

EASY TO OPERATE



LD-Digital System.

Four front panel buttons control all of the digital operating functions of: tare, peak hold on, peak hold erase, readout selection in pounds, kilonewtons or kilograms and power on/off.

CELL PHONES OR HAND OPERATED RADIOS
MAY AFFECT ACCURACY DURING CALIBRATION
& OPERATION.

Test Mark Industries, Inc

1048 24th Street Extension
Beaver Fall, PA 15010
Tel:(724) 847-8600 Fax: (724) 847-8605

LIMITED WARRANTY

Test Mark Industries, Inc. (The Company) warrants that hardware and software/firmware products manufactured by The Company, when properly installed, used, and maintained, will be free from defects in material and workmanship. Test Mark Industries, Inc. warrants a) the SOFTWARE/FIRMWARE will perform Substantially in accordance with the accompanying written materials and b) the HARDWARE will be free from defects in materials and workmanship under normal use and service for a period of (1) one year from date of receipt. The Company's obligations under this warranty will be limited to repairing or replacing, at The Company's option, the part or parts of the hardware and software/firmware which prove defective in material and workmanship within one (1) year from the date of delivery, provided the buyer gives The Company prompt notice of any defect or failure and satisfactory proof thereof. Products may be returned to The Company's factory. The Company will deliver replacements for defective products to the Buyer, freight prepaid to the destination provided for in the original order. With respect to any product or part thereof not manufactured by The Company, only the warranty, if any given by the manufacturer thereof, will apply. It is the responsibility of the Buyer to determine the suitability and safety of this product for any particular purpose. The Company disclaims all liability for incidental or consequential damages. In no case will The Company's liability exceed the original purchase price. THE COMPANY MAKES NO OTHER OR FURTHER WARRANTY, EXPRESS OR IMPLIED, INCLUDING ANY WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE OR WARRANTY OF MERCHANTABILITY.

COPYRIGHT NOTICE

The contents of this manual copyright © 1999. All rights reserved. Nothing in this manual may be reproduced in any manner, either wholly or in part for any purpose whatsoever without written permission from Test Mark, Inc.

LD LICENSE AGREEMENT

This is a legal agreement between you, the end user, and Test Mark, Inc (The Company). By using **LD** you are agreeing to be bound by the terms of this agreement.

- 1.0 License Grant.** The Company hereby grants the end user a personal, nontransferable and non exclusive license to use one copy of the software/firmware and related documentation on a single indicating system.
- 2.0 Intellectual Property Rights.** The Company is the sole owner of all right, title and interest to the **LD** and all copyrights, trademarks, and trade secrets therein. The Company is protected by United States copyright laws and international treaty provisions. Therefore, the end user must treat the software/firmware like any other copyrighted material and may not copy the written materials accompanying the **LD**.
- 3.0 Restrictions.** This Agreement and the Licensed Software/Firmware may not be assigned, Sub-licensed or otherwise transferred by the Customer. The end user must not reverse engineer, decompile, or disassemble the Licensed Software/Firmware or attempt to do so. The Licensed Software/Firmware may not be modified without the written consent of The Company.
- 4.0 Termination.** The Company may terminate the license contained in this Agreement by written notice upon any breach of any term by the end user. Upon termination, the end user shall immediately return the **LD** to the factory. Section 2.0 of this Agreement shall survive termination of this Agreement.
- 5.0 Purchase by Governmental Agencies.** If the end user is a federal, state or local governmental agency or unit, then as a matter of contract, the end user will accord The Company and the Licensed Program the same rights The Company would have had under the Copyright Act of 1976, as amended.
- 6.0 Governing Law.** This Agreement shall be governed by and construed in accordance with the laws of the State of Pennsylvania.

TABLE OF CONTENTS

1.0 INTRODUCTION1

THE DIGITAL SYSTEM2

2.0 THE FUNCTIONS3

 2.1 Load Display3

 2.2 Key Functions3

 2.3 Peak Hold Function3

 2.4 Peak Erase3

 2.5 Peak Display Readout3

 2.6 Tare Function4

 2.7 Rate of Load Control4

3.0 CALIBRATION5

 3.1 Instructions5

 3.2 Procedure6

HYDRAULIC CONTROL VALVE AND HYDRAULIC PUMP SECTION8

4.0 HYDRAULIC CONTROL VALVE9

 4.1 Metered Advance Position.....9

 4.2 Full/Advance Position9

 4.3 Hold Position.....9

 4.4 Retract Position9

 4.5 FIGURE 1: Control Valve10

 4.6 Sequence of Operations.....11

 4.7 Maintenance and Safety Precautions.....12

 4.7.1 Test Mark Pump and Flow Control12

 4.7.2 Safety Precautions12

 4.7.3 Hydraulic Fluid Level.....12

 4.7.4 How to Operate the Pump13

 4.7.5 Troubleshooting14

8.0 STATEMENT OF WARRANTY.....16

You will find that the LD-Series digital is an easy to use microprocessor based load indicating system, with a high degree of accuracy, if all operational instructions are followed.

All command and control functions for test operations and calibration of the digital are entered through three (3) front panel buttons. These buttons are Prog/Tare, Peak Hold/Up Arrow and kN.kg/Down Arrow. Their specific functions are outlined in the test operation and calibration procedure sections of this manual.

Please read both sections of the manual carefully before operating the machine.

THE DIGITAL SYSTEM

2.1 LOAD DISPLAY:

When conducting a test the digital will display all load values in its primary counting unit of pounds. After a test is completed and the peak hold function is activated, test result values can be toggled automatically and displayed directly in either Kilonewton or Kilogram values via a front panel key.

2.2 KEY FUNCTIONS AND HOW TO USE THEM:

First, turn the digital unit on and allow it to warm up for five (5) minutes before conducting a test.

2.3 PEAK HOLD FUNCTION:

Purpose: When activated stores and displays the highest actual peak load value reached during a test in either Pounds, Kilonewton or Kilogram values. **IMPORTANT:** To avoid reading an ERRONEOUS value from a previously stored test, you must erase the peak stored test value at the end of each test.

2.4 PEAK ERASE:

To erase a stored peak value, push and hold down for 2 - 3 seconds the PEAK HOLD and kN.Kg/DOWN ARROW keys. The digital will then alternately display +99.99 and the word "PEAK" for 2 - 4 seconds and then display "00", indicating that the stored test value is now erased and the PEAK HOLD mode has been activated for the next test.

2.5 PEAK DISPLAY READOUT:

At the completion of a test, the displayed load value will drop off as the sample begins to yield and will fall to a "00" reading when the sample is completely broken down. To recall the highest peak load value reached during the test, press the PEAK HOLD key once.

The digital will now alternately display the word PEAK and the load value in pounds in 4 second intervals for 30 seconds, and then time out. This cycle can be repeated by pressing the PEAK HOLD key again.

To display peak load values in metric units, press the kN.Kg/DOWN ARROW key once for Kilonewton values, press it again for Kilogram values. After test values have been documented, erase the stored peak value.

2.6 TARE FUNCTION:

Purpose: The Prog/Tare function is used to clear all displayed load test values on the digital before the start of a test. Activating the Auto-Tare function energizes a decimal point indicator light on the lower right side of the display, signaling that the tare function has been activated and new test load values will be displayed.

HOW TO USE: To start a test, advance the machine piston until the clear distance between the upper platen bearing surface and the test specimen is approximately 1/32". Press the Prog/Tare button and all displayed load values are cleared and the tare indicator light is activated. Test load values will now be displayed as load pressure is applied to the test specimen.

2.7 RATE OF LOAD CONTROL:

Based on ASTM C-39 specifications, the stress rate of load applied to a 6" x 12" test cylinder is 20 to 50 psi per second or approximately 33,930 to 84,820 lbs. per minute.

HOW TO SET RATE: Install a spare 6" x 12" concrete cylinder in the testing machine. Tare the digital unit and pre-load the cylinder. Place the valve in the metering position and slowly begin turning the rate of load control knob counter-clockwise to increase the rate of load, while watching the load value increase on the digital unit. With a stopwatch, measure the time it takes for the load reading to increase by 10,000 lbs. in 10 seconds time. This equals a rate of load of 60,000 lbs. per minute, which is a good average rate of load and easily set. Once you have set the rate of load, it can be locked in by tightening the thumbscrew on the side of the rate of load control knob.

3.1 LD-SERIES DIGITAL CALIBRATION INSTRUCTIONS

DIGITAL MODEL NUMBER TM-5000-M

Read all of the following information and verify the calibration accuracy of the testing machine before attempting a recalibration of the machine.

The digital displays the five most significant counting figures of a six-figure format, counting in 10-pound increments. The least significant figure, the “one’s” figure is not displayed. You must mentally add the zero figure to each reading on the display. Example: a displayed value of 115.19 equals 115,190 lbs.

Two decimal points are displayed during normal operation of the digital. The left hand decimal point is the equivalent of the comma separating the hundreds and thousands positions in the displayed value. This decimal point can be programmed out using the code 1 position in the software if it causes confusion. The right hand decimal point is displayed only when the Auto Tare function is activated. The Auto Tare function is controlled by the code 3 position in the software.

When the metric function kg is displayed, the decimal point for thousands will apply as it does for the pounds display and can be programmed out if desired.

When the decimal point for kN is displayed, it will be moved one position to the right of the pounds/kilogram decimal point. The kN decimal point is used to indicate tenths of a kilonewton and is part of the software instructions, making it a permanent display.

All programming and calibration functions are controlled by the three push button switches on the face of the digital unit. These three buttons are: Prog/Tare, Peak Hold/Up Arrow and kN.kg/Down Arrow. If no input switch command options are given to the digital, the HCA code calibration circuit will time out and return to normal mode of operation in approximately 4 to 4 1/2 minutes. All other circuit functions such as code 1 will time out in approximately 15 to 30 seconds.

If the digital displays the code LOC command, the calibration program lockout dip switch is activated. It must be deactivated (turned off) before new calibration points will be accepted by the unit. The program calibration lockout dip switch is located underneath the digital face plate, and is the top one on the dual dip switch card. The digital face plate must be removed to gain access to the switch. To remove the face plate bezel, simply use your fingernail or thumbnail on the under side of the top bar of the bezel approximately 3/4” in from each side. Lift up very gently and rotate bezel away from the digital unit. There is a high spot on the bezel which fits into a notch in the case and it must clear the case before the bezel will come free. The face plate consists of 2 separate pieces. The outside piece is a clear plastic cover and the inside piece is colored plastic which contains the artwork. Both plates can be scratched very easily, so use care when handling and storing them.

CAUTION: Always re-engage the program lockout dip switch to the on position after calibrating so that the calibration is protected.

It is strongly recommended that when entering the zero or span point using a calibration proving device such as a load cell, that the piston float or hydraulic pressure be held as steady as possible for 2 - 3 seconds before and during the entry of each calibration point. This procedure will allow the digital unit to be as accurate as possible.

3.2 CALIBRATION PROCEDURE

NOTE: You can exit the program at any stage by pressing Prog/Tare and up Arrow buttons simultaneously.

Step 1: Turn on digital unit. Complete display lights up for 3 seconds and displays all "8's". Unit should have a warm up period of 5 minutes before normal use or a calibration procedure is done.

Step 2: Simultaneously press Prog and Up Arrow button. The display will alternately flash BRI and a numeric value between 1 and 7. This is the position to control the brightness of the display and can be adjusted by using the Up Arrow and Down Arrow buttons to make the display brighter or dimmer. Select a preferred setting between 1 and 7.

Step 3: Press Prog button. If LOC command appears, see previous note to deactivate program lockout dip switch if you wish to recalibrate the unit.

Step 3A: With the LOC switch deactivated, the display will alternate between CAL and 000. To enter the cal program, use the up arrow to make the display alternate between CAL and 010.

Step 4: Pressing the Prog button will shift the unit into the physical calibration mode and alternately display ZERO and 0. Advance the machines piston until it is within 1/16" to 1/32" from touching the calibration load cell set up. Make sure hydraulic valve metering is adjusted so that the piston is held in this same position, neither advancing or retracting significantly for 2 - 5 seconds.

Step 5: Press Prog button. The unit will enter the Zero (0) calibration point and shift automatically to the upper value span calibration position. The display will then alternately flash between SPAN and machine capacity. Now load the machine until a load value equal to machine capacity is indicated on the calibration device (load cell) and press the Prog button. The span calibration point is now entered. The digital will automatically shift back to the start of the cal program and will alternately display CAL and 010.

Step 5A: In order to ensure that the auto tare function works consistently, the offset number for the numerical calibration must be accessed. Using the Down Arrow, change the 010 reading in the cal mode to read 020.

Step 5B: Press Prog and the display reads OFSE and a number. Using either the Up or Down Arrow, change the number displayed by + or - one (1) value count.

Step 5C: Press the Prog button again and the display will alternately flash SCAL and a 5-digit number.

NOTE: Changing the scale number will change the actual physical calibration of the machine. Do not change this number unless you want to manipulate the actual calibration of the machine.

Step 5D: Press the Prog button and the digital unit will return to the start of the cal mode. The display will flash between CAL and 020.

Step 5E: In order to proceed further into or through the rest of the menu, it will be necessary to lower the 020 reading to 000.

Step 6: Press Prog button. COD 1 and 60 will appear on the display. If necessary, use Up Arrow or Down Arrow buttons to set the value of 60 on the display. This is the selection for the left hand

decimal point. If you wish to delete the decimal point, use Up Arrow or Down Arrow buttons to set a value of 0.

- Step 7: Press Prog button. COD 2 and 060 appear. Adjust to 060 if necessary using Up Arrow or Down Arrow buttons.
- Step 8: Press Prog button. COD 3 AND 307 appears. This position controls the auto tare and MUST read 307. If necessary, use Up Arrow or Down Arrow buttons to set value of 307.
- Step 9: Press Prog button. COD 4 and 000 appear. Use Up Arrow or Down Arrow buttons to adjust to 000 if necessary.
- Step 10: Press Prog button. COD 5 and 000 appear. Use Up Arrow or Down Arrow buttons to adjust to 000 if necessary.
- Step 11: Press Prog button. This should put you back into the normal operation mode.

NOTE: If the calibration should fall marginally out of tolerance, say the center span is a little too high but low and high ends are in standard, you can try inputting the Span Cal point 500 pounds high. Maintain the HCA Span setting at machine capacity, but set the calibration point at 500 lbs. higher than machine capacity as displayed on the load cell. This should have the effect of lowering all load value readings slightly in the mid-range.

To improve the low-end accuracy, if necessary, the zero portion of the HCA calibration set point can be changed to 1% of machine capacity value.

Change the HCA Zero (0) set point using the Up

Arrow or Down Arrow to read Zero/1% of machine capacity value, with the upper span cal point set at machine capacity. Follow steps 1 through 15.

HYDRAULIC CONTROL VALVE

AND

HYDRAULIC PUMP SECTION

4.0 HYDRAULIC CONTROL VALVE

4.1 METERED ADVANCE POSITION

Placing Control Handle No. 1 (see figure 1) into the metered advance position allows the operator to adjust the rate of loading through the use of Control Knob No. 2. The adjustment for increasing the rate of loading is to turn Knob No. 2 counter-clockwise, for decreasing the rate of loading turn Knob No. 2 clockwise. **CAUTION:** Do not over-tighten Control Knob No. 2.

For the testing of concrete cylinders, the rate of loading must conform to ASTM C-39 specifications. It states that for a hydraulically operated testing machine, the load must be applied at a constant rate within the range of 20 to 50 psi/sec. Knob No. 2 controls the rate of loading. Based on ASTM specifications, for a 6" diameter concrete cylinder, the loading rate should be 565 lbs/sec. to 1413 lbs/sec. or 34,000 lbs/min. to 84,000 lbs/min.

On Test Mark digital load indicating machines, please see Rate of Load in the digital manual.

On gauge machines a reading of 10,000 lbs. on 10 seconds is a good average and is easily set through the use of Control Knob No. 2 and a watch with a second hand.

4.2 FULL/ADVANCE POSITION

Placing control Handle No. 1 into the rapid advance position causes the piston to advance rapidly in a non-controlled rate of loading. This is normally used for pre-loading a specimen or rapidly advancing the piston to reduce the daylight opening between the specimen and the platen. **CAUTION:** When pre-loading a specimen, watch the machine's load indicator to prevent overloading, or the premature failure of the specimen.

NOTE: DO NOT ALLOW THE MACHINE TO TRAVEL BEYOND THE MAXIMUM PISTON STROKE TAG LOCATED ON THE FRONT OF THE LOAD FRAME, AS YOU WILL OVER-EXTEND THE HYDRAULIC RAM.

4.3 HOLD POSITION

Placing Control Handle No. 1 into the hold position (see figure 1) stops the loading of the specimen and holds the pressure on the specimen at that point.

4.4 RETRACT POSITION

Placing Control Handle No. 1 into the retract position releases all pressure in the hydraulic cylinder allowing the piston to retract to its start position. It is not necessary to retract the piston fully between tests. A daylight opening that will allow the specimen to be inserted and removed is all that is required.

NOTE: During continuous operation of the machine, the Flow Control Valve will go through a significant temperature rise. This is not a cause for alarm, as the temperature rise will not affect the operation of the testing machine.

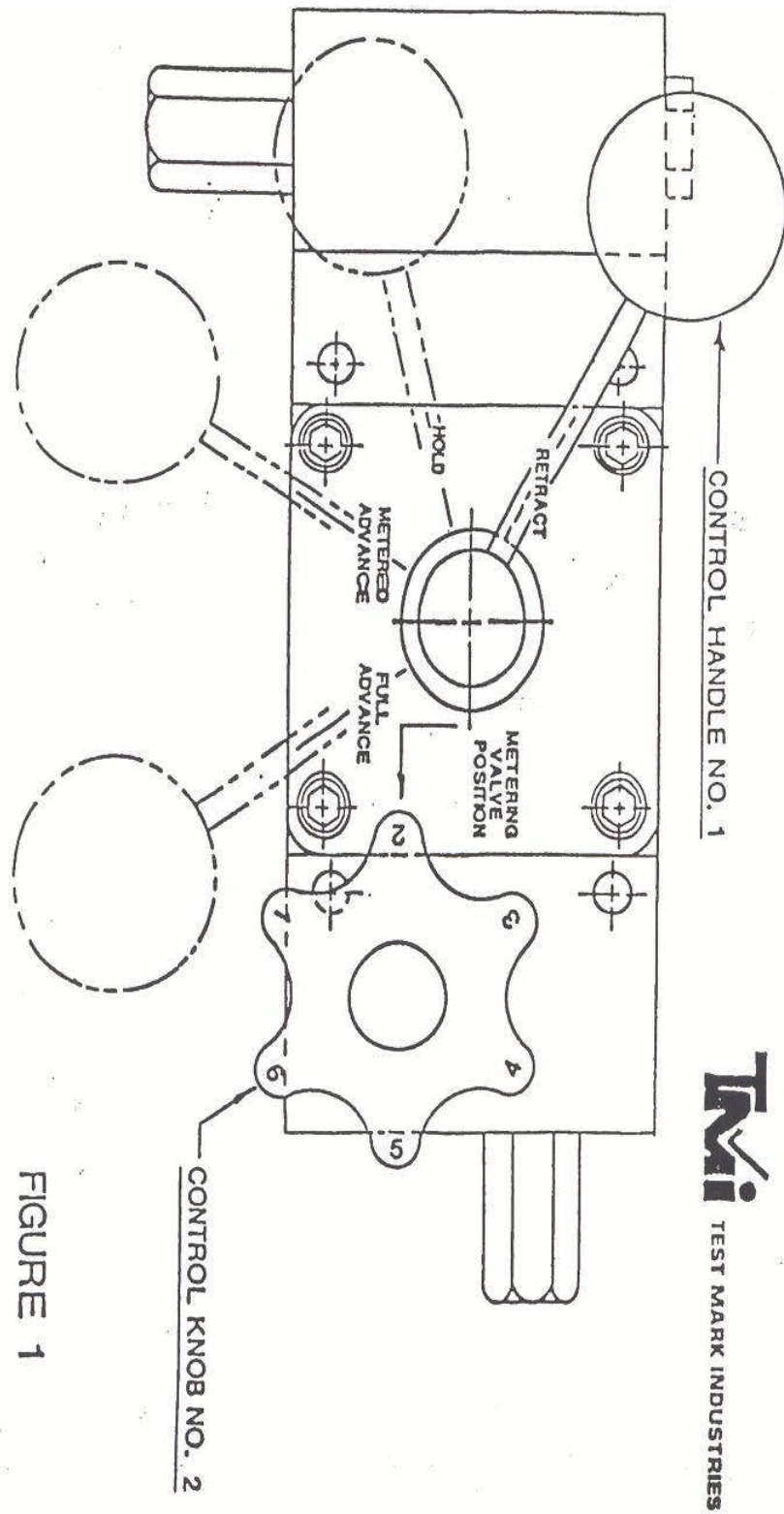


FIGURE 1

4.5 FIGURE 1: CONTROL VALVE

4.6 SEQUENCE OF OPERATION

1. Motor switched off, carefully center specimen in testing machine.
2. Turn Control Knob No. 2 clockwise to a snug position. Never over tighten.
3. Position Valve Control Handle No. 1 to a “metered advance” position.
4. Switch on pump.
5. If a preload of the specimen is desired, position Valve Control Handle No. 1 to “full advance”. Caution is required not to overload or fail the specimen.
6. Watch the gauge/digital. When the desired preload has been attained, move the Valve Control Handle No. 1 to the “metered position”.
7. To increase the rate of loading, turn Control Knob No. 2 counter-clockwise. To decrease the rate of loading, turn Control Knob No. 2 clockwise.
8. To hold pressure at any desired point, position Valve Control Handle No. 1 to the “hold” position.
9. To release pressure so that the platen will return after a test has been completed, position Valve Control Handle No. 1 to the “retract” position.
10. For repetitive testing of identical specimens with a gauge machine, Control Knob No. 2 can be preset with a stopwatch, and then locked in position by tightening the thumbscrew located beneath the knob. For a 6” diameter specimen, the loading rate should be 565 lbs/sec. to 1413 lbs/sec. or 34,000 lbs/min. to 84,000 lbs/min. For gauge machines a reading of 10,000 lbs. on 10 seconds is a good average and is easily set.

4.7 MAINTENANCE AND SAFETY PRECAUTIONS

4.7.1 TEST MARK PUMP AND FLOW CONTROL VALVE

This two-stage hydraulic pump incorporates precision design and engineering features, which make it the most outstanding pump of its kind on the market. All moving parts are made from high-grade tool steel, heat treated, machined, ground and lapped to extremely close tolerances to assure efficient operation and long life. Peak efficiency for either continuous or intermittent operation is assured at the full range of pressures up to 10,000 psi. You will have uninterrupted, trouble-free service if you keep it clean and free of dust.

4.7.2 SAFETY PRECAUTIONS

WARNING: To help avoid possible personal injury,

- Disconnect the pump from its electrical supply before performing maintenance or repair procedures.
- Repairs and maintenance should be performed in a dust-free area by a qualified technician.
- Should a hydraulic hose ever rupture, burst or need to be disconnected, immediately shut off the pump and shift the control valve to the retract position to release all pressure and allow the machines piston to return to its at rest position. Cycle the control valve twice to its retract position to make sure all pressure is released. Never attempt to grasp a leaking hose under pressure with your hands. The force of escaping fluid could cause serious injury.
- Do not subject the machines hydraulic hoses to potential hazard such as fire, extreme heat or cold, sharp surfaces or heavy impact. Do not allow the hose to kink, twist, curl or bend so tightly that oil flow within the hose is blocked or reduced.
- Periodically inspect the hoses for wear because any of these conditions can damage the hose and possibly result in personal injury. Should a hose need replaced, contact Test Mark with your machine model number and capacity for replacement parts.

4.7.3 HYDRAULIC FLUID LEVEL

- When checking the oil level, retract the machines hydraulic cylinder to its at rest position and disconnect the power supply. Clean the area around the filler plug and remove the plug.
- For machines supplied with 3/4 hp pump, maximum capacity is when the oil is 1 1/2" (38 mm) below the cover plate with the cylinder retracted.
- For machines supplied with 1/2 hp pump, maximum capacity is when the oil is 2" (50 mm) below the cover plate with the cylinder retracted.
- When adding oil, use only **Dextron III Automatic Transmission Fluid**. To fill, insert a clean funnel with filter, add oil slowly being careful not to overfill the pump. Check oil level when finished and remove any oil if pump is overfilled. Check to see that the breather-hole in the filler cap is open to prevent the build up of excessive air pressure in the reservoir, and to assure that the cylinder retracts smoothly, then replace filler cap.

- The frequency of oil changes will depend upon the general working conditions, severity of use and overall cleanliness and care given to the testing machine and the hydraulic pump. An air hose should never be used to clean the machine or pump as it will blow dust into the hydraulic system and cause damage to the hydraulic pump and load control valve. The oil should be changed at least every three hundred (300) hours of use under severe working conditions, where dust contamination of the oil is quite likely to happen. When changing the oil drain, flush and refill the reservoir with Dextron III Automatic Transmission Fluid.

4.7.4 HOW TO OPERATE THE PUMP

1. Make sure all valve and hose fittings are tight. Plug in electric motor.
2. Set valve in the retract position, set switch on run, and let pump idle for a few minutes.
3. Run piston out to its full travel several times to eliminate air from the system. This should be done with a concrete test cylinder in the machine. The pump is now ready to be put into regular operation.

4.7.5 TROUBLE SHOOTING

CORRECTING MINOR HYDRAULIC PROBLEMS

The hydraulic unit should be observed constantly for out of the ordinary performance and unusual noises. If any of these are present, shut off pump and take corrective steps immediately to avoid possible expensive repairs later on. Some of the most common minor problems and their remedies are listed:

PROBLEM	CAUSE	REMEDY
Improper advance or return	Air in circuit, oil supply low	Add oil. Run unit to work out air
	Dirt in system causing valves to lock open.	Flush out entire oil system and fill with new oil.
	If trouble is not cleared up by above remedies, trouble may be due to dirty or plugged up strainer screen.	Drain oil. Next remove pump base cover and clean or replace screen.

CAUTION: Do not operate pump without screen, as particles of dirt will be sucked into pump and valve mechanisms, seriously damaging valve seats.

Unable to reach pressure	Same as above	Same as above
Necessary to add oil often	Oil leaks	Check for broken lines, loose fittings or connections.
Noise in hydraulic system	Air in system. Low on Oil.	Add oil. Run pump to work out air.

If the above corrective measures fail to make the pump function properly, it is recommended that you send the pump back to the factory or to a qualified service representative. Under no conditions allow unqualified personnel to attempt to repair the pump, particularly the pump block unit or control valve unit, as serious irreparable damage may result.

STATEMENT OF WARRANTY

Test Mark Industries warrants all new testing machines, testing apparatus and supplies manufactured by Test Mark Industries against defects in workmanship and materials for a period of 24 months from the original date of shipment, provided the equipment has been properly installed, maintained and operated in accordance with installation and operating instructions. This limited and exclusive remedy does not cover normal wear and tear. The Test Mark Industries manufactured product must be free from accident, damage by fire, water or act of God to be eligible for warranty.

Test Mark Industries will repair, replace or credit at Test Mark Industries' option defective product or component parts. When repair can be accomplished by exchange of a component part, the customer may be required to remove the part of modular component and install the exchanged part.

Warranty does not cover expenses, either direct or indirect, that may arise from the use or the inability to use Test Mark Industries products, or the secondary owner in the event of resale.

Products not manufactured by Test Mark Industries will carry the warranty of the original manufacturer. Under no circumstances shall Test Mark Industries be liable for any injury, loss, or damages, whether direct or indirect, incidental or consequential, arising out of the use of, or inability to use the products described herein.

This exclusion of liability for loss or damages, whether direct or indirect, incidental or consequential, shall apply to all claims whether sounding in contract, warranty, tort including both negligence and strict liability, or any other basis of liability.