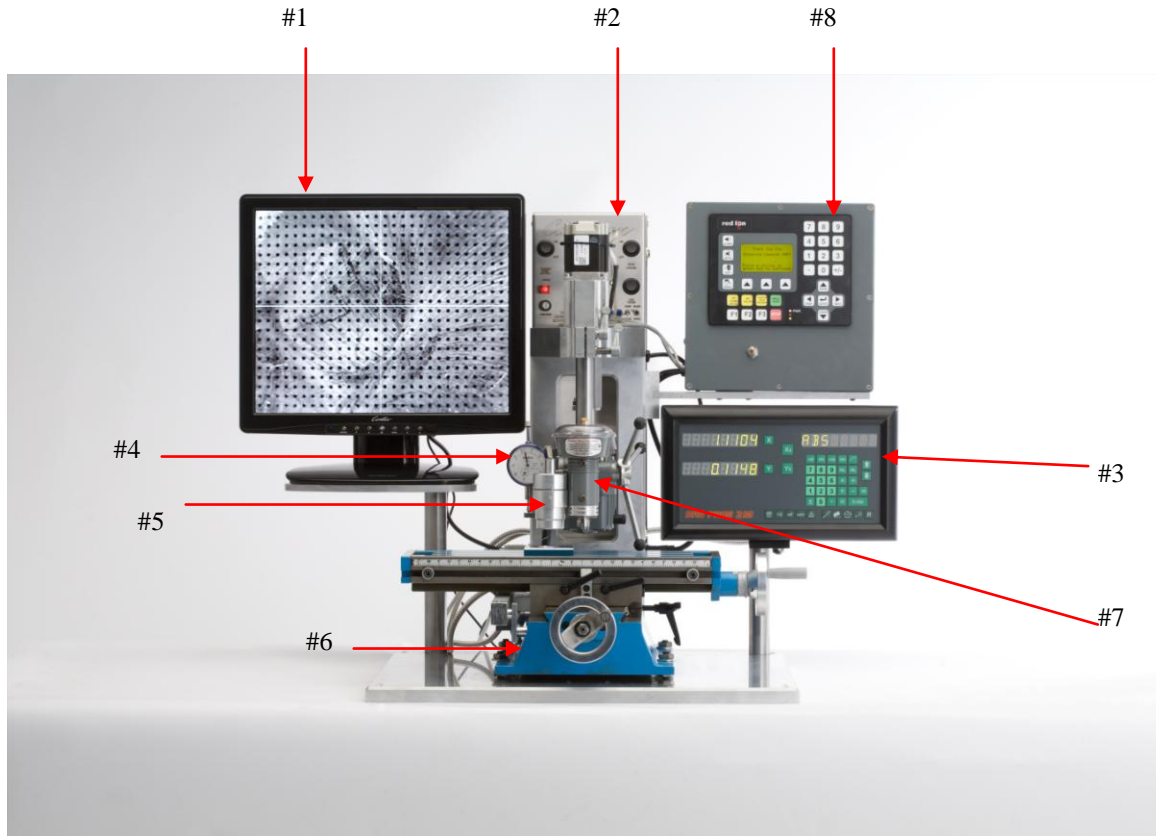
The troubleshooting section is limited to simple checks and fixes an operator can make. Any troubleshooting activities beyond those listed in this section should not be attempted without input from a Cameron representative.

RECOMMENDED SPARE PARTS

A recommended spare parts list. Stocking these parts at your facility may reduce downtime.

2. INTRODUCTION

2.1 Overview of the System



- #1—Monitor (Flat Panel)
- #2—Control Box
- #3—DRO Panel
- #4—1” Travel Dial Indicator
- #5—VEF Camera
- #6—X-Y Table
- #7—Spindle Head Assembly with NSK Spindle
- #8—Red Lion Programmable Z Axis (Optional)

3. INSTALLATION

3.1 Electrical Requirements

The system uses a Nominal 110 VAC, 50-60 HZ @ 5 Amperes. The power connection is a standard 3-pole male plug, located at the rear of the control box.

<p>WARNING: DO NOT CONNECT THE POWER CABLE TO ANY POWER SOURCE UNTIL THE MACHINE IS IN ITS FINAL LOCATION AND ALL OTHER CONNECTIONS HAVE BEEN MADE.</p>
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3.2 Dimensions

Width: 28”
Depth: 28”
Height: 24”
Weight: Approximately 150 lbs.

Be sure to leave space at the rear of the unit for cable routing and access to rear components. In the interest of safety, we recommend that you allow for ample free working space surrounding the unit.

The MD70-X is designed and constructed to function in various manufacturing atmospheres. It is a precisely calibrated piece of equipment. Please avoid rough handling when moving and installing the machine.

3.3 Uncrating the System

Due to the ever-changing requirements of our customers and shipping companies, the crating of the system may differ from shipment to shipment. A separate set of instructions for unpacking your system is supplied with the paperwork you received. If you do not find this paperwork, call Cameron’s customer support.

Rest assured your system has been packaged as safely and reasonably as possible. We expect the system to be received without damage to it or any of its parts.

All Cameron equipment is shipped F.O.B. (Freight on Board) Sonora (our shipping dock).

If upon receipt of your crate you see that there has been damage, such that you fear the contents may have been damaged, immediately inform the shipper. They are responsible for bringing the system safely to you.

Please use caution when uncrating the system. At least two people should be involved, as one person can not handle the weight and size of the system.

Here are some simple tips:

- **Do not** tip or jar the equipment.
- **Do not** drop the equipment.
- **Do not** lift the system out of the crate by the X-Y stage handles. Lift only from the bottom of the plate. (Watch your fingers!)
- **Do not** open the crate in a dusty or moist place.
- **Inspect** the equipment immediately for obvious damage from shipping.

3.4 Moving the Machine

The MD70-X is separated into modules and can be handled by two people with average lifting capabilities.

Keep the machine upright and set it down gently on its workbench.

Here are some simple moving tips:

- At least two people with average lifting capabilities are required to move the equipment.
- Do not tip or jar the equipment.
- Do not drop the equipment.
- Do not lift the system by the X-Y stage handles. Lift only from the bottom plate.
- Be sure the table or bench is sturdy enough to hold the machine (150 lbs.).

WARNING: WATCH YOUR FINGERS! WHEN SETTING THE MD70-X DOWN ON ITS BENCH, MAKE SURE YOU DO NOT SET THE MACHINE ON YOUR FINGERS! ALTHOUGH THE UNIT IS NOT HEAVY ENOUGH TO CAUSE DAMAGE TO YOU, IT MAY CAUSE PAIN IF LOWERED ONTO A FINGER OR HAND.

3.5 Initial Set-up Procedure

1. Read and understand all manuals and instructions before beginning set-up.
2. Set monitor base on riser platform. Insert monitor into base. Attach both to platform from underneath with Phillips screwdriver.
3. Set the monitor on the plate and install the crossbar across the top of the monitor.
4. Plug the cables to the back of the monitor.



Back of the Monitor

5. Install the DRO on the mounting plate and plug in the cables to the back of the unit.
6. Plug the MD70-X into an outlet with nominal 110 VAC 50 – 60 HZ @ 5 amps. If that outlet is not available plug the MD70-X into the optional step-down transformer. If you did not choose this option, please contact a Cameron representative for assistance.



Back of the DRO

7. Turn on the main power on the control panel.

3.6 Installing the Drill Bit

Install your drill bit or mill cutter as you would on any ordinary drilling machine. There is no procedure for this, specific to Cameron systems.

3.7 Mounting the Work Piece

Your unit may have been delivered with a work piece mounting fixture, which has been installed on the standard table. Refer to the system specification sheet supplied with your system for details.

If your system does not have a custom-built fixture, the standard table is installed. The table has two standard 5/8" T-slots.

CAUTION: NEVER LOOSEN THE BOLTS HOLDING THE X-Y TABLE TO THE BASE PLATE. THIS MAY CAUSE THE UNIT TO BECOME MISALIGNED. LOOSENING THE BOLTS VOIDS THE WARRANTY.

4. OPERATIONAL SET-UP

The following sections explain how to safely set the system up for operation.

4.1 Safety Precautions

The first and most critical step toward the safe and efficient operation of this or any other piece of equipment is to **READ AND UNDERSTAND ALL SECTIONS OF THIS MANUAL** prior to operating the equipment.

It is important to follow all of the safety precautions required by the machine's owner as well as state, federal and local codes. In addition to the rules of common sense, the following safety rules should also be observed:

- ⊗ Always turn the main power off before connecting or disconnecting the foot switch. Not doing so could blow the fuse.
- ⊗ Keep extremities, hair, clothing, jewelry or other personal items that may get caught up in the moving parts of the machine, away from those parts whenever the machine is running.
- ⊗ Long hair should be tied back while operating or standing close to an operating machine.
- ⊗ Do not wear loose clothing or dangling jewelry while operating or standing close to an operating machine.
- ⊗ Do not insert any object, other than the material for which the machine was constructed to process, into the machine at any point.
- ⊗ The machine must never be operated with the belt cover removed.
- ⊗ Even though machine power is switched off, dangerous voltages are still present within the control box.
- ⊗ Disconnect the machine from AC power prior to removing any safety cover.

4.2 Reference Diagrams of the MD70-X

Diagram 1:

- 1.1 Variable Speed Control On/Off Switch
- 1.2 Speed Control Knob
- 1.3 Power Indicator Light
- 1.4 Fuse Holder
- 1.5 Main Power Switch
- 1.6 Video Edge Finder On/Off Switch and Indicator Light
- 1.7 White/Black Line Switch
- 1.8 Crosshair Adjustment Knobs

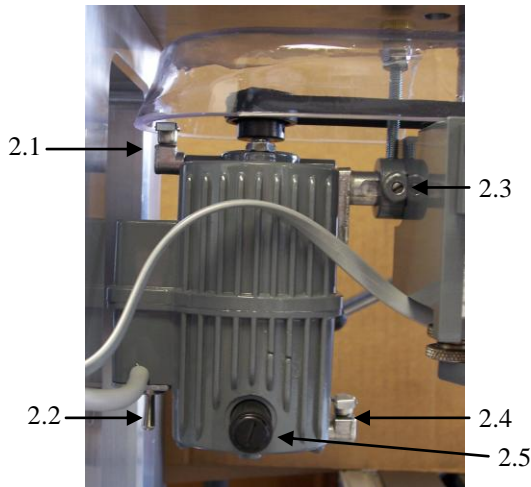
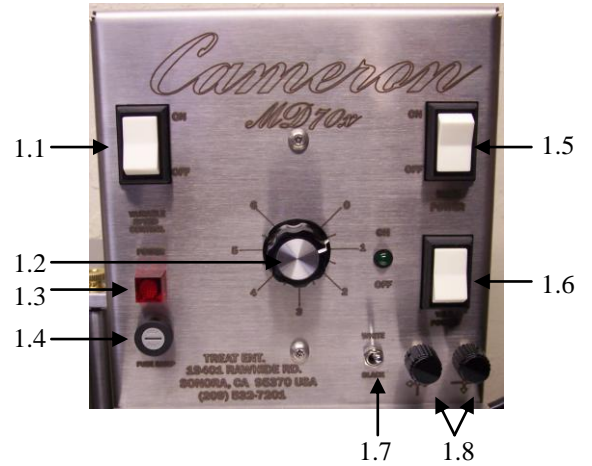
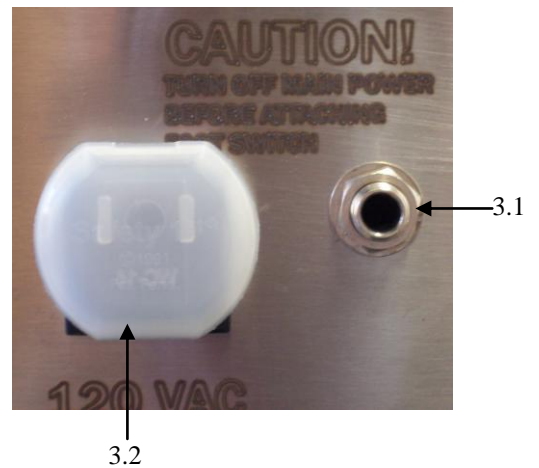


Diagram 2:

- 2.1 Upper Oil Cup
- 2.2 Motor On/Off Switch
- 2.3 Belt Adjustment Screw
- 2.4 Lower Oil Cup
- 2.5 Brush Holder

Diagram 3:

- 3.1 Foot Switch
- 3.2 Accessory Outlet



4.3 Operating the Cameron MD70-X Milling & Drilling System

Steps of operation:

1. Turn on main power switch (1.5 in diagram 1)
2. Turn on the motor (2.2 in diagram 2)
3. To use the variable speed control, turn on the switch (1.1 in diagram 1) and select the desired speed using the control knob (1.2 in diagram 1)
4. Select tool and proper collet.
5. If you would like to use the VEF, then follow the VEF setup instructions.
6. Touch tool to part surface and set dial indicator to '0' (To avoid tool damage we recommend turning the spindle on for this step.)
7. Consult your machinist handbook and the tool manufacturer for suggested spindle speeds.

We recommend 'peck drilling' as the most effective method of drilling most materials. To extend the life of your drills and end mills, use cutting fluid when possible. Operation of this machine is most effective when using the DRO. Please read and follow the instruction manual for the DRO.

4.4 Video Edge Finder Set-up

The VEF is installed at the factory. The crosshairs can be adjusted at the discretion of the owner. If you choose to adjust the crosshairs follow the steps below.

To determine the crosshair to drill differential do the following:

1. Touch drill bit to work piece.
2. Set dial indicator to zero.
3. Drill a test hole and retract to .100 above zero.
4. Lock down column on drill using the column lock, located on the right side of head, just above the handle.

5. Zero the DRO (both X and Y)
6. Dial over the hole in the X-axis (approx. 1.658")
7. With the column still locked, adjust the camera focus to the surface of the work piece.
8. Move X-axis over until test hole is centered under the camera.
9. Adjust the Y-axis crosshair line on the enclosure to be in the center of the hole. This will make the Y differential '0'.
10. Record the DRO reading for the X-axis. This is your crosshair differential.

An optional procedure to steps 2 and 3 above is to set the touch point to .100". This allows .100" dial reading before touch point. It also allows the focus of the camera to be set at zero, giving you a .100" clearance between the tool and your work piece.

4.5 Operating the Programmable Z Axis (Purchased Option)

4.5.1 Setting Home Position

Home is the height above the part the drill will return to when the drill cycle is finished.

1. Press 'Set Home/Offset' button
2. Press F1 to set home position.
3. Jog up or down to desired home position. Press F3 when finished.



4.5.2 Setting the Offset

Offset is the start height of the drill cycle.

1. Press ‘Set Home/Offset’ button
2. Press F2 to set the tool offset length.
3. Turn on the motor.
4. Using ‘Down Fast’, ‘Down Slow’ and ‘Index Down’ bring the drill down until tool touches the top of the part. (Index down moves down the amount entered in the index depth box.) F1 toggles between up and down.
5. Press F3 when the drill touches the top of the part.



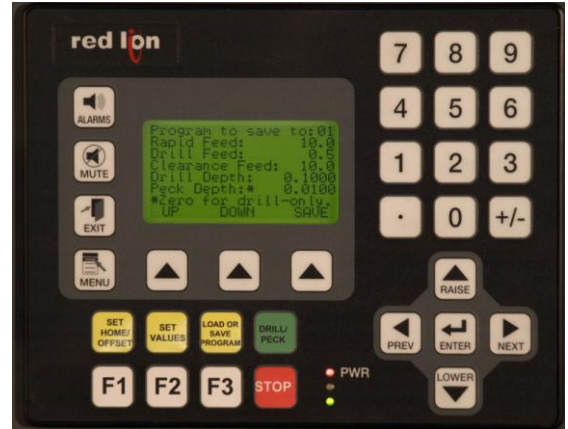
4.5.3 Loading a Program

1. Press ‘Load or Save Program’
2. Use the up and down buttons to select the desired program.
3. Press Load to retrieve the program.



4.5.4 Creating and Saving a New Program

1. Press 'Set Values' to create a new program.
2. Either use the number pad or the 'Raise' and 'Lower' buttons to set the values. Press 'Enter' after entering the value. Use the 'Next' and 'Previous' buttons to move to other values.



Rapid Feed: The downward speed of the drill to the offset position. And also the upward speed of the drill to the home position after drill cycle is done.

Drill Feed: The feed rate downward during the drill cycle.

Clearance Feed: The feed rate while the drill cycle is moving upwards to clear chips from the drill flutes.

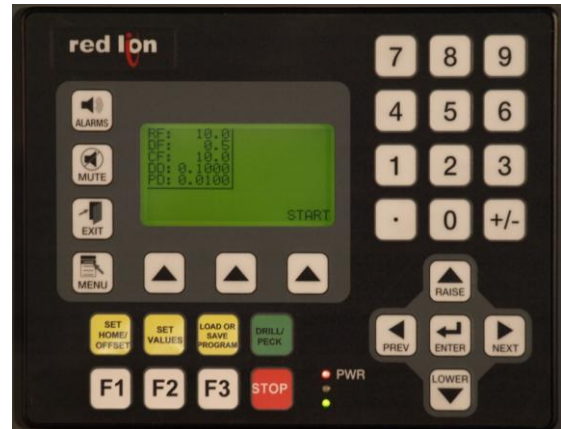
Drill Depth: The total depth the hole that is drilled during the drill cycle.

Peck Depth: The depth drilled before the drill is moved upward to clear chips from the drill flutes.

3. Press 'Load or Save Program' after all values are set.
4. Press F1.
5. Use the up and down buttons to select a program number. Press Save to save the program under that number. After the program is saved, press a yellow or green button to continue.

4.5.5 Drilling

1. After loading a program, press ‘Drill/Peck’.
2. Press Start to begin drilling.
3. After drilling cycle is complete, either move X-Y table to next hole location or put in next part.



4. Press Go Again to repeat drill cycle with the same settings.
5. To stop the drill press during the drilling cycle, press the ‘Stop’ button.

Press F1 to return to the home position. (If you are at the home position, it won't move.)

Use the yellow buttons to change the settings or the green button to restart the drill cycle.



5. MAINTENANCE

5.1 Adjustments

5.1.1 Flat Belt Adjustment

If the belt is run too tightly, it will reduce power and cause undue vibration. Full driving power with maximum smoothness is attained with proper belt adjustment. To adjust, loosen the belt adjustment screw (see section 4.2, diagram 2). Retighten screw after adjusting.

5.1.2 Adjusting the Head Balance Spring

The head balance spring is adjustable to suit particular requirements by loosening the three screws of the friction lock ring, located at the left side of the head casting. To adjust the head balance, turn the friction lock ring one-half turn and turn the spring tensioner casting with a screwdriver inserted into the slot at the center of casting. (Counter-clockwise rotation increases spring tension.)

5.2 Care and Maintenance

Do not over lubricate.

Do not use ‘3 in 1’ oil.

- Sliding members should be periodically wiped clean and lubricated with WD-40.
- The two motor bearings should be oiled every 40 hours with a good quality, non-gumming mineral oil.
- The length of the brushes should be checked after approximately 500 hours of use. The brushes should be replaced with factory supplied brushes if they are less than ¼” in length.
- Wipe the monitor with a clean, dry cloth and a mild glass cleaner as needed. Clean the camera lens with a commercial lens cleaner as needed.

6. TROUBLESHOOTING

Usually the first questions that needs to be answered anytime there is a problem are: “Is it plugged in?” and “Is it turned on?”. These questions may seem ‘dumb’, but many times the solution arises when these two questions are answered. So, don’t forget to check if it’s plugged in and turned on.

Problem	Things to Check
Machine does not run when main power switch in turned on	<ol style="list-style-type: none"> 1. Make sure machine is plugged in the proper power supply. 2. Make sure the motor switch is in the on position. 3. If the foot switch has been plugged in, then press down the pedal to activate for hands free operation. 4. Make sure the variable speed control knob is not set too low. 5. Make sure the circuit breaker (top right side of unit) is not tripped. 6. Make sure the 5amp fuse is not blown.
Machine is excessively noisy.	<ol style="list-style-type: none"> 1. Adjust the belt tension. 2. Check and tighten work piece mounting, vise or fixture. 3. Lightly oil motor with a light mineral oil. 4. Check for loose pulleys and their alignment.
Not enough low speed torque.	<ol style="list-style-type: none"> 1. Switch to a smaller pulley on the motor and/or a larger pulley on the spindle. 2. Check and adjust the belt tension.
Not reaching high RPM settings	<ol style="list-style-type: none"> 1. Check variable speed control knob position. 2. Check belt position. 3. Check to see that small pulley is located on spindle and the large pulley is on the motor. 4. Check the wear length of the motor brushes, replace if they are less than ¼” long.
Drill press head will not move up or down	<ol style="list-style-type: none"> 1. Make sure the column lock is released. 2. Clean column and rack & pinion area with WD-40. (This should be done after every 40 hrs of use.)

<p>Excessive drill breakage</p>	<ol style="list-style-type: none"> 1. Make sure that the work piece is securely held in a vise or fixture. 2. Use cutting fluid to extend the life of drills. 3. RPM setting is too high or too low for application. Use machinist’s handbook, or call drill bit vendor for advice on feeds and speeds for your type of material. 4. Use the dial indicator to observe feed rate. A smooth feed rate should be your goal.
<p>No power to monitor.</p>	<ol style="list-style-type: none"> 1. Check power cord. 2. Check on/off switch on the front of the monitor.
<p>No image on monitor</p>	<ol style="list-style-type: none"> 1. Check video cord from monitor to the electrical enclosure. 2. Check that the VEF power switch is on.
<p>Have image but no crosshairs</p>	<ol style="list-style-type: none"> 1. Check the white/black line switch to make sure it is properly selected. (section 4.2, diagram 1) 2. Check VEF line adjustment knobs to see if the horizontal and/or vertical lines have been adjusted to the edges of the screen. (section 4.2, diagram 1)
<p>No power to the DRO</p>	<ol style="list-style-type: none"> 1. Check power cord from the back of the DRO to the electrical enclosure. 2. Check the power switch on the back of the DRO.
<p>For all other DRO troubleshooting, see the DRO manual.</p>	

If your issue wasn’t addressed or if your problem continues, please contact a Cameron representative.

7. REPLACEMENT PARTS LIST

The following is a partial list of replacement parts. Parts are available from the factory. Please call for pricing.

<u>Part #</u>	<u>Description</u>	
MD157-7	Belt Guard	\$27.50
MD147-1	Single Speed Motor	125.00
MD138-7	Motor Brushes (Set of 2)	10.50
70X-150	Flat Belt	12.00
3AG-5	5amp Fuse	
70X-121	Motor Pulley, Standard	
70X-122	Motor Pulley, Large	
70X-123	Motor Pulley, Small	
70X-124	Spindle Pulley, Standard	
70X-125	Spindle Pulley, Large	
70X-126	Spindle Pulley, Small	

8. TECHNICAL SERVICE

Cameron MD70-X has been designed and constructed using the highest quality standards and materials. However, should your unit fail to function properly, in spite of regular maintenance and you cannot find the solution to the issue in the troubleshooting section of this manual, then contact Cameron for technical support. Our engineers can probably determine how to correct the problem on the phone.

Treat Enterprises, Inc. provides complete after sales service and support for all Cameron products.

Our hours of operation are:

Monday – Friday 7am to 3:30pm Pacific Standard Time

Cameron observes the following US holidays:

- New Year's Day
- Memorial Day
- Independence Day
- Labor Day
- Thanksgiving
- Christmas Day

To obtain service, contact Cameron via telephone, fax or email:

Telephone: 1-800-369-7769 or 209-532-7201

Fax: 209-532-1211

Address: Cameron Micro Drill Presses
19401 Rawhide Road, Sonora, CA 95370

Email: sales@cameronmicrodrillpress.com

Web-site: www.cameronmicrodrillpress.com

9. WARRANTY

Cameron Micro Drill Presses warrants that items of its own manufacture will be free from defects in material and/or workmanship at the time of delivery and will be so for a period of three months after leaving the Cameron facility. If any such item proves to be defective, Cameron retains the option to repair or replace the item in question at its own expense. An inspection will take place at the Cameron facility to determine if the item has been used and maintained as intended during the warranty period. After contacting Cameron's service department and receiving return authorization, the owner of the machine is required to ship the item (freight prepaid) to Cameron Micro Drill Presses for inspection of the machine.

Warranties on components not manufactured by Cameron, but included and sold as part of the system, are limited to those provided by their original manufacturers. However, Cameron will handle returns of those components as well. The owner must still ship the component prepaid.

This warranty is expressly limited to the repair or replacement of defective items as described above. In no event shall Cameron be held liable or accountable for incidental or consequential damage due to any breach of warranty, defect in material, workmanship or omissions/misstatements in this or any documentation. Cameron shall not be responsible for repair or replacement of items which have been subjected to neglect, accident or misuse, or which have been altered by anyone other than Cameron personnel.

Cameron retains all protected, proprietary rights, including patent rights, rights to devices originated by Cameron, which are part of the equipment, and rights to designs or data furnished to the owner.

10. THIRD PARTY DOCUMENTATION

The original manufacturers of components, which are not manufactured by Cameron, have supplied some information. These are referred to as 'Third Party Documentation.' The information is included in the form in which Cameron received it with no changes, deletions or additions. Cameron accepts no responsibility or liability based on the information included in any third party information. If you believe the information is false or not complete, please contact the manufacturer of the component.

The third part manuals and/or data sheets either are bound together with this manual or have been supplied as part of a complete document package typically delivered with the machine.

11. YOUR NOTES

You may use this page to note any changes made, helpful tips, calibration parameters or set-up information. Use to keep any information not contained in this manual, which an operator may find useful in the set-up and operation of this machine.
