

CM-225A Auto Load Test Frame

Version 1.2

Operator's Manual

DURHAM GEO-ENTERPRISES

Operating Instructions

© 1998 Durham Geo-Enterprises, Inc.
2175 West Park Court • PO Box 870907
Stone Mountain, GA 30087 USA
Telephone 770.465.7557 • Fax 770.465.7447
Printed in the USA

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Setup

Thank you for purchasing a Durham Geo Auto Load Test Frame. By following the setup, operating, and maintenance procedures, you can enjoy a lifetime of use.

Upon receipt, please inspect the frame and electronics for damage. If you note any problems, please notify the freight company that delivered the frame and call Durham Geo-Enterprises at ☎ 1-800-837-0864 or fax at 1-770-465-7447.

Due to the weight of the frame, extreme care should be taken when un-crating the load frame. By using a lifting strap around the top section of the frame, with the fragment guards open, one can move the frame with a forklift or a hoist. A load capacity of at least 3,000 lbs (1,360 kg) is recommended.

Warning!

Always lift the frame from the top of the frame. The frame should not, under any circumstances, be lifted from the bottom.

While you are un-crating the machine, you should be aware that each load frame is shipped full of oil. Take care not to tilt or tip over the frame. Also, take care not to damage any accessories, such as the side enclosure, where the hydraulics and electronics are located.

After unpacking the frame, place it on a flat level surface. A few things to think of when choosing a place to set the frame are:

SETUP

1. Proximity to at least 2 electrical outlets. Due to the power required by the motor at startup, it is not advisable to plug the pump and digital readout(s) into the same outlet.
2. Relatively cool (less than 100°F/37°C) and low humidity (less than 80%) area.
3. Place the machine so that the back is accessible.

Mount the load frame using the holes provided on the sides of the frame. The recommended bolt diameter is 1/2" (12 mm). Some measurements to aid in the mounting of the frame are listed, and in the drawing, below:

- Distance between the two holes: 15.5" (393.7 mm)
- Distance from the center of the mounting holes to the front, and also the back, of the frame: 5.00" (127 mm)

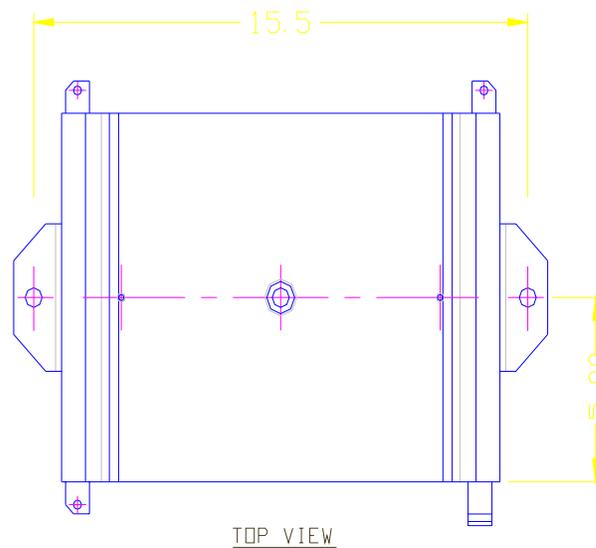


Figure 1.1 Top View of the CM-225.

Check all hydraulic fittings for tightness. The fittings can be accessed by taking the access panels off the back of the unit. Each fitting should be pulled tight and snugly seated. Loose fittings will result in leaking fittings, however, don't over-tighten the fittings as this may strip out the threads and make future repairs difficult.

SETUP

Your load frame should now be ready to use. Take a second and check that everything is attached and ready for testing. Check the oil level in the tank. This can be accessed by removing the access panel on the front of the machine. It should be approximately $\frac{1}{2}$ " to $\frac{3}{4}$ " (1 - 2 cm) from the top of the tank. If it is low, fill the tank with 215 grade hydraulic oil.

Operation

The CM-225 series load frames are constructed of carbon steel plate. These machines are precision machined and welded to provide an accurate platform for the hydraulic loading piston and top platen. The top platen is designed to swivel as necessary, so that the load is applied evenly across the specimen. The Durham Geo load frames are also specially engineered to minimize stretch under load, which is critical to uniform breaks. This means that deformation from front to back and side to side, under changing loads, will be equal.

Load is applied through a bottom-acting piston. The piston is precision machined with a chrome finish to reduce friction. A return spring allows for quicker return of the piston on completion of a test.

The load frame is powered by a two-speed high-pressure hydraulic pump. The pump, 2-gallon (7.5-liter) reservoir, and control valve are mounted on the side of the load frame, allowing easy access for service.

The applied load is displayed and monitored by the Controller. Readings can be displayed in the engineering units of the user's choice at the introduction/instruction menus at the time of startup. All calibration data is held safely in non-volatile memory.

The loading force is displayed on the Controller via a high-precision pressure transducer. The transducer converts the hydraulic pressure into an electrical signal, which is converted to engineering units and displayed on the Controller. The pressure transducer has a 10,000 psi (68,948 kPa) range, 0.02% linearity, and 1 ½ times over-pressure capability. This is a simple, but very effective and accurate method for converting hydraulic pressure to load.

The following 2 pages show details and descriptions of the major parts used in operation, calibration, and maintenance of the CM-225 series load frame.

OPERATION

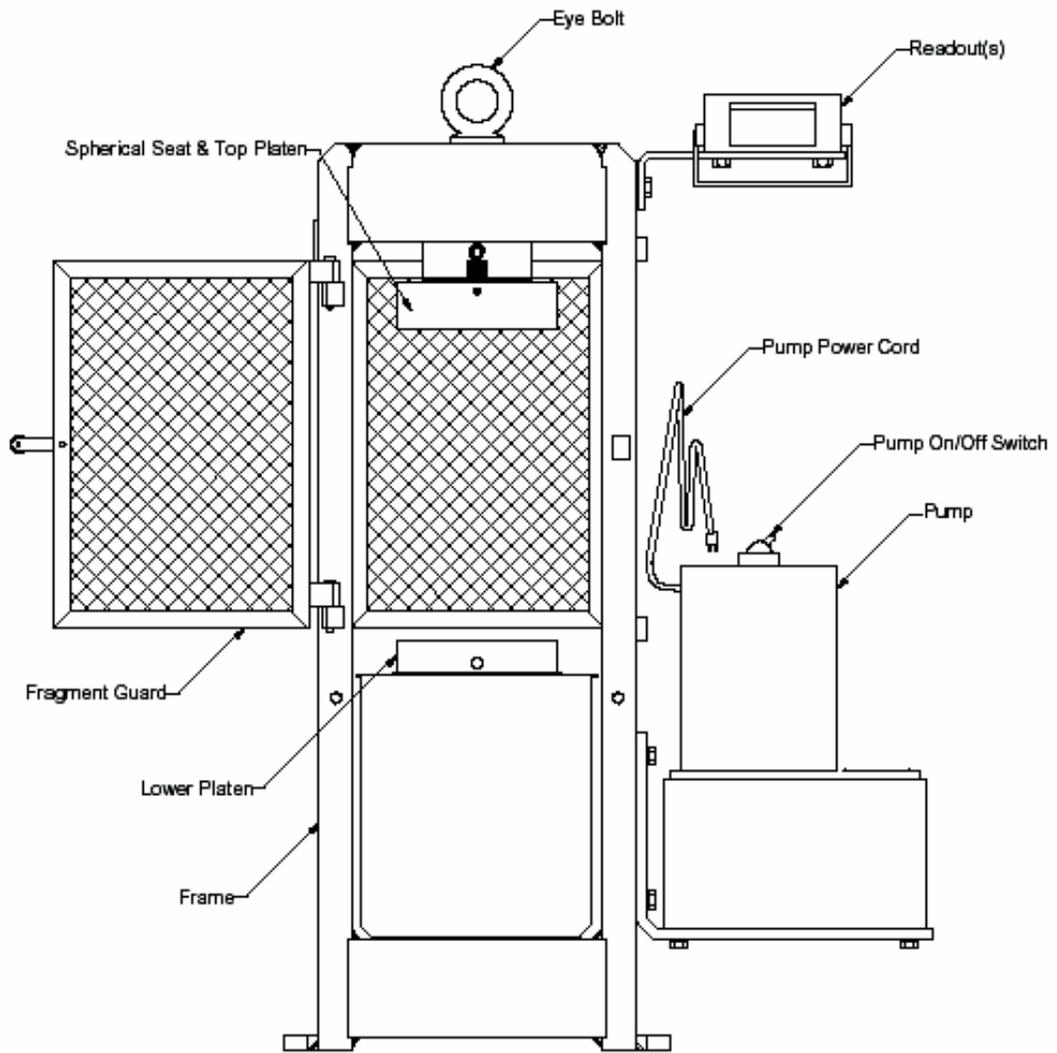


Figure 2.1 Front View of the CM-225.

OPERATION

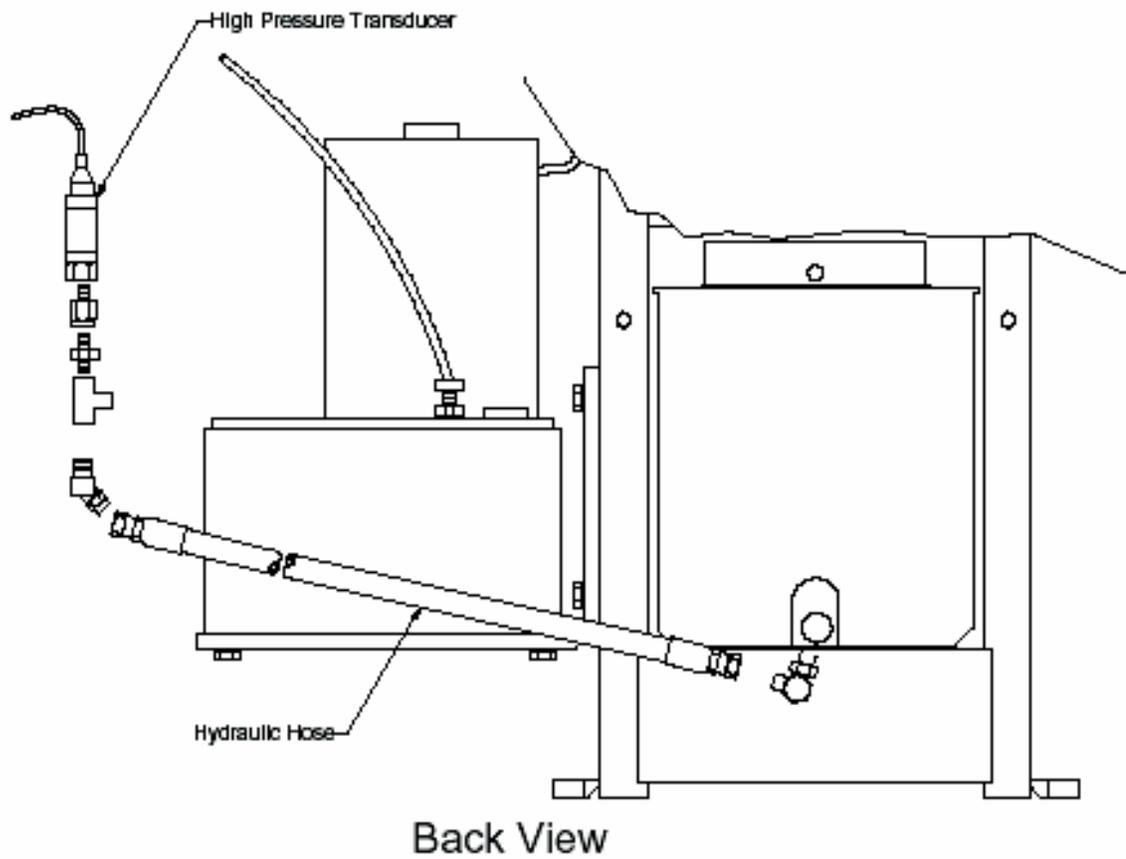


Figure 2.3 Back view of the CM-225.

Hydraulics

The movement of the hydraulic cylinder is controlled through the valve mounted on the pump, which, in turn, is controlled by the Controller. The valve has 4 positions:

1. Retract
2. Hold
3. Metered Advance
4. Full Advance

These four positions are actuated by the Controller, which moves the valve to the appropriate position.

Retract	The retract position is used to release pressure from the cylinder and return the cylinder to the home position. This is the position in which the valve should be when the frame is not in use.
Hold	The hold position is used to lock the cylinder in its place and maintain a pressure.
Metered Advance	The metered advance position is used during the actual test to control the rate of loading.
Full Advance	The full advance position is used to rapidly maneuver the cylinder into position for testing. Typically, the valve is placed in this position to move the sample up to the top platen.

Warning!

Remember that the hydraulic system is active as soon as the pump is turned on! Always make sure to press the red stop button after turning on the pump. This will prevent possible injury to personnel or accidental damage to samples. The hydraulic system will immediately pressurize once you start the test. Please familiarize yourself with the location of the Emergency Stop button in case of an emergency (hydraulic leaks, over-pressurizing, etc.).

Electronics

The “brains” of the CM-225 is the Load Indicator & Controller. The Controller allows the operator to:

1. Setup the Test
2. Calibrate the machine (in software)
3. Change the engineering units (US Customary or SI)
4. Perform valve tests
5. Change the seating and break thresholds
6. Control the hydraulics

Caution: See the Reference Section for details on the function and operation of the Load Indicator & Controller.

Running a Test

Before running a test, check all your setup conditions to insure the frame is ready for testing. The hydraulic valve control should be tested, be set in the “retract” position and the cylinder should be all the way down. Also, please refer to the Safety/Warnings on page 18.

Warning: Always turn on the indicator BEFORE turning on the pump! After turning on the hydraulic pump IMMEDIATELY press the red stop button (not the larger Emergency Stop button) to insure the hydraulic cylinder is in the retracted mode.

To run a test:

1. Turn the system on.
2. Place the sample between the platens.
3. Close the fragment guards.
4. Set all parameters in the Controller.

OPERATION

5. Start the test.
6. The Controller will load the sample to failure.
7. When the sample fails, the Controller will move the hydraulic valve to the “Retract” position.
8. Record all pertinent information.
9. Remove the sample.
10. Brush off aggregate and dust with a small brush or cloth. Do not spray off with water. A moist sponge or cloth is acceptable.
11. Repeat steps 2-10 to continue testing.

Safety / Warnings

Operation

- Always wear safety goggles and gloves when operating, calibrating, maintaining, or otherwise using the equipment.
- Always have the fragment guard in place before operating the equipment. Keep hands and fingers out of equipment during operation.
- This equipment must be bolted to a stable base before use. Failure to properly secure the equipment may result in serious injury or death.

Pump

- Close the oil fill plug to prevent leakage when transporting the pump.
- Do not exceed the rated capacity of 10,000 psi. (69 MPa)
- Do not tamper with the high-pressure relief on the pump.
- Do not adjust the relief valve, it is preset at the factory to 250,000 lbf (1112 kN). Any adjustments will void all warranties.

Cylinder

- Do not exceed the load rating of the cylinder. (i.e. the load rating of the frame which is 330,000 lbf or 1468 kN)

OPERATION

- Do not set loads that are poorly balanced or off-center on the cylinder.

Power Supply

- Do not use an ungrounded extension cord.
- Avoid conditions, which could create an electrical hazard.
- If the power cord is damaged or wiring is exposed, replace or repair immediately.
- Ensure the line voltage is the same as the voltage as specified on the plate of the electric motor.

UPKEEP

Calibration

Each concrete load frame is calibrated before it leaves the factory. The calibration certificate is enclosed with the machined. The certificate does not replace the required ASTM on-site calibration. However, it is useful for comparing calibration results. In most instances a re-calibration of the load frame is unnecessary.

ASTM requires a calibration be performed once every 12 months.

The following procedure gives step-by-step instructions on how to change the calibration data.

Warning

Only a certified calibration technician should change any of the calibration values in the Controller.

Maintenance

The hydraulic system is powered by a two-stage hydraulic pump coupled to a selector valve. The cylinder is a single acting spring return device. The maximum rated pressure of the system is 10,000 psi (69 MPa). For safety reasons, the pressure relief on the pump has been set below 10,000 psi (69 MPa).

Before operating the system for the first time, after any repairs, or after an extended period of inactivity, please check the following items.

Hydraulic Hose
and Fittings**Warning!**

Before working on hydraulic lines, always disconnect the power to the pump and place the valve in the retract position.

1. Before operating the pump, make sure all hose connections are tight. Use an open-end wrench of the proper size to tighten the fittings.
2. If you find a loose fitting, be careful not to over-tighten it. Over-tightening may cause premature thread failure or cause high-pressure fittings to split at pressures lower than their rated capacities.
3. Unplug the electric motor before breaking any hydraulic connection in the system.
4. Should a hydraulic hose burst or rupture immediately shut off the electric power by pushing the emergency shut-off switch.

Warning!

NEVER attempt to grasp a leaking hose under pressure with your hands. The force of the escaping hydraulic fluid could cause serious and permanent injury.

5. Avoid any conditions, which could damage the hose and impair the pump's performance. Never allow the hose to kink, curl, or bend so tightly that the oil flow within the hose is blocked or reduced. This could damage the hose and possibly result in serious injury to persons working in the immediate vicinity.
6. Do not subject the hose to any potential hazard (i.e. fire, extreme heat or cold, heavy impact or sharp surfaces) which may rupture or weaken the hose.
7. Do not use the hose to lift or move the equipment connected to it.
8. Periodically inspect the hose for signs of wear. NEVER use a defective hose with pressurized equipment.
9. Always consult the manufacturer before painting the hoses. NEVER paint the fittings.

Spherical Seat

(Please refer to the Drawing #2594 located at the back of this manual)

The spherical seat and upper platen are precision made and should be handled carefully. The spherical seat will need to be oiled semi-annually to insure proper operation. To remove the spherical seat:

1. Make sure the spherical seat is supported from underneath before removing the retaining bolt.
2. Remove the eye bolt from the top of the load frame.
3. Using the “T” wrench supplied with the frame, remove the bolt located in the cavity left by removing the eyebolt.
4. Remove the spherical seat from the frame and place on a flat surface. Remove the springs retaining bolts #9 (3 each) and springs #6. Separate the dome from the seat and inspect both surfaces from rust, scratches, and any deformities. Remove any rust, and oil both surfaces with a 40-weight oil and reassemble. Use caution when reinstalling the spherical seat back on the frame.

Platens

If the machine is not being used for several days, apply lightweight oil to the platens. A cloth that is soaked in oil will work to apply the oil to the top and bottom platens. This will prevent any rust from forming on the platens, and lengthen their life and appearance.

Draining the Reservoir

1. Take off the front access plate.
2. Clean the exterior of the pump.
3. Unscrew the red oil cap.
4. Using a siphon pump, remove all the oil from the reservoir.

Filling / Changing the Oil in the Reservoir

1. Before filling or changing the oil in the reservoir, thoroughly clean the area around the filler cap with a clean cloth to prevent contamination of the oil by foreign particles.
2. Remove the filler cap and insert a clean funnel with filter. Add enough oil to fill the reservoir to within approximately $\frac{1}{2}$ " to $\frac{3}{4}$ " (1 - 2 cm) of the fill hole when the cylinder is in the fully retracted position. Use only new, clean, approved hydraulic oil (215 SSU @ 100°F/37.8°C). Tank capacity is 2 US gallons (7.5 liters).
3. Check the oil level in the reservoir weekly.
4. Drain, flush, and fill the reservoir after every 600 hours of use. If conditions are abnormally dirty or dusty, more frequent oil changes are recommended.

HELP!

Troubleshooting

Problem	Cause	Solution
Motor does not run.	Pump not turned to “On” position.	Flip toggle switch to run position.
	Unit is not plugged in.	Plug in unit.
	No voltage supply.	Check line voltage.
	Broken lead wire or defective power cord plug.	Replace defective parts.
	Defective switches.	Check switches.
	Defective motor.	Replace motor.
	Thermal protector switch inside motor housing is open.	Wait for motor to cool before starting.
	Defective starter relay.	Replace defective parts.
Pump is not delivering oil or delivers only enough oil to advance ram partially or erratically	Oil level is too low.	Fill reservoir to within 1” of the filler plug with all rams retracted.
	Loose fitting to cylinder.	Check couplings to cylinder. Inspect couplers to insure that they are completely coupled.
	Air in the system.	Bleed the system.

Troubleshooting (continued)

Problem	Cause	Solution
	Air leak in suction line.	Check and tighten the suction line. The pump filter should be cleaned and if necessary, the pump should be dismantled and all parts inspected and cleaned.
	Cold oil or oil is too heavy. (Hydraulic oil is higher viscosity)	Change to a lighter oil. Call Factory.
	Relief valve or low pressure Unloading valve out of adjustment.	Adjust as needed. Call Factory.
	Defective directional valve.	Inspect all parts carefully and replace if necessary.
	Sheared drive shaft key.	Replace. Call Factory.
	Motor rotating in wrong direction.	Reverse rotation. Call Factory.
Pump builds pressure, but cannot maintain pressure.	Oil leak.	Check to see if there are any external leaks. Tighten any loose fittings.
	Leaking valve.	Call Factory.
	Faulty relief.	Call Factory.
Pump will not build to full pressure.	Faulty pressure gauge.	Calibrate gauge.
	External leakage	Tighten loose fittings.
	Relief valve setting.	Take note of the maximum pressure that the pump reaches. Call Factory.
	Check for leaks in the valve.	Call Factory.
Electric motor cuts out.	Insufficient power supply.	Check if line voltage matches equipment range.
	Faulty motor and/or thermal protector.	Call Factory.

☎ Factory Phone #: 1-800-837-0864 ☎

Troubleshooting (continued)

Problem	Cause	Solution
Rams will not retract.	Check the system pressure; If the pressure is zero, the control valve is releasing pressure and the problem may be in the ram(s) Defective valve.	Check the rams. Test valve operation and inspect parts. Call Factory.
Pump delivers excess oil.	Relief valve not properly set. Check pressure gauge.	Call Factory. Calibrate gauge.
Controller will not turn on	Power supply is not functioning properly	Check voltages on power supply
Load is displaying unusual readings	Wrong Engineering Units Diameter of sample is incorrect	Change engineering units in the Working Units screen (Metric/English) Input correct sample size in the Sample Geometry screen
Load Frame is breaking samples in Full Advance (before going into Metered Advance)	Seating threshold is set to high	Input correct seating threshold in the Machine Setup screen (Lower the threshold)

☎ Factory Phone #: 1-800-837-0864 ☎

Specifications

CM-225 Series Specs	English Units	Metric Units
Load Capacity	250,000 lbf	1112 kN
Vertical Daylight	14.5 in	368 mm
between platens		
Horizontal Daylight	10.75 in	273 mm
Upper Spherical Seat	7.0 in	178 mm
Bottom Platen	7.0 in	178 mm
Piston Area	38.42 in ²	0.0248 m ²
Max. Ram Travel	3.0 in	76 mm
Overall Height	40.25 in	1.02 m
Overall Width	26.75 in	0.68 m
Overall Depth	16.5 in	419 mm
Net Weight	950 lbs	431 kg

Hydraulics	
Max. Operating Pressure	10,000 psi (68,948 kPa)
Pump Type	2 stage 1st stage - low pressure, high volume 2nd stage - high pressure, low volume
Hose Size	3/8" R9 Hydraulic hose
Oil Type	ASTM/150 (ref.) 215/46
Capacity	2 US gallons (7.5 liters)

Model #	Voltage [V]	Frequency [Hz]	Phases
CM-225	110	60	1

Accessories and Related Products

Equipment/Product	Purpose	Part #
Flexural Strength Test Beam Attachment	Two-piece unit easily installed in the CM-225 load frames for flexural strength testing of beams	C-170
Cube Spacer Set	Attachment for testing 2" cube specimens	C-18040
Cylinder Spacer Set 3" x 6"	Used with the CM-225 load frames when testing 3" x 6" cylinder specimens	C-18060
Cylinder Spacer Set 4" x 8"	Used with the CM-225 load frames when testing 4" x 8" cylinder specimens	C-18070
Concrete Load Frame Stand	Stand ready made for the CM-225 load frame Allows easy installation and securing of the machine	164501
Upgrade from single to dual readouts (scales)	Convert a single range digital readout to a dual range readout on the CM-225 load frames	Call
Cylinder Mold, Disposable Plastic (three sizes)	Constructed of one-piece, non-absorbing, non-adhering plastic for forming cylindrical test specimens of wet concrete	C-210 C-215 C-220
Mold Stripping Tool	Used for splitting disposable cylinder molds to remove cured concrete sample	C-211
Domed Plastic Lid	Reusable lid for plastic cylinder molds	C-212
Steel Cylinder Mold	Reusable steel mold to form 6" x 12" cylindrical test specimens splits vertically for easy sample removal	C-225
Beam Mold (three sizes)	Fill with fresh concrete to produce a concrete test specimen for flexural testing of concrete beams (6x6x20in ; 6x6x24in ; 6x6x30in)	C-230 C-231 C-232
Cube Mold	Used to form three 2" compressive test cube specimens	C-235
Pi Tape	Gives a fast, accurate measurement of cylinder diameter in one reading, to an accuracy of +/- 0.001"	C-196
Vertical Capping Set	Set includes all equipment needed for efficient and accurate capping of 6" x 12" cylindrical samples	C-270
Vertical Cylinder Capping Fixture (three sizes) 6"x12" ; 4"x8" ; 3"x6"	An aid in capping concrete cylinders, the fixture enables accurate alignment and simplifies the process	C-275 C-27510 C-27520
Capping Compound (three sizes) 50lb ; 100lb ; Pail	Specially formulated powder for capping provides a smooth, level test surface	C-280 C-281 C-282
Padcap System (three sizes) 6in ; 3in ; 4in	An alternative to traditional capping, cast urethane or neoprene padcap discs slip into solid steel receivers, which fit easily over the ends of the cylinder for testing	C-289 C-28903 C-28904

Limited Warranty

Durham Geo warrants that equipment shall be free from defects in material and workmanship for a period of **90 days** from the time equipment is put into service. In any event, the warranty period will not exceed **6 months** from the date of shipment.

Durham Geo's liability shall be limited to replacement of components or equipment (at the manufacturer's discretion) that have been determined by the manufacturer to be faulty. No claims in excess of component replacement value will be recognized. Durham Geo will not be held liable for damages or lost business relating to a warranty claim.

Specifically excluded from this warranty are claims deemed by the manufacturer to have resulted from normal wear and tear, improper use, or abuse of the equipment.

Exceptions to this warranty are:

Steel Frame	Lifetime Warranty
Motor & Pump	1 Year Warranty
Electronics	1 Year Warranty

For a complete warranty disclosure, please call 1-800-837-0864 📞 (outside Georgia, USA) or (770) 465-7557 📞 (inside Georgia, USA) or refer to the printed statement on the back of any Durham Geo original invoice.

Information Record

Frame Model #: CM-225Ad

Frame Serial #: _____

Sold By: _____

Date Purchased: _____

The model and serial numbers, for the frame and readout, are listed on the side and back of the equipment, respectively. You will need these numbers if you call Durham Geo for service or support.

We can be reached between 8:00 am and 5:00 pm Eastern Standard Time (EST) at:

Telephone:

1-800-837-0864 (outside Georgia, USA)

(770) 465-7557 (inside Georgia, USA)

Fax:

(770) 465-7447

ATTENTION:

Please attach the following drawings:

300666 Assembly, CM-225 Load Frame (1 page)

BOM CM-225 Concrete Load Frame Ass'y (1 pages)

300665 Plumbing diagram CM-225, CM-425, CM-625 (1 page)

300664 Wiring Diagram (1 page)

BOM of Wiring Diagram (1 page)

2594 Assembly, Spherical Seat (1 page)

2590 7.0 x 3 x 4.0 Hydraulic Cylinder (1 page)

BOM of Hydraulic Cylinder

Discard this sheet and attach the above drawings in the order above.

Operators Manual

Gauge Buster Plus

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FOREWARD

Gauge Buster Plus has been designed and constructed with great care in every phase of assembly. In order to insure reliability, both the mechanical and electrical components have been built with the best available materials. Nevertheless, it has been proven that a thorough understanding of the machine, together with proper attention, will pay big dividends. The sections of this manual provide description and instruction on the operation and maintenance of the mechanical, electrical and software components.

You as a customer are our most valued asset. We take pride in our systems and are proud that you have become an owner. We welcome your comments about our products and wish that you express them. It is the only way that we can continue to build the best available test systems to satisfy your needs.

HOW TO USE THIS MANUAL

This manual is intended to educate the customer on the capabilities, operation and maintenance of the **Gauge Buster Plus**. In addition, it is to be used as a supplement for any information supplied by the load frame manufacturer. Maintenance procedures specified by the load frame manufacturer should be followed unless specifically noted herein. Read this manual and become familiar with the operation of your test machine prior to operating the **Gauge Buster Plus**.

TECHNICAL SUPPORT

If a problem should occur with your testing machine:

- First check that all external inputs are properly connected.
- Second call the supplier/manufacturer of your test machine.
- Third call Durham Geo technical support.

1.0 INTRODUCTION

Gauge Buster Plus is a low cost indicator designed to replace dial gauges on materials testing machines. Features include an Auto-Test-Reset mode for hands free operation, bar graph load rate display, permanent storage of test data and easy transfer of results into data base programs. It's accuracy, which exceeds ASTM E4, ease-of-use and ruggedness results in a system of unrivaled price/performance.

Gauge Buster Plus is ideal for:

- Beam Bend Testing
- Concrete Cylinder Testing
- Cement Cube Testing
- Force Calibration
- Remote On-Site Testing
- Quality Control
- Product Evaluation
- Proof Testing

Standard Features:

- Display Live Load, Peak Load and Peak Stress numerically.
- Indicate Load Rate with a bar graph. The rate pointer moves between its limits. Decreasing the rate moves the pointer left. Increasing the rate moves the pointer right.
- Adjust the upper and lower rate limits depending on the testing requirements. Ex: ASTM C39 20-50 psi/sec.
- Select engineering units of Lb, N, KN and Kg. Stress in PSI, Mpa, Kpa and ksc. Length in inches, mm, or cm.
- Define and detect the end of test with the Sample Break Detector.
- Auto-Test-Reset which automatically enables the indicator for the start of the next test without requiring operator interaction.
- Store up to 400 test results to permanent memory. Results include Date, Time, Specimen ID#, Peak Load plus a statistical summary of Peak Load. Report options include Job#, Specimen Age, and Weight.
- Activate Auto-Store to automatically store the results of each test.
- Activate Auto-Transmit to automatically transmit the results of each test out the serial communications port.
- Transmit results to a printer or remote computer through the serial communications port.
- Store up to four load cell calibrations for multiple load cell systems. The load calibration algorithm allows up to 5 calibration points per cell with piecewise linear fit between points. Accuracy exceeds ASTM E4 Standards and in general is greater than 0.5% from 1% of full scale to full scale.
- Digital output activates at sample break or machine overload.

1.1 Gauge Buster Plus Options

- WinCom Windows based serial communications software to import data into spreadsheet and database programs.
- Bar Code Reader input to scan specimen number into the Gauge Buster.
- S-Trak, ADMET's database and report generation program for concrete cylinders.
- Battery Pack for portable applications.
- Shunt Calibration.
- Serial RS-232 Printer.

- Pressure Transducers - 1,000 2,500 5,000 10,000 psi.

1.2 Printed or Transmitted Reports

- **Test Results Report.** Test reports with up to 400 results stored to permanent memory is standard. Each test report consists of: date, time, specimen ID#, peak load plus a statistical summary of load.
- **Load Calibration Report.** A load calibration report can be produced for each load cell calibration table which has been accessed. The report consists of the full scale and resolution values for each calibration table in addition to the measured and corresponding load value for each calibration point.

2.0 THE KEYS

2.1 The <ZERO/0> Key

The ZERO key performs the following functions.

- Defines a new zero load.
- Places the Indicator Test Status in Ready Mode.
- Clears out the previous test results from the test buffer and initializes the indicator for the next test. **Make sure the previous test was stored prior to pressing ZERO or it will be lost.**
- Enters the number zero.

2.2 The <STORE> Key

The STORE key writes the current test result which consists of peak load, date, time and specimen ID# to permanent memory then increments the specimen ID#. All results stored to memory can be printed or download to a remote computer.

2.3 The <ENTER> Key

The ENTER key performs the following functions.

- Accepts/assigns the value in a data entry field to that field.
- Turns ON/OFF a menu option.

2.4 The <ESC> Key

The ESC key performs the following functions.

- Returns to the Live Indicating Screen from any menu.
- Clears a data entry mistake by restoring the original number in a data entry field.

2.5 The <UP & DOWN ARROW> Keys

The ARROW keys allow the operator to scroll through menu items.

2.6 The <NUMBER> Keys

The NUMBER keys are used to select a menu option from within a menu or input a numerical value in a data entry field.

3.0 THE MENUS

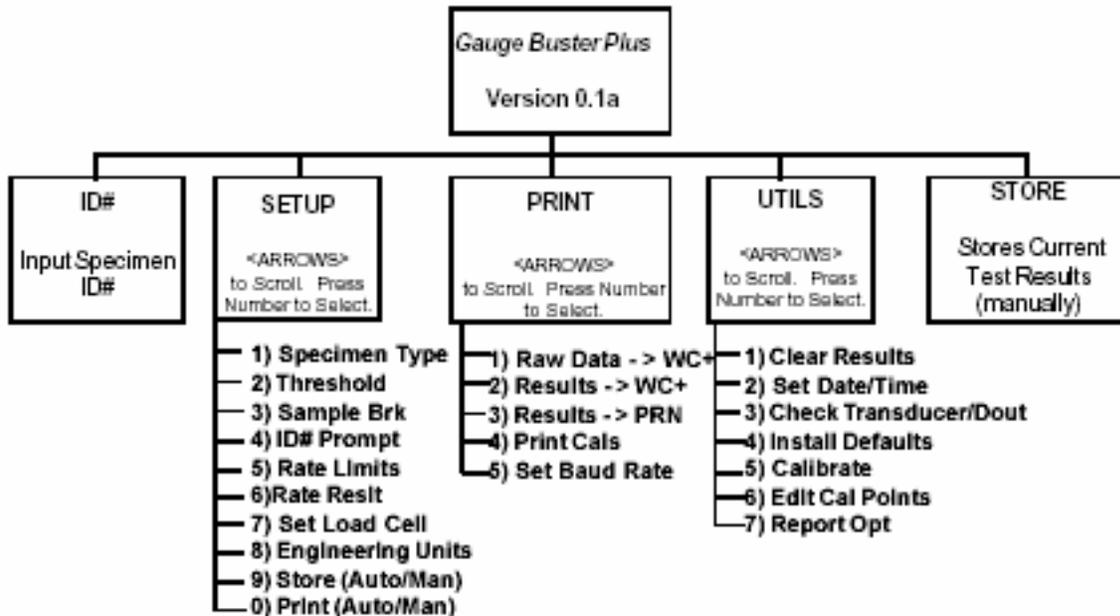


Figure 3.1 - Gauge Buster Plus Menus.

3.1 The SETUP Menu

Press the <SETUP> key from the Indicating Screen to enter the SETUP Menu. Use the <ARROW> keys to scroll through the menu items. Use the <NUMBER> keys to select the menu item. The following functions are provided in the SETUP Menu.

1) Specimen Type. Select the specimen type for the sample to be tested. After selecting the type of specimen, the appropriate dimensions are requested.

2) Threshold. Set the start test threshold in load units. The start of a new test is marked by when the load goes above the threshold value. **Gauge Buster Plus** employs a 2 line by 16 character display. When a test is not in progress the lower line of the display will show the peak load from the previous test. When the load exceeds threshold, the lower line of the display will change over to rate indication.

3) Sample Brk. Sample Break is defined as a percentage of peak load and is used to define the end of a test. If Sample Break = 10 percent and Peak Load = 100,000 Lb, then the test will terminate when the load drops below 10,000 Lb.

4) ID# Prompt OFF/ON. Select **ON** for display to prompt for Specimen ID# when storing the test results.

5) Rate Limits. Defines the lower and upper limits for the rate pointer. The lower limit is marked as an "L" on the rate display line and the upper limit is marked as an "H" on the rate display line during a test.

6) Rate Reslt OFF/ON. Select **ON** to display the average load rate at the end of the test along with the peak load.

7) Set Load Cell. **Gauge Buster Plus** will store up to four load cell calibrations in permanent memory for multiple load cell applications. Set Load Cell is used to

select which load cell calibration is used for a given test (L0-3). The active load cell is displayed in the upper left hand corner of the Live Indicating Screen.

8) Engineering Units. Used to select between load units of Lb, N, KN, and Kg, Stress units of PSI, Mpa, Kpa and ksc and rate units on a per second or per minute basis.

9) Store. If **Store** is set to AUTO, the results are automatically written to the results buffer and the specimen ID# is incremented when sample break is detected. If **Store** is set to MAN, it is necessary to press the <STORE> at the end of test to save the test results to memory and increment the specimen ID#.

10) Print. If **Print** is set to AUTO, then the results are automatically printed after sample break is detected. The **Gauge Buster Plus** will automatically print column headings at power up or when exiting the SETUP Menu. If **Print** is set to MAN, pressing the <PRINT> key will print all stored test results.

3.2 The PRINT Menu

Press the <PRINT> key while in the Indicating Screen to enter the PRINT Menu. Use the <ARROW> keys to toggle through the menu. Use the <NUMBER> keys to select the menu item. The following functions are provided in the PRINT Menu.

- 1) Raw Data -> WC+.** Transmit the test results stored in the results buffer in text format (not delimited).
- 2) Results -> WC+.** Transmit the test results stored in the results buffer to a comma delimited text format (CSV file format). A comma delimited text format allows the file to be properly imported into spreadsheet and database programs. WinCom is a program offered by ADMET to capture and save test results on a remote PC. WinCom can also be configured to automatically import the results into a spreadsheet or database program.
- 3) Results -> Prn.** Transmit the test results stored in the results buffer in text format (not delimited) to a serial printer.
- 4) Print Cals.** Print all load cell calibrations.
- 5) Set Baud Rate.**

NOTE: The data output port in the **Gauge Buster Plus** is an RS232 serial port which can be connected to a serial printer or remote computer. The serial protocol is 9600 baud, 8 data bits, 1 stop bit and no parity. See Section 6.1 for connections to the Serial-I/O port.

3.3 The UTILS Menu

Press the <UTILS> key from the Indicating Screen to enter the UTILS Menu. Use the <ARROW> keys to scroll through the menu. Press the <NUMBER> keys to select the menu item. The following items are found in the UTILS Menu.

- 1) Clear Results.** Erase all test results stored in the results buffer. Make sure you have printed the data before erasing memory.
- 2) Set Date and Time.** **Gauge Buster Plus** is Y2K compliant.
- 3) Ck Trans-DOU.** This function displays the transducer readings in A/D counts and also allows the operator to turn the overrange/sample break digital output ON and OFF. Possible A/D values are between -8,000,000 and +8,000,000.
- 4) Install Defaults.** Used to put all setup parameters in a known default state.
Installing defaults DOES NOT effect any of the calibration information.

5) Calibrate. Calibrate a load cell according to ASTM E4 standards. See Section 5.0 for calibration procedures.

6) Edit Calibration Points. This function allows the calibrator to modify the load value for a given calibration point.

7) Report Options. This function allows the user to select which optional report fields; Job#, Specimen Age, and Weight, to activate. If one or more of these optional fields are turned ON, at the press of the ID# key, the Specimen# prompt appears followed by prompts for each of the active Report Options.

3.4 The ID# Menu

Press the <ID#> key from the Indicating Screen to input the Specimen ID#. The Specimen ID# can be 8 digits long. Input the Specimen ID# and press <ENTER> to accept the ID#. Note: The Specimen ID# will be automatically incremented after the current test result has been printed or stored. If Report Options in the SETUP menu are turned ON, prompts for JOB#, Spec Age, and Weight will follow the Specimen# prompt.

4.0 OPERATION

Section 4.1 describes how to setup for a test. Section 4.2 describes how to perform a test and store the results to memory. Section 4.3 describes how to generate test reports. Section 4.4 describes how to download the stored test results to a remote PC.

4.1 How to Setup a Test

Step 1: Press <SETUP> from the Indicating Screen. From the SETUP Menu select the following and enter values for each.

Specimen Type: Specimen type to be tested, Cylinder, Cube, Beam Ctr, Beam 3rd, Round or Area.

Threshold: Enter a load value which when exceeded will signal the start of a new test.

Sample Break: Enter a number as a percentage of peak load which will define the end of test.

Rate - Low Limit: Enter the lower rate limit, marked as "L" in the rate display.

Rate - Hi Limit: Enter the upper rate limit, marked as "H" in the rate display.

Load Cell: Select the load cell number if necessary.

Engineering Units: Set load units to Lb, N, KN or Kg. Set rate units to per second or per minute.

Store: AUTO/MANUAL

Print: AUTO/MANUAL

See Section 3.1 for more information.

Step 2: Press <UTILS> from the Indicating Screen. Clear results from memory.

Note: If the stored results are important, print before clearing. See Section 3.3 for more information.

Step 3: Press the <ID#> from the Indicating Screen. Input the specimen ID#. The specimen ID# will automatically increment after the current test is stored. If Report Options have been turned ON, additional prompts will follow.

4.2 How to Perform a Test and Save Results

If the steps in Section 4.1 were followed, you are now ready to perform a test. The current test settings are saved in permanent memory and will not change unless they are modified by the operator.

Step 1: Insert the specimen in the machine and move the crosshead to the desired starting position. If using a hydraulic machine, float the piston by moving off its stop.

Step 2: Press the <ZERO> key to tare any residual load from the readout.

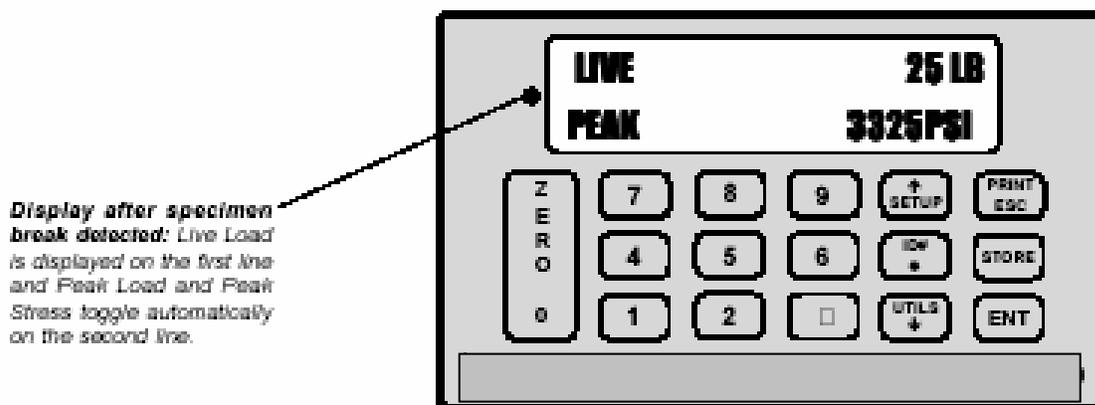
Step 3: Begin loading the specimen. Once the load exceeds the start test threshold value, the lower display line will change to the rate pointer and the Sample Break detector is armed.

Step 4: Once sample break is detected the test is complete and the lower display line will show peak load. If Auto Store or Auto Print are turned ON, the results will either be saved to memory or printed automatically. If Auto Store is turned OFF, press <STORE> to save the current test results. Note: If you do not press <STORE> before pressing <ZERO> or the start of a new test, the results will be lost.

To continue running tests, repeat Steps 1, 3, 4. **Gauge Buster Plus** is designed to operate in a "hands free" mode. This means that once it has been setup and properly zeroed, the operator should not have to touch the keypad. If a test result is stored, the specimen ID# will automatically increment.

4.2.1 The Indicator Status

READY and TESTING are the two possible Indicator Modes. Below is a picture of the Live Indicating Screen



4.3 Printing Test Reports to a Serial Printer

If the steps in Section 4.2 were followed, a test report containing all of the results stored to memory can be obtained.

Step 1: Press <PRINT> from the Indicating Screen.

Step 2: Turn on your printer and Press <1> Results to Printer to print all stored tests.

4.4 How to Download Stored Test Results to a Remote PC

A data transfer cable and WinCom program diskette manufactured by ADMET is required to download test results to a remote PC. Refer to the WinCom program manual for downloading test results to a computer.

4.5 Options

The options listed below are available with Gauge Buster Plus. Each option will not work unless it has been purchased.

- *CHECK CALIBRATION (CKCAL)* only works with transducers that employ a wheatstone bridge. It functions by shunting a known resistance across two legs of the bridge to generate a constant output. That output is used to verify that the electronics are functioning properly. The procedure for CHECK CALIBRATION is as follows:
 - 1) Unload the machine and press <ZERO>.
 - 2) Wait a few seconds, then press <ENT>. A non-zero load reading should be displayed for 3 seconds.
 - 3) Note the load reading and compare it to previous calibration checks. Contact your service representative if there is a large difference between readings.
- *BAR CODE READER (BarCode input)* allows a RS232 serial Bar Code Reader to be used to scan barcode data into the Specimen # field of the test results.

5.0 CALIBRATION

Refer to Section 6.1 for details on transducer connections.

5.1 How to Calibrate Analog Transducers

Step 1: Turn on the system and allow it to run for 10 minutes before calibrating.

Step 2: Select the Engineering Units for calibration from the SETUP Menu. See Section 3.1 for more information.

Step 3: Select <5> Calibrate from the UTILS Menu.

Step 4: Enter the password. Call your equipment manufacturer if you have lost the password.

Step 5: Enter the load cell number. Use zero if your system has only one load cell.

Step 6: Input the full scale range or the capacity of the machine. The range should be input in the currently active engineering units.

Step 7: Input the resolution or minimum load increment.

Step 8: Press <1> Calibrate to enter the measure mode or <ESC> to exit. **If you decide to exit the Calibration Menu at this time the values entered for Full Scale and Resolution will be saved.**

Required Information Before Continuing Calibration

The program will enter the measurement mode if <1> is pressed in Step 8. During this mode, the technician can take up to five calibration point readings (a minimum of 2 points is required). **The first calibration point must be at zero load.** It may be beneficial to take a few more calibration readings in areas of greatest inaccuracy. The number next to "PT" on the display will indicate how many calibration readings have been taken. As the calibration points are entered, write down the corresponding load value. After all five calibration points have been taken, or the <STORE> key is pressed when using less than five points, the **Gauge Buster Plus** automatically switches to engineering input mode. Input the load value corresponding to each calibration point reading stored. The calibration points are stored sequentially. The first point is zero followed by the second, third and so forth. Once an engineering unit value has been entered for each calibration point stored, the unit will automatically save the calibration.

Step 9: Unload the machine or place the transducer at its zero point. If calibrating a hydraulic machine, float the piston before taking any readings. Press <ENTER> to take the zero reading. The left side of the display will indicate PT1 has been read.

Step 10: Load the machine to a desired load and press <ENTER> to set a calibration point (voltage measurement). The voltage value is NOT displayed but it has been saved to non-volatile memory. Write down the corresponding engineering unit value for each calibration point. Repeat this step until all readings are taken.

Step 11: Press <STORE> to exit the measurement mode if fewer than five calibration points are used. The program will automatically proceed from Step 10 to Step 12 after the fifth reading.

Step 12: Input the corresponding engineering unit value for each measurement point. After all values have been entered, the program will automatically generate the corresponding scale factors and store them to permanent memory.

DONE! READY TO VERIFY CALIBRATION

Step 13: To verify the calibration, exit out to the Indicating Screen and apply specific loads to the machine and compare the reading on the indicator with the standard.

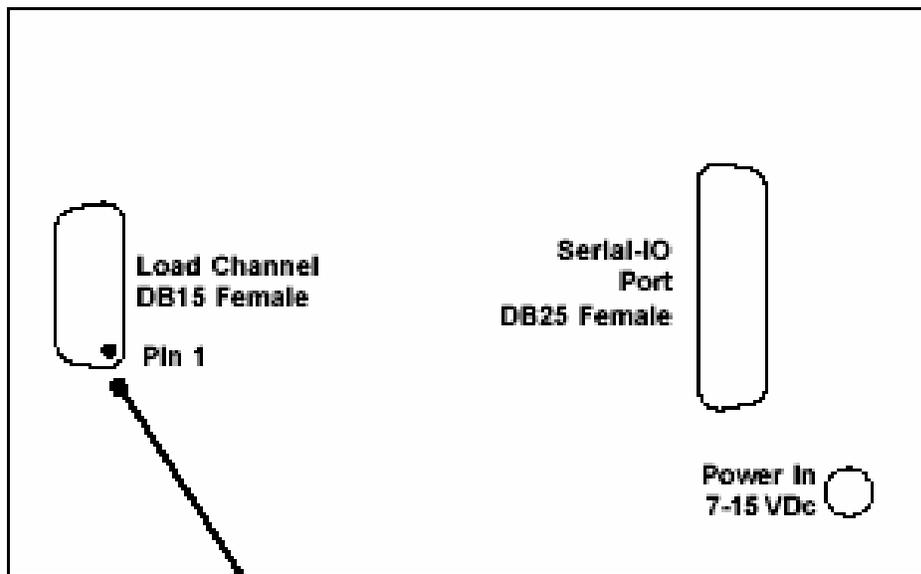
Step 14: If you choose to adjust one or some of the calibration points, use the Edit Calibration function from the UTILS menu. This function will allow you to edit load values for one, some or all calibration points without forcing you to repeat Steps 2-12.

5.2 What Occurs During Calibration

The calibration procedure allows up to five calibration points to be entered. Each successive pair of points is connected by a straight line and the slope of each line is the calibration scale factor used for that region. This results in a piecewise linear function which maximizes accuracy.

6.0 ELECTRICAL/MECHANICAL DATA

6.1 User Connections



Please note the location of Pin 1

Figure 6.1.1 - *Gauge Buster Plus* Rear Connection Panel.

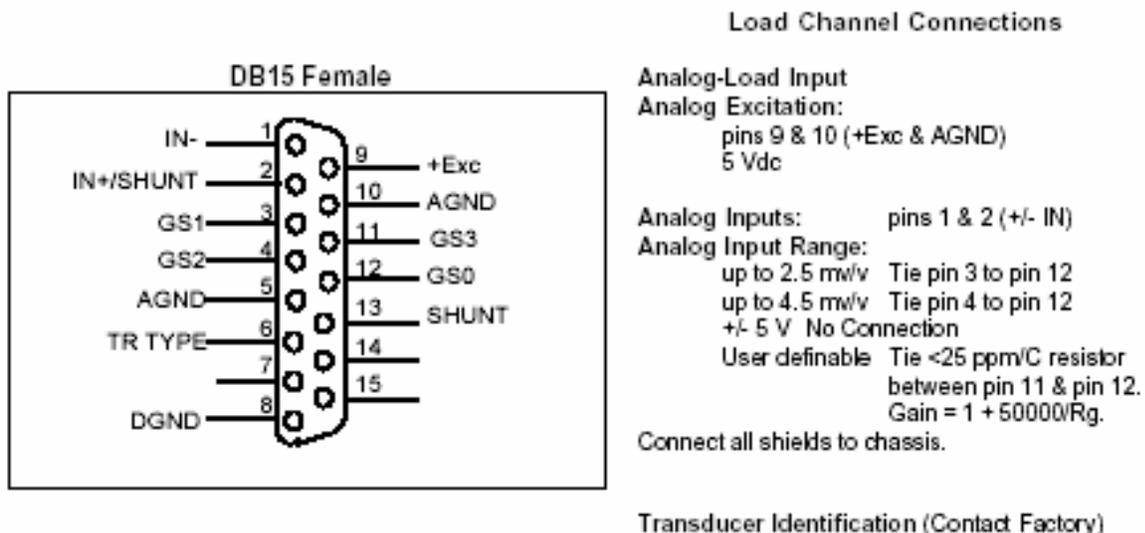


Figure 6.1.2 - Analog Transducer Pin Designation.

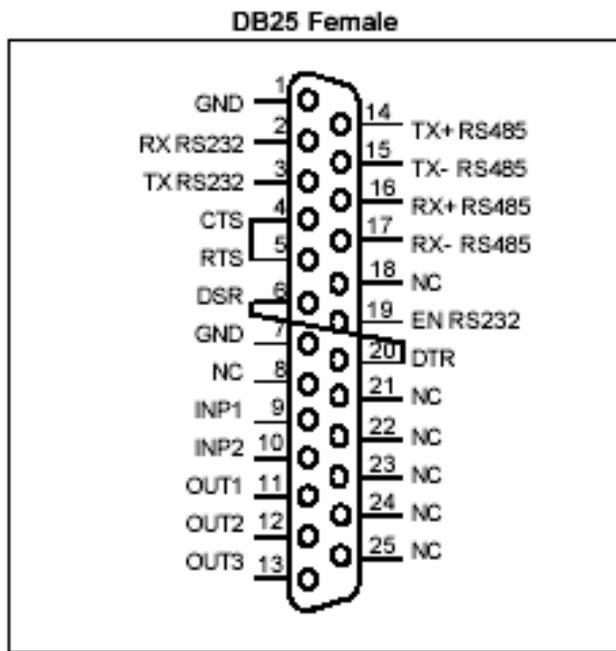


Figure 6.1.3 - Serial-I/O Port Pin Designation.

Serial-I/O Port Pin Designations

Digital Outputs: OUT1-OUT3.

Compatibility: TTL. Connect between output and ground.

Output Assignments: OUT1 - Normally ON, Turned OFF on load overrange or sample break.

All other outputs undefined.

Digital Inputs for Load Cell Select: INP1 (pin 9) & INP2 (Pin 10). Pull to GND to Close.

Load Cell Select Table

	inp1	inp2
LC0	Open	Open
LC1	Closed	Open
LC2	Open	Closed
LC3	Closed	Closed

RS232 Serial Port: Use pins 2, 3 and 7.

Protocol: 9600 baud, 8 data, 1 stop, no parity

For RS485 operation connect pin 19 (ENRS232) to GND.

Connect all shields to chassis.

6.2 Serial-I/O Port

The Serial I/O port is used to transmit test results to a serial printer or computer. It also has three digital outputs. Output1 (pin 11) is normally on and will turn off on sample break or load overrange.

6.3 Power (DC) Input

The **Gauge Buster Plus** requires a 7-15Vdc unregulated input voltage.

6.4 Factory Password: 268

It is suggested to remove this page from the manual and placing it in a safe place.

Automatic Loading Installation and Calibration Guide

Version 3DGE, 05/15/04

MegaForce is an automatic loading valve mounted on an OTC ½ hp or ¾ hp pump. Below are instructions for installing, calibrating and testing with MegaForce.

Installing MegaForce on a Machine

- 1) Disconnect both ends of the hydraulic hose. Remove the OTC pump from the machine and drain the reservoir. Re-fill with suitable clean oil and mount the pump back on the machine. Do not reattach the hose.
- 2) Remove the four socket head screws holding the 9609 valve to the top of the tank. Pull the 9609 valve off, being careful so as not to damage the o-rings on the high pressure tube that feeds oil from the pump to the valve.
- 3) Remove the tube with o-rings from the pump or tank. Clean and inspect the o-rings. Replace if necessary. Push the tube back into the pressure line on top of the tank.
- 4) Remove the MegaForce valve from its packaging. Inspect the bottom of the valve and make sure it is free from any foreign matter. Install the ¼" NPT nipple into the return port on the bottom of the MegaForce valve. Connect the hydraulic hose to the 3/8 NPT female port on the back of the valve. Connect the circular electrical connector with cable (included with valve) to the MegaForce valve.
- 5) Install the MegaForce valve onto the top of the tank by carefully aligning the high pressure port over the tube exiting the tank and aligning the nipple over the tank return. Note: On ¾ hp systems you will need to remove 2 screws that hold the tank cover to the reservoir. The screws are in the left front underneath the MegaForce valve. Attach the valve to the top of the tank by tightening the four screws held captive in the MegaForce valve. A T-handled Allen driver works well to tighten the screws which are accessed from the four holes on top of the valve.
- 6) Mount the rectangular MegaForce interface box. The operator will be using the start and stop buttons on the interface box so make sure it is in a convenient location.
- 7) MegaForce can be operated with an indicator.
- 8) Mount the indicator. Connect the cable with the DB9 male end to port D3 of the interface box (The other end of the cable has the circular connector and should already be connected to the valve.). Connect the cable with DB25 connectors on both ends to port D2 of the interface box and to the I/O port on the indicator. If a passive I/O module is supplied, connect it between the I/O port on the indicator and the DB25 pin cable connector.
- 9) Install the pressure transducer in the load sensing hydraulics and connect the transducer cable to the indicator.

MegaForce Start-up and Calibration

- 1) Place your load cell in the machine. Choose a cell that cannot be damaged when loading the machine to capacity.
- 2) Supply electrical power to the interface box and indicator. Twist the Emergency Stop button, which will spring out, turning on the indicator unit.

Warning: Always turn on the indicator BEFORE turning on the pump! After turning on the hydraulic pump IMMEDIATELY press the red stop button (not the larger Emergency Stop button) to insure the hydraulic cylinder is in the retracted mode.

After the indicator displays the main screen, press the “ent” <ENTER> button on the indicator to place the unit in the manual mode. The “D” displayed on the main screen will change to an “M” when manual mode is in operation. Press the green Start button (do not hold, just a momentary press). The piston should begin to move upwards.

- 3) After the load cell contacts the upper loading platen, press the green Start button several more times. You should see the load increase. Press the red Stop button. You should see the load decrease. When in manual mode the green and red Start and Stop buttons are used to increase and decrease the load, respectively. Continue to press the green button until you reach machine capacity. Intermittently remove your hand from the green button to allow the machine to catch up. Push and hold the red stop button to unload the machine. You are now ready to calibrate the machine.
- 4) Enter the calibration menu in the indicator and input the full scale range and resolution. Press “1” to calibrate. The first reading must be at zero load. Float the piston before taking the zero load reading by pressing the green Start button. Once the piston begins to move but before the load cell touches the platen, press <ENTER> to take the zero load reading.
- 5) Use the green Start button to increase the load and enter other calibration points where necessary. Turn switch to unload the machine then press <STORE> on the indicator to enter the force values for each calibration.
- 6) Exit to the indicating screen. To verify the calibration, return to Manual and press the green Start button. As the piston begins to move but prior to it contacting the load cell, press the <ZERO/TARE> key. After the platen contacts the load cell, verify the load values by using the Start and Stop buttons to increase or decrease the load.

Start Control Setup

There are two control parameters that are established based on the types of tests being performed. Once they have been determined they will not have to be changed. This process was performed at the factory and is listed here for information purposes only. The two control parameters are START CONTROL LOAD and START CONTROL TIME.

START CONTROL LOAD – Defined as the load above where automatic servo control begins. To determine the START CONTROL LOAD in pounds, multiply the area of the piston by 200 psi.

$$\text{START CONTROL LOAD (lb)} = 200 \text{ psi} \times \text{Piston Area (sqin)}.$$

Before we enter the correct START CONTROL LOAD we need to determine the START CONTROL TIME. In order to determine the START CONTROL TIME, press <SETUP> then use the arrow keys to scroll to the Control Menu. Once in the Control Menu, use the arrow keys to move to the START CONTROL LOAD. Press <ENTER> to select START CONTROL LOAD then enter a load value 10 times the calculated START CONTROL LOAD from above. Once START CONTROL LOAD X 10 is input, you will be prompted for START CONTROL TIME, leave on the current setting then exit to the live screen.

Make sure the unit is in the Auto mode. Press the green Start button to begin loading. The load should settle at a constant value, after the platen contacts the load cell or specimen placed in the machine. If the steady state load is below the correct START CONTROL LOAD calculated above, you will need to increase the START CONTROL TIME (In general, START CONTROL TIME is less than 10 seconds.). If the load is slightly above the correct START CONTROL LOAD calculated above, leave the START CONTROL TIME as is. If the load is much higher than the START CONTROL LOAD, decrease the START CONTROL TIME.

Continue to adjust the START CONTROL TIME until the steady state load is slightly above the correct START CONTROL LOAD.

Once the START CONTROL TIME is correct, go back to the Control Menu and set the START CONTROL LOAD to the correct value calculated at 200 psi.

Next you need to set your test rates.

Setup and Run a Test

1) Go to the Control Menu under SETUP and enter the desired TEST RATE. If you want to rapid load to a preload value, then test at the desired test rate, set the PRELOAD value and the PRELOAD RATE (Should not be faster than the machine is capable of loading.). Setting PRELOAD to zero disables the preload function. You are now ready to begin testing.

2) Place a specimen in the machine. Press the Green Start button. The piston will begin to move. A few seconds after the force exceeds the START CONTROL LOAD, MegaForce will begin controlling at the PRELOAD RATE. If the PRELOAD RATE is zero, it will automatically switch to the TEST RATE. MegaForce will continue controlling at the TEST RATE until sample break or the operator depresses the Red Stop Button. Repeat this step to run another test.

Switching Between Modes (Manual/Auto)



Main Screen



Press <ENTER> for Manual Mode



Manual Mode Screen – “M:” Displayed



Press green start button to “jog” up



Press red start button to “jog” down



Press <ENTER> to exit Manual Mode

When in “SETUP” or “UTILITIES” to Change Screens



Press Down Arrow to Page Forward



Press Up Arrow to Page Back

Set Date and Time



Press “Utils” button to enter utility



Utility menu first screen



Press 2 to enter Date/Time menu



Press 1 to set Date
Press 2 to set Time
Press “ESC” key to exit

Setting Rates for Concrete Cylinders



Press "Setup" to enter Setup Menu



Press 1 to enter Specimen Type



Press 1 to choose type (Cylinder shown)



For Cyl type, input diameter, & press "Ent"



For Cyl type, input length, & press "Ent"



Press 5 to enter "Set Rate" menu

Setting Test & Preload Rates, cont'd



Press 1 to enter "Test Rate"



Input test rate & press "Ent"



Press 2 to enter "Preload"



Input preload amount & press "Ent"
MUST BE < 50% of BREAK



Press 3 to enter "Preload Rate"



Input preload rate & press "Ent"
MUST BE < 2700 kg/sec
Will return to main Setup Menu

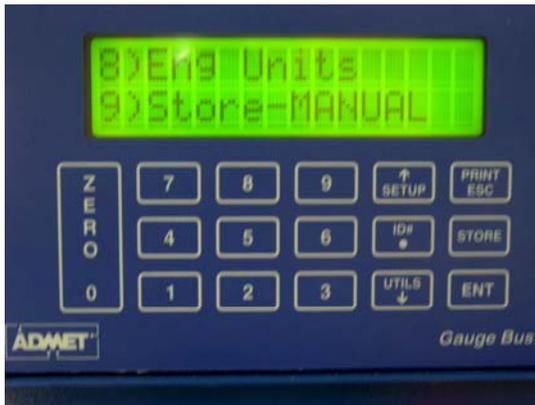
Changing Engineering Units (from main Setup Menu)



Press 8 to enter "Eng Units" submenu



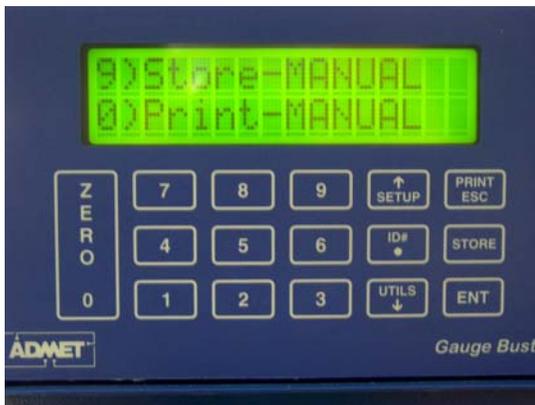
Choose required engineering units & press "Ent" to return to Setup Menu



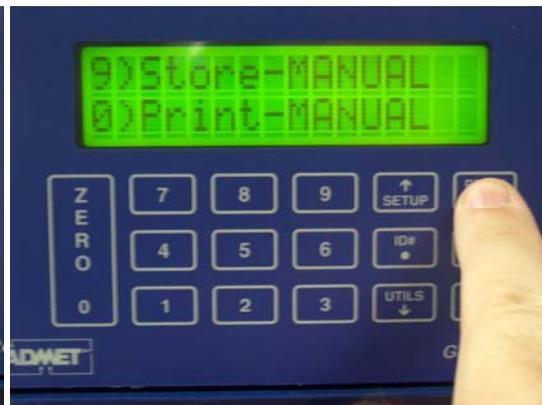
Press down arrow to scroll Setup Menu



Press down arrow to scroll Setup Menu



Press down arrow to scroll Setup Menu



Press "Esc" to return to Main test screen

**Settings
Setup**

	General		Cylinder		Beam 3rd	
	English	Metric	English	Metric	English	Metric
1 Specimen Type			Cyl		Beam 3	
1 Cyl Dia/Beam Width			6 in	15.24 cm	6 in	15.24 cm
2 Cyl Length/Beam Height			12 in	30.48 cm	6 in	15.24 cm
3 Beam Length			-	-	18 in	45.72 cm
2 Threshold	500lb	226.8 kg				
3 Sample Break - % of Peak		50				
4 ID# Prompt		Off				
5 Set Rates						
1 Test Rate			1000 lb/sec	453.59 kg/sec	35 lb/sec	15.88 kg/sec
2 Preload			30000 lbs	13608 kg	0 lbs	0 kg
3 Preload Rate			3000 lb/sec	1360.78 kg/sec	0 lb/sec	0 kg/sec
4 Start Control						
1 Start (lb)	1000 lbs	453.6 kg				
2 SC Time (sec)	4 sec					
5 Hold Load (lb)	0 lbs					
6 Rate Result						
7 Set Load Cell						
8 Eng Units	lbs/sec	kg/sec				
9 Store	Manual					
10 Print	Manual					