

OPERATING INSTRUCTIONS

**Durham Geo™**

S-610 LOADING FRAME.

FOR UNCONFINED COMPRESSION  
AND CBR TESTING

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**IMPORTANT**

**THE OPERATOR SHOULD READ THE ENTIRE INSTRUCTION  
MANUAL BEFORE ATTEMPTING TO OPERATE THIS SYSTEM.**

*All information, illustrations and specifications in this manual are based on the latest information available at the time of publication. We reserve the right to make changes at any time without notice and without incurring any obligation.*

## INTRODUCTION

Congratulations! You have just purchased a Brainard•Kilman™ S-610 Load Frame. This frame has been designed for a wide range of needs in the soils laboratory, including performing measurements of soil bearing strengths (CBR and LBR) and Unconfined Compressive testing.

The S-610 Load Frame has a built-in motor speed control board capable of providing consistent load rates of .005"/min and .250"/min, up to a maximum load of 10,000 lbs.

The S-610 Load Frames have been assembled by Durham with the highest quality standards in mind. However, occasionally circumstances beyond our control may result in damage during packing or shipping. Please inspect all packages received and note any missing or damaged parts as soon as possible. If you find any problems, please contact us immediately.

### General specifications:

Load control:	Down/stop/up rotary switch, rapid override switch, and travel limit indicator lights.
Speed Control:	By touch panel: UP arrow – faster, DOWN arrow – slower.
Speed Range:	From .005" up to 0.250" per minute.
Bottom platen:	6.25" diam. (made in such a way to receive different adaptors.)
Platen travel:	3-1/4" maximum
Distance between columns:	11-3/4"
Daylight (without load Measurements device):	20"
With extended rods:	35"
Strain Measurement:	Optional: clockwise or counterclockwise dial indicators. Electronic LDT or digital dial indicators. (see separate manual)
Load Measurement:	Optional: proving ring or load cell with digital readout, (see separate manual).

Overall Dimensions: 19"W x 15"D x 35"H

Weight: 160 pounds

### **SETTING UP THE LOAD FRAME**

1. Remove the S-610 accessories from the packing crate. Check the contents you have received against the enclosed packing slip. Check all components for shipping damage and notify Durham immediately if damages are found.
2. Place the load frame on a sturdy, level surface. It is important that the machine be as level as possible. After being sure that the Load Control Switch is turned to off, plug the unit into a 110V AC socket.
3. Using a bubble level, verify that the cross head is parallel with the bottom platen.

### **MACHINE MAINTENANCE**

Due to the nature of the test run on this machine, proper lubrication is essential for the long term life of the load frame. We recommend weekly lubrication of the spindle with a medium weight gearlube. This is accomplished by removing the socket head in the center of the platen and dripping 2 or 3 drops of oil into the spindle assembly (figure 4). **ALWAYS HAVE THE SOCKET HEAD IN PLACE WHEN TESTING.** This prevents water from dripping into the spindle assembly and destroying the bearings. We also recommend weekly lubrication of the chain and sprockets with a chain oil.

The best way to enjoy a trouble-free machine is to keep it relatively dry, clean and lubricated. Following these guidelines should result in years of trouble free testing.

## USING THE LOAD FRAME

The load frame is controlled using the up/down directional switch, the rapid feed push-button, and the speed controller. Please refer to Figure 1 for the location of these controls on the front panel.

There are two operating modes for the S-610. These are:

- 1) "Rapid" mode
- 2) "Controlled" mode

In the "Rapid" mode, the platen moves at the fastest possible speed in the indicated direction. The "Controlled" mode allows the user to select the speed on the speed selector.

To start the S-610 Load Frames, turn the Up/Down Selector Switch in the desired direction. The indicator light for that direction will glow and the machine should begin to move.

The following sections discuss the various functions and uses of the front panel controls.

### **SPEED SELECTOR FOR THE S-610**

The speed controller is placed on a bracket attached to the right hand strain rod.

**To Operate:** Turn on power, rotate switch to Up, the display on the control drive will then be switched on.

**To Adjust:** Press UP arrow for faster speed, DOWN arrow to slow. When the desired speed is reached, the platen will be traveling at that rate.

Rotate switch to Off position, machine will now be ready for use.

**NOTE:** The selected speed will be maintained in memory even when power switch is off.

## **OVERTRAVEL INDICATOR**

The Overtravel Indicator Light comes on and the machine automatically stops when the platen overtravels in the up or down direction. To move the machine off the Overtravel Limit, simply reverse the direction of motion until the Overtravel Light is extinguished.

## **ACCESSORIES**

The back of the load frame has two auxillary power receptacles built into it. These are 110V AC outlets and are meant to be used at the power for peripheral devices such as Plotters and Readouts. The following section describes how to connect the Plotter supplied by Durham. Each unit is checked for accuracy and factory set before being shipped. This allows you to make the following connections and be up and running in the shortest possible time. A technical manual for the Plotter has been included and you should familiarize your self with this manual and refer to it for topics not covered in the following section. If you are having problems getting the Plotter or the Readouts to work, please call Durham for assistance.

## **MOUNTING OPTIONAL STRAIN MEASUREMENT HARDWARE**

Before running a test you will need to install the various measurement devices appropriate for that test. If you have purchased our E-870 strain measurement hardware kit or Unconfined testing accessories, the following sections will explain their installation and use. If you already have strain measurement hardware and are not sure how to use it on the S-610, please contact Durham for further assistance.

## **USING THE E-870 PACKAGE**

Several options are available for mounting the strain hardware. Included with the strain hardware are the following items:

- 1) ½” dia rod threaded one end (161101)
- 2) ½” jam nut
- 3) bracket –indicator support rod (161701)
- 4) tie rod adaptor
- 5) dial indicator pick up bar (161501)
- 6) gauge support arm assembly (117301)
- 7) gauge support rod w/washer and cap screw (118001)
- 8) LDT mounting bracket (158401)

A diagram (figure 3) of the suggested mounting arrangement is included with these instructions. An important thing to remember is that the load cell for proving ring is a source of deflection and any measurements of piston travel should be made below the load cell. We recommend mounting the dial indicator pickup bar between the load cell and the CBR piston.

Use this as the pickup point for the linear transducer or dial indicator. This arrangement allows for true measurement of penetration. Due to the variations in molds, we have supplied this machine with two locations to mount the support rod. The ½” rod should be mounted off the platen, however, we have supplied you with a bracket that will allow you to mount the support rod off a strain rod. Due to deflections in the frame under load, this arrangement is not recommended. The remaining parts should be attached as shown in figure 3.

## **USING UNCONFINED HARDWARE**

Unconfined hardware consists of the following parts:

- 1) ¾” UNF x ½: UNF adaptor
- 2) 1.4 and/or 2.8 loading cap
- 3) 1.4 and/or 2.8 pedestal
- 4) ¼-20 cap screw

To install the unconfined pedestal, remove the platen and place the ¼-20 cap screw provided with the set in the center hole. (See figure 5). The pedestal is threaded in the bottom and screws onto the cap screw. The cap is threaded ½-20 and can be attached to a load cell directly or by using the adaptor provided. (See figure 5).

## **USING ELECTRONIS STRAIN MEASUREMENT DEVICES**

The Electronic Strain Measurement package consists of the following items:

- 1) X-Y Plotter
- 2) Linear Displacement Transducer (LDT)
- 3) 5000 or 10,000 lbf Load Cell
- 4) All Necessary Cabling
- 5) a) 1 Dual Output Readout or  
b) 2 Single Output Readouts
- 6) Technical Manual for the X-Y Plotter
- 7) Instruction Manual for Readout(s)

Unpack the Strain Measurement Devices and check them for damage or missing parts. Mount the Readout(s) on the S-610, using the bracket supplied on the tie rod. Set the Plotter on the table beside the S-610. Plug in the Plotter and the Readout(s).

## DUAL OUTPUT READOUT

This configuration uses the 10 volt analog output generated by the Readout and the 30 millivolt output generated by the LDT to drive the Plotter. The factory configuration for the X-Y Plotter is as follows:

- 1) Y-Axis: sensitivity = 1 volt/inch  
Connected to : Load Cell  
Voltage out from Readout: 0 volts @ 0 lbf  
10 volts @ full scale  
Normal/invert switch: Normal
  
- 2) X-Axis: sensitivity = 5mV/inch  
connected to: LDT  
Voltage out: 0mV @ 0.000"  
30mV @ full scale  
Normal/invert switch: Normal

Connect the supplied cable to the output of the Readout. Connect the other end to the Plotter. The Plotter connection is on the bottom of the Plotter. Please refer to the Plotter technical manual for more information on the Plotter. Refer to the Digital Readout manual for more information on the Digital Readout.

## DUAL READOUTS WITH ANALOG OUTPUT

This configuration consists of two Readouts with analog outputs. Each Readout has been set up to provide 10 volts output at full range and zero volts output at 0. Each input device has been calibrated to a Readout and should be matched with that Readout during testing. Refer to the Readout instruction manual for pairing.

All the cabling for these units has been prepared at the factory. These cables consist of:

- 1) Y-cable assembly (female connector x 2 male 5 pin).
- 2) Plotter input cable (male 5 pin x 14 pin Centronics).
- 3) 5 pin connectors on measurement devices.

To connect the Plotter, first attach the linear transducer and the load cell to their respective Readouts. Attach the Plotter input cable to the Plotter. Plug the male five pin connector on the Plotter input cable into the female 5 pin socket on the Y-cable. All of the above cables should now be in their respective socket with the two male ends of the Y-cable still unattached.

The ends of the Y-cable are labeled with the axis that they drive. Attach each plug to the Readout you wish to see on that axis. Plug in the Plotter and you're ready to go.

If, after reading the Plotter manual, the Plotter isn't functioning properly, check the following switch settings. All of these switches are on the top face of the Plotter.

- 1) Both "invert/normal" switches should be set on "normal"
- 2) The "mv/in" setting for the y-axis (load) should be set on "2V"
- 3) The "mv/in" setting for x-axis (travel) should be set on "1V"
- 4) Use the variance knob to check the zero setting.

If there are any questions about this setup procedure, please call our factory at 1-800-837-0864 for assistance.

## **TROUBLESHOOTING**

The S-610 has been designed and assembled to give years of testing performance with a minimum of maintenance, however problems do arise. Please refer to the following chart if you encounter problems and don't hesitate to call Durham if you encounter a situation not covered here.

<b>PROBLEM</b>	<b>POSSIBLE CAUSE &amp; SOLUTION</b>
• Machine not running	Blown fuse needs replacement. Fuse holder is found on the back panel. Replace with same rating fuse.
• Machine running Load not increasing	Sprocket slipping on shaft. Inspect sprockets for slip page. If found, tighten screw.
• Machine running, rate Not controllable.	Electrical problem. Call Durham.

### **WARNING**

Do not attempt to remove any panels with the unit plugged in. Before examining the interior of the machine disconnect power to the Load Frame. 110 volts is painful and can cause serious injury to yourself and the machine.



