VICI

Valco Instruments Co. Inc.

VICI Metronics
Dynacalibrator® Model 150
Instruction Manual

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Introduction

Unpacking

Inspect shipments upon receipt and report shortages and incorrect or damaged material to us immediately. Damaged shipments must remain with the original packaging for freight company inspection.

The package should include the following:
- Dyncalibrator® Model 150
- manual
- power cord
- forceps
- fittings kit
- tool to remove/secure the front panel and the chamber cap

Permeation devices, if ordered, will ship separately. The permeation device shipping tubes, complete with the charcoal and desiccant packets, should be kept for storing the devices when they are not in service. If a device will not be used for at least a week and its total useful life is less than a year, leave it packaged and place it in cold storage to prolong its useful lifetime.

General Description

The Dynacalibrator Model 150 is a constant temperature system designed to generate precise ppm or ppb concentrations of chemical compounds in a gas stream, using permeation devices as the trace gas source. It is used as a reference for the calibration of instruments in the field of gas chromatography, verifying the accuracy of analytical data generated from air pollution monitoring, industrial hygiene surveys, odor survey programs, and tracer studies, and in other instruments that measure gas concentrations.

A passivated glass-coated permeation chamber houses the permeation device(s), with inert carrier gas sweeping the calibration gas/vapor from the chamber. The temperature controller maintains the chamber temperature at a set point with an accuracy of ±0.01°C, traceable to NIST standards. The wide range of temperature settings (5°C above ambient to 110°C) allows the end user to generate a wide range of volumetric concentrations for both low and high vapor pressure chemical compounds. The desired volumetric concentration is established or changed by simply varying the carrier flow.

The passivated glass coating of the stainless steel chamber assembly is compatible with most chemicals, including sulfur compounds; however, it is not compatible with hydrofluoric acid.
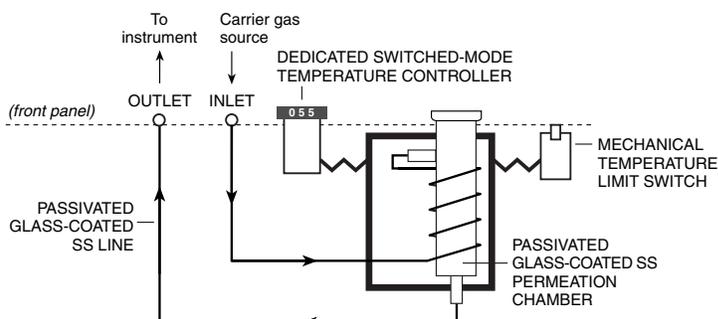

Figure 1: Dynacalibrator Model 150 schematic

Specifications

Features ································· Passivated glass-coated stainless steel chamber
Stainless steel cap
Dedicated switched-mode temperature controller with
    front panel and serial port control
Adjustable mechanical temperature limit switch
Digital readout for set point and chamber temperature
Power switch with LED indicator light
Stainless steel inlet and outlet fittings for 1/16" tubing
    (Adapters and tubing included for connection to
    1/8" and 1/4" tubing)
Universal power input 110 VAC/230 VAC
Chassis cooling fan

Permeation chamber ·················· Stainless steel, passivated with Inertium® and
    Ultradeactivation® coating
Screw cap access
9.5" long by 0.875" ID (24 cm x 2.2 cm)

Permeation device
    Maximum total length ··········· 24 cm (9.5")
    Maximum diameter ·············· 1.6 cm (0.62")

Temperature control
    Range ························· 30°C to 110°C
    Accuracy ······················ ±0.01°C at a set point from 5°C above ambient to 110°C

Accessories ························· Power cord for 110 VAC power source
        (220 VAC Model 150-C)
    Forceps for removing and inserting permeation devices
    Tool for removing and securing permeation chamber cap
    Kit for connecting larger tubing sizes
        1/8" to 1/16" reducing union (P/N ZRU21)
        1/4" to 1/16" reducing union (P/N ZRU41)
        1/16" OD by .030" ID by 20 cm tubing (P/N T20C30D)

Carrier flow ························· Recommended range of 100 - 1200 ml/min

Dimensions ························· 6" wide x 15" deep x 7" high
(15.4 cm x 38.1 cm x 17.7 cm)

Weight ····························· 10.5 lbs. (4.8 kg)

Inertium® and Ultradeactivation® are registered trademarks
of AMCX (Advanced Materials Components Express)

Specifications subject to change without notice.

Installation

Connections (refer to Figures 1 and 2)

1. Plug the power cable from the main power connector on the rear panel of the calibrator to a 110 VAC power source (220 VAC with Model 150-C).

2. Turn on the calibrator with the main power switch on the rear panel. The display will light up, indicating that the unit is on. The temperature controller display will indicate the current chamber temperature.

3. Connect the carrier gas source (50 psi maximum pressure) to the carrier inlet on the rear panel. The maximum recommended flow is 1.2 LPM.

4. Connect the SPAN OUTLET to your instrument.

⚠️ **Always leak check the entire instrument and all flow connections, particularly if toxic, corrosive, or flammable gas mixes will be generated.**

Use clean/dry air or N_2 to perform a pressure/decay test to verify the leak integrity of the system before putting it into service.

Chamber Temperature

Important Chamber Temperature Considerations

• If the chamber temperature exceeds the value set by the mechanical temperature limit switch, the heater will automatically shut down and a warning screen will appear on the touch screen controller.

• When the front panel door is removed, the heater automatically shuts down.

• Always refer to the separate instructions accompanying the permeation tube(s) to make sure that the selected temperature is compatible with the permeation tube(s) being used.

The front panel displays the current chamber temperature and the control status of the instrument, indicated by the PNL and TMP lights. *(Refer to Figure 2 on page 4.)* The chamber temperature can be set manually through the controls on the front panel or remotely through RS-232 communication. *(Refer to the chapter entitled "Serial Port Communications" on page 7)*. After a temperature set point is entered by either method, it is written to memory so that after a power failure the unit will return to the condition previously established.

Chamber temperature will ramp up at the rate of approximately one degree per minute. The observed standard deviation of one-second block average readings of the chamber block temperature is 0.0005°C over one hour. This is the stability as indicated by the RTD's. The deviation in actual chamber temperature is less than 0.002°C at set point, per degree change in ambient temperature.
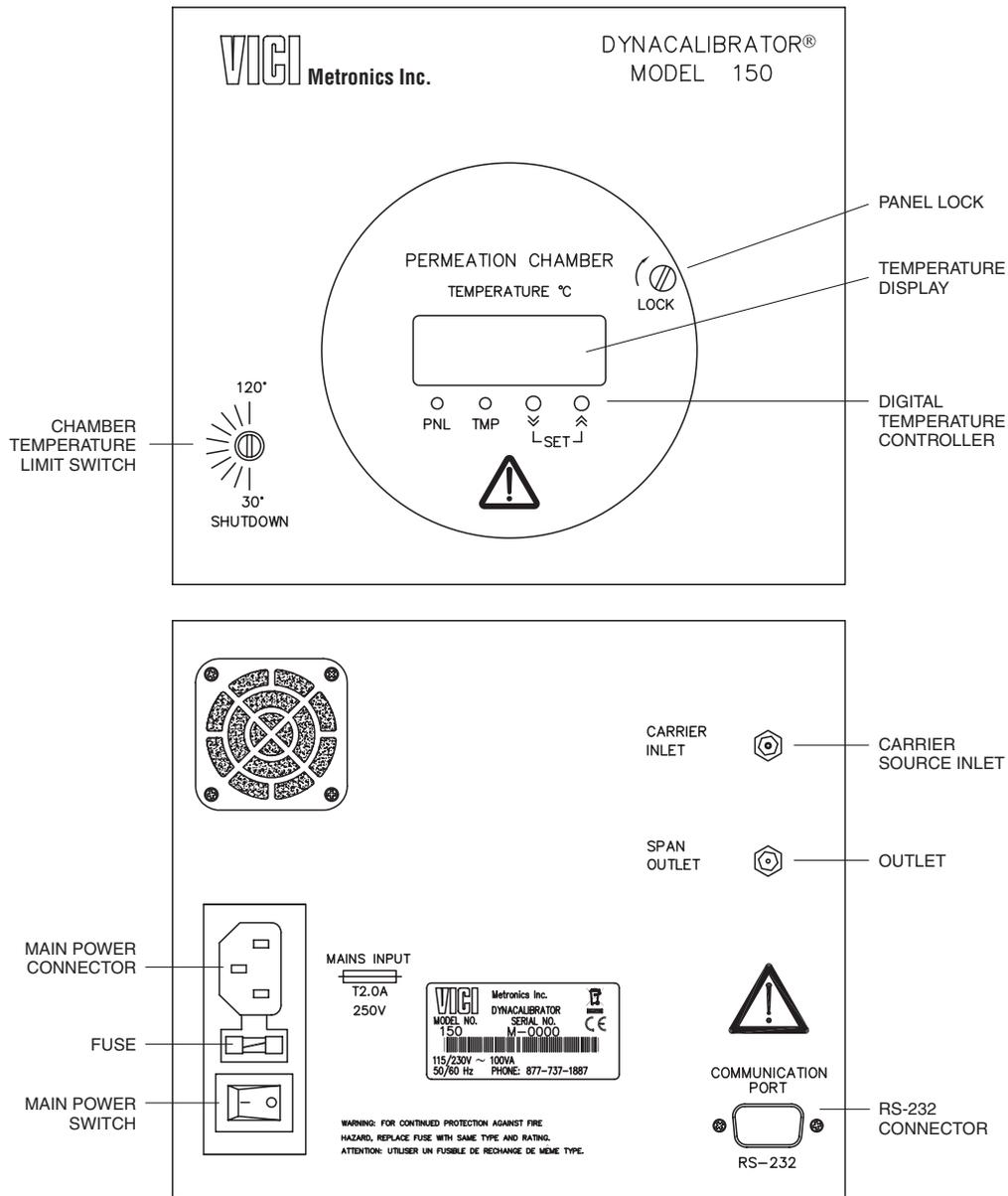
Figure 2: Dynacalibrator Model 150 front and rear panels

PNL	Light on	Light off	Light flashing
	Front panel control enabled	Front panel control disabled	Set mode

TMP	Red light	Flashing green light	Solid green light
	Chamber temperature is not equal to set point temperature	Chamber temperature is approaching set point temperature	Chamber temperature has been within 0.1°C of the set point value for 1 hour or more

Figure 3: Functions of the PNL and TMP lights

Setting the Chamber Temperature Manually

To read the current set point: press and hold the ⋀ button.
To read the chassis environment temperature: press and hold the ⋁ button.

1. Simultaneously press the ⋀ and ⋁ buttons, then release them. The PNL light will start flashing, indicating the controller is in the temperature set mode.

2. Use the ⋀ and ⋁ buttons to reach the desired temperature set point.

3. To enter or register the desired temperature set point, simultaneously press the ⋀ and ⋁ buttons, then release them. The PNL light will stop flashing. If the set point is not entered, after two minutes the controller will ignore the temperature in Step 2 and revert to its previous status.

To prevent the set point from being accidentally changed, the front panel controls can be disabled with a serial command. Refer to the section titled "Serial Port Communications" on page 7.

Setting the Chamber Temperature Limit Switch

A mechanical thermostat is integrated with the temperature control circuit for fail-safe temperature control. This thermostat should be used to prevent accidental overheating of low temperature permeation devices or permeation devices containing toxic or hazardous chemicals. Overheating can rupture the device or cause an unintended release of chemicals.

The temperature markings on the front panel are approximate (±10°C). For a more accurate setting:

1. Using a flat-tipped screw driver or the tool provided, turn the limit switch all the way clockwise.

2. Turn on the Dynacalibrator. Do not install any permeation devices yet.

3. Set the chamber temperature 5°C higher than the desired operating temperature, and wait for temperature equilibrium.

4. After equilibrium, slowly rotate the limit switch counterclockwise until the display reads "PFAIL". (You may hear a faint click.)

5. Turn off the Dynacalibrator and wait 15-20 minutes for the chamber to cool.

6. Turn on the Dynacalibrator and set the chamber operating temperature.

⚠️ **When PFAIL occurs, the Dynacalibrator must be turned off long enough for the chamber to cool before the power is turned back on.**

Setting the Chamber Temperature via Serial Port (RS-232)

Refer to the section titled "Serial Port Communications" on page 7.

Installing the Permeation Device(s)

1. Turn off the power switch.

2. With the tool provided, rotate the panel lock screw 90° counterclockwise.

3. Gently pull the front panel assembly out.

⚠ **CAUTION: The permeation chamber cap may be warm to touch. If the calibrator has been in use, avoid exposure to gas vapors while opening the chamber cap by using appropriate mitigation and personal protection equipment.**

4. Unscrew the chamber cap with the tool provided.

5. Add or remove the permeation device(s) with the supplied forceps or other tool appropriate to the job.

6. Secure the chamber cap with the tool provided.

7. Run a pressure/decay test to make sure that the chamber cap is leak tight.

8. Reinstall the front panel assembly and rotate the panel lock screw 90° clockwise.

9. Turn on the power switch and allow one hour for equilibration.

Refer to the separate instructions accompanying the permeation tube to make sure that the selected temperature is compatible with the permeation tube being used.

Important Permeation Device Considerations

• If more than one tube is to be used in the oven at the same time, order all the tubes with permeation rates given at the same temperature.

• Certified permeation devices should be used only at the temperature specified on the certificate.

• Using any permeation device beyond its recommended temperature range could result in the destruction of the device by explosion and/ or changes in the membrane characteristics. If in doubt, contact VICI Metronics or their authorized representative with the part number of the device to determine its maximum temperature limit.

Serial Port Communication

The Dynacalibrator Model 150 can be monitored and controlled remotely by means of a serial port connection and a terminal emulation program such as HyperTerminal.®

The unit is controlled by entering two-character commands, shown in the table below. Commands may be either upper case or lower case. Parameters enclosed in brackets ([ ]) are optional. Note that for enable/disable commands, the states indicated by an "*" are the defaults at power-up. Only the altered set point temperature and function coefficients are retained when power is off and restored at power-up.

| Command	Meaning
DC[[=] n]	Show/set decimation count *(Data logging rate, in seconds)*
L+	Start data logging *(Log data at the interval set by the decimation count:* *DC=1 sets a one second interval)*
L-	Stop data logging*
P+	Enable front panel control*
P-	Disable front panel control *(Prevent set point from being changed with panel controls)*
SC	Show coeffecients
TE	Read environment temperature
TR	Read controlled temperature
TS[[=] n]	Show/set temperature setpoint
VR	Show firmware version
??	Display the list of available commands

* Factory defaults, reset at start-up

Setting Up Serial Communication via HyperTerminal®

1. To open HyperTerminal in Windows®, click Start > Programs > Accessories > Communications > HyperTerminal. The following screen will appear:
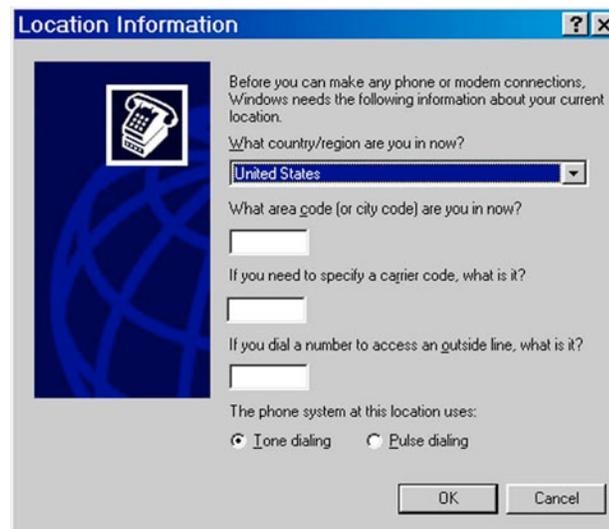
2. Click "Cancel". Since no modem is involved, this information is not necessary.   The following screen will appear:
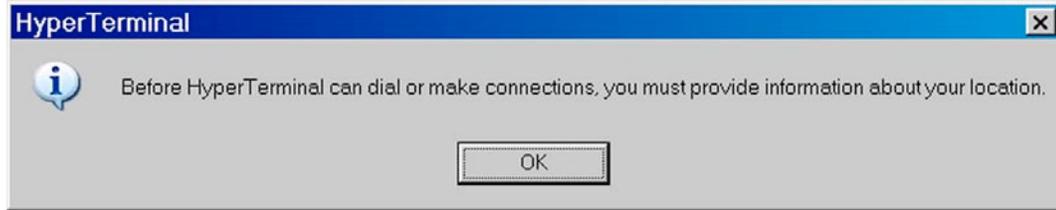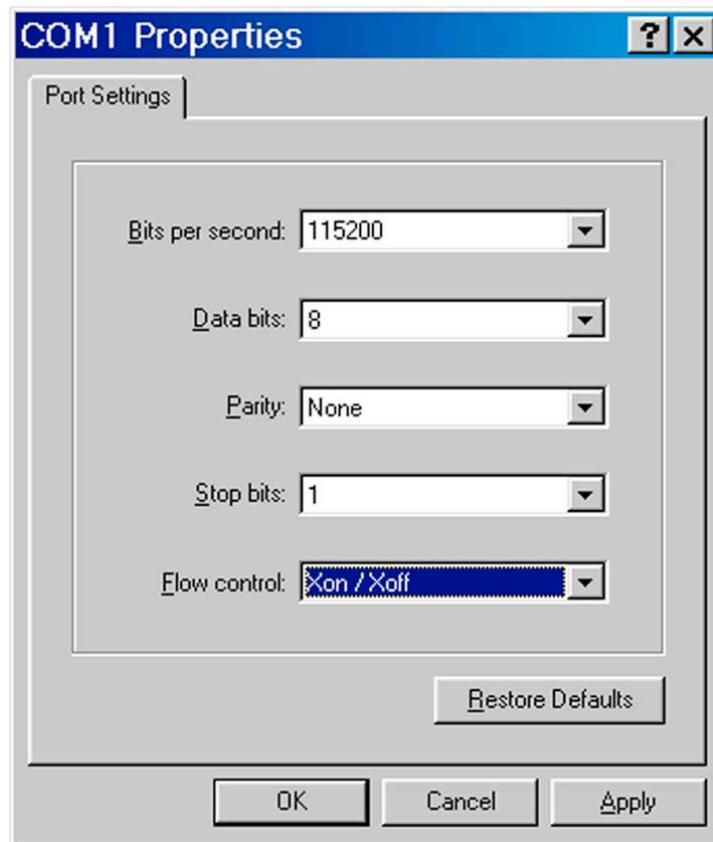

3. Click "OK", which reveals the next screen:

4. Enter a name, such as "Dyna150", and select an icon to associate with the file. Then click "OK". .

5. If necessary, click through the warning screens again to get to this screen:
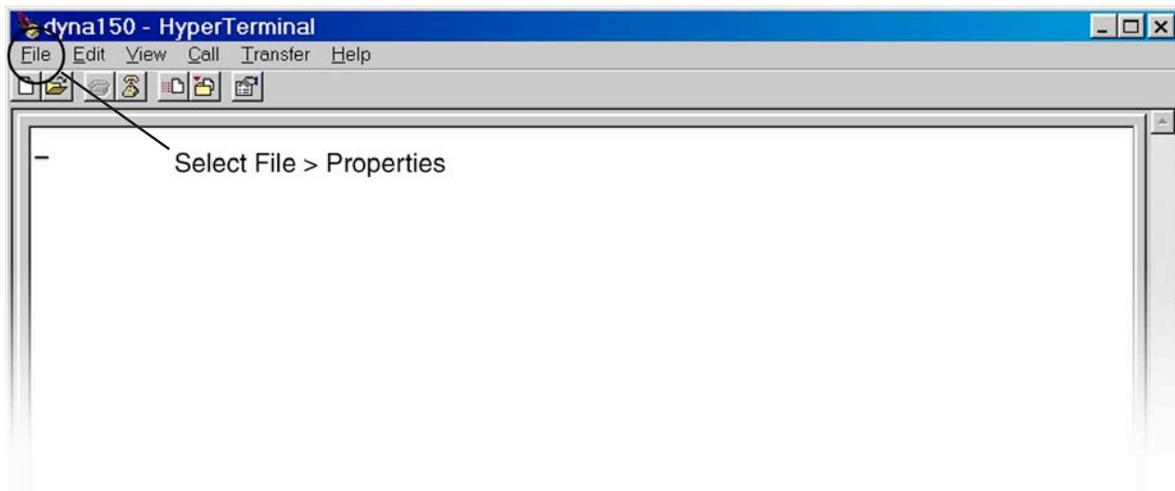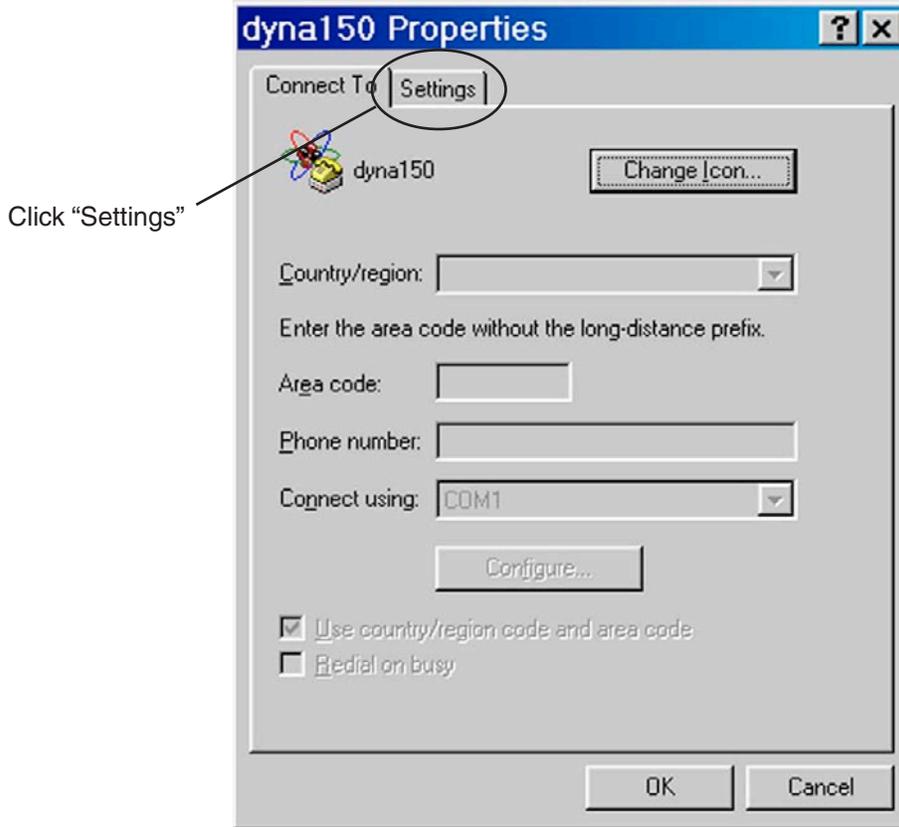
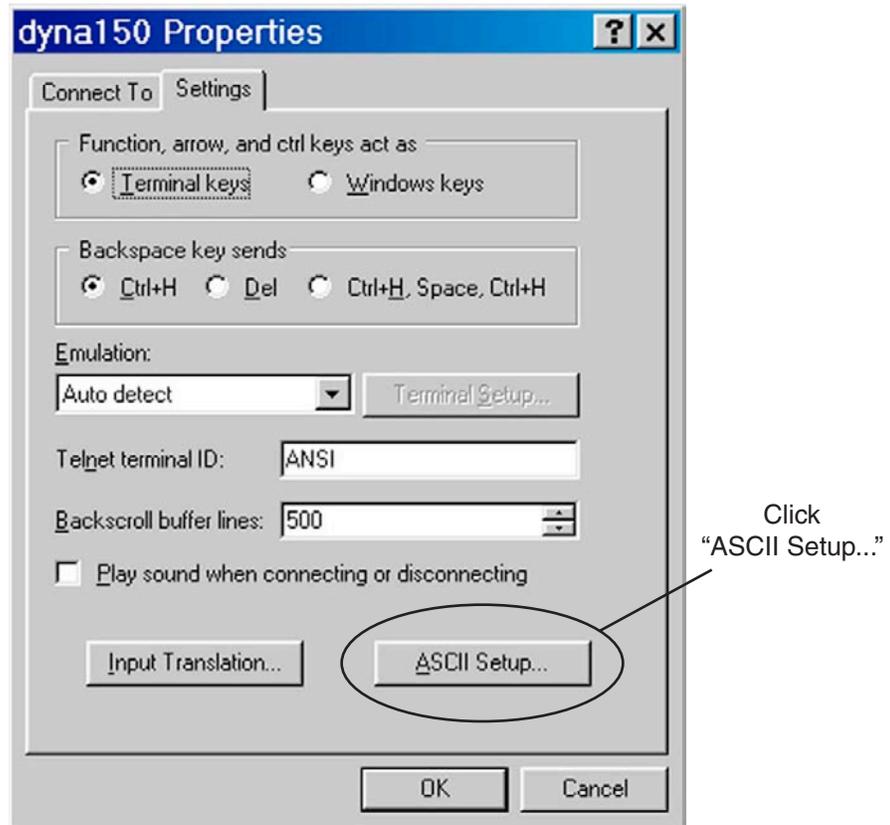6. Select the appropriate COM port and click "OK" to bring up this screen:

7. Set the port parameters as indicated above, and click "OK".

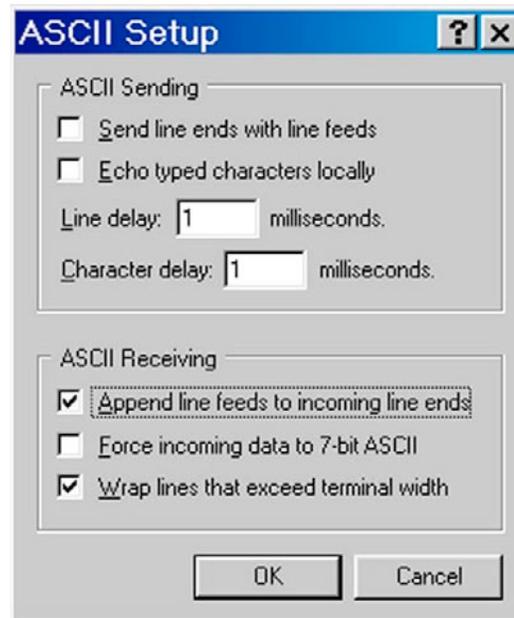8. Now we are at the Dyna150 HyperTerminal screen (below). Select "File", then "Properties:

Click "Settings"

9. On the Dyna150 Properties screen (above), click "Settings" to bring up the screen below.

Click "ASCII Setup..."

10. Click "ASCII Setup" and set the parameters as indicated below. Click "OK".

11. When the screen returns to Dyna150 HyperTerminal (page 9, bottom illustration), click "File", then "Save" to save this Dynacalibrator Model 150 communications setup.

The following text will be displayed in the HyperTerminal window when communication is first established with the Dynacalibrator Model 150:

> Parameters recovered.
> Program checksums ok.
> Initializing SPI . . . ok
> Initializing A/D . . . ok
> Initializing IIC . . . DS1624 started
> Valco Dynacalibrator online.

A simple processor test can be performed by opening Hyperterminal before powering up the Dynacalibrator. If the processor has some defects, the message "Bad checksum in Block xxx" is displayed instead of line 2 above. If this occurs, please consult the factory.

Entering Commands

Each command must be followed by the <ENTER> key.

Examples:
> To set the chamber temperature to 50°C, type "TS=50" and press <ENTER>.
> To read the set point, type "TS" and press <ENTER>.
> To read the current chamber temperature, type "TR" and press <ENTER>.
> To start data logging, type "L+" and press <ENTER>. To stop data logging, type "L-" and press <ENTER>.

Calculations

Concentration of the permeant compound in the span outlet stream is inversely proportional to the carrier flow rate through the chamber. It is determined using the folowing equation:

$$\text{Concentration (ppm)} = \frac{K * P}{F}$$

Where: K = 24.45 / molecular weight of gas
P = permeation rate in ng/min (information included with the permeation device documentation)
F = Chamber carrier flow (ml/min)

If the permeation rate is known for some reference temperature, the rate at a second temperature can be estimated as follows:

$$\log P = \log P_O + 0.034 (T - T_O)$$

Where: P_O = Permeation rate at reference temperature T_O
P = New permeation rate at temperature T

Certified devices should be used only at the temperature specified on the certificate.

Using any permeation device beyond its recommended temperature range could result in the destruction of the device by explosion and/or changes in the membrane characteristics. If in doubt, contact VICI Metronics with the part number of the device to determine its maximum temperature limit.

Sample Calculation

Given:
Permeation rate: 21,000 ng/min Cl_2 @ 30°C
Carrier flow: 500 ml/min

Then:
$$\text{Concentration (ppm)} = \frac{K * P}{F}$$

$$= \frac{(0.346)(21,000)}{500} = \textbf{14.5 ppm}$$

For zero reference measurement, remove the permeation device from the chamber.

Shutdown

1. Open the permeation chamber according to the instructions in the section called "Installing the Permeation Device(s)" on page 5.

2. Remove the permeation devices and return them to the shipping tube with the charcoal packets.

If the device will not be used for at least a week and its total useful life in less than a year, the device should be placed in cold storage to prolong its useful lifetime.

Factory Repair Service

VICI provides complete repair and calibration services for Dynacalibrators. If service is required, contact the facility indicated below for authorization and repair specifics prior to returning your unit.

North America, South America, and Australia/Oceania

VICI Metronics Inc.
tel: (877) 737-1887
fax: (360) 697-6682
metronics@vici.com

Europe, Asia, and Africa

VICI AG International
tel: Int + 41 41 925-6200
fax: Int + 41 41 925-6201
info@vici.ch

Equipment should be shipped in the original or equivalent packing materials, prepaid and insured. Include a complete written description of symptoms, problems, or calibration requirements, as well as the name and phone number of the person to contact for discussion of the required service. Upon receipt, VICI will inspect the equipment and advise the contact person of any unusual repair time or cost factors prior to starting the work. Repaired equipment will be returned with an invoice for any costs not covered by warranty.

Remove all permeation tubes from the chamber before packaging and shipping the Dynacalibrator.

Warranty

This Limited Warranty gives the Buyer specific legal rights, and a Buyer may also have other rights that vary from state to state. For a period of 90 calendar days from the date of shipment, VICI Metronics Inc. (hereinafter Seller) warrants the goods to be free from defect in material and workmanship to the original purchaser. During the warranty period, Seller agrees to repair or replace at Seller's option defective and/or nonconforming goods or parts (exclusions noted below) without charge for material or labor, subject to inspection FOB VICI Metronics Inc. factory. Buyer's exclusive remedy is repair or replacement of defective and nonconforming goods.

Seller excludes and disclaims any liability for lost profits, personal injury, interruption of service, or for consequential incidental or special damages arising out of, resuiting from, or relating in any manner to these goods

This Limited Warranty does not cover:

> lamps or fuses
> damage due to improper shipping
> damage due to improper use
> damage due to modifications or alterations
> damage due to improper maintenance.

This Limited Warranty does not cover defects, damage, or nonconformity resulting from abuse, misuse, neglect, lack of reasonable care, modification, or the attachment of improper devices to the goods. This Limited Warranty does not cover expendable items. This warranty is VOID when repairs are performed by a nonauthorized service center or representative.

The warranties contained in this agreement are in lieu of all other warranties expressed or implied, including the warranties of merchantability and fitness for a particular purpose.

This Limited Warranty supercedes all prior proposals or representations oral or written and constitutes the entire understanding regarding the warranties made by Seller to Buyer. This Limited Warranty may not be expanded or modified except in writing signed by the parties hereto.