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# **CLF-40 Automated Compressive Load Frame**

**Part No. 120-285**

## **Instruction Manual**

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**Ver. 1.2**

**OFI Testing Equipment, Inc.**

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## ***Intro***

The OFITE CLF-40 Automated Compressive Load Frame was designed to determine the compressive strength of a well cement. The most common means of determining the compressive strength of a cement involves applying a force to the sample at a constant rate until the sample fails. The maximum loading at which the cement fails is defined as the cement's compressive strength. Unfortunately, data obtained from this type of testing is typically inconsistent and widely varied. Manually operated hydraulic presses are normally used for testing purposes and maintaining a constant loading rate is very difficult. The CLF-40 incorporates a computer chip to control the loading rate. Operator inconsistencies are significantly reduced in comparison to manually operated hydraulic presses.

## ***Description***

A cement slurry is prepared and cured according to the guidelines outlined in API Specification 10. A cured cement sample is then placed onto the platen of the CLF-40. The unit is turned on, a loading rate is selected, and the test is started. The platens will begin applying compressive strength until the cement sample fails. At that point, the maximum load on the sample is recorded.

## ***Specifications***

- Maximum press capacity: 40,000 lbf
- Self-aligning hardened platens
- Microprocessor controller
- Loading rates variable from 250 to 40,000 lbf/min (in increments of 250)
- Safety head and rupture disk prevent over pressurization
- Proportional control valve accurately controls load rate
- Safety shield protects operator
- Control stand remotely located from hydraulic press
- Size: 23" W × 23" D × 26.5" H (58 × 58 × 67 cm)
- Weight: 225 lb (102 kg)

## ***Requirements***

- 115 / 220 Volt, 50/60 Hz

## ***Components***

#120-28-061	Brush
#120-90-035-1	Filter
#122-074	Fuse

# Setup

## Hardware

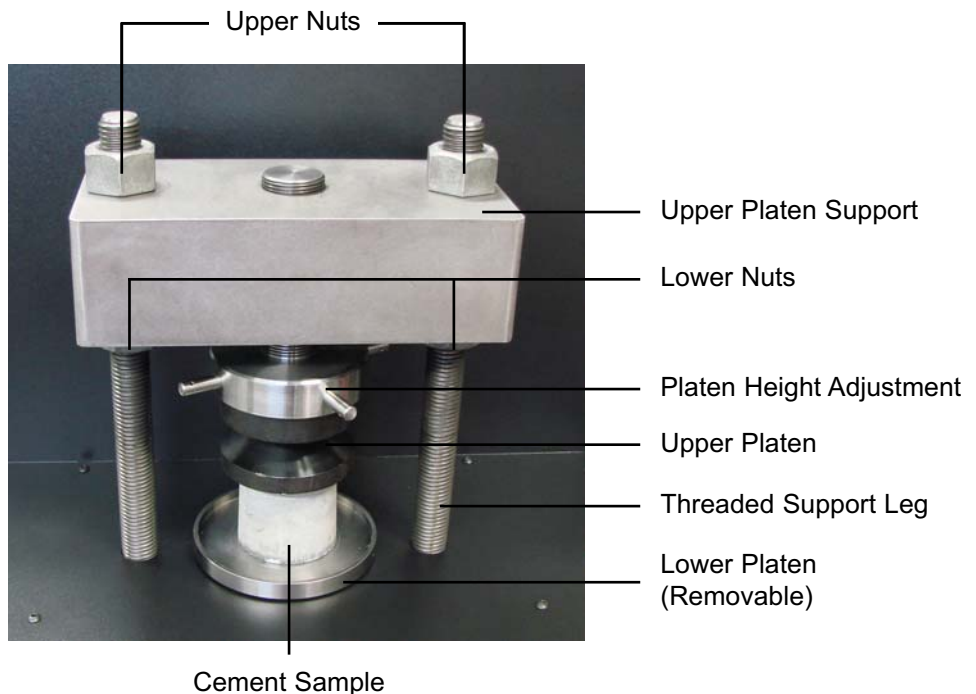


### Note

1. Carefully remove the instrument from the wooden crate.
2. Leveling legs are provided to level the instrument. Rotate the legs until the instrument is level.
3. Plug the unit into a suitable grounded electrical supply.
4. The upper platen support has been lowered to protect the platens during shipping. Raise the upper platen support high enough to allow room for a cement sample beneath it:
  - a. Unscrew the upper nuts. They should be about an inch from the top of the threaded support legs.
  - b. Raise the upper platen support up to the upper nuts. Tighten the lower nuts until they are holding the upper platen support in place.

Although the upper platen is self-aligning, the unit will perform better if the upper platen support is level.

- a. Tighten the upper nuts hand tight.



# Setup

Software

The CLF-40 can be connected to a computer via a serial connection (RS-232) or over a network (ethernet).

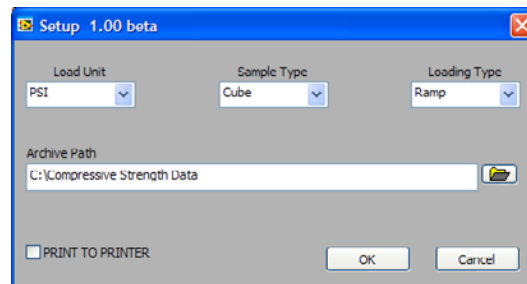
If the CLF-40 will be used in standalone mode only, skip the following steps and proceed to page 6.

1. Open the CLF-40 software by double-clicking the icon on the desktop.
2. Select "Setup" from the "Utilities" menu.
3. Select a load unit: MPa, PSI, or lbf
4. Select a sample type: Cylinder or Cube
5. Select the loading type.

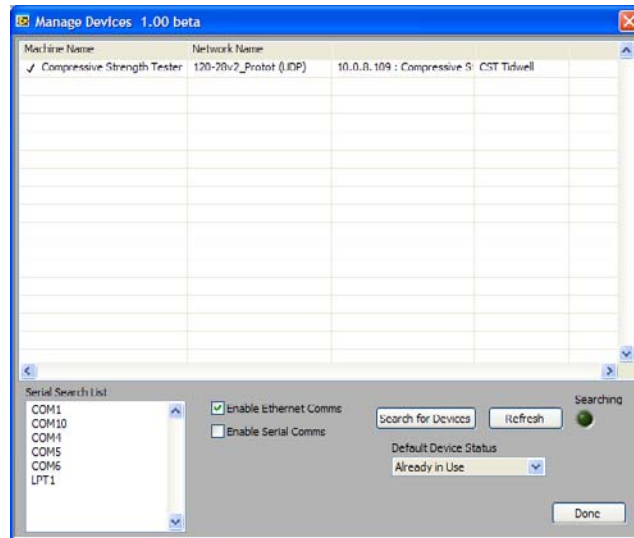
Constant: Increase the load at a rate of 40,000 lbf until the specified load is reached.

Ramp: Increase the load at the specified rate until the total load reaches 40,000 lbf.

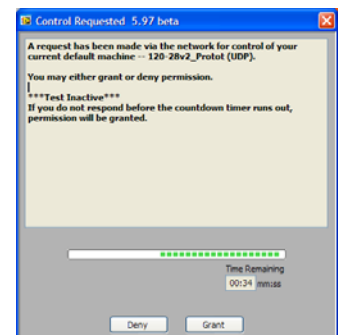
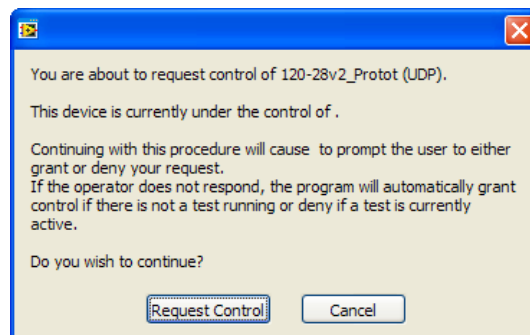
6. Select an archive path. This is where all test results will be saved.
7. Select the "Print to Printer" option if you want the software to automatically print the test results on the default printer at the end of a test.
8. Click OK to save your changes.



9. Select “Manage Devices” from the “Utilities” menu.



10. If the CLF-40 is connected via Ethernet, make sure the “Enable Ethernet Comms” option is selected. If it is connected via serial, make sure “Enable Serial Comms” is selected.
11. If your CLF-40 does not show up in the list at the top of the screen, click the “Search for Devices” and “Refresh” buttons. If the device still doesn’t show up, check the connection and try again.
12. Locate the device you want to manage in the list at the top of the screen. Right-click the device and click “Select Default Device” to assume control.
13. If another user already has control of the device, you have the option of requesting control. When you request control, the other user has 60 seconds to deny control, otherwise, control will automatically be transferred to you.
14. Click “Done” to return to the main screen.



# Testing

## Preparation



1. Open the safety shield.
2. Turn the platen height adjustment to the right until the upper platen is high enough to place a cement sample beneath it.
3. Center the cement sample on the lower platen.
4. Turn the platen height adjustment to the left until the upper platen touches the cement sample.
5. Firmly close the safety shield.

**If the safety shield is not firmly closed, the unit will not allow a test to begin.**

# Testing

Standalone Mode

The controls for the CLF-40 are on the right-hand side of the unit.

Use the Selection Wheel and Cancel button to navigate through the built-in menus. Push the wheel in to begin or to select an option. Turn the wheel (in either direction) to cycle through the options. Press the Cancel button to return to the previous menu or stop a test.



1. Load the cement sample as described on page 6.
2. Turn the Power and Pump on.

To run a standard API test:

Press and hold the 16000 / 4000 switch until the cement sample fails.

**16000** - This setting will increase the load at a rate of 16000 lbf/min.

**4000** - This setting will increase the load at a rate of 4000 lbf/min.

The maximum load is 40000 lbf. If the cement sample does not fail, the load will continue to increase until it reaches 40000 lbf.



Tip

**To run a saved test:**

1. From the main menu, select option 2 "Run Saved Test".
2. Select the test you wish to run.

To modify an existing test or create a new test, refer to the instructions on page 8.

3. Press the Selection Wheel in to run the test.

## **Creating and Modifying Custom Tests**

The CLF-40 unit can store up to 30 custom tests in the onboard computer. These tests can be recalled and run at any time.

1. From the main menu select option 4, "Edit Saved Tests".
2. Select the test you want to modify. If you are creating a new test, select an empty test.
3. Set the loading rate and the maximum load.
4. Press the wheel in to save the test.

### **To run a custom test:**

1. From the main menu, select option 3 "Custom Test".
2. Set the loading rate and maximum load.
3. Press the Selection Wheel in to run the test.

At the end of a test, the maximum load applied before the cement sample failed will be shown on the display.

After each test, clean the debris from the lower platen. Brush the debris into the receptacle on the front of the cabinet. Also, remove the lower cabinet and brush away any remaining debris underneath it. The front receptacle can be removed for easy disposal.

# Testing

With Computer



Tip



Note

1. Open the software by double-clicking the icon on the desktop.
2. Select “Load Sample Info” from the “Utilities” menu.
3. Enter the information about the cement sample being tested.

Use the “Cube Number” field when you plan to test multiple cubes from the same cement slurry. Begin by entering 1 in the “Cube Number” field. Then, after a test is complete, the “Cube Number” will automatically increase by one. You can leave the rest of the information the same and continue testing cubes. When all cubes have been tested, you will have a series of test results for a single cement slurry.

The rest of the fields on the “Load Sample Info” screen are used for display only. They will show on the test results, but do not affect the test itself.

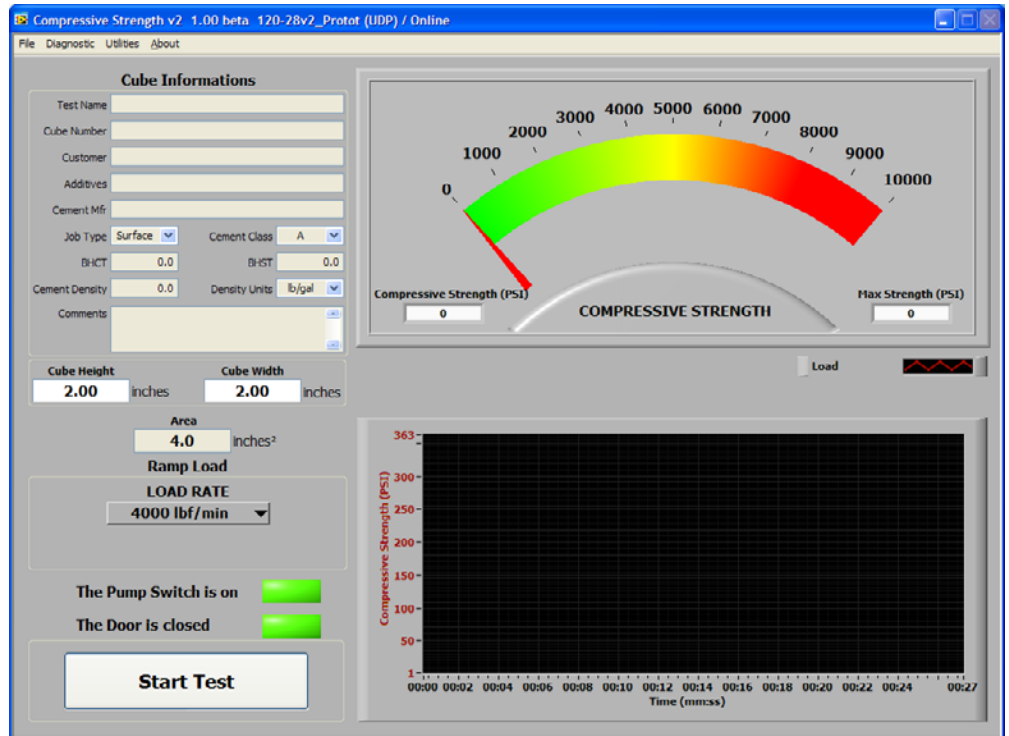
4. Click OK to save your changes.

5. Enter the sample dimensions.

If you selected “Cylinder” in the “Sample Type” field on the “Setup” screen, you will be asked for the sample diameter. However, if you chose “Cube”, you will be asked for the cube width and height. These values are used to convert the force applied to the sample (lbf) to compressive strength (PSI).

6. Enter a loading rate.

If you selected “Constant” in the “Loading Type” field on the “Setup” screen, you will be asked to enter a load in lbf. However, if you chose “Ramp”, you will be asked to select “4,000 lbf/min”, “16,000 lbf/min”, or “Variable”. If you choose “Variable”, type the loading rate into the field provided.



7. Once you have entered all the information, load the cement sample into the unit as described on page 6.
8. At this point, there are two ways to start the test:
  - a. Click and hold the “Start Test” button in the software.
  - b. On the machine, press and hold the “4000/16000” button.

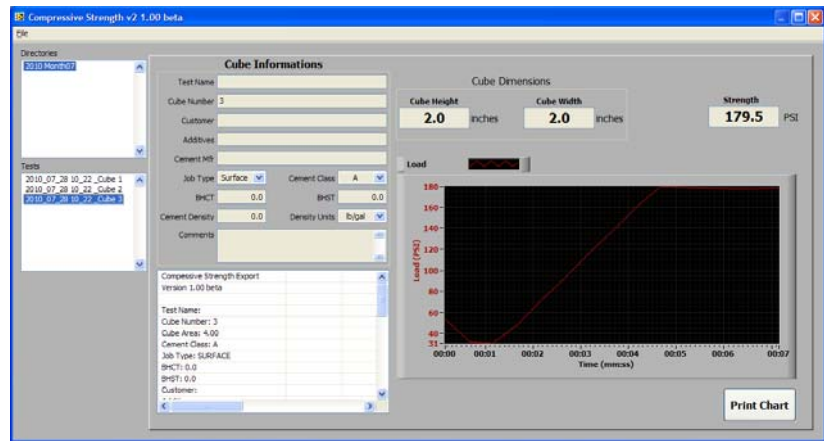
The unit will continue to apply force to the sample as long as you hold the button down. When you release the button, the test will stop, the test data will be saved to the computer, and the “Cube Number” value will increase by one.
9. After each test, clean the debris from the lower platen. Brush the debris into the receptacle on the front of the cabinet. Also, remove the lower cabinet and brush away any remaining debris underneath it. The front receptacle can be removed for easy disposal.
10. To test another cube from the same slurry sample, simply reload the machine with the next cube and repeat step 8. Continue doing this with each cube.

# Appendix

## Software Functions

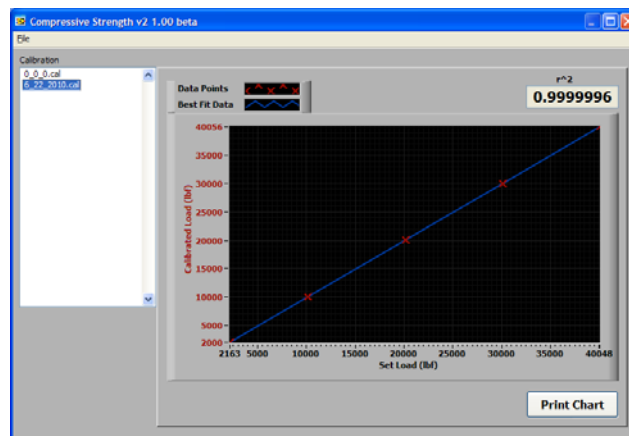
To retrieve data from a previous test:

1. Select “Open Data Archive” from the “File” menu.
2. In the “Directories” box, choose the date of the test you want to retrieve.
3. In the “Tests” box, choose the tests you want to retrieve.
4. To print a chart of the test, click the “Print Chart” button.



To retrieve data from a previous calibration:

1. Select “Open Calibration Archive” from the “File” menu.
2. In the “Calibration” box, choose the calibration you want to retrieve.
3. To print a chart of the calibration, click the “Print Chart” button.



# Calibration

The CLF-40 should be calibrated periodically. The frequency of calibration is specified in API RP10B-2 or ISO 10246-2. Refer to those documents for more information.

Calibration requires a specially designed load cell. Refer to the documentation provided with your specific load cell for operating instructions.

To calibrate the unit:

1. Turn the Power on.
2. From the onboard menu, select option 5 "Calibrate".
3. Enter the current date.
4. Enter the calibration range. The maximum load is 40,000 lbf.
5. Enter the number of points you will be using in your calibration. Five points are recommended.
6. Place the load cell between the two platens. Make sure the upper platen is not touching the cell.
7. Zero the reading on the load cell.
8. Once the load cell is zeroed, turn the platen height adjustment to the left until the upper platen touches the load cell.
9. Firmly close the safety shield.
10. Turn the Pump Power on.
11. Press the wheel to start the calibration.
12. Wait for the reading on the load cell to stabilize. Then enter the load cell reading into the CLF-40 and press the wheel to accept. Repeat this step for each point in the calibration.



**Note**

The first calibration point will be an offset value. After you enter the offset, the screen will lead you through the number of calibration points specified in step 5 above.

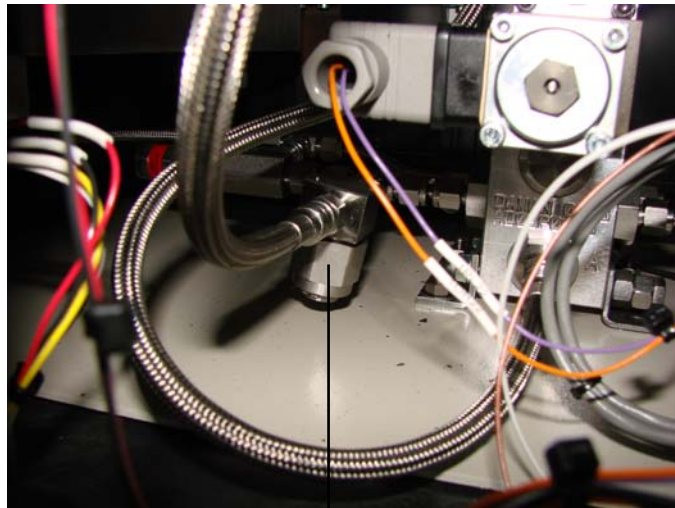
13. When the calibration is complete, you can review the calibration data. If the unit did not pass the calibration, an error will be displayed. Contact OFITE Technical Support to arrange repairs.
14. If there are no errors, push the wheel in to accept the calibration.

# Maintenance

## Filter

The system incorporates a filter to keep the hydraulic fluid clean. Over time, solids will build up in the filter and reduce the flow of fluid. Check the filter after every 100 tests. If the filter is dirty, clean it with a mild solvent. If it is damaged, replace it (#120-90-035-1).

1. Open the panel on the right-hand side of the unit cabinet.
2. Unscrew the filter housing. This will require a 1" wrench.
3. Remove the filter and clean it with a mild solvent.
4. Return the filter to the housing.
5. Return the filter housing to the unit and tighten it completely.
6. Close the panel.



Filter Housing



# Maintenance

## Fuses

The CLF-40 has two 4-amp fuses (#122-074) at the main AC Power Inlet. If the unit will not power on, check these fuses and replace them if necessary.

1. Unplug the electrical power cord.
2. Remove the fuse holder from the AC Power Inlet at the back of the unit.
3. Inspect both fuses. If either fuse is blown, replace it with a new one.
4. Re-insert the fuse holder into the AC Power Inlet.
5. Plug in the electrical power cord.

