

# 3000

SERIES

# OPERATING INSTRUCTIONS

Plant Water Status Console

October 2000



*Fig. 1 - Model 3005 Plant Water Status Console*

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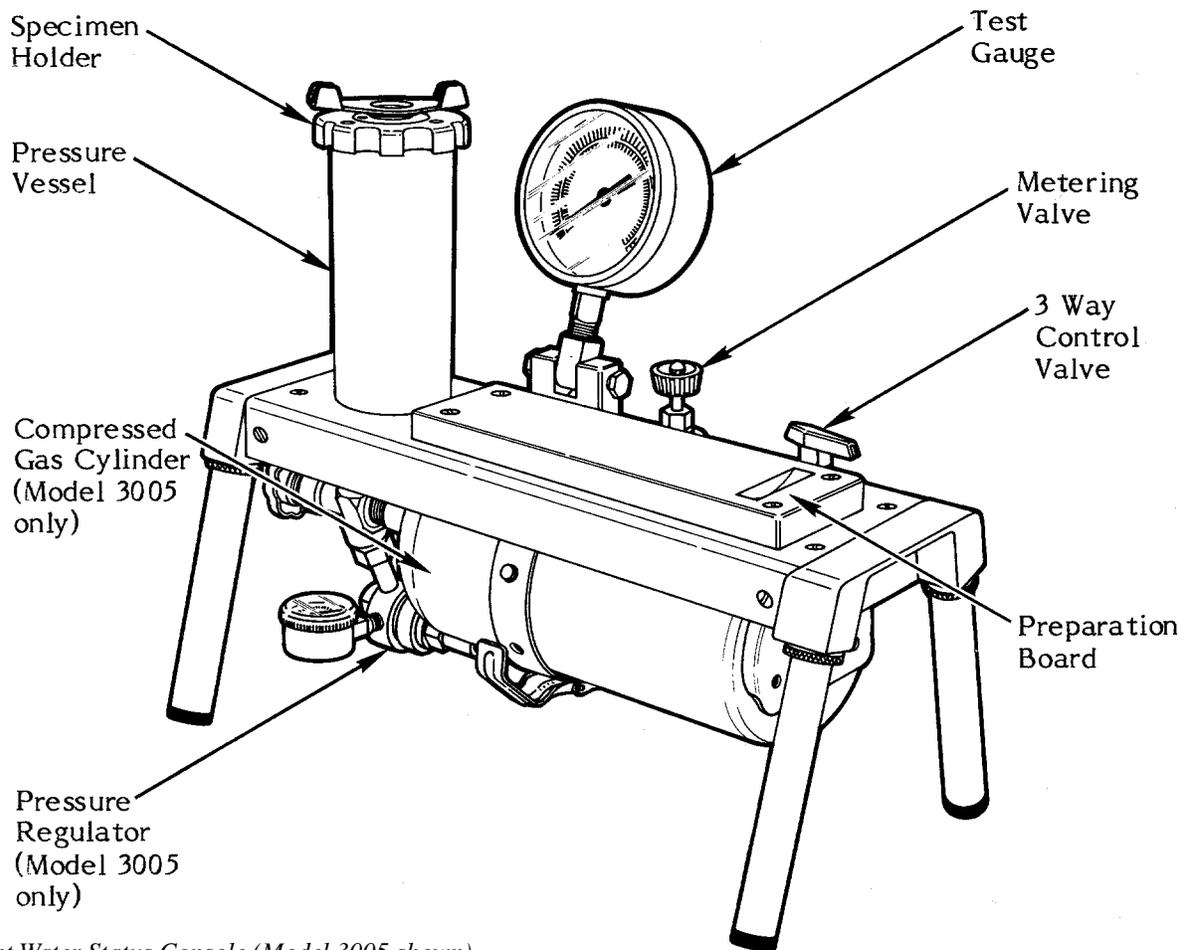


Fig. 2 - Plant Water Status Console (Model 3005 shown)

### Model 3000

The Plant Water Status Console, Model 3000, is supplied without the compressed gas cylinder or the pressure regulator, but does come with a 3-foot long, flexible, high pressure (3,000 psi working pressure) stainless steel connecting hose to connect to your pressure source. One end of the connecting hose is sealed to the pressure inlet of the console. The other end can be fitting with standard 1/4-inch pipe fittings to connect to your regulated pressure source. We recommend you use brass pipe and tube fittings that have a 3,000 psi working pressure. The regulated pressure that you supply to the console must not exceed the maximum pressure reading of the pressure readout gauge of the console. For standard units this pressure is 600 psi.

### Model 3005 (Fig. 2)

The Plant Water Status Console, Model 3005, is supplied with a compressed gas cylinder and connected pressure regulator for field operation. The pressure regulator has been set at the factory for the maximum operating pressure of the unit which, for standard units, is 600 psi.

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## **Your New Plant Water Status Console**

### **Unpacking**

The Plant Water Status Console was thoroughly tested before shipment. When packed, it was in perfect working order. Unpack with care being sure to remove all packing material. Follow the instructions carefully in order to assure long, trouble-free service.

### **Note**

Any damage found upon receipt should be reported immediately to the transport carrier for claim. It is important to save the shipping container and all evidence to support your claim. Be sure to read all operating instructions thoroughly before operating the unit.

### **Not Liable For Improper Use**

Soilmoisture Equipment Corp. is not responsible for any damage, actual or inferred, for misuse or improper handling of this equipment. The Plant Water Status Console, Model 3000 or Model 3005, is to be used solely as directed by a prudent individual under normal conditions in the applications intended for this equipment.



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## ACQUAINT YOURSELF WITH THE PARTS

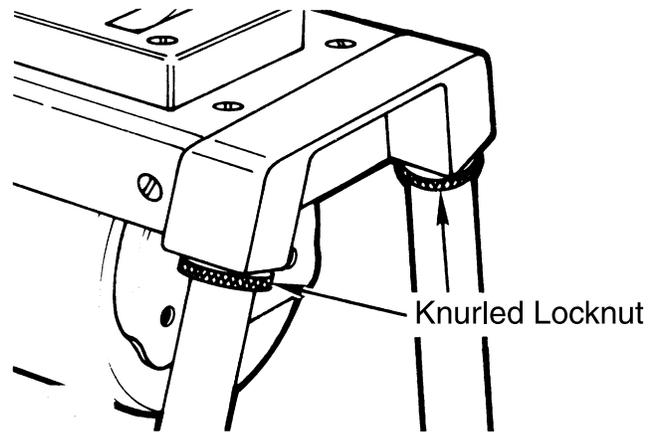


Fig. 3

The four legs screw into the end castings of the control panel. The height is adjustable so the console sits evenly on the bench. Each leg has a knurled lock nut (Fig. 3) to lock the leg at the desired position. Extension legs are available so that the console can be adjusted to work bench height.

The stainless steel pressure vessel, 2-3/4 inches by 6.5 inches deep, will accept a great variety of leaf samples. Very large leaf samples can generally be folded without damage so that the pressure vessel can accommodate them as well.

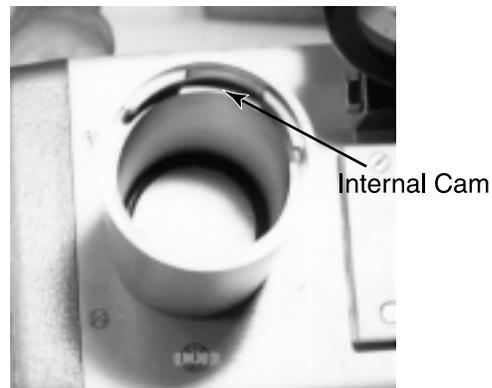


Fig. 4

The specimen holder is held securely in place with four internal cams at the top of the vessel. The vessel's high pressure gas inlet is in the center of the vessel base. Remove the specimen holder by turning the closing cap counterclockwise 45° and pulling the holder upward (Fig. 5). To insert the specimen holder for a run, turn the specimen holder 45° clockwise to lock it in place.

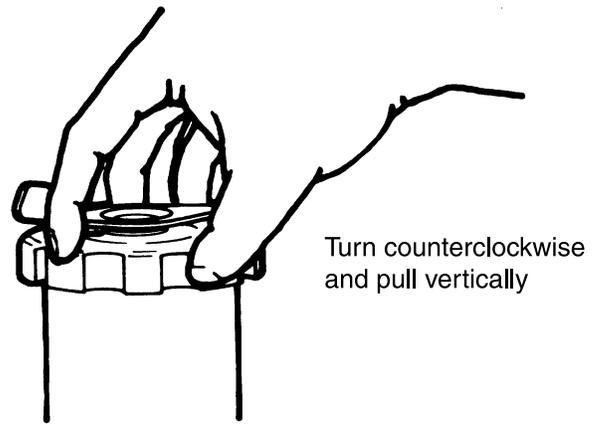


Fig. 5

When the specimen holder is removed the first time, it may require considerable force. The “O” ring used to make the pressure seal tends to “seize” to the metal surface if it is allowed to remain in the compressed position for a considerable time. To minimize this problem, apply a thin coat of light grease, such as stopcock grease or Vaseline, to the “O” ring. Then, after the specimen holder is removed for the first time, it will enter and close.

The fail safe valve (Fig. 6), in line with the pressure vessel cams, prevents build up of pressure in the pressure vessel unless the specimen holder is completely locked in place.

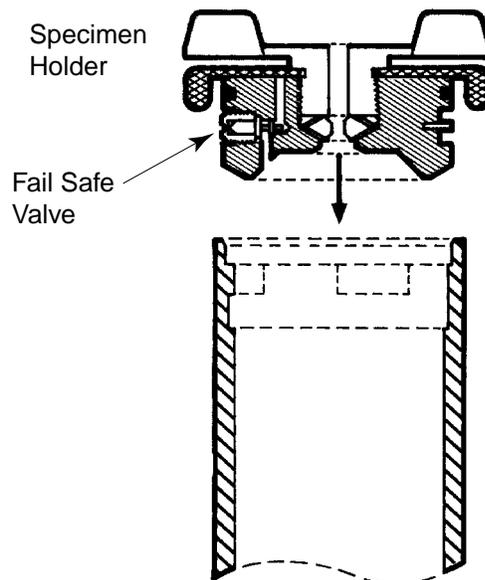


Fig. 6

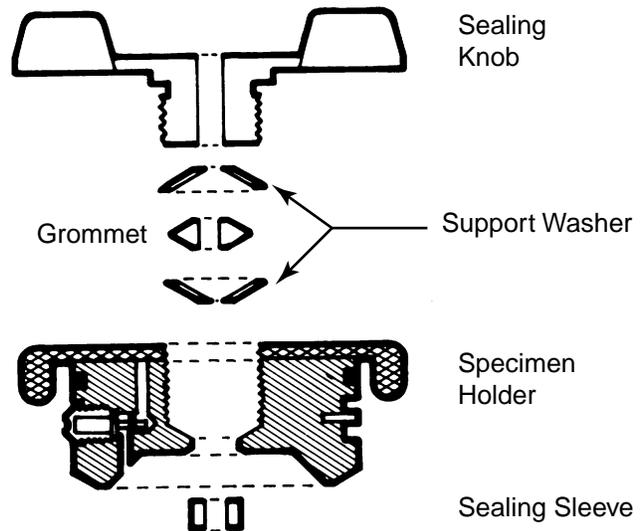


Fig. 7

The sealing knob (Fig. 7) on the specimen holder actuates the collet-type closure that pressure seals the specimen and sealing sleeves during a run. Turning the sealing knob clockwise seals the specimen. Turning counterclockwise releases the seal.

The 4.5 inch dial face, 1/4% accuracy Test Gauge, graduated in both psi (pounds per square inch) and in bars, indicates the pressure within the pressure vessel at all times. The swivel support base provides a detent to hold the gauge in two reading positions and one position for transport (see below). A zero pointer position adjusting screw is provided for zeroing the pointer in the event it is jarred out of place.



Transport Position



First Reading Position



Second Reading Position

Figs. 8, 9, 10

The metering valve controls the rate at which pressure is built up in the pressure vessel. The valve is usually adjusted so that the rate of pressure increase is in the range of 5-10 psi per second. Turning the valve counterclockwise increases the rate of flow. During routine tests, this valve can be left at one fixed position to give uniform pressure building up on all samples. When the metering valve is closed (by turning clockwise) care should be taken not to exert excessive closing force since this tends to damage the valve seat and the long tapered valve which provides the sensitive gas flow control.

The control valve directs the flow of gas into or out of the pressure vessel or seals the gas within the pressure vessel (Fig. 11). When the control valve is in the "OFF" position, high pressure gas within the pressure vessel is sealed in and no gas can enter or leave. When the control valve is in the "PRESSURIZE" position, high pressure supply air from the pressure regulator flows through the metering valve, through the control valve and into the pressure vessel. When the control valve is in the "EXHAUST" position, the high pressure gas within the pressure vessel exhausts immediately to the atmosphere.

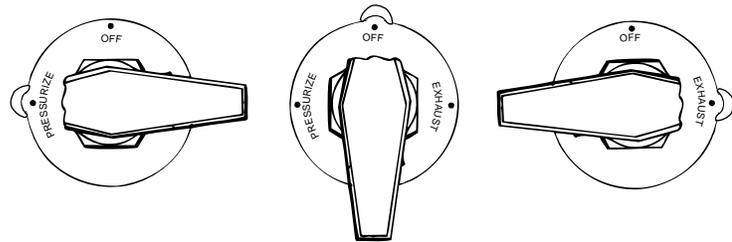


Fig. 11

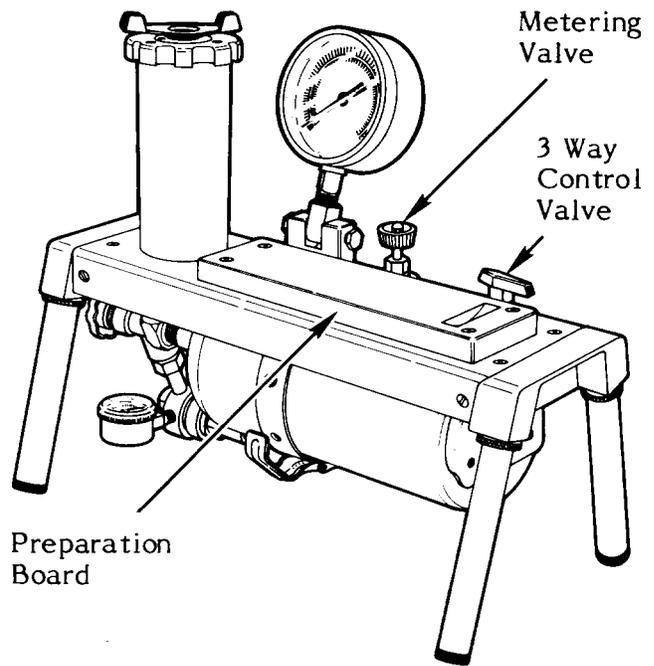


Fig. 12

The hardwood preparation board provides a convenient cutting block for the preparation of leaf samples. The notch at the right end holds the specimen holder during the loading operation to minimize possibilities of damage (Fig. 12).

Underneath the panel a safety relief valve is incorporated in the system to prevent damage from any excess buildup of pressure. The relief valve is set at the factory so that pressure will be released when it exceeds the maximum operating range of the console (Fig. 13).

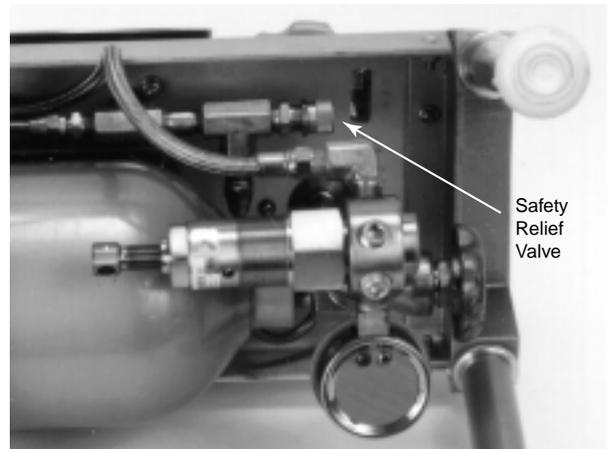


Fig. 13

The pressure regulator is connected to the compressed gas cylinder. It can readily be removed for replacement or refilling of the cylinder. The output pressure on the regulator has been set at the factory at 600 psi for standard consoles.

The small pressure gauge screwed into one of the ports of the regulator indicates the pressure within the compressed gas cylinder and is used as a guide to indicate when the cylinder needs refilling (Fig. 14).

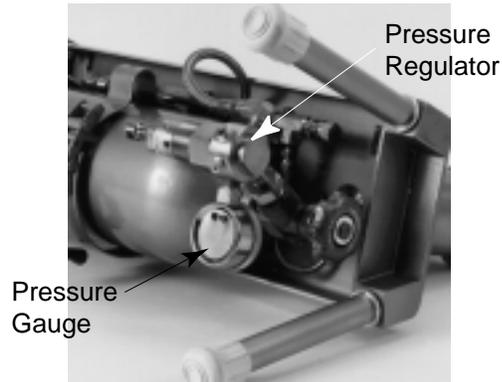


Fig. 14

The refillable, 2,000 psi, 25 cubic feet capacity, compressed gas cylinder is held securely by the bottle bracket beneath the chassis. When empty, it can be filled in place without removing it from the chassis. The sealing valve at the end of the tank should be kept closed (turn clockwise) except when the console is in use (Fig. 15).

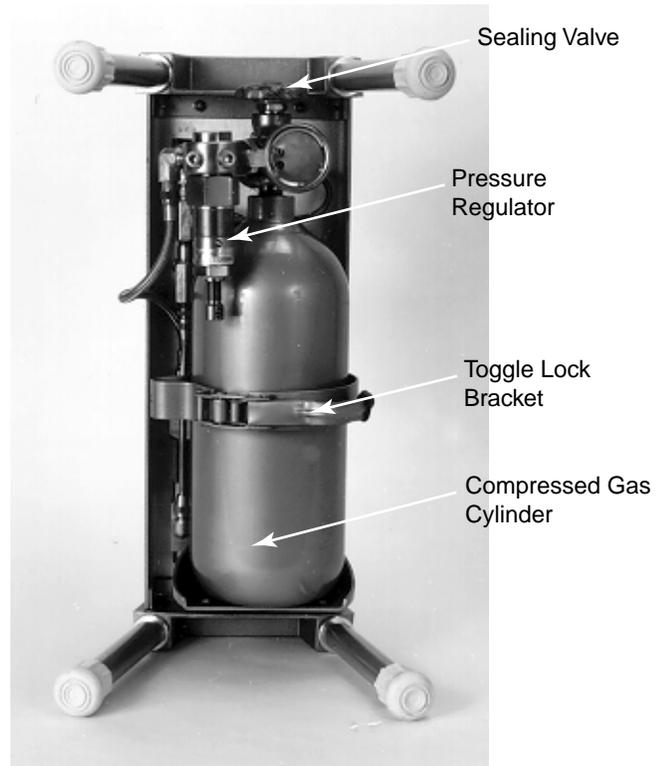


Fig. 15

## Making a Run

Step 1.

Close the metering valve, turning clockwise (Fig. 16).

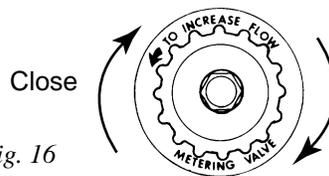


Fig. 16

Step 2.

Turn control valve to "OFF" position (Fig. 17).

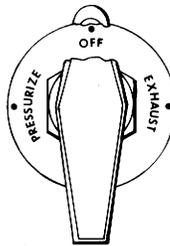


Fig. 17

Step 3.

Open compressed gas cylinder sealing valve, by turning counterclockwise (Fig. 18).

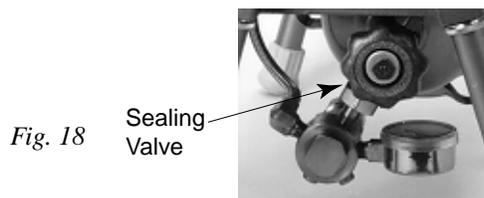


Fig. 18

Step 4.

Remove specimen holder from pressure vessel, as described earlier, and place in notch of sample preparation board (Fig. 19).

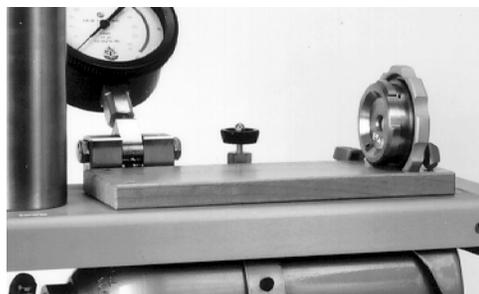


Fig. 19

**Step 5.**

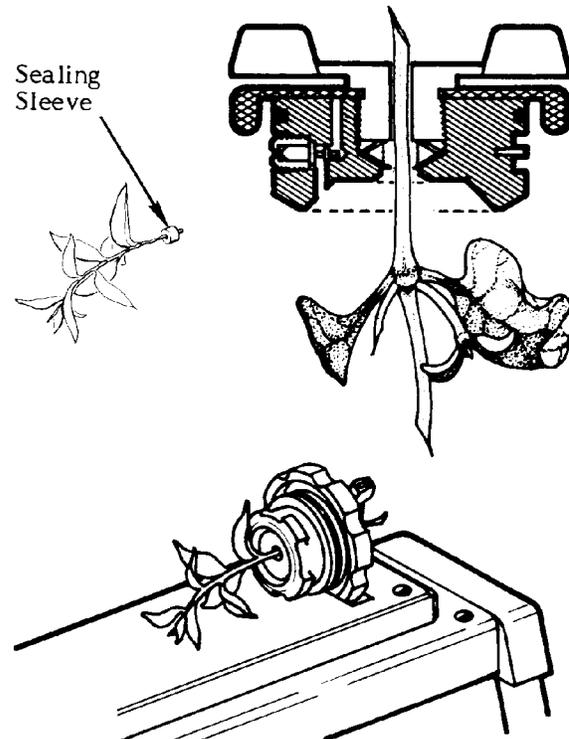
Select sample leaf to run.

On initial run to check out unit and to acquaint yourself with its operation, you can substitute a round rod for the leaf sample in order to seal the specimen holder. A nail, rivet, dowel pin, or round 1/8-inch to 1/4 inch in diameter may be used (Fig. 20). If the diameter to be sealed is less than 1/8-inch, select the support washer with the 9/64-inch hole. If the diameter to be sealed is greater than 1/8 inch select the support washer with the 1/4 inch hole. Next, select one of the rubber sealing sleeves that best fits the stem diameter.



*Fig. 20*

**Step 6.** Arrange the sealing sleeve on the stem, as shown, and insert into the specimen holder, as shown. Turn the sealing knob clockwise until the compressing grommet squeezes the sealing sleeve sufficiently around the stem to hold it securely (Fig. 21).



*Fig. 21*

**Step 7.**

Holding the specimen holder by the closing cap, insert the leaf sample into the pressure vessel and then push the specimen holder down into place in the pressure vessel. Pushing down with both thumbs (one thumb on either side of the specimen holder, is a good way to secure the specimen holder in place.) Then, turn the specimen holder 45° clockwise, using the closing caps to lock it under the cams of the pressure vessel.

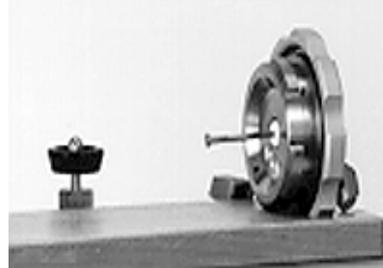


Fig. 22

**Step 8.**

Tighten the sealing knob further, if necessary, to be sure that the sealing sleeve is sealing properly around the stem.

**Step 9.**

Turn the control valve to the PRESSURIZE position (Fig. 22).

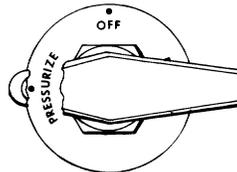


Fig. 23

**Step 10.**

Slowly open the metering valve, by turning it counterclockwise, and observe the pressure buildup on the readout gauge (Fig. 24). Adjust valve until rate of increase is in the range of 5-10 psi per second or at the rate you desire for the test.

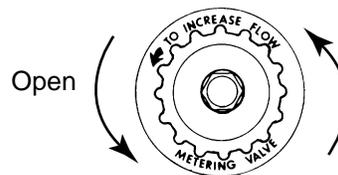


Fig. 24

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### Step 11.

To stop the build up of pressure within the vessel at any time, simply turn the control valve to the “OFF” position. To resume build up of pressure, turn the control valve slowly to the “Presurize” position.

Note: if the control valve is turned quickly to the “PRESSURIZE” position after an interruption in pressure build up, as above, there will be a quick jump in pressure of a few pounds within the pressure vessel. This is caused by the high pressure gas that builds up in the connecting tube between the metering valve and the control valve while the control valve is in the “OFF” position. When the control valve is opened quickly, this small volume of high pressure gas (supply pressure -600 psi) discharges immediately into the pressure vessel. Thereafter, the metering valve limits the flow.

### Step 12.

The build up of pressure within the vessel can also be stopped or reduced at any time by turning the metering valve in a clockwise direction. Once you know the approximate value for the equilibrium pressure for the plant specimen being tested, it is usually desirable to reduce the rate of pressure build up as you approach the equilibrium pressure so that the equilibrium value can more accurately be determined.

### Step 13.

As pressure builds up in the pressure vessel, carefully observe the cut end of the petiole of the sample.

If you hear air escaping around the sealing area of the sample, or if the stem seems to be “extruding” or moving up out of the sealing sleeve, simply tighten the sealing knob further to exert higher sealing pressure to stop the leak or movement.

**CAUTION:** Never put your eye directly over the center of the pressure vessel during a run. Always observe the sample stem from the side. Remember you are dealing with high pressures and it is possible that a sample - such as an individual needle from a pine tree - can be ejected from the holder. It is recommended that the end of the cut petiole be observed through a low-power magnifying glass. The glass will give a better view and also offers protection for the eyes.

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Step 14.

The equilibrium pressure for the individual sample is reached when sap starts to flow from the exposed cut end of the sample.



Fig. 25

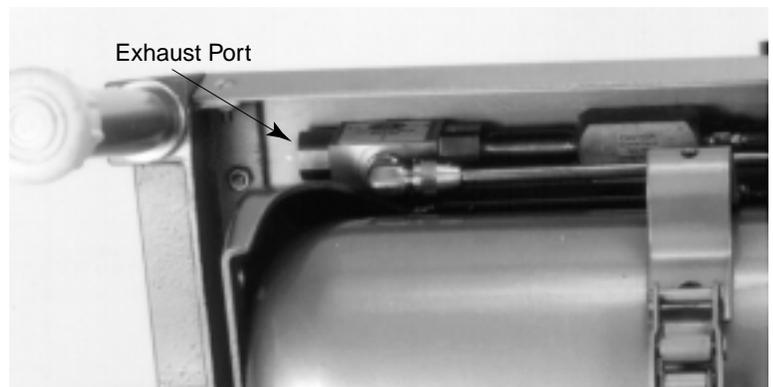
After the sample has been mounted in the extractor and during the initial stages of the pressure build up within the extractor, the cut end will appear relatively dry. However, when the equilibrium pressure is reached, the end will slicken up and be shiny and wet in appearance as sap starts to flow from the end of the sample. If pressure is further increased, small bubbles may be formed and arise in the extruded sap.

The build up of pressure should be stopped immediately when the cut end of the sample starts to slicken in appearance by the extrusion of sap. The pressure reading at this point is the equivalent to the negative force with which the plant water is held within that particular sample. After the equilibrium pressure has been reached, one can verify the pressure immediately by dropping the pressure in the pressure vessel below the equilibrium value. When this is done, you will note that the sap stops flowing immediately, pulls back into the stem of the sample, and the cut surface acquires the relatively dry appearance again. The build up can then be resumed again at a slow rate until sap again begins to flow. You will note that the second equilibrium obtained matches very closely the first reading.

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### Step 15.

After this equilibrium value, sometimes referred to as plant water potential or plant water stress, has been determined and noted, pressure in the pressure vessel is exhausted through the control valve by turning it to the “EXHAUST” position.



*Fig. 26*

The exhausting gas will make an appreciable noise depending upon the pressure in the extraction vessel. The exhaust port is underneath the control panel (fig. 26) and baffled by the end castings that hold the leg. The exhausting gas presents no hazard to the operator.

### Step 16.

Remove the sample by loosening the sealing knob slightly when the specimen holder is still in the pressure vessel. Then, turn the closing cap of the specimen holder 1/8 turn (45 °) in a counterclockwise direction.

Pull the specimen holder, with the specimen still in place, directly up out of the pressure vessel. Further release the sealing pressure on the specimen by turning the sealing knob counterclockwise until the specimen and sealing sleeve can be readily removed.

The thrust washer will tend to remain in place in the specimen holder and can be left there to accept a subsequent sample.

### Step 17.

If no further samples are to be run, shut off the compressed gas cylinder sealing valve. Remaining high pressure gas within the system beyond the storage tank valve can be cleared, if desired, by turning the control valve to the “PRESSURIZE” position with the metering valve opened somewhat. Under these conditions, the gas in the system beyond the storage tank will ex-

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haust through the pressure vessel. After exhausting the pressure, turn the control valve again to the 'OFF' position.

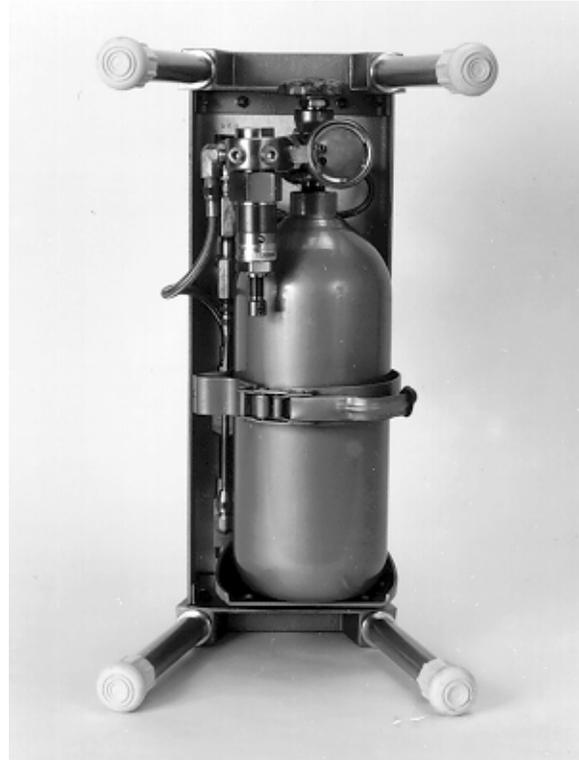
## **GENERAL CARE AND MAINTENANCE**

### **To Replace the Compressed Gas Cylinder**

The compressed gas cylinder can be easily replaced with a full tank or the tank can be filled from a larger supply tank without removing it from the console.

Step 1.

Set the console on end (Fig. 27) and support it so that it doesn't fall over.



*Fig. 27*

Step 2.

Loosen and undo the 1-1/8 inch lock nut that holds the tank. A 1-1/8 inch open-end wrench or crescent wrench of sufficient size is required for this operation. This lock nut has a right-hand thread and therefore the nut must be turned in a counterclockwise direction to undo it.

When the lock nut is completely removed from the storage tank fitting, the pressure regulator will separate from the gas cylinder and can be left hanging from its stainless steel connecting tube.



*Fig. 28*

If the storage tank needs to be removed completely,, loosen the bottle bracket wingnut (Fig. 28), then swing the closure bolt free from the hinged bracket (Fig. 29).



*Fig. 29*

## To Refill Compressed Gas Cylinder



Fig. 30

The compressed gas cylinder can be refilled with gas while it is still mounted to the console after the regulator has been removed (Fig. 30).

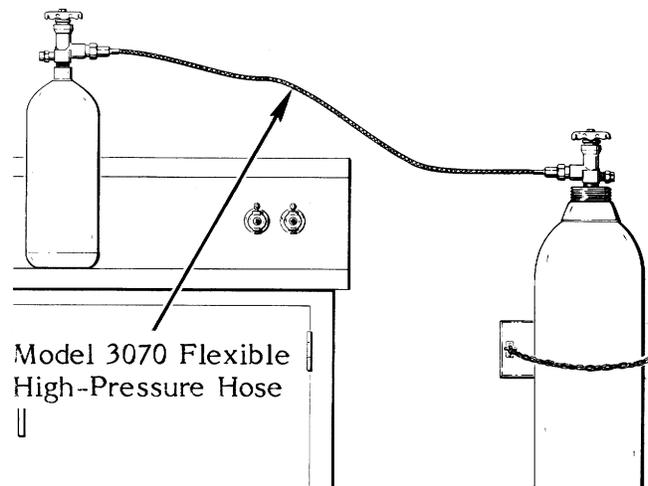


Fig. 31

If more convenient, the storage tank can be removed from its support frame, as indicated on page 17. Filled and then replaced in the console (Fig. 31).

To fill the storage tank from a larger supply tank, our Model 3070 Flexible, High Pressure Hose is used. Connections for the refilling operation are shown on Page 18 (Fig. 31). The lock nuts on the ends of the flexible hose are tightened securely in place on both tanks, using a 1-1/8" open-end wrench or the equivalent. The tank valve on the small storage tank is now opened first. The valve on the larger pressure supply tank is then opened slowly so that the high pressure air from the large tank can flow to the small tank. After a period of time, when no further flow noise of gas is observed, the valve on the large tank is sealed shut. The valve on the smaller tank is then closed securely. After the valves on both tanks are closed, the lock nut on one end of the hose is loosened slowly. High pressure gas within the flexible hose will drain out of the loosened end. Thereafter, the flexible high pressure hose is removed from both tanks. After filling, the pressure regulator is again connected to the compressed gas cylinder. The round nose on the connection fitting of the pressure regulator makes the pressure seal to the compressed gas cylinder. The lock nut serves only to hold this round nose securely in contact with the mating fitting on the tank. The threads of the lock nuts themselves do not make a pressure seal. Tighten the lock nut securely.

Note: if the compressed gas cylinder has been removed from the console, be sure that it is oriented in the proper position so that the regulator fits correctly below the console. The pressure gauge on the pressure regulator should be in a horizontal position when the storage tank is oriented properly.

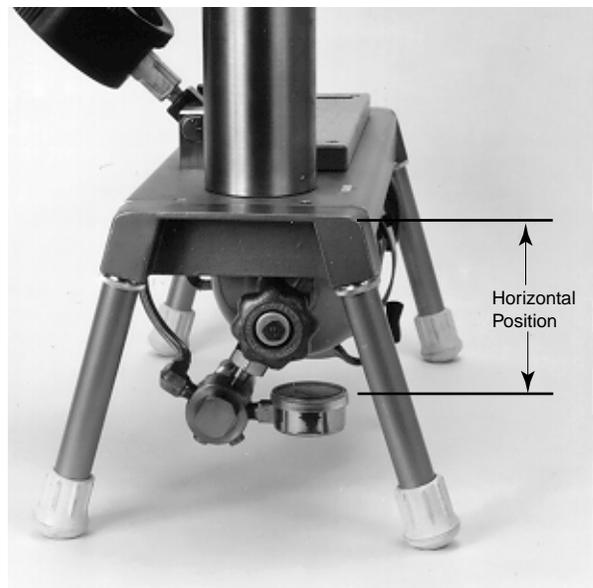


Fig. 32

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## Minor Adjustments

### To Adjust the Zero Position of the Pressure Readout Gauge

In the event the pointer is jarred off of the zero position during transportation and handling, it can be rezeroed easily. To do this, unscrew the cover plate of the test gauge by turning it counterclockwise.

The zero adjusting gear (Fig. 33) on the gauge pointer is then turned clockwise or counterclockwise with the adjusting tool supplied with the unit to bring the pointer back to the zero position.

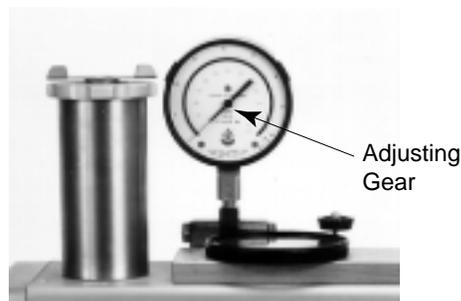


Fig. 33

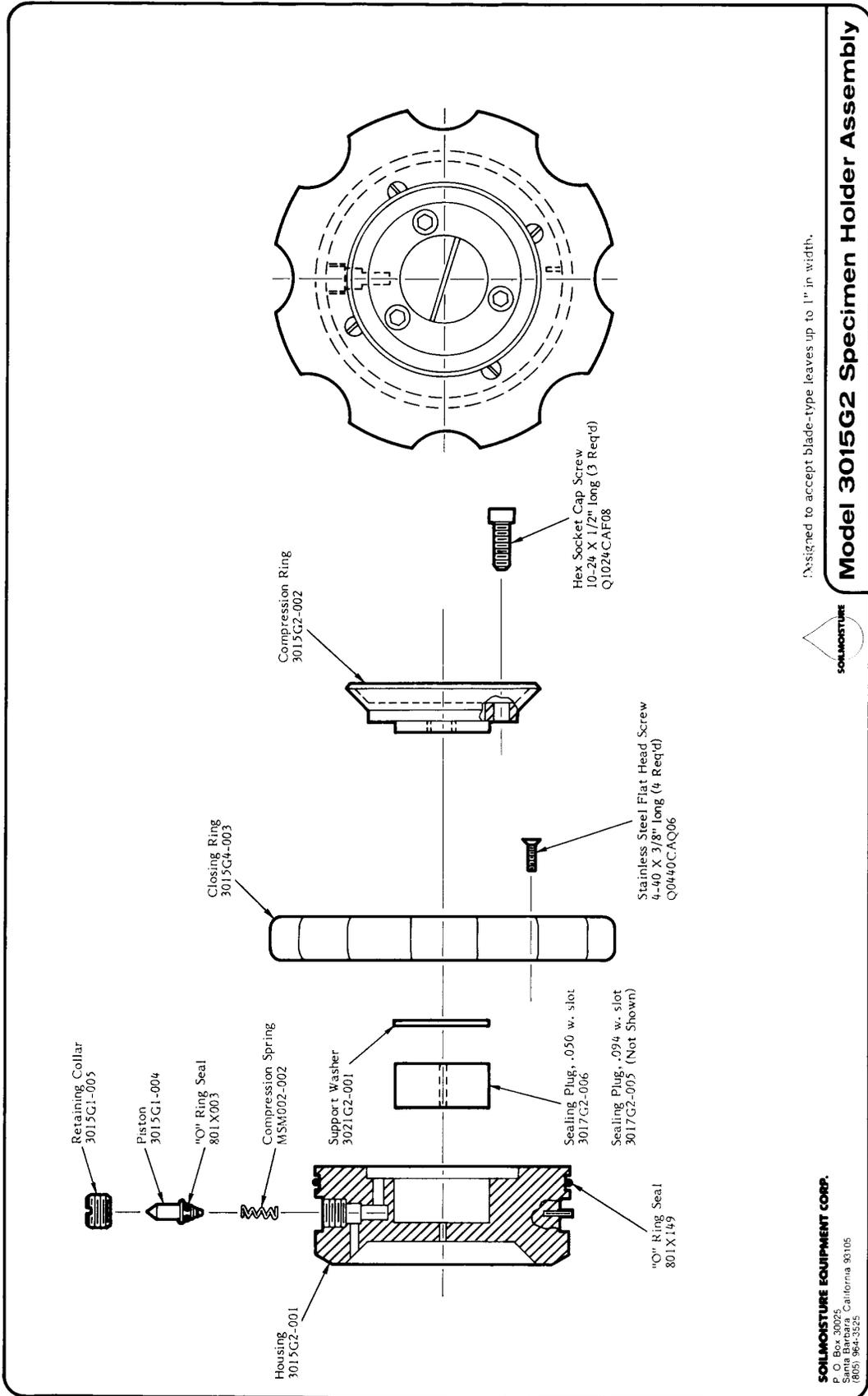
Replace the cover plate by screwing it on in a clockwise position. Tighten securely to prevent infiltration of dust into the gauge.

Note: on special units the readout pressure gauge is sometimes supplied with a friction-type adjustable pointer. If this type of gauge is on your unit, the zero position of the pointer is adjusted by grasping the knurled disc at the center of the pointer and moving the pointer itself with respect to this disc until the desired zero position is obtained.

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## Replacement Parts

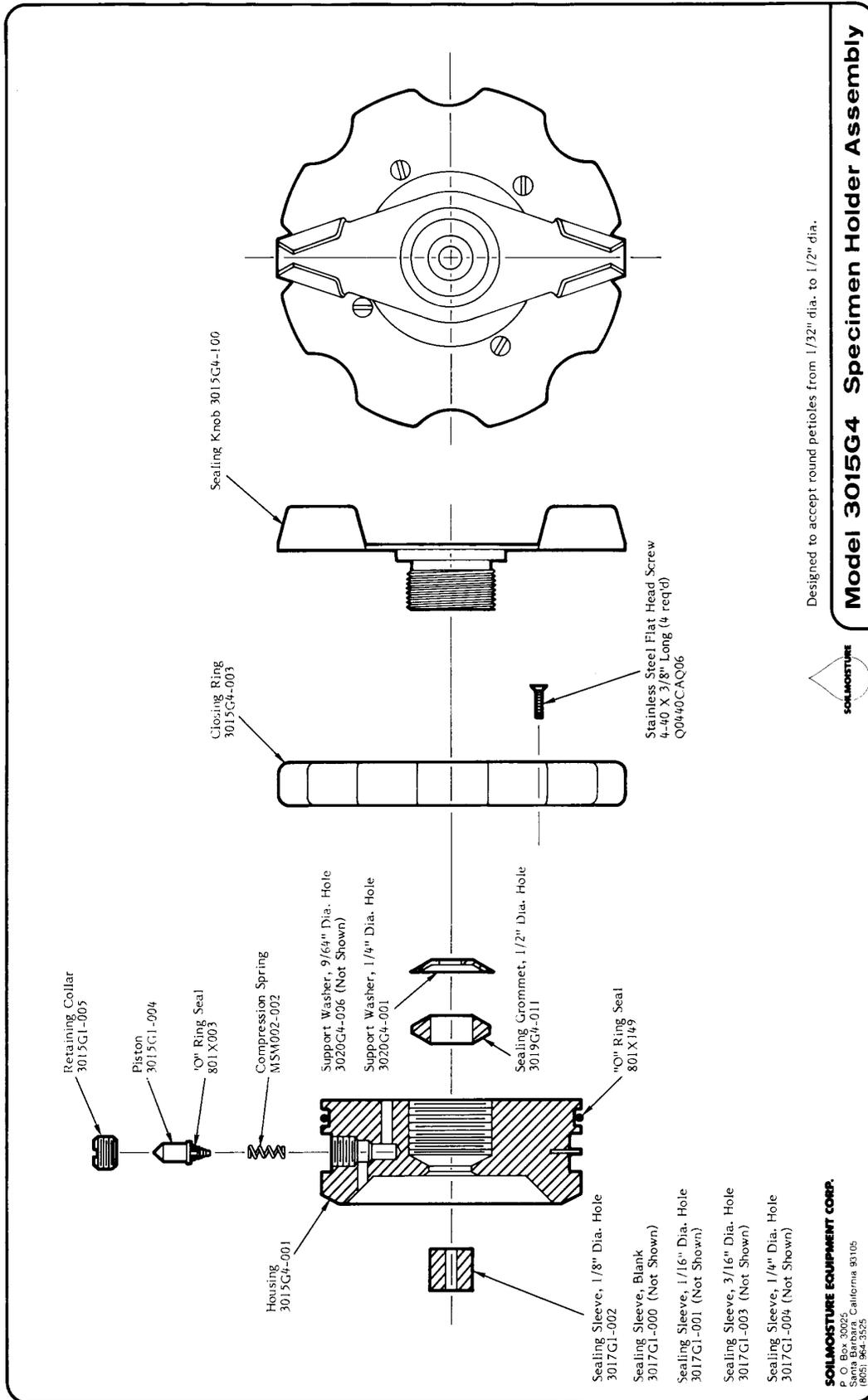
0761G5	THREE-WAY PRESSURE CONTROL BALL VALVE	0.34 kgs
0767P2000G1	TANK REGULATOR, 0 to 2000 psi range Replacement for 3005 Tank Regulator	1.36 kgs
0767P2000G2	SOURCE TANK REGULATOR, for 3000 Plant Water Status Console, high pressure	
0780P0600	TEST GAUGE, 0 to 600 psi, (0 to 40 bars)	0.96 kgs
0780P1500	TEST GAUGE, 0 to 1500 psi, (0 to 100 bars)	0.92 kgs
3000-009L2.25	CONTROL VALVE CONNECTOR, 1/4" NPT	0.09 kgs
3000-011	METERING FLOW CONTROL VALVE	0.28 kgs
3072	COMPRESSED GAS CYLINDER 25 cubic ft. capacity nitrogen supply tank.	5.22 kgs
3075L04CR	LEGS, 4" (10 cm) long, (set of 4)	0.41 kgs
3075L08CR	LEGS, 8" (20 cm) long, (set of 4)	0.99 kgs
3075L32CR	LEGS 32" (81 cm) long, (set of 4)	3.44 kgs
M802X149	NEOPRENE O-RING SEAL, for all specimen holders	0.004 kgs



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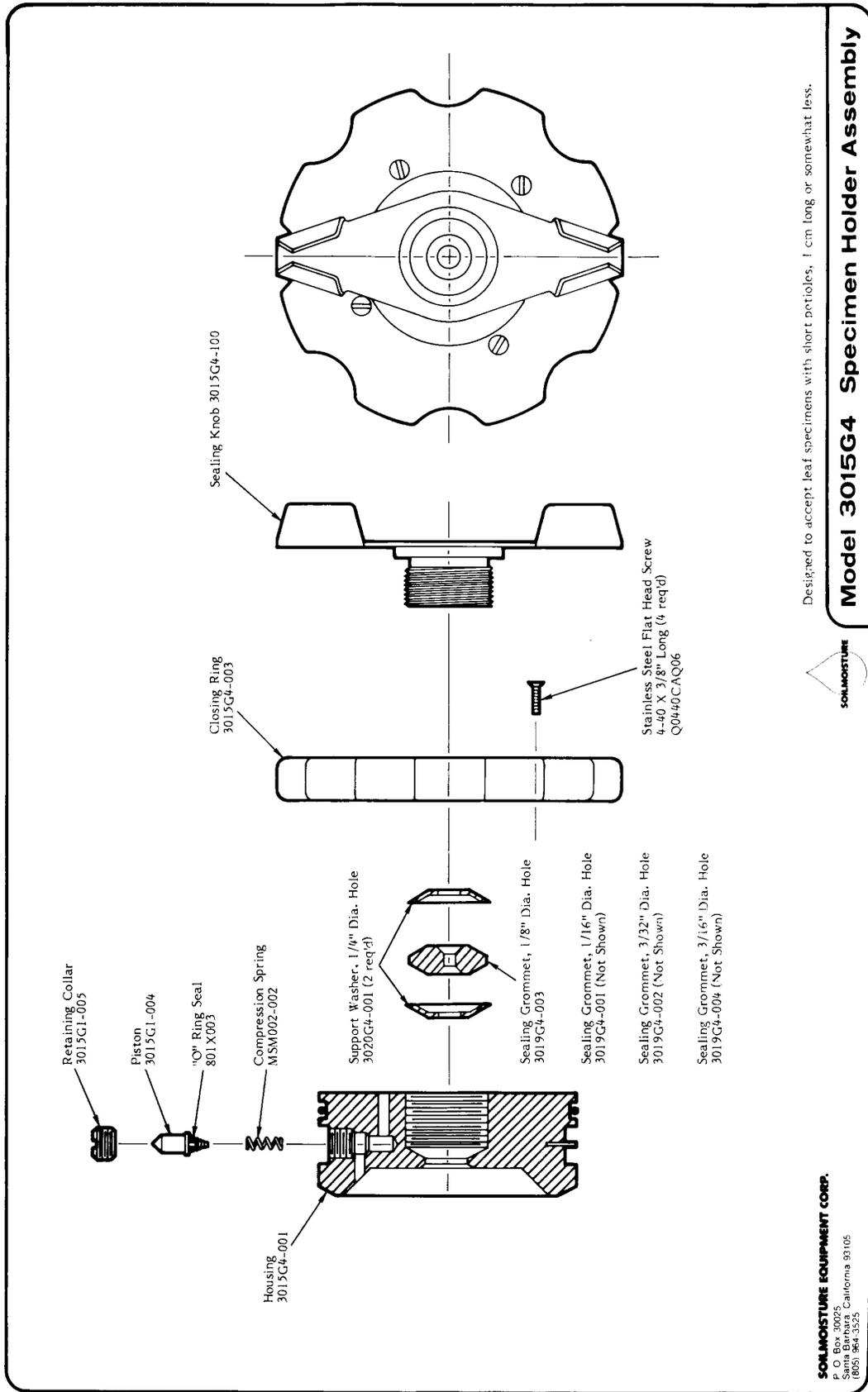


Designed to accept round petioles from 1/32" dia. to 1/2" dia.



**Model 3015G4 Specimen Holder Assembly**





Designed to accept leaf specimens with short petioles, 1 cm long or somewhat less.



**Model 3015G4 Specimen Holder Assembly**

**SOILMOISTURE EQUIPMENT CORP.**  
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0898-300/3005.p65 (10/2000)

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