Introduction

July 15, 2003

Description of Tester

This tester moves springs across one or more load cells. Air-powered press rams then compress the springs to certain test heights using mechanical stops. Then load cells provide a measurement of the spring force exerted at these precise heights.

An embedded PC computer times and controls these moves, aided by custom Moyer hardware to trip valves, rotate the motorized dial, and read the load cell signals. The computer decides which are good springs and sorts the rest using a Moyer chute.

The T-120 can be adapted for auto loading, printing out test data, and sending it to a data-collector system. The computer assists with R&R studies, and can store the setup and sorting information for several different springs.

The tester can be set up for testing different springs, or dedicated to high-volume testing of a certain spring job.

Organization of this Manual

This manual was written to be as complete as possible in all setups and adjustments, without making you wade through all that just for simple operations. The details you might require in certain situations are tucked away in the "Advanced Topics" section of each chapter.

The chapters on mechanical and load-check setups are arranged in the order these steps should be performed, as later adjustments depend on prior adjustments being done.

If you have any questions about the manual, contact us at Moyer and we'll try to straighten it out.

Optional accessories are covered in this manual, some of which you may have, like custom lockable dial, and cam-stroked rams.

Using Your New Tester

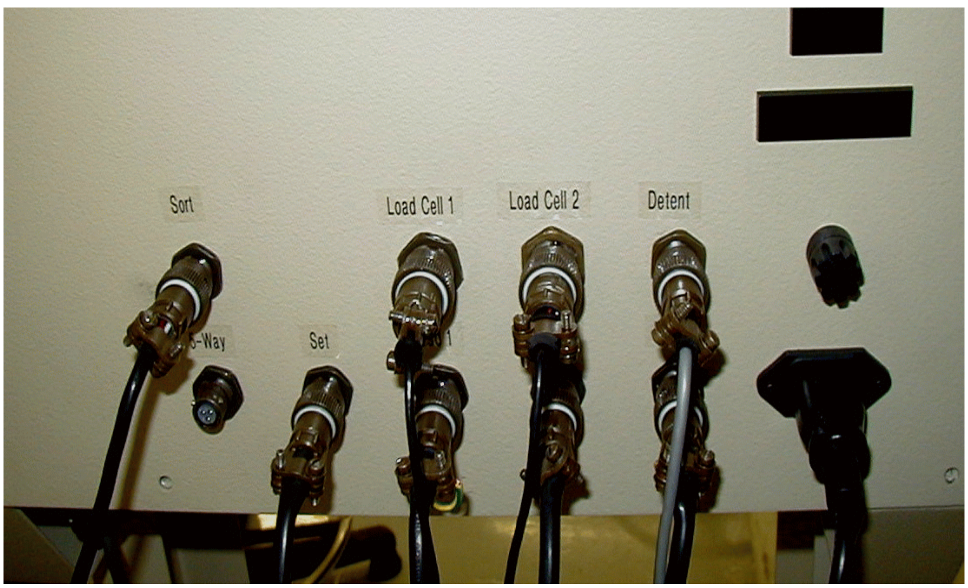
This chapter assumes you've received a new tester that has been tooled and set up for certain springs. It covers placement and hookups, and running some springs to check it out. Moyer personnel will do this for you at delivery, but you might move the machine later or just want this procedure documented.

Placement

A controlled environment like an air-conditioned QC lab is not necessary for the tester. Please place the tester to avoid fans, strong air currents, and machinery with a lot of vibration (like grinders.) In general, any area where you can "feel" machinery vibration through your feet or with your hand on the tester is not a good location. The tester's computer will filter out most "noise" but best results avoid noise.

It is necessary to use the leveler feet on the bottom of the tester's four legs so it's stable and cannot rock. The computer console has four levelers too.

Power



Your compressed air supply with a quick-disconnect attaches into the first regulator of the array on the back of the tester. 80 to 100 psi is recommended.

The electrical connection is a 120vac 3-prong cord attached to the back of the computer console. The AC power connection MUST be grounded.

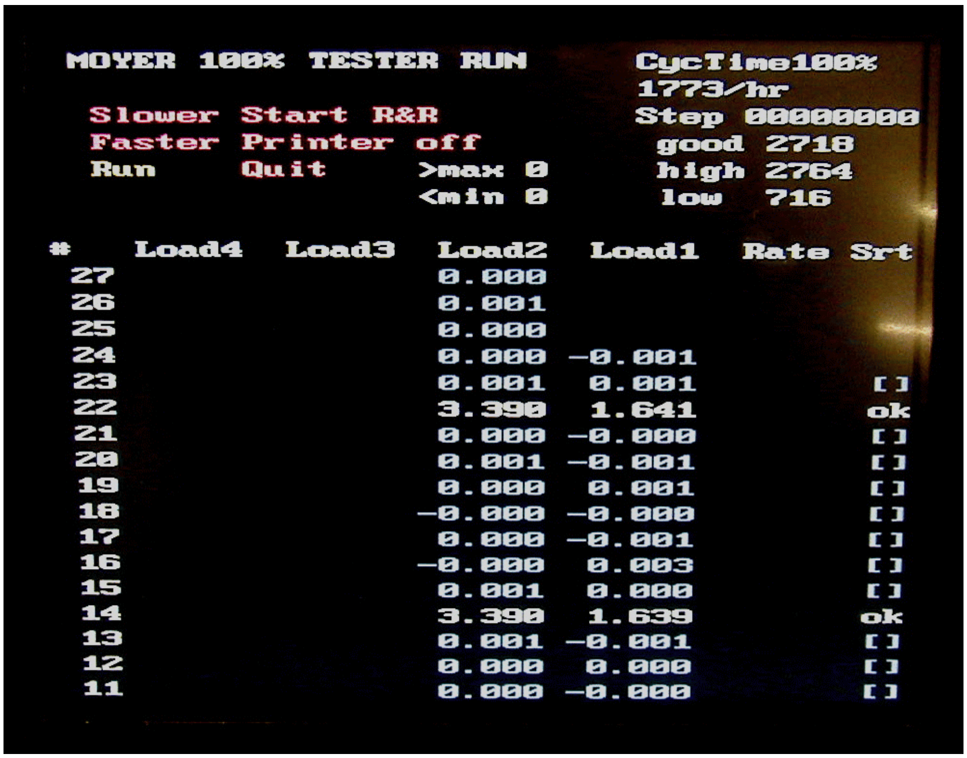
Control cable outlets for valves and load cells are marked with legends. You can follow the air lines from a station to its valve, then plug that valve's cord into the appropriate outlet. We generally number the rams and load cells counter-clockwise from the sorting chute. Usually the "Set" station/column with no load cell is CCW. furthest from the chute.

The "Escapement" if you have one, is further left or CCW and may have a small air cylinder (with a magnetic prox sensor that plugs into the "Detent" legend.) The cylinder and escapement are activated by the same valve, which plugs into the"Escape" legend. The cable from a 3-way sorting chute (or the 3-pin cable of a Moyer 5-way chute) plugs into the "Sort" legend. The "5-way" legend is ONLY for the second 2-pin cord on a Moyer 5-way chute.

Power Up!

Now that the tester and computer are properly attached, you may turn ON the switch under the keypad on the console. After a few seconds, the "Main Menu" will appear on the screen. You're now ready to do more detailed press-height adjustments and load calibrations. These steps are detailed in the next chapter, but for now, let's just see it run and check that all its parts move.

The top line on the Main Menu is "Automatic Run" and should be blinking in yellow. Pressing the "Enter" key will activate the yellow item and bring up a new and different screen. Press it once and you'll get a clean "Automatic Run" screen with no load data on it yet. It has a little Menu on the top left with the word "Run" highlighted in yellow. Press the "Enter" key and the tester will run; the dial will turn, press rams will come down and up together, and the chute will activate.



On the screen, load numbers will appear in various spots. Since no springs are loaded in yet to check, these numbers will be like 0.000 or -0.002, zero or close to it.

The tester will stop itself after about a dozen cycles or so with no springs. Of course, you can stop the tester any time by pressing the "Enter" key since now the word "Stop" is highlighted in yellow on the screen. This is similar to the Cycle Start/Stop knob on other machines.

Usage

Now that you've seen how it runs and verified that all parts seem to move and are thus connected, you can perfect the critical adjustments. If you know the machine is adjusted, you can put springs in the dial and actually sort them. Normally, this is what you would do at shift changes and breaks. Keep the word "Run" or "Stop" highlighted in yellow and just press "Enter" key to do your work or take a break.

You can even turn OFF the power switch to go home, turn it ON in the morning, press Enter twice and start loading springs.

!! Caution !! - Calibrate Frequently

Changes in weather or environment, normal wear, and such can adversely affect T-120 calibration. It should be verified against a known standard on a regular basis.

Companies have different rules (which could vary from spring to spring) concerning how often to re-calibrate load and check physical adjustments for wear. Some re-calibrate at the beginning of every shift and break. Some check a known ‘standard’ spring or a sample checked on a tester with traceability.

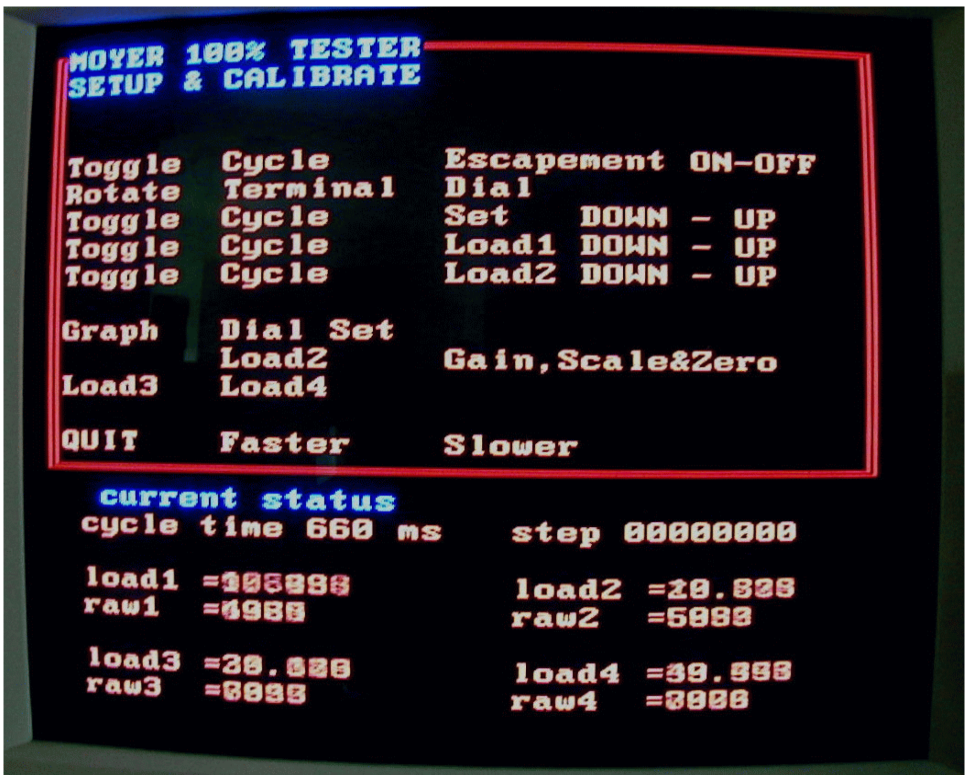
It’s easy, doesn’t take long, and cheap compared to the investment made in this precision instrument. It’s absolutely necessary if you’re enrolled in ISO or QS 9000 certification!

Mechanical Test Height Setups

The air-powered press rams will compress the springs to repeatable, precise "check-heights." This chapter tells you how to adjust or check these heights for our different types of ram designs. Also, you can use flow control on the rams to avoid shock, recoil, and vibration.

Getting Ready

First, remove the carrier dial from the tester by removing the central ½-20 bolt and washer holding it on. Look at the load cell puck (testing surface) of each load station to check that the puck is centered in the hole formed by the two neighboring subplates. You can slide a piece of paper or thin shim all around the two gaps freely to ensure no contact with the load cell puck, which would cause bad readings. If not centered, loosen the four bolts holding the load column onto the table and tap it into place, checking the gaps with the shim, then retighten. The load cell itself can be repositioned on the column, also.



At the console, select "Operation Tests" (2nd line down) on the Main Menu. The screen that appears has many options you'll use in this section to move the press rams up and down and adjust the dial movements. The right half of the screen just has labels identifying which station will move, and the left half is two columns of menus which can Toggle a ram up or down, or cause it to Cycle on its own.

Cold-Set Station

This is the easiest station to set up, and prepares you for the more complex setups. Put a spring under the set ram's puck and see that there's clearance of 1/16" to 1/4". To adjust this clearance, you can loosen, move, and retighten the lock collar on the cylinder shaft between the puck and cylinder body. You can use the menu item "Toggle" Set Station to move the ram down to help you adjust this collar. Also, you should at this time reduce the Set Ram's regulator's pressure so the ram can be pushed easily by hand. This is a safety measure, as well as making these adjustments easier.

When this ram is down, compressing the spring to solid, you can slide the lock collar at the top shaft to provide a dead-stop against the top cylinder body. Be sure the spring is not compressed so forcibly it's slanted or deforming coils. You can use a shim under the spring when adjusting this downstroke to prevent too much compression.

If you're not getting enough stroke at one end, you can remove the four 3/8-16 bolts attaching the cylinder and spacer blocks to the outer edges of the tall "column" and move that assembly up or down in ½" increments and replace the bolts into their appropriate holes.

Next, check the air regulator pressure supplying this cylinder. Look at the middle body or aluminum end cap of the Bimba cylinder to find an engraved part number. The first two digits are the "size" or "factor" of the cylinder. For example, an engraving of 092.5-DXDENT means a size of 09 and total stroke of 2.5"

Also, you should know the “load at solid” of the spring, from the spring design sheet or print. Multiply this Load by 13 and divide the result by the cylinder Factor to get the pressure to set the regulator to.

(Psi = Load x 13 / Factor).

For example, I’m using a 124-DXDENT Bimba cylinder to cold-set a spring with a “load @ solid height” of 24 lbs. So I need to set the regulator to at least 26 psi, maybe a bit higher at 30 psi.

(24 x 13 / 12 = 26)

An alternative method is to reduce the regulator’s pressure and Toggle the Set Ram down on a spring. Slowly increase the regulator’s pressure until the spring goes solid. Then check the pressure and increase it by an extra 20%.

When the air pressure is adjusted, place a spring under the set ram puck and select the menu item “Cycle” Set Station to cause it to move up and down on its own. Where the air hoses come into each end of the Bimba air cylinder are flow-controls or snubbers with an adjustment screw. Adjust each screw so the cylinder comes to a stop with a gentle “click” and not a “bang” or strong shock. Too much adjustment, though, will cause the ram to move too slowly or not compress the spring all the way. Remove the spring and be sure the downstroke then is not too hard to shock the rest of the machine whenever a batch of springs runs out later in real testing. Also, it’s okay for the up stroke to be stronger and quicker, since those shocks have more time to “die out” before the next load readings are taken.

Load Ram (Straight Air Cylinder Style)

The previous steps will be used in these following sections to adjust the load stations, along with more complex steps to ensure parallel pucks and account for how far load cells move when squeezed. For these procedures, you'll need correct Jo-blocks for the test heights, and a typical spring.

Adjusting the up-stroke to clear the top of the spring is easy, and is done with the lower lock-collar, just like for the Set ram. Adjusting the down-stroke takes more work, and is done with the fine dead-stop screw mounting the top of the air cylinder, explained a bit later.

First, calculate and adjust the regulator's pressure just like before, but using the "test load" and load cylinder's part number. Then select the menu item to "Cycle" Load and adjust the cylinder's snubbers for smooth click stops without sacrificing too much speed, like before. Remount the whole cylinder assembly up or down if needed to match the new spring. Now you're ready for the more complex steps.

!! Caution !! - Load Cell Safety
(1) Remove all springs, jo-blocks, tools, or other material from the load cell puck.
(2) When using the jo-blocks, temporarily reduce the air regulator to around ½ the calculated setting, enough to move the ram but not smush the load cell with too much force.
(3) Never attempt to forcibly squeeze a jo-block into the space between a ram puck and load cell puck.
(4) Never Cycle or Toggle down a ram with a jo-block under it.

Coarse Height Adjustment Procedure:

(1) Adjust the dead-stop screw on top of the cylinder so there's about a 1/10" gap between its lip and the tall hex nut. You will have to loosen the top setscrew on the nut first.

(2) Toggle the ram down.

(3) Place the jo-block onto the load cell area next to the ram puck, and visually estimate the difference in height.

(3) Toggle the ram up, loosen the lock-collar above the dead-stop to move it to the estimated height difference, and retighten it.

An alternative method:
(1) Reduce the regulator's pressure so the cylinder can be moved by hand.
(2) Toggle the ram down.
(3) By hand, move the ram up enough to put jo-block under it, then let the ram rest on it.
(4) Adjust the dead-stop screw and top lock collar so the collar rests on top of the dead-stop.
(5) Remove the jo-block and increase the ram's air pressure to normal.

For these next steps, it's crucial that you observe the bottom of the "Operation Tests" screen, where load cell results are displayed. You will need to watch the "Loads=" number for the correct load cell you're adjusting. Ignore the "raw=" value, except that it should never be 0. If the load cell has not been calibrated, use a random spring to calibrate it now at the "mean" load values. This is not an accurate calibration, it's just supposed to be close.

Parallel the Pucks:

(1) Toggle the ram down and slide the jo-block under it. If it has to be forced in, use a wrench to turn the dead-stop screw CCW to raise the ram so the jo-block slides in with a LITTLE friction. If there's no friction, turn the dead-stop screw CW to lower the ram until you feel some gentle pinch. Never squeeze it in with force, as that can damage the load cell.

(2) Now slide this jo-block to the left edges of the pucks and observe the reading at the bottom of the screen. Slide the jo-block to the right edges and observe the reading. If the difference in these readings is

more than 10% to 20% of your load tolerance or more than 2% to 4% of the load cell capacity, you'll need to make the pucks parallel.

(3) There's a set of four screws that mount the cylinder to spacer blocks, and another set of four 3/8-16 screws mounting these spacers to the edges of the tall column. Either of these sets can be loosened a little to allow you to tap the ends of the cylinder left or right to tilt the ram puck slightly. Some users loosen only three screws.

(4) Shims can be placed under the top or bottom mounts to adjust the front-to-back parallelism.

(5) Any of these steps can change the gap enough to release or pinch the jo-block. You'll have to turn the dead-stop screw to readjust the gap height to keep a LITTLE pressure on the jo-block.

(6) The readings for the left, right, front, and back edges of the pucks should be gotten very close to each other, but they'll never match exactly, so don't spend too much time on it. We're just minimizing errors due to a spring's position under the pucks.

(7) An additional tip that can help sometimes is to loosen the screw that mounts the bottom of the load cell to the column, and turn the load cell 90 degrees or so.

(8) Retighten all mounting screws. You can leave the ram down with the jo-block centered under it for the next adjustment, below:

** Advanced Topic **

It may be useful to temporarily use a lower air pressure from the regulator to prevent overloading the load cell, or to make it easier for you to slide the jo-block around by hand.

The body of the load cell is labeled with a partnumber and size in pounds. SMT1-22 means it's a 22 lb cell. Multiply this by 3 and divide the result by the air cylinder's size "Factor."

(LowerPsi = 3 x Loadcell / Factor)

For example, an SMT2-112 load cell is used with a Bimba 172-dxdent cylinder. So the lowered safe pressure setting is 20 psi, since

(3 x 112 / 17 = 19.76 psi)

Fine Adjustment:

(1) Leave the ram down, with the jo-block centered between the pucks.

(2) If the air pressure was lowered to a safety value, increase it now to the real working pressure you calculated based on the actual load value being tested (Load x 13 / Factor)

(3) Observe the load readings and use the wrench to adjust the dead-stop screw in small amounts until the reading is very close to your mean test load for this station. We're doing this adjustment to make up for the small amount the load cell deflects when it's used.

(4) Retighten the soft nylon-tipped setscrew on the dead-stop nut. This may cause the load reading to change a bit, so you may need to note this change and readjust the dead-stop screw by the opposite amount to account for it.

These steps look like a lot of work, but with practice, should take 5 to 10 minutes per ram. Toggle the rams back up and set aside the tools you used. Now it's time to precisely calibrate your load cells, outlined in the next chapter.

Load Ram (Rotary Cam-Pusher Style)

These press ram stations do not use an air cylinder, but instead a bearing-guided shaft pushed by a precision-ground cam that's rotated 180 degrees using an air-driven rotary actuator. This ensures the most repeatable test height, and can in most cases allow a tester to run at faster production rates. The adjustments are different, and are done in a different order. You'll still need correct jo-blocks for the test heights, and a typical spring.

Setting up-stroke to clear the top of the spring is a matter of installing the correct size cam, since we only adjust test height, and have to live with whatever space results at the Up position. Moyer can quickly design smooth-acting cycloidal cams with standard strokes in increments of 0.10" or custom to your needs.

Air pressure is simpler, since you need enough to turn the cam quickly. 25 to 50 psi should suffice. The snubbers are only used if there is too much obvious shock felt from the rotary actuator, which has its own internal cushioning.

For these next steps, you'll need to observe the bottom of the "Operation Tests" screen, where load cell results are displayed. You will need to watch the "Loads=" number for the correct load cell you're adjusting. Ignore the "raw=" value, except that it should never be 0. If the load cell has not been calibrated, use a random spring to calibrate it now at the "mean" load values. This is not an accurate calibration, it's just supposed to be close to assist in the next steps.

!! Caution !! - Load Cell Safety (same as before)
* Remove springs, jo-blocks, and tools from the load cell puck.
* Don't force a jo-block between pucks or Toggle a ram down on it.

Height Adjustment Procedure:

(1) Toggle the ram down and loosen the lock collar around the ram puck.
(2) Rotate the ram puck on its fine threads CCW so it's high enough to slide the jo-block under it.
(3) Rotate the puck CW to squeeze the jo-block, and observe the "Load=" reading. Rotate the puck down so this reading is very close to your mean test load for this station. This makes up for the small amount the load cell deflects down when it's used.
(4) Retighten the lock collar around the top of the ram puck.
(5) If more adjustment height is needed, you can loosen the lock collar around the brass follower at the top of the shaft, rotate the shaft several times on these threads, and retighten the collar.

Parallel the Pucks:

(1) Now slide this jo-block to the left edges of the pucks and observe the reading at the bottom of the screen. Slide the jo-block to the right edges and observe the reading. If the difference in these readings is more than 10% to 20% of your load tolerance or more than 2% to 4% of the load cell capacity, you'll need to make the pucks parallel.
(2) There's a set of four 3/8-16 screws mounting the whole pushers' assembly to the edges of the tall column. Loosen 3 of these to allow you to tap the ends of the assembly left or right to tilt the ram puck slightly.
(3) Shims can be places under the top or bottom of the assembly to improve the front-to-back parallelism.
(4) Any of these steps can change the gap enough to release or pinch the jo-block too much, so you may need to readjust the puck on its threads to keep the correct pressure on the jo-block.
(5) The readings for the left, right, front, and back edges of the pucks should be gotten very close to each other, but they'll never match exactly, so don't spend too much time on it. We're just minimizing errors due to a spring's position under the pucks.

(6) An additional tip that can help sometimes is to loosen the screw that mounts the bottom of the load cell

to the column, and turn the load cell 90 degrees or so.

(7) Retighten all of the mounting screws.

These steps look like a lot of work, but with practice, should take 5 to 10 minutes per ram. Toggle the rams back up and set aside the tools you used. Now it’s time to precisely calibrate your load cells, outlined in the next chapter.

Load Cell Calibration

Unlike a postal scale or metric ruler, load cells do not produce an absolute and permanently calibrated reading of pounds applied to them. You give it some electric power, and it gives you back a tiny percentage of that power based on how hard it's squeezed. The special Moyer electronics in the console can measure this power and convert it into pounds, newton, or other unit you desire.

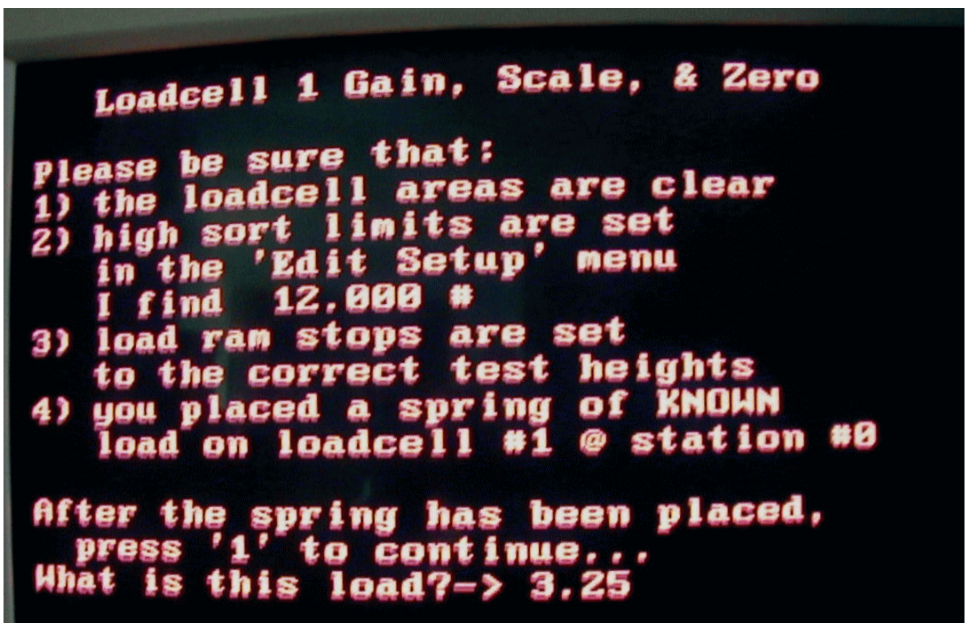
This chapter shows you how to set up this conversion accurately. Thereafter it should be checked and set again often. Please do not just run the tester month after month assuming it's always correct and true and stays that way, it doesn't! Changes in weather and environment, normal wear, or your new fan can change the calibration. Some companies re-calibrate at the beginning of every shift and break.

!! Caution !! - Load Cell Handling Precautions:

Load cells aren't solid and rigid, but are meant to distort under load. So, they can be damaged by too much load or bad handling of these kinds:

(1) a short fall.
(2) over-tightening or bottoming out the installation bolts.
(3) twisting the body while the bolts are tightened (please see the hand-sketch in the back of this manual showing the correct way to mount a puck onto a new cell.)
(4) impact of dense material falling onto them.
(5) leaving a jo-block on them while toggling a ram down.
(6) running the wrong spring with higher rate.

We've provided two places in the Menu system to allow you to calibrate the load cells. From the "Edit Setup" menu you can select a load station to configure sort limits and other tech info. The "Calibrate" option at the bottom of this info brings up step-by-step instructions to follow to calibrate and zero the cell properly.



The same instructions can be accessed from the middle of the "Operation Tests" menu with the options labeled "Load1" through "Load4." Use which method is most convenient for you at the moment.

This tester is truly universal with different systems of measuring units. You'll type in a number representing the value of the load currently squeezing a load cell. The computer doesn't know or care if this number is in pounds, newton, kilos, troy ounces, carats, or stone. The readings it will give in the future will then be in these same units.

Generally, we number load rams and load cells CCW from the chute, but this is arbitrary. There are two methods of calibration, and we'll describe the most convenient first.

Using a Calibration Spring - a.k.a. “Golden Spring Method”

(1) Grab a new spring and mark one end that will always be pointed “up.” “Set” the spring if called for on the print.

(2) Using one of your high-precision hand testers like the “Moyer TruLoad 150" to test this spring at its check heights and record these measurements on a scrap paper. Test the spring again, to be sure it’s repeatable. Keep the spring and paper together in a little baggie, since you may want to use it several times.

(3) Take the spring to your T-120 Rotary 100% Tester and place the spring onto the center of the load cell puck, keeping the same end “up” as on the hand tester. If the carrier dial is installed, then drop the spring into a dial hole and use the “Rotate” option from the “Operation Tests” menu a few times to place the spring under the ram you want to calibrate.

(4) Start the calibration process by selecting the required load from the middle of the “Operation Tests” menu, or use the “Calibrate” option from an “Edit Setup” submenu. A new screen will appear with instructions, which we’ll follow here.

(5) Press the ‘1' key on the keypad and see that the correct ram comes down upon the spring.

(6) You’ll be asked “what is this load?” so use the keypad and type in the value you got from the hand-tester, and press the ‘Enter’ key.

(7) The computer will show you a “raw” value. You’re just looking to see that the last digit is fairly stable, and fluctuates very little. Wait about a couple of seconds and press ‘Enter’

(8) The ram will come up by itself and the computer will display a “raw zero” value representing the weight of the spring’s wire. Wait a couple seconds to let it settle good and press ‘Enter’. The last menu will return and that load station is now accurately calibrated!

(9) PLEASE NOTE: if the “raw zero” value displayed in Step 8 is 0, then we have trouble! Please refer to the sketch at the back of this manual to show you how to make a simple electronic adjustment to the “MIBLOAD pots” inside the computer console.

You’ll notice that the load cells always give a “raw” reading even when empty, due to the weight of the puck. Also, when a spring is not on a puck, the scaled “Load=” value is a small negative value close to the weight of the spring.

Using a Standard Weight

For this, you need no spring, but you do need a known weight that is close in magnitude to the test load you intend to measure. For example, if you are testing a 17 lb load, get a 15, 20 lb or maybe a 10 lb weight, but not a 1 or 5 lb, and certainly not something so heavy that will damage the load cell.

The load cell & puck must be moved to one of two holes provided on the back corners of the tester baseplate. Please review the load cell handling precautions listed earlier, since they are particularly vulnerable out of the tester.

(1) Place the known weight GENTLY onto the puck of the load cell, and wait a few seconds.

(2) Select the appropriate calibration option from the menu, and press ‘1' to start the process. A ram may come down, but ignore it.

(3) Type in the value of the known weight and press ‘Enter’

(4) When the “raw=” value is shown, wait a couple seconds and press ‘Enter.’ A ram somewhere might go back up.

(5) GENTLY remove the weight, wait a couple seconds until “raw=” is steady, and press ‘Enter’

(6) Carefully remount the load cell into its station.

Carrier Dial Movement Setup

There are two kinds of dials designed for this tester. A general purpose one with 12 hooks mainly for hand loading, and custom dials of certain thickness and hole diameter, for automatic loading of large dedicated jobs.

12-Hook Dial

With all 12 hooks installed on the central aluminum hub, will accept springs up to about a 1.7" diameter. For larger springs up to the size of our standard load cell pucks (2.5") you can remove every other hook and inform the computer it's a 6-hook dial.

This dial is ideal for small sample runs, or families of springs that test on the same load cell but have differing lengths or diameters. This dial requires that the springs are not too slender and can reliably stand on their own and remain standing when pushed by a 90-degree "V."

Physical Installation

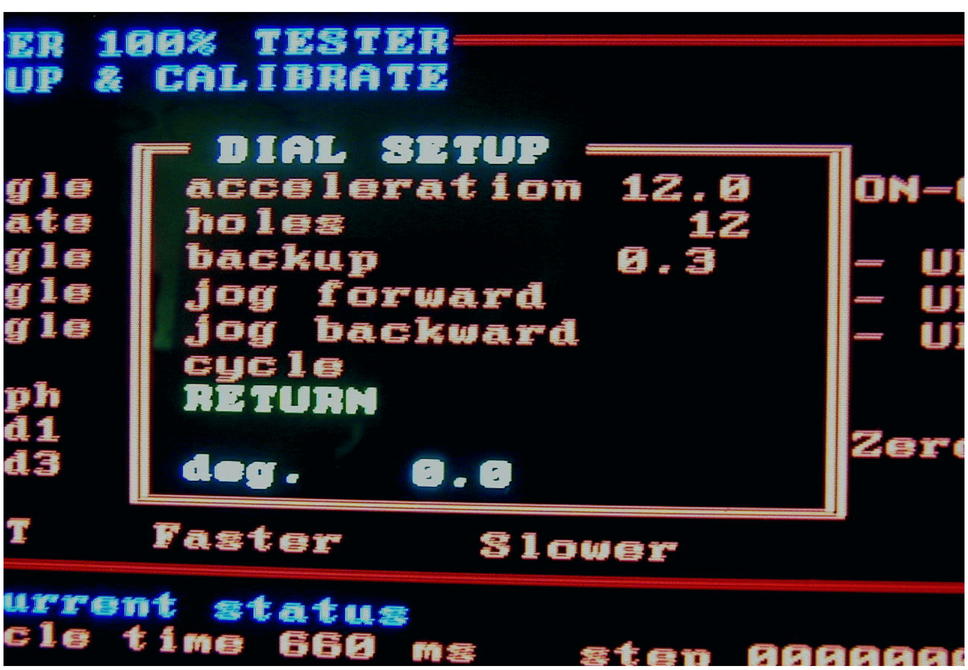
Be sure all rams are UP and fit the dial hole onto the stub and ledge on the top of the shaft in the gearbox. A ½-20 bolt holds it against the ledge with the aid of ½" SAE washers and maybe a jam-nut to decrease the bolt's threaded length.

The dial should be raised approximately 1/8" above the subplates. Height adjustment is easy. There's a 3/8-16 bolt on the bottom of the center shaft, accessed through the bottom of the base plate, inside the bore of the black gearbox. Loosen this bolt with an allen wrench, and the whole dial and shaft assembly can move up and down. Tightening this bolt jams the shaft firmly in place in the gearbox bore. Much like bicycle handlebars are adjusted with one screw.

If the dial appears tilted or not level, you can adjust the 1/4-20 nuts supporting the top and bottom of all four corners of the gearbox. It takes a little time, since the supports around it only permit small swings of the wrench. If you do adjust these nuts, be careful not to over-tighten them, as that will squeeze the gearbox and cause damage.

Of course, be sure all rams in the UP position clear the top of the dial. The ram pucks can go into the dial between hooks with some clearance. Toggle one of the rams Down into the dial and then turn the knob on the motor, in front, to center the two hooks around the ram puck.

Movement Setup



In the middle of the "Operation Tests" screen is a menu option called "Dial Set." Select this option and a small boxed menu appears in the center of the screen.

The top line is a value for "acceleration" and affects how fast the dial indexes. It's usually from 9.0 to 12.0. Values like 15 or larger can throw springs off center puck position a little when the dial stops, and values less than 8 would slow down the production rate unnecessarily.

The second line, “holes” selects a series of values available for how many holes (or hooks) are in the full 360 degrees of the dial. Available values are 4 and 8 (for a custom machine). 6 and 12 are most used. 18 and 24 are available for custom dials for smaller springs and high indexing rates.

The third line “backup” is important to adjust properly, as it tells how much the dial should “back away” from the spring after placing it. The dial must of course, touch the springs to push them into position right under the center of the ram pucks, and then must back away so the hole or surrounding hooks are centered around the spring body before the rams come down for testing. If the dial touches the springs while loads are being measured, the load readings can be incorrect (generally too low).

The “cycle” option lets you quickly check the dial setup. Place a spring into the dial at the loading area, and select “cycle” repeatedly to index the spring through the tester. Watch that springs are centered correctly between the pucks of each ram, and not “thrown” forward when the dial stops its movement. Also check that each spring seems centered in its dial hole, with fairly equal clearance space all around it.

The other menu items let you move the dial in tiny amounts to help you adjust backup to properly center the springs in the hole. When finished adjusting, select “done” and the box disappears. Notice also on the second line of the “Operation Tests” menu is a “Rotate” option that will index the dial for you also.

Custom Dial with Detents

These dials are for two reasons. Some springs are too slender and may fall over when pushed, so they need the containment in a custom sized hole. Also, any spring being automatically loaded from an escapement may “bounce” off the loading surface. A hole contains this bounce and captures the spring.

Around the outer edge of the dial are machined “V-grooves” to accept a “poker” nose on a small cylinder usually mounted just below an escapement on the same column. After the dial indexes, when the escapement activates, this “detent cylinder” also activates, to lock the dial so the current hole is firmly centered below the escapement nozzle. Mis-fed springs can stop the dial, get smashed under the rams, crush a load cell, and even get sorted wrongly.

You can check this action with the top line of the “Operation Tests” menu. Be sure that the detent cylinder does not actually visibly MOVE the dial. Use the knob in front on the motor to adjust the dial by hand back and forth so the detent goes into a V that is already in correct position, so no final movement is caused which may cause the dial holes to touch correctly positioned springs.

Another feature we’ve provided is a magnetic prox switch on the detent cylinder that detects when the nose has completely nestled into the V. Using this signal in the “Edit Sequence” screen ensures the tester will stop running if the dial becomes jammed or seriously off position a few degrees.

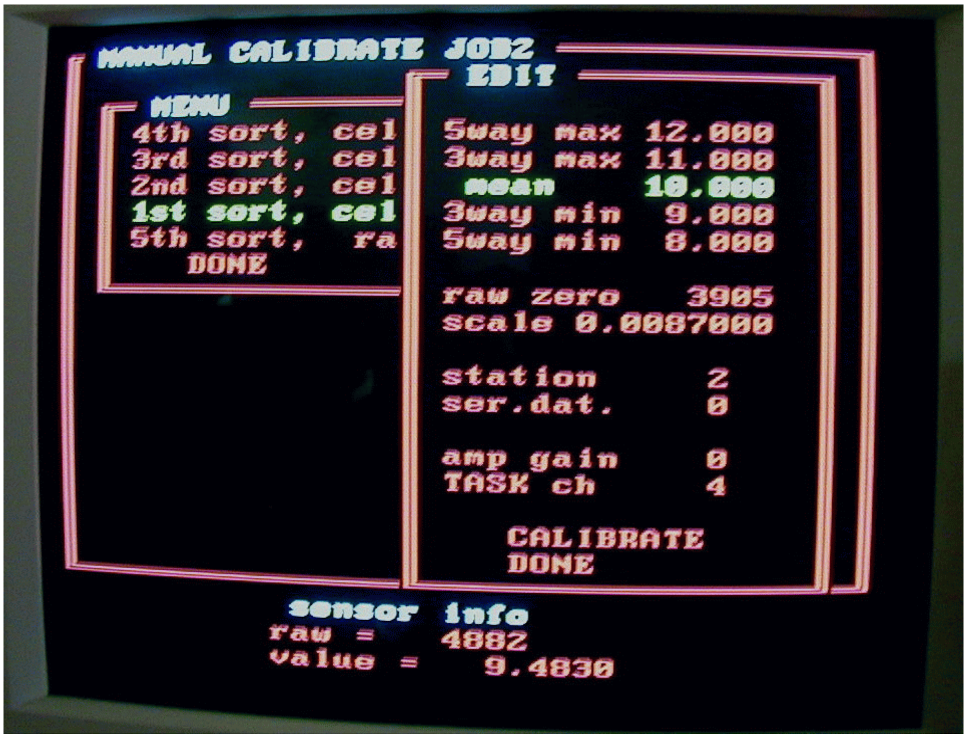
After setting up a dial, it’s a good idea to go into the “Automatic Run” screen and “Run” the tester with a few springs to observe that springs are centered under the rams correctly, not thrown past, centered within the holes at testing, and the detent action does not visibly move the dial closer to the springs.

Sorting Setup

From the Main Menu, select “Edit Setup” and you’ll see a new menu on the left side listing the “testing sensors” in a fully equipped tester. The first couple of lines might never be used, since they’re for Loads 3 and 4, or even exotic sensors like solid-height, which most testers are not equipped for.

“Rate” is the last choice, since some loads must be measured first before Rate can be calculated. Keep in mind that “Rate” is not actually a physical station with a sensor, so think of it as an imaginary little column sitting between the last load station and the chute.

Selecting one of these lines displays a new larger box on the right side that lists setup values unique to that station. Required for minimum operation is sort limits, station number, and TASK channel. The rest is calibration info that is entered for you auto-matically, as described in a previous chapter.



Editing Cells

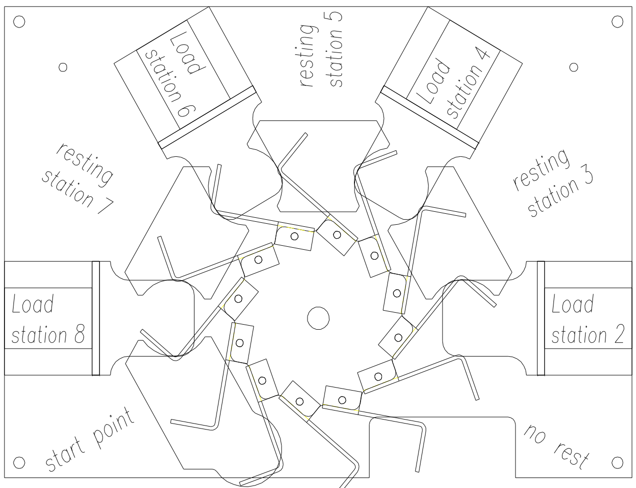
Use the up and down arrow keys on the right edge of the keypad to move the yellow highlight onto the value to edit. Pressing the ‘Enter’ key will display a little flashing square cursor, showing you where new digits can be entered. When finished typing a new value, press ‘Enter’ again to accept the value and allow moving the yellow highlight to a new line.

Sort Limits

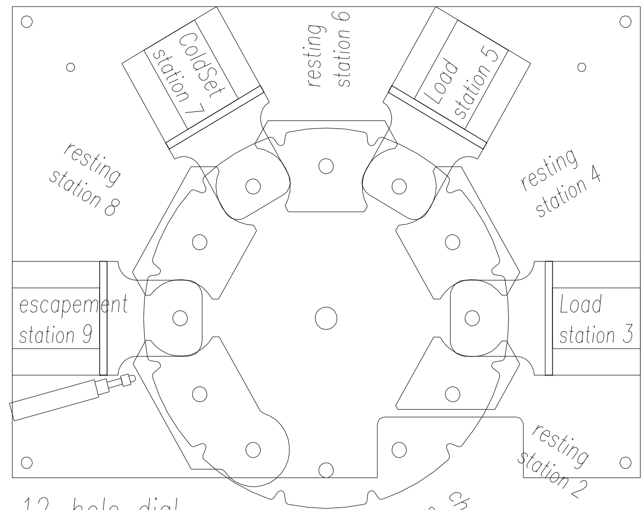
When a sensor takes a reading, it is immediately compared to the 5 numbers entered into the upper 5 rows of the list. The system defines an 'ok' (a non-sorted) spring as one in which the measurement for each and every active station falls somewhere between the proper "3way max" and "3way min" values. An ‘ok’ spring is allowed through the center throat of the chute into the “Good Parts bin.”

The "mean" value in the middle is for human reference only, and is ignored by the computer. It is automatically recalculated if its value is not between the 3way max+min values after you’ve entered them. You can force recalculation by entering 0.00 in its value. For 5-way sorting, enter sorts values into the “5way max” and “5way min” cells, otherwise set them both to 0.00.

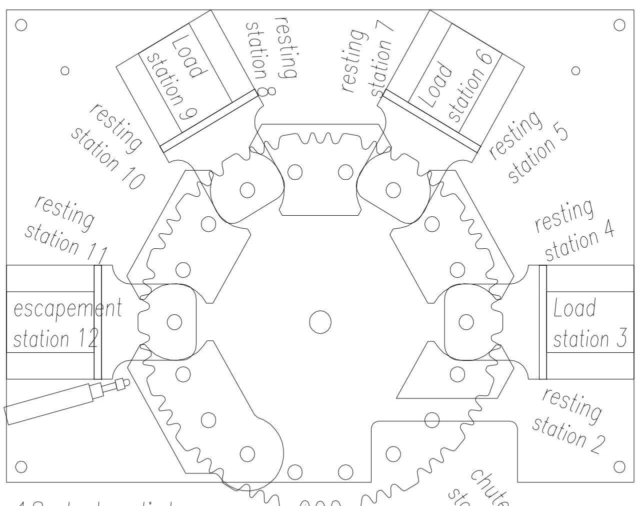
High and low limits may be interchanged to place reworkable springs into common containers. The ‘Sort Priority’ is useful in separating reworkable defects. If any test indicates the spring may have fallen over, that test takes priority. ‘Rate’ takes the next higher priority, followed by loads one through four, with load four being the lowest priority.



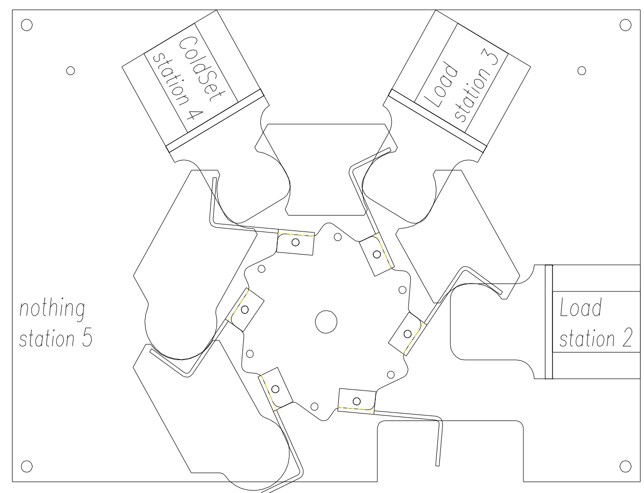
12-hook dial
multiple load-checks
rate check



12-hole dial
pre-chute resting point



18-hole dial
pre-chute resting point



6-hook dial
simple 2-load + set

Station #

A 0 here tells the system to ignore this sensor and NOT take any readings or compare to any sort values that may be entered on the top lines.

Otherwise, this value is used to tell the system how many springs away from the sort chute this sensor is located. This allows the load or rate readings for any certain spring to be kept with the other load reading(s) for that spring. Here's how it works:

The chute (or the "exit position" over the funnel where the spring can actually fall out of the dial) is <u>ALWAYS considered as Station #1</u>! Then every dial hole or index position where a spring can sit is numbered sequentially counter-clockwise from the exit hole. So usually the last Load checked, mounted near the chute, is then Station #2. Where this is NOT the case, is where there is a little platform between the last Load and the chute where a spring can sit before being indexed over the funnel to fall out to be sorted. In that case, this sitting position is considered Station #2 and the last Load is Station #3.

The remaining stations are numbered higher according to how many dial holes/indexes there are between stations. For example, if the last Load is Station #2 and you're using a 12-hole/hook dial, then there are 2 indexes between stations. So the next to the last Load must be assigned as Station #4. So then "station #3" is not a sensor at all, but a position on the subplate between the load columns where a spring sits temporarily between these real stations.

If using an 18-hole dial, there are 2 resting positions between each load station, so the loads are numbered 3 apart. So going CCW or leftward, the next loads are Station #5 and #8. If using a 6-hook dial, then the load stations are numbered in sequence. There can be no resting station, so the chute is (always!) Station #1, the last Load is Station #2, more loads are Station #3 and #4.

After assigning station #'s to all the loads and Rate, there is an easy way to check if they're right. From the Main Menu, go into the "Automatic Run" screen, and select "Run" to start the motion. Place only ONE spring into the dial and let go alone through the whole tester and out the chute. Select "Stop" and look at the readings that have scrolled down the bottom half of the screen. If all the actual (non-zero) readings are all in one row straight across (and the chute sorted it into the correct bin) then you assigned all the station #'s correctly. If any valid reading is diagonal to another, then that station was numbered wrong.

Ser.dat.

Using this field, you can cause the measurements from this station to be output from an RS-232 serial port, if the 9-pin connector has been supplied on the back of the console. 3 options are available:

0 = don't transmit any data from this sensor.

1 = transmit data about GOOD springs only, those which get marked as 'ok' on the screen and pass through the chute center.

2 = transmit data about ALL the springs read by this sensor.

The protocol is 9600 baud, no parity, 8 data bits, and 1 stop bit. The format of the characters is DataMyte compatible, where each reading must have a decimal point, and separated by a space. For example:

123.45 124.10 122.96 122.88

TASK ch

Refers to which analog sampling 'port' the sensor is actually wired into. The load cell's shielded cable plugs into a 6-pin connector on the back of the console, then an internal wire harness connects it to a small daughterboard called MIBLOAD, which is plugged into the MIC, or 'Moyer Interface Card,' which is plugged into the embedded PC's ISA slot. Enough tech-talk?

Typically, most T-120 testers are equipped for 2 load cells wired into TASK channels 4 and 5. So the entry for TASK ch should usually be either 4 or 5. If you have more loads, they would usually be connected into a 2nd MIBLOAD board, into TASK channels 2 and 3.

Special Notes for RATE station

Since 'Rate' is not really a sensor, but just a calculation based on prior real measurements, it is set up special:

(1) Station # must be the same station # as the last load involved in the Rate calculation. (Usually Station #two, last load before the chute.)

(2) the 'scale' field is used to enter the divisor value (height difference) since Rate is force-change divided by length-change. The force is read from the load cells, and the length is used from the entry in the 'scale' field.

(3) ser.dat. can be used as usual, but 'zero', 'amp gain' and 'TASK ch' are not used and any values entered are ignored.

** Advanced Topic **

The other entries in the menu are shown for information, and not meant to be directly changed by the user. They are automatically set when you calibrate the load cell or sensor.

The ‘amp gain’ is how high (0 to 100) the load cell signal is amplified before being read. When testing a force much smaller than the load cell’s rated capacity, this entry will be large, up to 100.

‘Raw zero’ represents the weight of the puck and one spring, and is subtracted from all load readings as the “Tare value.”

‘Scale’ is the multiplier that finally converts the computer’s digital binary readings into human units, like Newtons and pounds. (Again, remember this is used differently for the Rate station.)

Testing Sequence Setup

The repetitive actions that occur when running a batch of springs with "Automatic Run" is controlled by the "sequence" that is programmed via the "Edit Sequence" menu option. A sequence that works well for a particular spring may be saved to the computer's internal storage for later retrieval and use.

In Automatic Run, the computer executes the rows in order, one after another. At each row, the computer thinks and acts in the following manner:

> Compare limit switches and any other of my eight inputs to the "Input" column. When they match (I'll wait until they do) I will proceed, and perform any special custom function that might be listed in the "Function" column.
>
> When I'm finished with that function, I will look at the "Output" column and change the settings of the air valves, or any of my eight output relays to match these columns.
>
> After I've sent this signal, I will sit, wait and do nothing until time runs out as listed in the "Delay" column. When this time runs out, I will go to the next row of the sequence, look at the "Input" column, etc.
>
> When I'm done with the very last row of the sequence, I will go back and start all over again with row #1.

Select “Edit Sequence” from the Main Menu to go into the editor, and I'll describe what you can do and what each column can accept. At this point, it might be very convenient to have a full alphanumeric PC keyboard attached, which will allow you to write descriptive labels for jobs or certain steps.

> ** Advanced Topic **
>
> If you wish to use a full PC keyboard, UNPLUG the power cord from the console, remove the screws around the back, and open the hinged back panel. On the inside, you will first encounter the MIC card with the sensor cables plugged into it. Behind and towards the top edge of the computer, you’ll find the coiled cord from the keypad and the round socket it plugs into.
>
> Unplug it and make sure the metal end does not rest on any electronics. Plug the full PC keyboard into the socket. Note that this is the older “AT-style” larger connector. If you only have the newer ‘PS/2 style’ keyboard, you’ll need to get a short adaptor cable (at Staples, Radio Shack, most nerd shops.) Replace the power cord and turn the console ON.
>
> Some PC keys will have different names that the keypad keys, which we have customized. I’ll refer to keys by all their different names, like MENU-/-F2 or UpArrow-F5.

Screen Commands

When you are in the editor, you can bring up a small menu of aids by pressing the MENU-/-F2 key and a number key as follows:

/1 Clear the current screen, replacing it with one that’s a sample of a typical sequence checking only one load.

/2 Clear the current screen, replacing it with one that’s a sample of a typical sequence checking four loads.

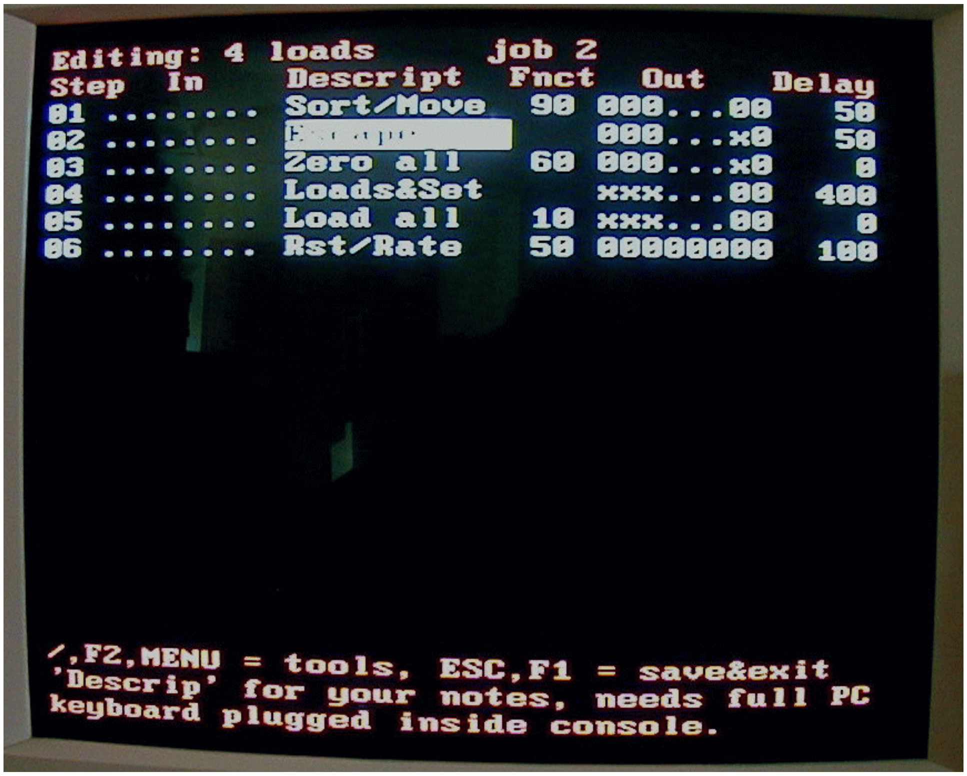
Those options give you an easy template to work from when you need to set up a new job and are asking yourself “where do I start?” Please note that all setup info for the current job is erased and gone first, so make sure this is just a copied job or one that’s messed up. Another convenient way to start with an easy template is to load a past job (that is most similar) from the “Change Job” menu, then select “Copy Job” to make a new copy at the end. Then edit and re-calibrate the new copy.

/3 Insert a new row below the current one. It will be an exact copy of the current row, and must be edited to be useful.

/4 Delete the current row.

/5 Change the title at the top of the page. The title can be a part number, customer, or such, to help remind you what setup you’re using.

Editing Cells



The editor is styled like a spread sheet, and works in much the same way. The arrow keys move the current data-entry box around to the various data cells, and you can type in new information over them and press the Enter key. This replaces the old value with your new one. Sorry, you can't enter formulas.

Each row represents a slice of time in which certain air valves are on or off, and certain measurement and decision functions are done. During "Automatic Run," the computer executes each row in turn, then starts all over at the beginning, for another cycle.

If you have too many rows to display on one page, you can flip pages by pressing the PgUp and PgDn keys, only on a full PC keyboard.

I’ll describe the column meanings, in order of simplicity:

“Step” column

Simply shows the order in which the rows are processed, and can’t be changed by the operator.

"Out" columns

Output is eight characters, and each character represents the state of a relay contained in the computer console. The relays are connected to air valve coils, 3-way or 5-way chute solenoids, or practically anything that operates on 120V AC.

For each box, entering a '1' or an 'x' definitely turns the valve ON, extending the press ram. Entering a '0' definitely turns it OFF, retracting the ram. Entering '.' does nothing, leaving the valve alone in its current state.

As you go LEFT TO RIGHT, the individual boxes in this column represent the following:

Box	1 - Set Ram
	2 - Ram for Load1 (usually closest to the chute)
	3 - Ram for Load2
	4 - Weak Sort
	5 - Strong Sort
	6 - Five-way Sort (you will need a Moyer 5-way chute for this)
	7 - Escapement
	8 - not assigned, but available for your special needs.

Boxes 4, 5, and 6 control the chute. You should not turn them on. Leave that decision to the computer. You will have to turn them all off with ‘000', usually done on the last line of the sequence, to retract the flapper.

For testers with 3 to 4 load-check stations, the valve for Box 1 supplies the rams for both Load 1&2, and the valve for Box 3 supplies Load 3&4 rams. The escapement and its small detent cylinder, if supplied, are both tied to the valve for Box 7.

"Fnct" column

Accepts a two-digit number, where the first/left digit is a special “function” for the computer to perform, and the 2nd digit refers to a certain load or subfunction:

0 - Erase the field, make it blank with no function.

10 - Measure all load sensors in one step. A very convenient function used often.
11,12,13, & 14 - Measure only one certain load; (11 checks load1, and 12 checks load2, etc.)

50 - Calculate spring Rate, using the last 2 loads that were measured.
51, 52, etc. - With a tester equipped with more than 2 load stations, calculate rate using the last load and a load further back; the second digit defines how many previous loads to skip (and not use for calculation).

60 - Zero/Tare all load sensors in one step. A very convenient function used often. This function is used just before activating the load rams down, to weigh each spring and subtract it from its force reading.
61, 62, 63, & 64 - Zero only one certain load sensor; (61 zeroes load1, and 62 zeroes load2, etc.)

90 - Apply all sorting rules to the loads measured for the spring at exit, and activate the chute flappers as needed to sort it. Then index the dial to drop it and move the other springs forward one station.

Functions beginning with 2, 3, 4, 7, 8 are reserved for future expansion, and have no effect now.

“Delay” column

A number goes in here to specify a delay time in milliseconds to wait before executing the next step. It allows time for snubbed air rams to move down, or move up and clear the springs before indexing the carrier dial.

The “Faster” and “Slower” options in the "Operation Tests" menu and “Automatic Run” menu affects all these delays temporarily when used.

“Descript” column

Used for comments to inform the human operators what a certain step does. This field is optional, and ignored by the computer itself. To modify this field, you must attach a PC keyboard to the inside of the console. Or you can edit job files at a typical desktop PC using a “DEMO” version of our T-120 software. Then you would have to use a floppy disk to transfer the file “P&W.DAT”

** Advanced Topics ** - "In" columns

It's possible to equip the tester with up to eight limit switches or proxes connected to an “input card” inside the console above the relay card. This can allow you some freedom from figuring delays before a certain critical step.

The "Input" column can then be used, for example, to delay a ‘Rams Down’ step to execute until a limit switch on a detent cylinder indicated that the dial plate has indexed correctly under the rams. Or to not index the dial until a spring has completely dropped from an escapement. Or to synchronize the tester with another machine.

Normally by default, all these columns are ‘.’ meaning to ignore them; execute all steps normally, separated only by timed Delays. A ‘1' or ‘x’ in a column means that column’s switch must be ON before that row’s step can execute. A ‘0' means the switch must be OFF before the step will execute.

Automatic Run

This Main Menu selection actually runs the tester for production use. It allows the machine to sort springs according to the sequence you have provided, to collect data for R&R studies, and to speed/slow the cycle rate of the tester.

Run/Stop option

The most used option of the "Automatic Run" menu will say "Run" at first. When you activate this option, it will change to say "Stop" and the tester will start going through the sequence. You may stop the tester by activating "Stop." This will change to "Run," allowing you to start the tester again where it left off. The "Quit" selection halts the sequence, clears the screen, and returns you to the "Main Menu."

Displayed Results

As each measurement is taken, it is displayed at the appropriate location on the screen. Measurements for a specific spring are in the same row. Missing springs are indicated on the display as having close to 0 readings, and colored dark.

When a spring is about to drop, the sorting decision is displayed in the last column. An 'ok' means the spring is within limits for all sensors used, and will drop straight through the chute. Other symbols indicate what sort has occurred. L is low/short/weak, H is high/long/strong. Lowercase means 3-way and Uppercase means 5-way sort, total rejection. Colors are used to clarify good & bad springs. Good readings within all limits are colored white, and any one reading outside any limits is colored red.

** Advanced Topics **

The "Faster" and "Slower" options let you speed up or slow down the whole sequence by 5% increments. Be aware that the air snubbers will not speed up, so these may have to be adjusted a bit. The speed change comes by varying the 'delay' values. A "CycTime" of 100% means you are using delays exactly as they appear in the "Delay" column in the "Sequence Editor."

The "Start R&R" or "Trial:#" option, in conjunction with "Run/Stop" lets you set breakpoints between trials of an R&R study. See that chapter for details on how to run a study.

The "Printer" option is a toggle that turns the printer output of the measurements on or off.

Change Job

The "Change Job" selection from the Main Menu displays the “Job Menu” which allows you to choose from a number of different jobs set up and stored earlier. Jobs can be deleted to make more room, copied, or printed out.

The top line displays the part number or name of the job for your information to help in selecting the job you want. (This job name is entered at the top of the “Edit Sequence” screen using the F2 5 command.)

Selecting Jobs - using ‘Job x1 of x2’ option:

Lets you switch over to the next job in storage. The first number x1 is the current job number the tester is using, and x2 is the total number of jobs you currently have in internal storage. It can store 6 or 7 jobs for older testers, and much more with newer testers equipped with a hard drive.

Selecting this menu option merely increments x1 and loads its setup and sequence into the tester's main memory for it to use from now on. If you increment past x2, it will start over at Job #1.

When a job is selected and loaded from internal storage, all Edit screens are automatically updated, like the sequence, sort limits, sensor calibration and setup values, and the carrier dial setup. But good/bad part counts, history of prior measurements, or R&R results are NOT saved.

Loading setups helps you quickly change from running one spring job to another. It’s strongly advised that you check the calibration of each load cell before you begin running a new job. It doesn't take much time, and ensures accuracy.

Copy Job

This is the method used for easily adding a brand-new job into a new “space” to give you a convenient template to edit while still preserving the old. If you have blank room in the storage, this option will copy all of the current job's information into the next available job number, increase the total number of jobs by 1, and make this new job the current job.

For example, you have 4 jobs stored now. You wish to make a new job similar to Job #2. You would change the current job to 2, if it isn't already, then Copy Job. Now, the current job becomes 5, which is an exact copy of Job #2. You then use "Edit Setup,” "Edit Sequence,” and "Operation Test" to fine-tune your new job’s setup.

Delete Job

This option erases the information in the current job, and renumbers all the higher jobs down one number. If you have 4 jobs and delete #2, then #3 becomes #2, and #4 becomes #3. You will then have 3 jobs total, and your current job will be set at #2. You will be prompted by the computer before all this happens, in case you select this option by mistake.

Print Job

Lets you print the job setups on paper to give you a hard-copy for your records, in case the internal storage gets erased or corrupted from events that affect any computer.

If the console is not equipped with a standard 25-pin parallel data connector, you can attach the cord to the connector inside the console behind the MIC card.

Please note that only “DOS-compatible” or “Epson compatible” printers will work. Most of the newer bubble-jets can only be used with Windows 95/98 desktop computers.

Tooling for New Jobs

Carrier Dial

The stock 12-hook dial is designed to fit and move a variety of spring sizes and shapes. Different heights of hooks have been designed and can be ordered from Moyer on a new hub. Custom dials with holes can also be ordered to help contain springs on escapement, or keep slender springs from falling over when indexed. Contact Moyer for custom dials or help in designing them.

Press Rams and Pucks

We design and supply these column assemblies in different strokes and load capacities to test or cold-set almost any spring.

This puck should have a diameter at least 10-20% larger than the spring diameter, to forgive minute spring position errors. Its height should be at least 3/4" to allow mounting on the shaft, and a reasonable effort should be made to make its bottom face perpendicular to the shaft. Small errors in this regard can be compensated for by shimming the ram mount, as explained in the "Load cell parallelism" section of "Mechanical Setup." The stock puck should be adequate for most applications.

Air Cylinders

Should be a model with a double-ended rod so there's bearing support at both ends to maintain squareness. They should be non-rotating or made so with extra parts, as we do. They should have exhaust port snubbers to control speed and minimize shock at the end of stroke.

The size of stroke and bore diameter are less specific. A large cylinder will press a wider range of loads, and long strokes can be limited with lock collars on the rods. However, you'll use more air, snubbing is more difficult and less effective, and there's more delay waiting for larger volumes to pressurize. So there are advantages to sizing a cylinder down to better match a certain spring application.

Load Cell Selection

The load cell we recommend for this tester is the Super-Mini (SMT) series. They are reasonably priced and available in the capacities of 1.1, 2.2, 5.6, 11, 22, and 56 lbs for the SMT1 Series, and 112, 225, and 450 lbs for the larger SMT2 Series. Metric labeled versions are also available. It's safer to order a load cell that's too strong, than one that's just right, depending on the model's 'safe overload', listed below:

Interface Model #	Safe Overload	Mounting Screw	Logo label Orientation	Puck Moyer #
SM	150 %	1/4-28 x 7/8"	right-side-up	39-F969
SMT1	1000 %	1/4-28 x 7/8"	upside-down	39-F969
SMT2	500 %	½-20 x 7/8"	upside-down	39-F964

For example, to measure a test load of 20 lbs, it's conceivable that some springs may be so bad they would measure at say, 25 lbs. The SMT1-22 load cell would not be as accurate as an SMT1-56. Please also refer to the "Handling Precautions" section of "Load Cell Calibration." Lighter load cells and SM models are delicate, and should be handled carefully.

New Load Cell Mounting

The pucks have a stud on the bottom that screws onto the top end of the load cell. Hand tighten it, supporting the body of the load cell very near the puck, to avoid torque on the main body.

Clean the other end and the column foot where it mounts using the proper screw listed above. A screw too long will bottom out in the load cell and damage it. Mount with the logo label plate oriented as listed, to avoid the signal cable from pulling down the active end.

Load cell cable and plug pinout. (Interface)

for a 4-wire load cell

Pin	A	Red	+ Power	(or "Excitation")
	B	Black	- Power	
	C	jumper to pin A		("Sense" not supplied)
	D	jumper to pin B		
	E	Green	+ Signal	(or "Out")
	F	White	- Signal	

for a 6-wire load cell

Pin	A	Red	+ Power	(or "Excitation")
	B	Black	- Power	
	C	?	+ Feedback	(or "Sense")
	D	?	- Feedback	
	E	Green	+ Signal	(or "Out")
	F	White	- Signal	

The shield on the load cell cable should be folded back and secured under the metal strain relief of the connector's shell. At the end of this manual is a drawing showing cable assembly.

For your information: Inside the computer cabinet, the female 6-pin sockets have cables that are plugged into the MIBLOAD, the small 3x4" amplifier board that in turn plugs into the larger MIC card. The MIBLOAD has two, 6 pin gold-plated IDC connectors near the top, allowing connection of two load cells at once. With the MIBLOAD components facing you, these connectors the top edge, and going left to right, pads 1 to 6 are wired to pins A to F on the industrial connector.

R & R Studies

As the springs are being tested in the "Automatic Run" mode, a running history is kept in memory of the last 256 springs. We take advantage of this data collection to allow this program to calculate figures for R&R studies.

Doing an R&R study consists of running the same small batch of springs a few times, keeping the springs in the same order, and noting the differences in measurements of the SAME spring.

In order for the computer to look at the history and match up the correct springs, you must indicate a break between each trial. The following section illustrates the whole procedure.

Running the Trials

Since the history has been updated to hold 256 springs, you can run many trials of many springs. Here, I will illustrate running 4 trials of the same 15 springs.

1. Collect 10 to 15 typical springs, and identify them by number. Scratch the number on a flat surface on the end, or have a second person responsible for collecting the springs leaving the tester, and place them in order in numbered cups of a muffin pan.
2. Go into the "Automatic Run" menu. Activate "Start R&R," then "Run" these 10 to 15 springs in order. You may wish to keep the same end up, or randomly flip them over, according to the QC spec for the spring.
3. When the last spring has been ejected, and its judgement has been displayed in the "Srt" column of the screen, "Stop" the run from the menu.
4. Activate the "Trial:1" option on the menu, and it will increment to "Trial:2."
5. Be sure the trial springs are in the original order. If not, sort the springs into their original order.
6. Activate the tester with the "Run" option, and run the springs through again. When the last spring is ejected, stop the tester, and repeat the last three steps until you have finished "Trial:4".
7. When you have finished "Trial:4" do not advance it to "Trial:5," but simply "Quit" the Automatic Run menu. Don't worry about the blank spots in the spring history table, as these blanks will be ignored.

History Table -
You can view readings for the last 256 springs tested by selecting "Data History" from the main menu.

R&R Study

To calculate R&R, select "R&R Study" from the main menu. The first screen shown gives the ranges in measurements taken for each spring for each particular station. Each row is a spring, and each column is a station. For a tester delivered to measure only two loads, only the middle two columns are of any use.
Press any key to view the next screen, which gives the R&R figures and some other stats used in their calculation. The last group of figures is of most interest, and I'll explain them:

Tolerance: These figures are calculated as a percentage of the tolerance, which is, the difference between the "3way max" and "3way min" that you specified in the "Edit Setup" menu.
%EV: Equipment variation, due to the ability of the tester in combination with this spring.
%A.V.: Appraiser variation, is this case due to the passage of time from trial to trial. This could be due to progressive setting of the spring or drift in the tester.
%R&R: Repeatability and Reproducibility, combines EV and AV.

R&R = Square_Root(EV*EV + AV*AV)

%GRR: Gage R&R, is another, simpler type of R&R measurement calculated independently of the others, and may be used in many cases instead of the "%R&R."

Caution on cold-setting the springs

We have found in our trials of running R&R studies that repeated cold-setting of the springs is a bad idea. It seemed to cause some of the springs we used for tests to be very unpredictable, and/or seemed to make their loads drop a little after each set.

We would recommend that you pretest your springs with the set on, then disable the set station while you're running the R&R study. You can disable the station by simply unplugging its cable from the back of the console. Remember to plug it back in when you are ready to run production testing again.

Preventive Maintenance

At least every 6 months or more often if needed, you should lube the tester and check its critical parts. Check the 4 leveling feet, so they're still solid on the floor, to keep the tester from rocking. Recheck all check-heights and puck parallelism with jo-blocks. Re-calibrating load cells has been discussed, and should be done very frequently.

Air Supply and Lubrication Points

Each air regulator on the back brace of the tester has a little tank for water and a filter. Drain any water by pushing in the little pin on the very bottom of the tank. Disconnect air pressure to remove the tank and inspect the filter for grease or obvious clogs. Change it if dirty, since clogged filters have prevented press rams from coming fully to their dead-stops.

Attached to the right side of each regulator is another little tank for pneumatic oil, which will keep the cylinder pistons moving smoothly and completely to a stop. Proper oil to use is air tool oil, 3-in-1 oil, or Marvel Mystery Oil. Please do not use paraffin-based oil like WD-40, since its solvents evaporate after time, leaving behind the stiff caked paraffin.

Mechanical Tightness

With the air supply disconnected, push each press ram up and down by hand to feel that the piston slides smoothly, and push on the ram pucks side to side to check for play and wear of the end bushings. These Bimba cylinders are reasonably priced and easy to replace, so you don't need to live with one that's shot.

For cam-actuated press rams, re-grease the cam and brass follower, and oil the push shaft and its guide bearings. Also check that the return spring is still strong and keeps the follower firmly on the cam.

The sorting chute should have a drop of oil on each flapper bushing. If the chute loudly buzzes when activating, that flapper's solenoid mount can be loosened and readjusted a bit so it's completely closed when the flapper is at the end of travel. This also prolongs the life of the solenoid and linkage.

Wear Surfaces

After time, springs will wear depressions in the middle of the hardened load cell pucks and ram pucks. Of course, this obviously affects the precision of your test heights and can even make 'puck parallelism' and 'load cell deflection' adjustments impossible to perform correctly. If you re-grind these surfaces yourself, please demagnetize the parts afterward. Preferably, please feel free to contact Moyer Process & Control for reasonably priced replacement parts.

Check Daily:

(1) Calibration of each load cell or other sensors.
(2) Load-check heights for cylinder-based press rams.

Check Monthly:

(1) Puck parallelism, and the height compensation for load cell deflection.
(2) Cleanliness of air filters and oil levels in the lubricators, psi and port snubber settings.
(3) Gaps in the sorting chute if a flapper does not actuate fully.
(4) Depressions in the pucks worn deep enough that would obviously affect repeatable test heights.

MOYER T-120 ROTARY 100% SPRING LOAD TESTER

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Table of Contents	**Page #**