

TABLE OF CONTENTS

SECTION 1	GENERAL INFORMATION	- 1 -
1.1	INTRODUCTION	- 1 -
1.2	PRINCIPLE OF OPERATION	- 2 -
1.3	TECHNICAL SPECIFICATIONS	- 2 -
1.4	PRECAUTIONS	- 2 -
SECTION 2	INSTALLATION	- 4 -
2.1	INSTALLATION	- 4 -
2.2	<i>RheoVac</i> SYSTEM INSTALLATION/SITE SELECTION	- 4 -
2.2.1	Probe Site Selection	- 4 -
2.2.2	Electronics Unit Site Selection	- 5 -
2.3	MOUNTING HARDWARE INSTALLATION	- 6 -
2.4	PROBE INSTALLATION AND ORIENTATION	- 6 -
2.5	ELECTRICAL CONNECTIONS	- 8 -
SECTION 3	OPERATION	- 14 -
3.1	GENERAL INFORMATION	- 14 -
3.2	SYSTEM START-UP	- 14 -
3.3	PORTABLE USB DATA STORAGE DEVICE/Warranty	- 14 -
3.4	DISPLAY	- 15 -
3.5	COMMUNICATIONS	- 15 -
3.6	DATA PROCESSING	- 16 -
3.7	CUSTOM SOFTWARE	- 17 -
SECTION 4	MAINTENANCE	- 18 -
4.1	GENERAL MAINTENANCE	- 18 -
4.2	CALIBRATION	- 18 -
4.3	SPARE PARTS	- 18 -
4.4	TROUBLESHOOTING	- 18 -
4.5	HARDWARE AND SOFTWARE MODIFICATIONS AND UPGRADES	- 20 -
SECTION 5	CUSTOMER SERVICE	- 21 -
5.1	QUESTIONS ON EXISTING HARDWARE	- 21 -
5.2	TROUBLESHOOTING	- 21 -
5.3	FACTORY AND FIELD SERVICE	- 21 -
5.4	QUESTIONS ON NEW EQUIPMENT	- 21 -
5.5	CONDENSER SERVICES	- 21 -
SECTION 6	CUSTOM INFORMATION	- 22 -
6.1	UNIT IDENTIFICATION	- 22 -
6.2	CONFIGURATION	- 22 -
6.3	SPECIAL INSTRUCTIONS	- 22 -

Appendix A - *RheoVac* Model 950 User Interface Software

Appendix B - *RheoVac* Model 950 Networking

WARRANTY

Intek, Inc. warrants each *RheoVac* product to be free from defects in material and workmanship under normal use and service, Intek's obligation under this warranty being limited to making good any part or parts thereof which shall, within one (1) year after delivery of such product to the original purchaser, be returned to Intek with transportation charges prepaid and which Intek's examination shall disclose to its satisfaction to have been thus defective; this warranty being expressly in lieu of all other warranties, express or implied and all other obligation or liabilities on Intek's part. The purchaser will assume all responsibility and expense for removal, decontamination and reinstallation of equipment.

RheoVac instruments are manufactured under United States patent numbers 4,255,968, 5,485,754, 5,752,411 and 6,526,755. Intek, *Rheotherm*, *Rheovec*, *Rheomax*, *RheoVac* and *RheoSmart* are registered trademarks of Intek, Inc.

Windows is a registered trademark of Microsoft Corporation in the United States and other countries.

Intek, Inc.
751 Intek Way
Westerville, Ohio 43082-9057
Phone (614) 895-0301 Fax (614) 895-0319
web site www.intekflow.com
e-mail techsupport@intekflow.com

SECTION 1 — GENERAL INFORMATION

1.1 INTRODUCTION

For the first time, all necessary properties of the gases in the condenser exhauster line are directly measured to provide an accurate determination of air in-leakage and condenser performance related parameters. These properties are measured to provide the power industry with the most advantageous and complete product for condenser system diagnostics:

the *RheoVac*® System*

*USPNs 4,255,648; 5,485,754; 5,752,411; 6,526,755

A model 950 *RheoVac* system consists of one, two or three probes reporting to a central signal conditioner and processor unit. The sensing probe, consisting of multiple sensors configured in a single probe head, is installed in the vacuum line between the condenser and the exhauster. The *RheoVac* system is superior to all other methods in that it makes no assumptions about the dynamic condenser and vacuum line environment. The sensor head employs the patented Rheotherm® technology to provide an accurate mass flow measurement. Additionally, temperature, pressure and water vapor relative saturation measurements are made using a high accuracy platinum resistance temperature detector (RTD), a strain gauge pressure sensor and a specially configured and calibrated water vapor saturation sensor.

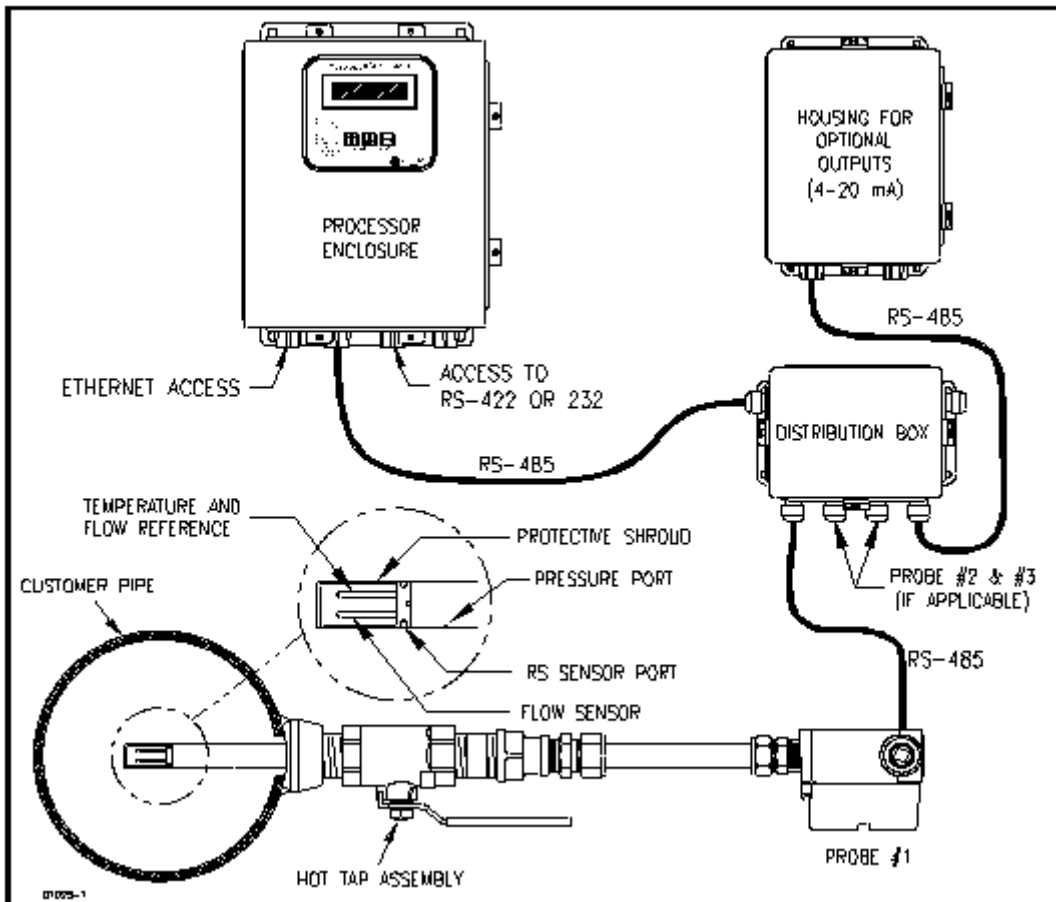


Figure 1 *RheoVac* Model 950

1.2 PRINCIPLE OF OPERATION

The principal features of the *RheoVac* system are shown in Figure 1. At the heart of the *RheoVac* system is the Rheotherm mass flow transducer, which uses the same patented thermal sensing technique employed in all precision flow instruments manufactured by Intek. Two temperature sensors are used one sensor is in thermal equilibrium with the flow medium and provides a temperature and flow signal reference, while the second sensor is located near a constant power heater so that its temperature is always above that of the fluid. The temperature of the heated sensor will vary with the stream velocity of the fluid. Hence, the measured temperature differential between the reference sensor and heated sensor is a function of flow rate, which is approximately proportional to the logarithm of mass flow rate (USPN 4,255,968).

The Rheotherm flow sensor is calibrated to measure the total mass flow of the gaseous water vapor/air mixture. From the other three measurements, the *RheoVac* electronics converts the total gas mass flow signal from the probe into two components, air mass flow rate and water vapor mass flow rate. This unique measurement method is disclosed in two separate patents (USPN 5,485,754 & 5,752,411).

The *RheoVac* system is fully calibrated in the factory under dynamic fluid conditions identical to those within the power plant vacuum line. No field adjustments are required.

1.3 TECHNICAL SPECIFICATIONS

Primary Calibration Accuracy: ±5% Total Mass Flow	Local Display: Back-lit LCD
Repeatability: ±0.5% of reading	Selectable display of air in-leakage and 6 of the other output parameters
Operating Temperature: Electronics: 40 to 120°F (5 to 49°C) Probe: 40 to 160°F (5 to 71°C) Never subject probe to temperatures above 210°F (99°C)	Input Power: 100-250 Vac, 50/60 Hz
Operating Pressure: 0.5 to 30 inches Hg absolute 15 psi maximum	Signal Output: RS-232/RS-422/Serial Modbus, Ethernet Eight 4-20mA signals (optional)
Process Connection: Hot tap assembly (1½" thread-o-let must be welded to pipe for hot tap installation)	Data Access: Ethernet
Wetted Surface: 300 Series SS and engineered plastic	Storage Temperature: -20 to 120°F (-29 to 49°C)
	Storage Pressure: 15 psig (maximum)
	Local Keypad: Parameter scrolling Metric/English units

1.4 PRECAUTIONS

Read the entire manual before installing and operating the *RheoVac* system.

Carefully select the best locations for installation of the probes. Access, installation clearances, freedom from standing water, and straight-run should all be considered when selecting a probe location.

Use reasonable care in handling the probe the sensing components are delicate. Do not bend the probes, damage the tips, or obstruct the sensing ports. If shipping the unit, make sure the probe is adequately protected from foreign objects and damage.

Use proper input power it must be between 100 and 250 Vac (nominal 120/240 Vac) at 50/60 Hz (60 Hz nominal).

Confirm the line and environmental temperature is always below the probe and electronics ratings never operate a probe at or subject it to temperatures or pressures beyond its specified limits. (See Section 1.3)

!! !! WARNING - Never allow live high temperature steam to flow either direction in the exhauster line where a probe is located. This can happen if steam jet ejectors are operated incorrectly.

!! !! WARNING - Do not allow the instrument's RS sensor (or separate RS probe) to come into contact with liquid water, water mist, or fog – these conditions may be present in your condenser vent line due to design configuration. The RS sensor measures relative saturation up to 100% but may fail under the above wet condition. Intek provides design services to improve condenser venting and reduce or eliminate entrained liquid water and excess condenser back pressure.

Keep moisture out of the enclosures once all service connections are made, make sure the enclosure lids are tightly closed and all gaskets are in place. Seal all conduit lines.

!! !! WARNING - Be sure to power up your *RheoVac* instrument system and probe(s) for at least 30 minutes before inserting probes into the vent line hot taps. DO NOT leave probe in vent line unpowered or when flooding the condenser.

SECTION 2 — INSTALLATION

2.1 INSTALLATION

These instructions cover installation of *RheoVac* instruments in their standard configuration. Additional information pertaining to your unit is covered in SECTION 6 CUSTOM INFORMATION . Carefully read these instructions prior to installing the equipment. Also, see preceding SECTION 1.4.

2.2 *RheoVac* SYSTEM INSTALLATION/SITE SELECTION

The *RheoVac* 950 can be configured with one, two or three probes. A three probe system is intended to be installed so that one probe is in each of the two exhaust lines coming out of the condenser (A side and B side). The third probe should go in the header pipe that runs to the exhauster(s). Other installation arrangements of multiple probes should be discussed with the factory.

2.2.1 Probe Site Selection

- ➡ The location for each probe should provide the probe sensing area with well-established smooth flow, uniform system temperature and pressure, and consistent non-liquid phase flow medium. Pipe sections ahead of a probe, in which water can accumulate, must be avoided. Refer to Figure 2 and select the most preferred location for each probe. Do not install the probes beyond any “trap” sections as shown in Figure 2, Configurations B and D. Special installation instructions unique to your unit, where applicable, will be noted in SECTION 6.3 SPECIAL INSTRUCTIONS. Refer to this section now to review special instructions.

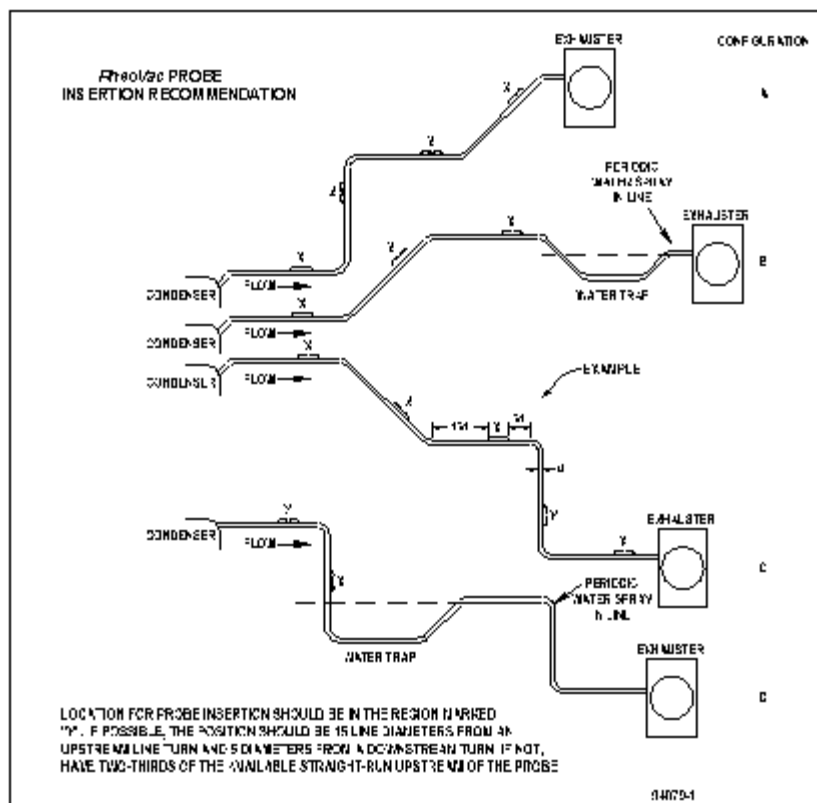


Figure 2 *RheoVac* Probe Insertion Recommendation

- ▣▶ Check installation clearance. Each transducer probe is almost 3 feet (0.9m) long and the hot tap assembly is approximately 13 inches (0.33m) long, therefore, allow minimum clearance of 4 feet (1.3m) for probe installation. Be sure there are no obstructions around the vacuum line that will interfere with probe insertion. Figure 3 shows the proper insertion angle. **THIS ORIENTATION IS IMPORTANT FOR PROPER OPERATION.**
- ▣▶ Observe the selected sites. They should be convenient for the removal and replacement of probes at any time for service without building scaffolding or waiting for plant shutdown.
- ▣▶ Check operating conditions. The temperature and pressure limits (see Technical Specifications; Section 1.3) of the unit should be checked to ensure compatibility with your application.
- ▣▶ Gases in the air removal line should be free of liquid water, mist or fog. Wetness in the line will result in erroneous readings from the instrument. If wet conditions exist in the air removal line, there is either air removal section damage or design flaws which adversely affect condenser performance. Consult Intek for assistance in evaluating the severity of the problem and possible remedies.

2.2.2 Electronics Unit Site Selection

The Model 950 typically has two or three electronics enclosures (see Figure 1). The processor enclosure and other electronics boxes should be installed in a convenient location and should be kept away from direct sources of heat, such as uninsulated steam lines, or moisture. The maximum temperature rating of electronics is 120°F; ensure that this temperature will not be exceeded. Once the wiring connections are made, close and latch down the box lid to protect the contents from damage and debris. All these enclosures should be located in a dry area and should be kept clamped shut during normal operation. Do not allow water to get into the enclosures. If installed outdoors, build a roof over all enclosures to prevent eventual water infiltration.

- A. Processor Enclosure: This 12x10 NEMA 4 enclosure houses the display and central processing unit. Input power (100-250 Vac, 50/60 Hz) is connected inside this enclosure. This enclosure should be installed in a convenient location and should be kept away from direct sources of high heat, such as uninsulated steam lines.
- B. Distribution Box: This 8x6 NEMA 4 enclosure is typically located near the probe that is closest to the processor enclosure unit. It is connected to the main processor with an RS-485 bus DeviceNet™ cable, which can be hundreds of feet long. The probe and transmitter RS-485 cable connections are also made within this box. The probe and transmitter cable lengths should be 15 ft. or less, if possible.
- C. Transmitter Box (optional): This 10x8 NEMA 4 enclosure contains terminals for accessing the eight 4-20mA signals. It can be located in or near the control room so that the 4-20 wires do not have to be run from the plant floor. An RS-485 DeviceNet cable runs from the distribution box to the transmitter box. (There are restrictions on how this can be done, so check manual Section 6, or contact the factory.)

2.3 MOUNTING HARDWARE INSTALLATION

- ① Check hardware. Verify that the probe slides through the hot tap assembly.
- ② Check installation configuration. Make sure the probe is parallel to the floor (see Figure 4). Be sure location is accessible for probe removal and maintenance.
- ③ Check installation clearance. Verify there is a minimum probe insertion clearance of 4 feet (1.3m) between pipe surface and any obstruction.
- ④ Install the mounting hardware. Drill a 1½” through-hole, center the thread-o-let over the hole and weld it onto the condenser vacuum pipe (see Figure 4). Thread the hot-tap assembly into the thread-o-let. Use thread tape or pipe dope to seal the connection. (Alternate: weld thread-o-let to pipe wall, then drill a 1¼” hole in pipe wall using a hot-tap drill.)
- ⑤ It may be necessary to apply a force of about 23 lb (102 Newtons) to remove or replace the probe under plant operating conditions.

2.4 PROBE INSTALLATION AND ORIENTATION

- ① Check proper installation direction. Each probe has a directional arrow on the junction box. Before installing the unit, note proper flow direction. This is important to instrument operation.
- ② Check serial number (S/N). If more than one *RheoVac* unit has been purchased, make sure the first five digits of the serial numbers of the probe(s) match the first five digits of the serial number of the main processor unit. The electronics and up to three probes are a matched set. Mismatched components will not work correctly. The dash number on the probe S/N is the probe number shown on the display. Record the probe number and installation location for future reference.
- ③ Verify stop clamp location (see Figure 3). A stop clamp is attached to each probe as an indication of its insertion depth. It is important that the stop clamp is securely in place to position the sensors in the correct location and to ensure that the probes do not contact the opposite pipe wall. Contact with the pipe wall could damage the probe. The clamp's location was determined based on your submitted pipe diameter, as shown in SECTION 6.2, and is marked with a groove on each probe shaft. Refer to this mark if a stop clamp is inadvertently moved. The two metal probe tips should be in the middle of the pipe.

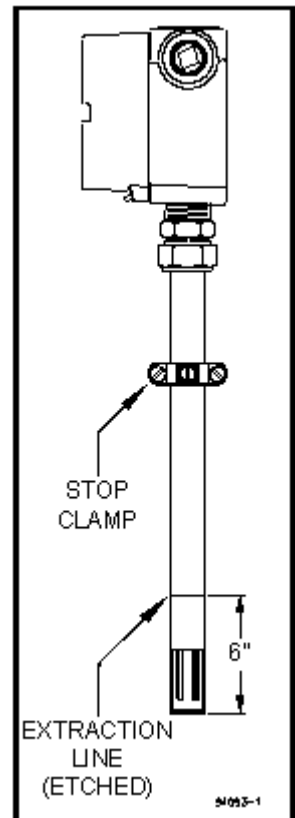


Figure 3
Probe Stop Clamp

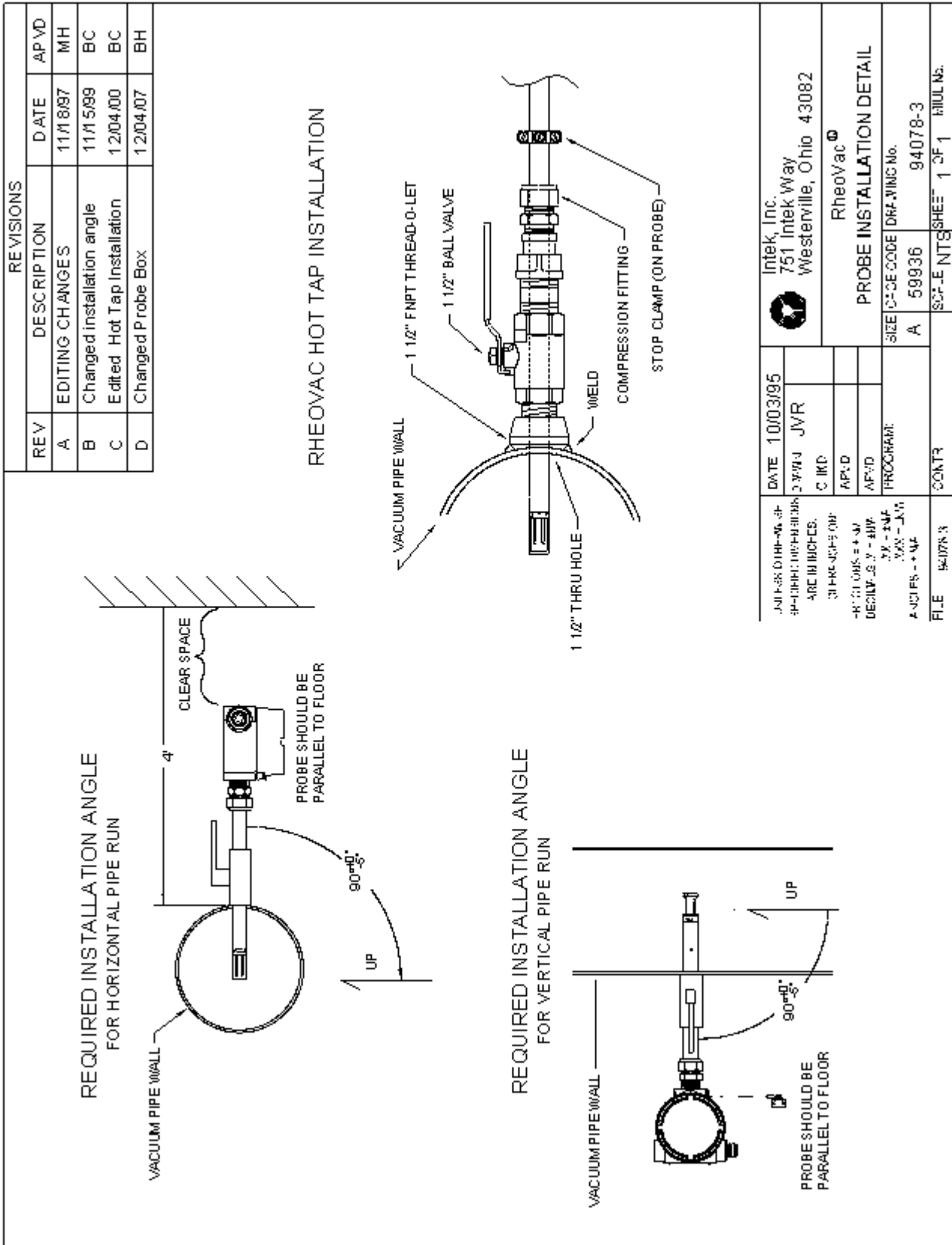


Figure 4 Transducer Installation Detail

- ④ Inspect the probe tips. Be sure wetted surfaces are clean before installing. If cleaning is needed, use a damp cloth wetted with alcohol and wipe dry using a second dry, soft, lint-free cloth. **Do not immerse probes** in alcohol or any other liquids. This may damage the probe sensors.
- ⑤ Be sure to power up your *RheoVac* instrument system and probe(s) for at least 30 minutes before inserting probes into the vent line hot taps. **DO NOT** leave probe in vent line unpowered or when flooding the condenser.
- ⑥ Install each probe. The probe should be mounted through the pipe wall using the hot-tap assembly. The probe installs so that the two sensor tips are side-by-side across the gas stream. The probes have a flow directional arrow on the junction box. When installing under vacuum, do not allow the clamp to "slam" against the seal nut upon opening the valve. Grasp the probe firmly, with hand against the seal nut, before opening the ball valve. Allow the probe shaft to slide slowly through the valve by controlling the amount of grip on the probe shaft. Special installation instructions, if any, will be noted in SECTION 6.
- ⑦ Prior to inserting probe, loosen the compression nut on the thermocouple connector of the hot tap and clean the inner surface of the thermocouple connector to ensure it is free of particles that may cause probe damage.

2.5 ELECTRICAL CONNECTIONS

!! IMPORTANT !! Inspect and **VERIFY** these electrical connections carefully. Improper connection could damage electronic components and sensor function. If additional holes need to be drilled in the processor enclosure, remove the electronics subassembly (mounted on a mounting plate) and temporarily store inside an ESD bag in a safe, clean place. Do not drill with electronics boards inside the enclosure.

- A. Main Processor Unit (see Figure 5)
 1. Sensor Power and Communication Line: Connect the distribution box to this main processor box using the RS-485 Communications/Power cable. Follow indicated connector color code. [*communications*: white (A), blue (B) and shield (SH); *power*: 24Vdc, red (+), and black (-)]
 2. Main Power: Connect main power terminals to a dedicated 100-250Vac, single phase, 15 amp circuit. An external disconnect switch should be used for disconnecting power to the system during outages. Power connection wires should be at least 18 gauge and comply with accepted wiring codes. SW1 is used for cycling power to reset.
 3. Serial Communication: Connector JP3 is the RS-232 serial communication interface. This interface should only be used for distances of 20 feet or less, such as to a laptop computer. A 20 foot serial cable with a DB-9 connector can be shipped upon request (see Figure 9 and Table I below). An RS-422 serial communication interface is present for long data communications when configured without 4-20 mA outputs.

Table I RJ-11 to DB-9 Module Adapter

RS-232 CONFIGURATION				RS-422 CONFIGURATION			
RJ-11 Pin Out		DB-9 Pin Out		RJ-11 Pin Out		DB-9 Pin Out	
1	Tx (transmit)	1	N/C	1	Tx+ (transmit+)	1	Rx- (receive-)
2	N/C	2	Tx (transmit)	2	Tx- (transmit-)	2	Rx+ (receive+)
3	Rx (receive)	3	Rx (receive)	3	Rx+ (receive+)	3	Tx+ (transmit+)
4	N/C	4	N/C	4	Rx- (receive-)	4	N/C
5	Power (+5V)	5	Ground	5	Power (+5V)	5	Ground
6	Ground	6	Pulled high	6	Ground	6	Tx- (transmit-)
		7	N/C	7		7	TBD
		8	Pulled high	8		8	TBD
		9	N/C	9		9	TBD

4. Network Connection: The Ethernet connection at JP1 is an RJ-45 style jack. A 10 foot Ethernet Cat 5 crossover cable is supplied with the unit.

B. Distribution Box (see Figure 6)

1. Connect the RS-485 wires (blue, white and shield) and 24Vdc power (red and black) from the main processor unit.
2. Install ½” liquid-tight conduit between the distribution enclosure and the probes unless ½” rigid conduit is used for long distance runs. Use a minimum of 6 feet of liquid tight at the probes.
3. The probe connector comes with an adapter which allows the attachment of the ½” flexible conduit connector.
4. Connect the probes to the distribution enclosure using the manufacturer supplied four conductor shielded cable. Probe cable connections are shown in Figure 6.
5. Optional - Connect the transmitter box to the distribution box using a RS-485 cable.

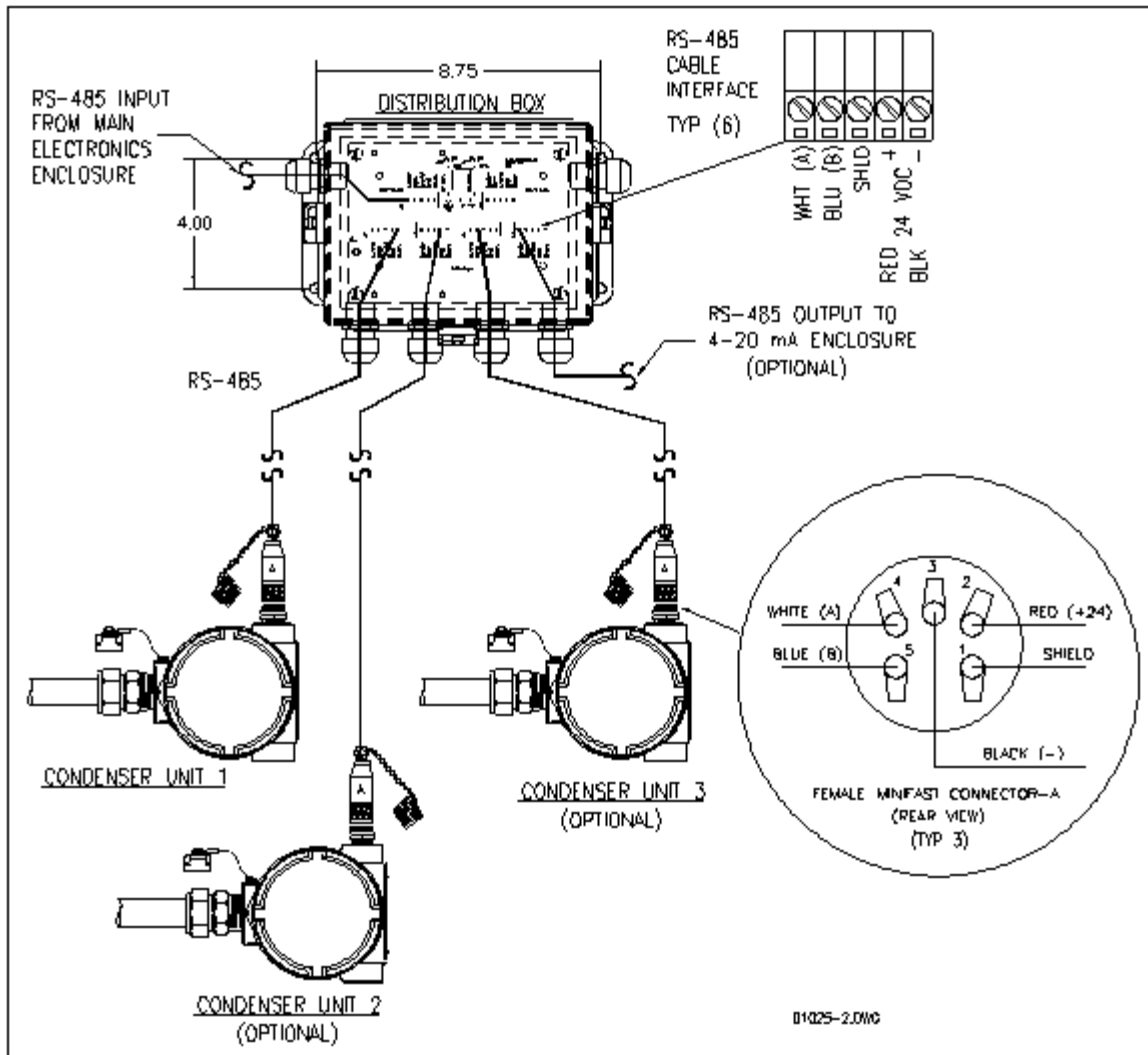


Figure 6 Distribution Box

- C. Probe - !! **CAUTION - Do not cross thread connection.** The probe is supplied with a convenient plug-in connector. The male side of the connector comes installed in the probe junction box. The female side is usually shipped loose and must be installed onto the RS-485 cable once it is run from the Distribution Box to the probe. A separate instruction sheet comes with the connector, showing the wiring connections.
- D. Transmitter Box (optional) - For driving eight (8) remote 4-20 mA analog signals from one RS-485 input port. (See Figure 8)
1. Connect the RS-485 communications/power cable from the distribution box (RS-485: white and blue wires; 24Vdc power: red and black wires).
 2. Connect up to eight (8) signal wire pairs to the indicated terminals for isolated 4-20mA outputs.
 3. Figure 8 provides the *RheoVac* wiring detail for the 8 channel 4-20 mA outputs. Table II provides the appropriate connection identification. Model 950 transmitters are configured as active (transmitter sources the current) when shipped. To change to the passive mode (receiver to source the current), extract each small 4-20 board, find the JP1 pins, and move the two jumpers from the "Act" pins to the "Pass" pins (two positions to the right of factory settings). Figure 7 shows the current output circuit. The figure also illustrates the active mode and the passive mode configurations.

Channel	Output Parameter
1	Actual volume flow
2	Total mass flow
3	Water vapor flow
4	Pressure
5	Water vapor/Air mass ratio
6	Relative saturation
7	Air in-leak
8	Temperature

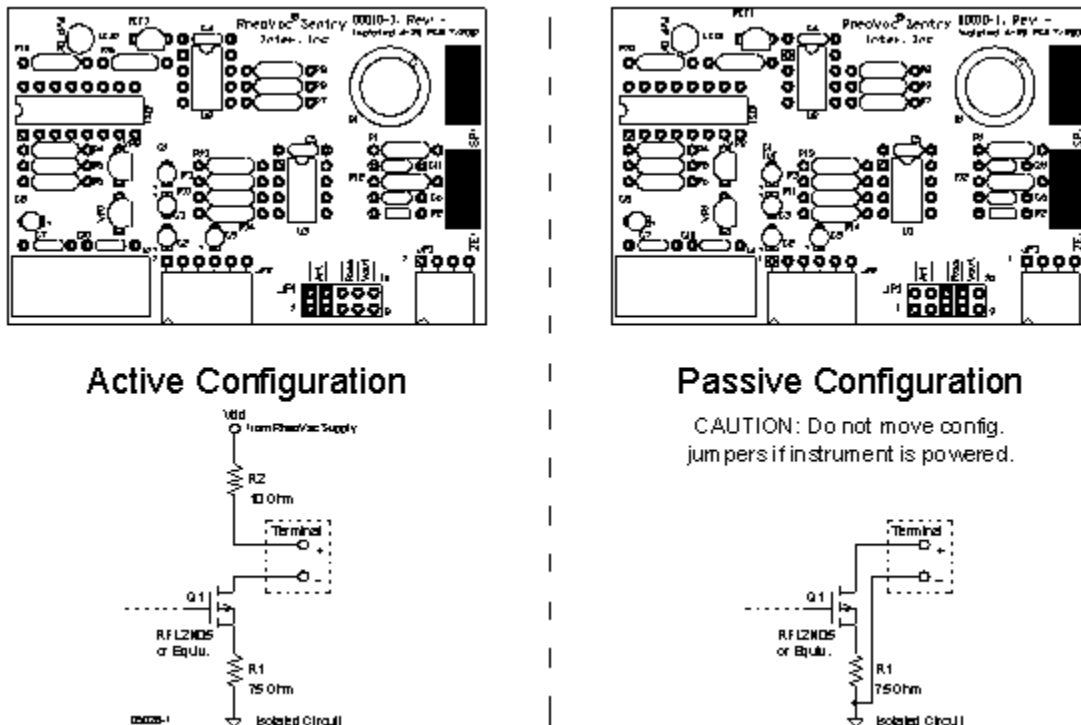


Figure 7 4-20 mA Output Circuit

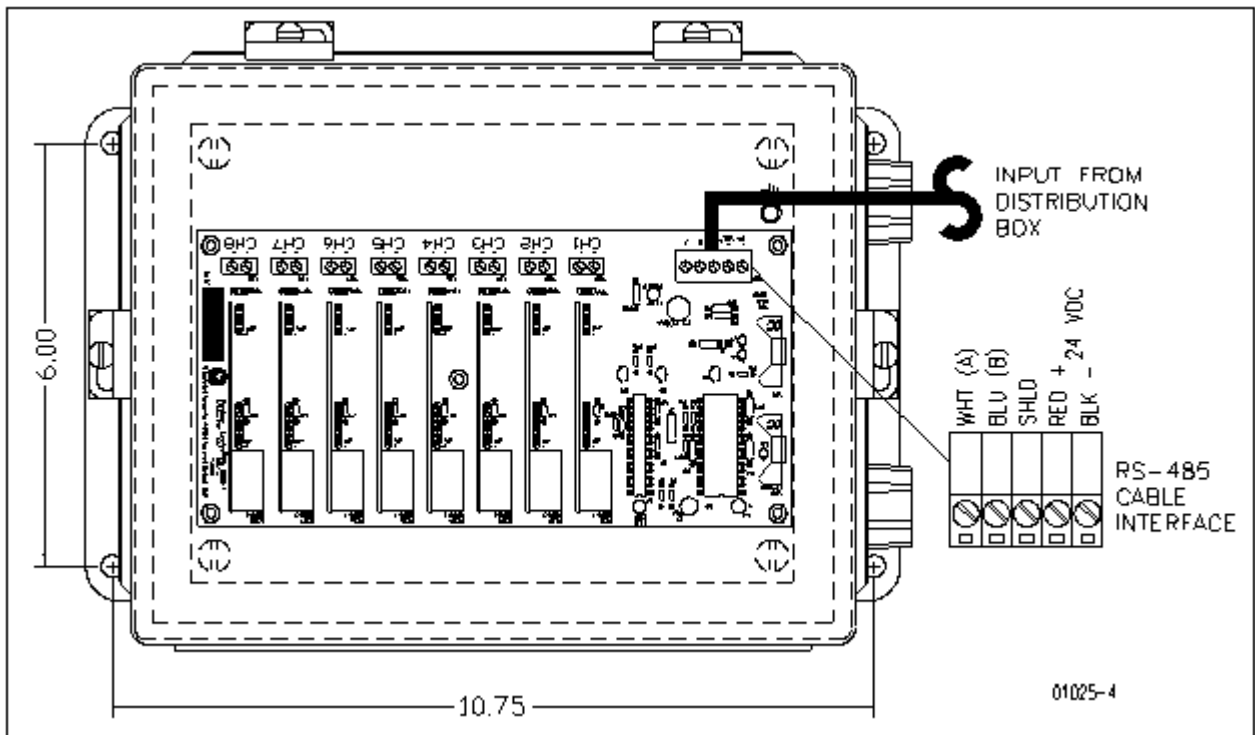


Figure 8 Optional Transmitter Box

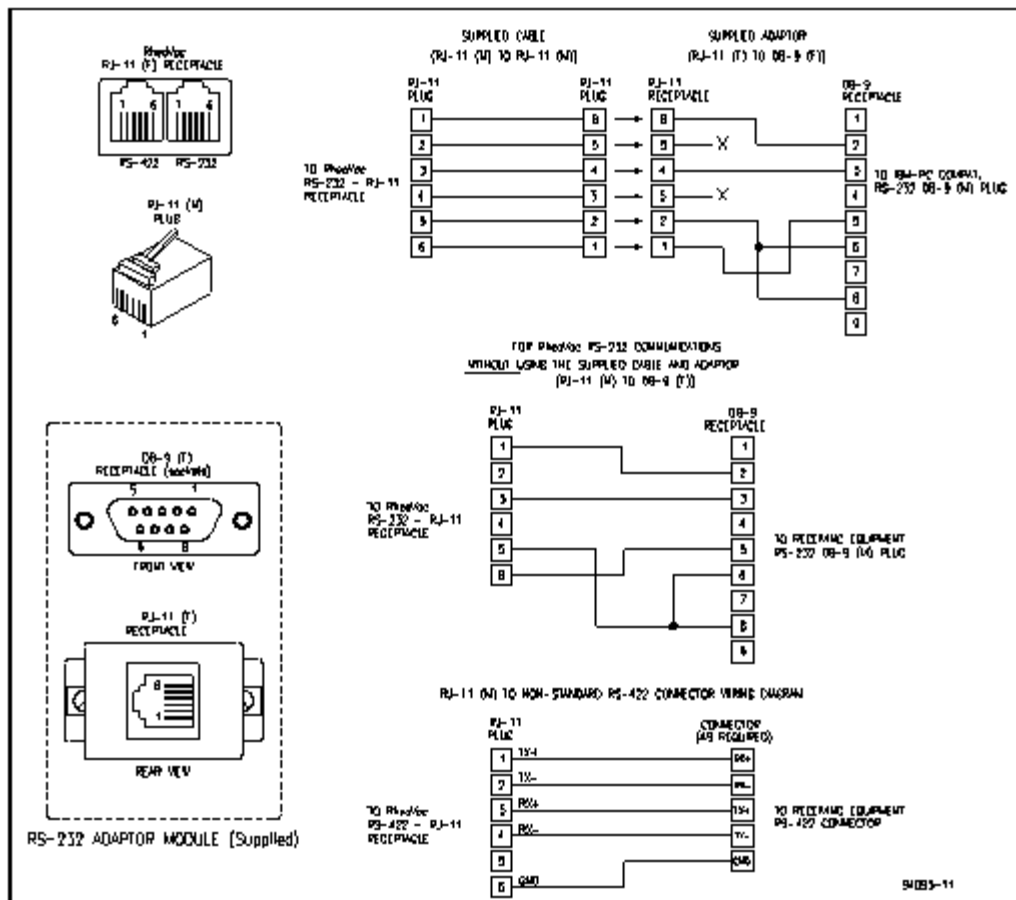


Figure 9 Serial Communications Interface

E. Cable Connection from Probe to Distribution Box

The *RheoVac* probes require special connectors to be installed on the supplied DeviceNet type 5711 cable sections that go from the Distribution Box(es) to the probes. The probes have the male mating connectors already installed. These connectors will use either the “backshell nut” or “conduit connector” (see Figure 10) depending on whether the cable is installed in a liquid-tight conduit. When installing without conduit, use the backshell nut; when using liquid-tight conduit, use the conduit connector with o-ring.

1. Slide all of the appropriate parts onto the cable as shown.
2. Strip the cable conductors as shown. The connector (Turck p/n B4151-0/9) has 5 retention screws to hold the wires in place. The use of crimp pins on the wires will greatly increase connection reliability.
3. Loosen all 5 retention screws (do not completely remove).
4. Insert the wires, in accordance with color-coding shown (see Figure 6, insert).
5. Tighten the retention screws on each wire.
6. Reassemble the connector parts (Figure 10).

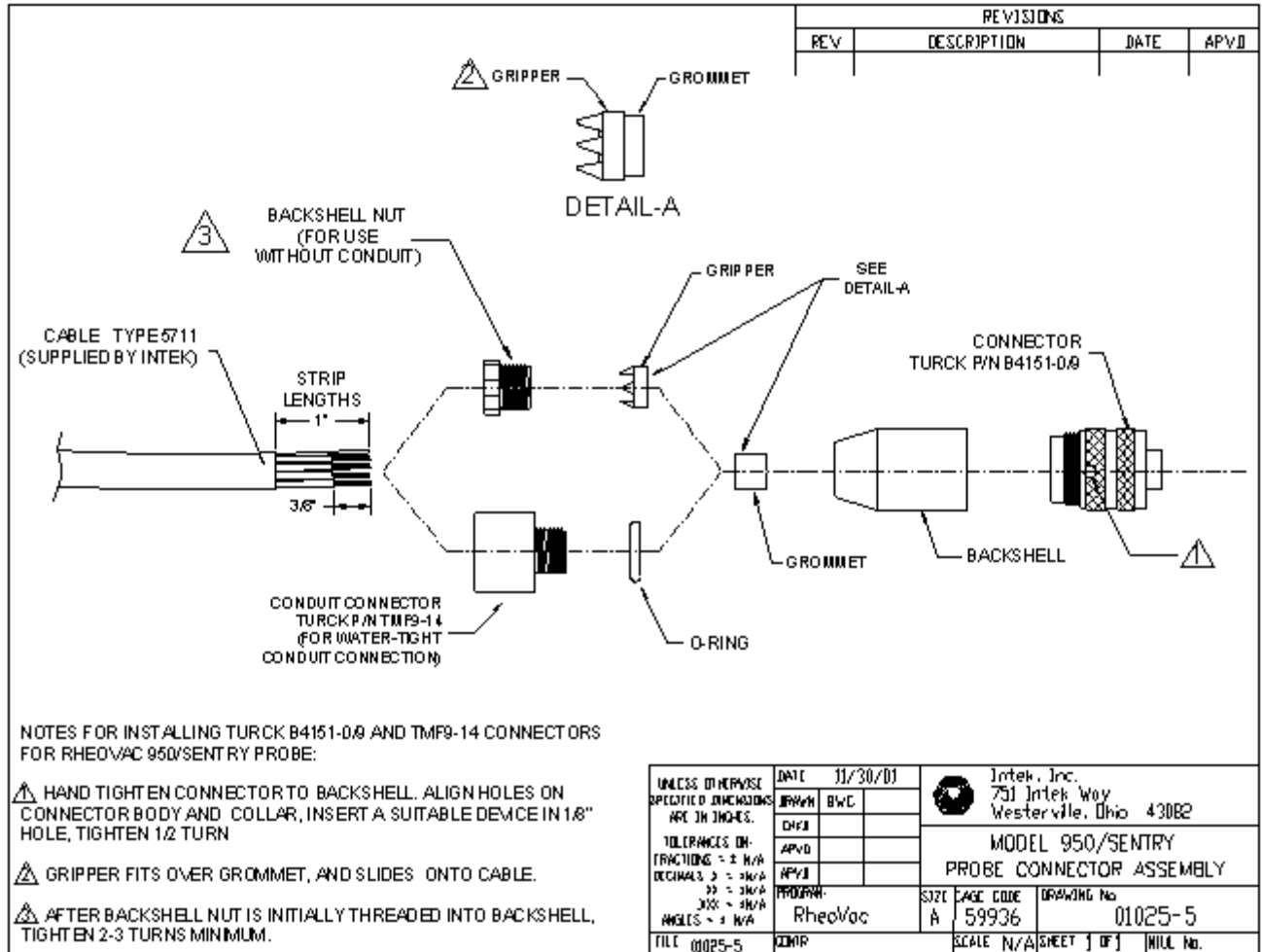


Figure 10 Probe Connector Assembly

SECTION 3 — OPERATION

3.1 GENERAL INFORMATION

The *RheoVac* system is calibrated, compensated, and linearized for a wide range of flowing media temperatures, pressures, and water vapor contents. However, abrupt changes in these parameters can cause the instrument to temporarily read the flow rate improperly, which could lead to transient spikes in the flow indication. In particular, if liquid (water) hits the probe tips, there will be high flow indications until all the water vaporizes. If liquid (water) is present for extended periods, the performance of the instrument will be compromised or the sensors can be damaged. See SECTION 2 INSTALLATION.

3.2 SYSTEM START-UP

Verify wiring from SECTION 2.5 is correct. With all power off, place the power *OFF/ON* switch, SW1, to “*ON*.” Close the main processor enclosure lid. While watching the main processor display, apply power to the instrument. After about twenty seconds the display should initialize to “*Health Check in Progress*” followed by additional initialization status messages. Within two minutes the display should indicate “Air In-Leak.”

Upon a "cold" initial start-up of the *RheoVac* system, the probe may take several minutes to give accurate readings. During this time, the probe is transitioning to thermal equilibrium conditions under vacuum.

3.3 PORTABLE USB DATA STORAGE DEVICE/Warranty Registration Instructions

Intek’s warranty program is stated at the front of the manual. To validate warranty, return the portable USB Data Storage Device after the *RheoVac* instrument has been in operation with the unit on-line for one week.

To return the portable USB Data Storage Device to Intek:

- ① Locate portable USB Data Storage Device in the main electronics enclosure (see Figure 5).
- ② Grasp bracket and carefully remove portable USB Data Storage Device.
- ③ Place portable USB Data Storage Device in the pre-addressed, padded envelope provided by Intek and mail.

The initial data stored in the device is used to verify proper operation of the *RheoVac* instrument and is required to provide baseline data for future technical support.

!! !! CAUTION Do not attempt to use non-Intek approved USB flash drives with the *RheoVac* instrument.

3.4 DISPLAY

The *RheoVac* 950 has a 2x20 alphanumeric scroll-through display that shows seven parameters for each probe. The display shows Air In-leakage, W/A Mass Ratio, Total Mass Flow, Temperature, Pressure, Relative Saturation, or Actual Volume Flow (as well as Time/Date, Software Version, or Serial Number). To change the displayed parameter, press the *Scroll* Up or Down arrows. The display units can be changed from English or Metric units by pressing the *Units* button.

If the Model 950 has two or three probes the display will show two or three serial numbers at a time, one for each probe. The numbers will be in order, from the lowest serial number to the highest, reading from left to right on the display. Example: 02611-1, 02611-2 and 02611-3.

3.5 COMMUNICATIONS

Typical *RheoVac* 950 instruments have an Ethernet port, two serial communications choices (RS-232 or RS-422) and eight 4-20mA output signals for each probe. Each process variable is a linear, fully temperature and pressure compensated value on any of these readable outputs. All 4-20 mA output signals are scaled such that 4 mA represents 0% of the rated full scale value (except temperature, which is 0°C) and 20 mA represents 100% of the rated full scale value (temperature is 100°C). The standard full scale values and definitions of all process variables are listed in Table III.

Table III. Process Variable Definitions and 4-20 mA Range*

PROCESS VARIABLE	4-20 mA FULL SCALE VALUE	PROCESS VARIABLE DEFINITION
ACTUAL VOLUME FLOW ACFM [m ³ /hr]	5000 [8,500]	The actual volumetric flow rate of gases leaving the condenser. It is a measure of exhauster capacity. Decreased capacity means pump degradation.
TOTAL MASS FLOW lbs/hr [kg/hr]	10000 [4,536]	The total mass flow rate of the flowing gas. Note: this value is not a measure of air in-leak. It is a measure of total vapor and air removal and exhauster operating capacity.
WATER VAPOR MASS FLOW lbs/hr [kg/hr]	8000 [3,629]	The water vapor component of the flowing gas being removed from the condenser.
<i>RheoVac</i> PRESSURE " Hg [mm Hg]	30 [762]	Absolute pressure at the <i>RheoVac</i> probe head. Should be equal to or less than turbine back pressure.
WATER VAPOR SPECIFIC VOLUME [cu. ft/lb]	N/A	The inverse density of the water vapor present in the line. Not supplied as 4-20mA output.
WATER to AIR MASS RATIO	20	Ratio of water vapor flow rate to dry air flow rate. Defines "vacuum quality."
RELATIVE SATURATION [%]	100	The percent concentration of water vapor in the extraction line relative to saturation.
PARTIAL PRESSURE, WATER "Hg [mm Hg]	N/A	The partial pressure of water vapor in the vacuum line. Not supplied as 4-20mA output.
AIR IN-LEAK SCFM [nm ³ /hr]	100 [169.9]	Actual measure of air volume flow rate passing the <i>RheoVac</i> sensor head, normalized to standard conditions (70°F, 29.9" HgA).
<i>RheoVac</i> TEMPERATURE °F [°C]	212 [100]	4 mA = 0°C/32°F 20 mA = 100°C/212°F Temperature of the flow media at the <i>RheoVac</i> probe head.

* See Custom Information section (Section 6) for custom units of measure.

Communication with the *RheoVac* unit using Intek supplied software is discussed in Appendix A of this manual.

3.6 DATA PROCESSING

TABLE IV. Column Headings for Data Downloads and Archived Data*

Time Stamp (Time of day)	Actual Volume Flow (ACFM)	Total Mass Flow (lbs/hr)	Water Vapor Flow (lbs/hr)	<i>RheoVac</i> Pressure ($"\text{Hg}$ abs)	Water Vapor Sp. Vol. (Cu. ft/lb)	Water to Air Mass Ratio (lb/lb)	Relative Saturation (%)	H ₂ O Partial Pressure ($"\text{Hg}$ abs)	Air Flow In-Leak (SCFM)	Probe Temp. ($^{\circ}\text{F}$)
0	1	2	3	4	5	6	7	8	9	10

* See Custom Information section (Section 6) for custom units of measure.

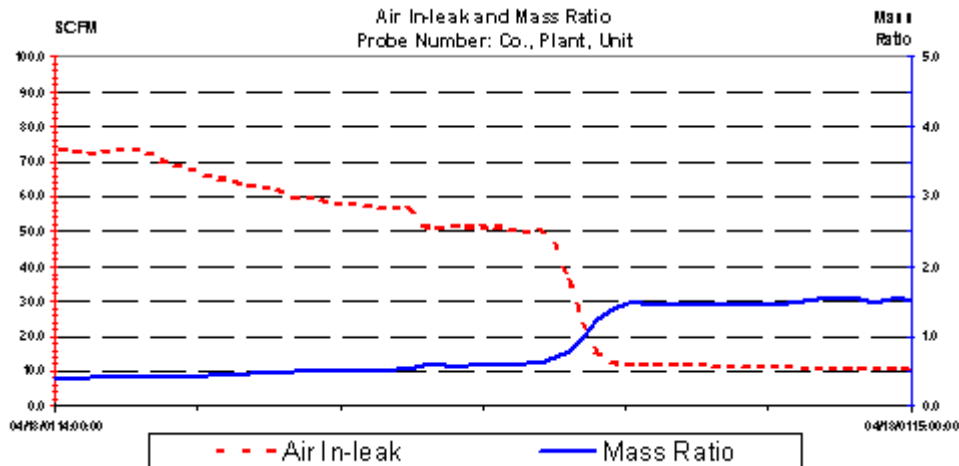
A very important part of understanding your condenser system comes from evaluating the data that is created and stored by the *RheoVac* instrument. The ability to evaluate data has been greatly enhanced with the *RheoVac* Model 950 by providing nearly unlimited data storage capacity. A data file is created for each calendar day that the monitor is operating. The ability to review stored data has been invaluable when troubleshooting condenser problems.

The importance of reviewing graphed data cannot be overstated. Reviewing data for normal operating conditions will greatly decrease the time needed to troubleshoot problem conditions when they arise. To simplify the graphing process, an Excel add-in has been created by the technical support team at Intek and is included with your *RheoVac* user software. This Excel add-in graphing utility, called *RheoGraph*, is an automated graphing macro that imports and graphs *RheoVac* data files.

The *RheoGraph* utility is contained in a self-extracting zip file called “*InstallRheoGraph.exe*” on the User Interface software CD. Executing the file will begin the menu driven installation process. The default installation path is to C:\RheoVac, do not change this path name during installation. The file *RheoGraph.xla* will be copied to the installation folder along with help files, sample data, and a readme text file. Microsoft Excel is required for the add-in to function.

Executing *RheoGraph.xla* will launch Excel and the graphing menu will appear. Selecting Auto will prompt the user to enter Company, Plant, and Unit info, which will be placed in the graph titles. Then the user is prompted to browse to the data file to be graphed. The data will be inserted into a spreadsheet page and four graph pages will then be automatically added as separate tabs in the workbook. When the graphs are complete, macro execution terminates.

Several advanced features are available by selecting Advanced on the Auto Start menu. For additional help, use the keyboard arrow keys to set focus on any button, then press F1. The following is an example of one of the graphs made by *RheoGraph* showing air in-leak and water vapor to air mass ratio.



3.7 CUSTOM SOFTWARE

Custom software may be developed by the user to receive and archive *RheoVac* data into a computer system. The electronics has a serial data protocol of 9600 baud, no parity check, eight data bits and one stop bit (i.e., 9600,N,8,1). Each transmitted group of data is sent in a standard ASCII coded format representing each process variable value, instrument identification and status information.

The data stream consists of 13 fields, followed by a carriage return <RETURN>. The first ten fields, nine bytes each, are the process variables. Following the process variables are the *RheoVac* serial number, nine bytes, the process identification tag number, 15 bytes, and the *RheoVac* system status, seven bytes. The data stream is then ended by a single <RETURN> byte (ASCII code 13). The total number of bytes transmitted in each data stream is 122 bytes per probe including the trailing <RETURN>. This data group is sent approximately once every three seconds. Table V shows the field names and number of bytes in one data stream.

TABLE V. Serial Output Data Stream**

Actual Volume Flow (ACFM)	Total Mass Flow (lbs/hr)	Water Vapor Flow (lbs/hr)	<i>RheoVac</i> Pressure ("Hg abs)	Water Vapor Sp. Vol. (ft ³ /16)	Water to Air Mass Ratio (lb/lb)	Relative Saturation (%)	H ₂ O Partial Pressure ("Hg abs)	Air Flow In-Leak (SCFM)	Probe Temp. (°F)	Instr. Serial Number	ID Tag No.	Status	Tem. <CR>
9 bytes	9 bytes	9 bytes	9 bytes	9 bytes	9 bytes	9 bytes	9 bytes	9 bytes	9 bytes	9 bytes	15 bytes	7 bytes	1 byte

** See Custom Information section (Section 6) for custom units of measure.

Each of the first ten process values are sent in the fixed decimal format of XXXX.XXXX with leading and trailing zeros inserted to maintain the nine character length. The next three fields are ASCII text strings followed by the <RETURN>. Example: The nine bytes for an air in-leak of 10.0 SCFM would be: 0010.0000, or 48,48,49,48,46,48,48,48,48 ASCII.

SECTION 4 — MAINTENANCE

4.1 GENERAL MAINTENANCE

Precautions should be taken to insure proper performance of all sensors. Since the quantification technique involves signal measurements, care should be exercised to prevent build-up of dirt and/or corrosive layers on the various terminal strip connections. Periodic checks with necessary cleaning should be performed to insure clean terminals. The joints of the sensor leads should occasionally be inspected for corrosion or presence of moisture.

4.2 CALIBRATION

The *RheoVac* instrument is calibrated at the factory in a calibration system which replicates the condenser and vacuum line environment. The system is designed to simulate the temperature, pressure, water vapor relative saturation and flow rate under the gaseous fluid conditions found within the power plant vacuum line.

In general, calibrations should be valid over a two year period if the probe is well maintained. Should the unit require re-ranging or recalibration, note the serial number of the *RheoVac* instrument and contact the factory concerning recalibration cost and turn around times. Refer to SECTION 5 CUSTOMER SERVICE of this manual for additional information.

4.3 SPARE PARTS

It is advantageous to have a spare probe. Should a spare probe be desired, it can be ordered and stored for installation at any time. A spare probe will come with a parameter disk for uploading from a laptop.

Spare fuses should be available for replacement of blown fuses. Appropriate fuses to stock are:

500 mA fuse, slow blow, Wickmann part number 3720500041 or equivalent, for probes.

1 A fuse, slow blow, Wickmann part number 372110041 or equivalent, for the main electronics.

There are no other normally recommended spare components to stock.

To replace the fuse in the main electronics: locate the AC Power Input board (shown in Figure 5) in the lower right hand corner of the main electronics box. Slide the power switch to the “OFF” position to disable power to the electronics. The fuses are shown at locations F1 and F2 (spare). Gently pull the fuse(s) from their sockets and gently insert the replacement 1 Amp fuse(s) as appropriate. Slide the power switch back to the “ON” position to enable power to the electronics. Close hinged lid and verify display backlight is on. Clamp close the enclosure lid, and tighten the latch screws.

4.4 TROUBLESHOOTING

Table VI provides a guide for plant personnel to identify causes of problems and determine appropriate actions to resolve problems observed. If problems are encountered and factory assistance is desired, please contact the factory.

TABLE VI. Troubleshooting Guide

MESSAGE CODE Description/Symptom	PROBABLE CAUSE	ACTION
MSG-0 <i>Communications not being received from probe(s)</i>	<ol style="list-style-type: none"> 1. Improper cable hookup 2. Blown main fuse 3. Failed RS-485 circuit 4. Damaged flow sensor 	<ol style="list-style-type: none"> 1. Verify plug-in connector properly mated 2. Check all cable connections 3. Check F1 fuse on probe board 4. Contact factory
MSG-1 <i>Invalid data received from probe(s)</i>	<ol style="list-style-type: none"> 1. Failed RS-485 communications component 	<ol style="list-style-type: none"> 1. Check wiring 2. Contact factory
MSG-2 <i>Flow sensor heater "OFF"</i>	<ol style="list-style-type: none"> 1. Blown heater fuse 2. Failed electronic component 	<ol style="list-style-type: none"> 1. Contact factory
MSG-3 <i>Relative saturation sensor power "OFF"</i>	<ol style="list-style-type: none"> 1. Probe temperature too high 	<ol style="list-style-type: none"> 1. Check to be sure probe temperature is <160°F 2. Contact factory
MSG-4 <i>RS heater "FF"</i>	<ol style="list-style-type: none"> 1. Component failure 	<ol style="list-style-type: none"> 1. Contact factory
MSG-5 <i>Pressure sensor heater "FF"</i>	<ol style="list-style-type: none"> 1. Problem with pressure port circuitry 	<ol style="list-style-type: none"> 1. Contact factory
MSG-6 <i>Temperature alarm (above 210°F/99°C)</i>	<ol style="list-style-type: none"> 1. Steam in exhaust pipe 	<ol style="list-style-type: none"> 1. Remove probe or cool line ASAP! Once line has cooled down and probe is reinstalled, check unit for proper function
MSG-7 <i>Wet probe</i>	<ol style="list-style-type: none"> 1. This usually indicates a condenser design or operation problem that requires corrective action 2. Hogging mode during start-up 	<ol style="list-style-type: none"> 1. Contact factory
MSG-8 <i>RS sensor problem</i>	<ol style="list-style-type: none"> 1. RS sensor has failed 	<ol style="list-style-type: none"> 2. Contact factory
Mass flow output saturates high , will not respond to flow changes	<ol style="list-style-type: none"> 1. Flow rate is not within range of calibration 2. Blown heater fuse 3. Failed electronic component 	<ol style="list-style-type: none"> 1. Contact factory about re-ranging instrument 2. Replace fuse 3. Contact factory
Mass flow output saturates low , will not respond to flow changes	<ol style="list-style-type: none"> 1. Flow rate is not within range of calibration 2. Failed electronic component 	<ol style="list-style-type: none"> 1. Contact factory about re-ranging instrument 2. Contact factory

When using the *RheoVac* software on a PC, the software may give you a “Communication Error or Message.” Use the Table VII to determine the source of this message and appropriate action.

Note: If the *RheoVac* instrument is operating without message indications but output readings are questionable, please send to Intek by telefax or e-mail the following plant data: turbine back pressure, hot well temperature, load, and inlet and outlet circulation water temperatures, along with at least 24 hours of data from the *RheoVac* instrument/probe for the same time period.

TABLE VII. Troubleshooting Guide (software communication errors)

OBSERVATION	PROBABLE CAUSE	ACTION
<i>Appears the first time the application was executed</i>	<ol style="list-style-type: none"> 1. Instrument not connected to the software defaulted serial port 2. Communication connections not made or instrument is not powered 	<ol style="list-style-type: none"> 1. Change serial comm port setting and hit "Retry" 2. Check connections and instrument power
<i>Appears intermittently after application has been running normally</i>	<ol style="list-style-type: none"> 1. Electrical noise interfering with communications 2. Too many applications running in windows 3. Another application is conflicting with this comm port or IRQ 	<ol style="list-style-type: none"> 1. Change to RS-422 communications, re-route or shield cable 2. Close other applications until problem self corrects 3. Change to a different comm port
<i>Completely stops working after application was been running normally</i>	<ol style="list-style-type: none"> 1. Instrument has stopped communicating 2. Loose or damaged communication connection 	<ol style="list-style-type: none"> 1. Check instrument power or look at instrument display for fault status 2. Check cable adapter at back of PC or at any other splices or at instrument
<i>Cannot be made to work at all with Com3 or Com4</i>	<ol style="list-style-type: none"> 1. Works fine on Com1 or Com2 but does not work on other port due to other hardware conflicts such as a modem 	<ol style="list-style-type: none"> 1. Using Windows Control Panel - System utility, check for IRQ or I/O hardware conflict - ADVANCED USERS ONLY

Note: Windows is a registered trademark of Microsoft Corporation in the United States and other countries.

4.5 HARDWARE AND SOFTWARE MODIFICATIONS AND UPGRADES

Note: The workgroup setting of the identification tab in Network Neighborhood Properties must be set to WORKGROUP which is the Windows 98 default setting. A Cat5 crossover network cable is required for proper Ethernet network communication to the *RheoVac* instrument.

4.5.1 UPDATING SOFTWARE

Normally, updating the main software residing on the *RheoVac* Model 950 should not need to be done by the user. However, software improvements or other factors may necessitate a user installation or upgrade of a new main program. When this is required, instructions will be supplied.

4.5.2 REPLACING PROBES

If it is necessary to replace one of the probes, a new probe and diskette (with probe-specific calibration data) can be ordered from Intek.

4.5.3 ADDING ADDITIONAL PROBES (maximum total probes is 3)

Each *RheoVac* Model 950 can communicate with up to three probes simultaneously. Additional probes can be easily added to systems that have fewer than three probes.

Each additional probe will be shipped with a set of calibration files that must be installed on the *RheoVac* instrument. Refer to drawings for mechanical and electrical connections. Specific instructions will be supplied with the probe(s).

SECTION 5 — CUSTOMER SERVICE

Intek's corporate philosophy is to help solve our customers' difficult flow measurement problems. When you purchase a *RheoVac* system you also receive Intek's outstanding customer service. For sales or product service, call your local representative or Intek directly at (614) 895-0301 8AM to 5PM EST/EDT weekdays or fax us anytime at (614) 895-0319. E-mail inquiries should be sent to sales@Intekflow.com or techsupport@Intekflow.com. Our customer service staff will provide assistance promptly.

5.1 QUESTIONS ON EXISTING HARDWARE

To allow us to help you more quickly, please have the serial number of the equipment available before you call.

5.2 TROUBLESHOOTING

If you have reviewed SECTION 4.4 TROUBLESHOOTING and have questions, please call our experienced engineers for assistance. In many cases we can solve a problem over the phone. Please provide as complete a description as possible of the problems encountered.

5.3 FACTORY AND FIELD SERVICE

If you request field service to help with condenser performance problems, Intek has, for a fee, experienced engineers available to meet your needs. For *RheoVac* instrument related questions, if a problem cannot be solved over the phone, with your help, we will determine if factory service or field service will be the best solution. Be sure to carefully pack the instrument/electronics; extra care should be taken to protect the probes from damage in shipment.

To request factory service on your instrument, a Return Material Authorization (RMA) and purchase order is required. Our customer service staff will assist you with the required information to return instruments for service.

5.4 QUESTIONS ON NEW EQUIPMENT

For a new *RheoVac* system or any liquid or gas flow meter or flow switch need, contact the Intek technical sales department at the above phone/fax numbers. Our staff will be pleased to answer all questions and provide our recommended solutions or instruments.

5.5 CONDENSER SERVICES

Intek has developed unique solutions for plants experiencing problems with dissolved oxygen, heat rate and excessive back pressure. We provide comprehensive condenser diagnostic and report services. Plant and *RheoVac* data is automatically transmitted to Intek and results are published via online reporting and regular hard copy reports. For a quotation, please call us at the numbers listed above.

SECTION 6 — CUSTOM INFORMATION

6.1 UNIT IDENTIFICATION

Model no.: _____

Serial no.: _____

Customer identification: _____

6.2 CONFIGURATION

The marked (X) items denote the configuration of this unit, as originally shipped from the factory.

Pipe Connection: Hot tap with 1½" MNPT connection

Input Power: 100-250 Vac, 50/60 Hz

Outputs:

Analog: 8 outputs (4-20mA) for each probe

Digital: Ethernet
 RS-232/RS-422

Data Access: Ethernet communication

Portable Data Storage: Portable USB Data Storage Device

Enclosures shipped:

- Processor Box
- Distribution Box
- Transmitter Box

Cables Shipped:

- 5711 interconnect cable (RS485) - _____
- Cat5 Ethernet cable - 10 ft.
- RS232 communication - 20 ft.

Software: Windows compatible *RheoVac* 950 software on CD - Version _____

Calibrated for customer line size of _____ inches, schedule _____

6.3 SPECIAL INSTRUCTIONS

APPENDIX A - *RheoVac*[®] Instrument User Interface Software

A.1 INTRODUCTION

User Interface Software (UIS) is provided on CD-ROM with every *RheoVac* instrument. This software is used to communicate with the *RheoVac* unit from a User Interface Computer (UIC). Some of the functions of the software can be performed using a serial cable, while all functions are available using an Ethernet connection. An Ethernet crossover cable is provided with each *RheoVac* instrument for the purpose of connecting a UIC directly to the *RheoVac* unit. The network functions are also capable of being used from any network computer if the *RheoVac* instrument is connected directly to the same network. In this case, the supplied crossover cable is not used; rather a straight, high noise-immune Ethernet cable with RJ-45 plug is used (supplied by customer).

Most details regarding use of the software can be found in the active help files from the pull down **Help** menu when using the software.

A.2 SOFTWARE INSTALLATION

A User Interface Computer (UIC) is required to access stored data and real time data of all parameters. A laptop is suggested for easy access to the main processor unit. Intek does not supply UICs but recommends the following System Requirements (minimum recommended):

Minimum System Requirements:

- Windows 98, Windows NT, Windows 2000 or Windows XP Operating Systems
- Pentium III, 400 MHZ processor with 128 MB RAM
- SVGA 800 x 600 display
- One CD-ROM drive
- One 10/100 Ethernet Port

Recommended (Optional):

- One 3.5 inch floppy disk drive (probe recalibration data files can be provided on diskette)
- One RS-232 serial port with DB-9 connector

The User Interface Software should be installed onto the User Interface Computer. Install the software by inserting the CD-ROM supplied with the manual into the CD-ROM drive and follow the on screen prompts. A folder, C:\RHEOVAC will be created and files will be copied to this folder. The executable file is **RheoVac User Interface.exe** and the others are drivers and configuration files that must remain in the RHEOVAC folder. If a previous version of User Interface Software is on the UIC, you will need to launch the installer a 2nd time.

A.3 USER INTERFACE SOFTWARE (UIS) SELECTION

After installation, the user interface is initiated by selecting [START\PROGRAMS\RHEOVAC\RHEOVAC USER INTERFACE]. The main menu appears, prompting for a selection of RS-232 Serial Communication or Ethernet Communication Utility. A list of functions for each utility appears below the green selection buttons.

Make sure the proper cable connection has been made and select the desired communication type by clicking on either green button.

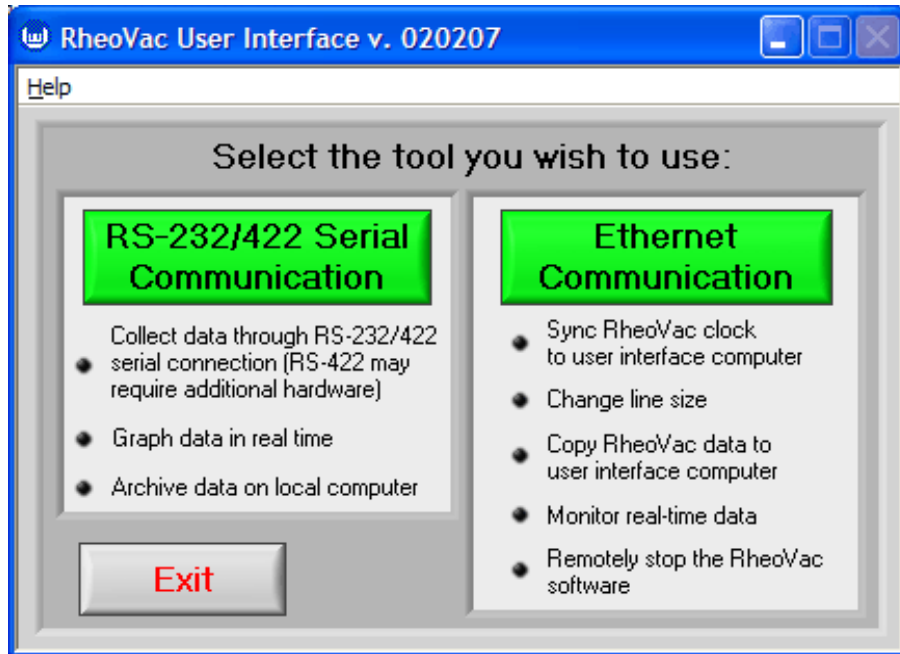


Figure A - Initial UIS computer Screen

A.4 RS-232/422 COMMUNICATION

This function requires a serial cable and connector, available on request, to connect the UIC and the *RheoVac* instrument electronics. This connection allows the user to view real time data of important parameters in a convenient gauge screen layout. From this gauge screen, the user may choose to graph a single parameter for all probes, graph all parameters for a single probe, or archive data directly to the UIC. The archive rate can also be adjusted. These are the only functions available using serial communication. No commands or updates can be sent to the *RheoVac* instrument using this communication method.

A.5 ETHERNET COMMUNICATION

User interface using Ethernet connection allows the user to: synchronize the *RheoVac* clock with the UIC clock, retrieve stored data¹, update files¹, change line size, and access data. These network access utilities are performed from a user interface computer (UIC) connected directly (peer-to-peer) to the *RheoVac* unit using a crossover network cable or from a network computer when the *RheoVac* instrument is connected to a network (LAN/WAN)² using a straight Ethernet cable.

Each *RheoVac* instrument is identified by a unique network ID. The ID begins with the letter “R” followed by the first five digits of the serial number found on the unit. (*RheoVac* Model 950 devices which have not been serviced by the factory since 2005 may use the serial numbers or “*RheoVac*

¹ File transfer can also be accomplished using Windows Explorer or Network Neighborhood

² Specific network set-up at Intek may be required.

950" network ID). The user must select the network ID from the pull down menu following the selection of Ethernet Communication utility from the Main Menu. If the Network ID is not in the list, select Add New ID and enter the correct six character Network ID. When a new ID is added to the list, it will be saved as the default for later use. Selecting the correct ID will initiate communication with the *RheoVac* instrument. Software features, in addition to those detailed above, are described within the User Interface Software itself.

A.6 SOFTWARE OPERATION

1. Set Clock (available with Ethernet connection only): Initiating this action will reset the *RheoVac* time clock to agree with the time on your UIC. Make sure the UIC has the correct time before proceeding.
2. Change Line Size (available with Ethernet connection only): Use this option to update the instrument's stored line size variable for proper volume and mass flow calculations. You should only need this option if the probe is installed in a pipe size that is different from the value set in the instrument at the factory. In Ethernet Communication, click on the Line Size tab. On the pull down menu for pipe size, click on the new value, then click on **Save**. Click **Load** to verify that the change was saved by the instrument.
3. Update Files (available with Ethernet connection only): If the probes are ever returned for recalibration, or some other change in the *RheoVac* operating software is needed, this tab will be used. Do not use it until then. Instructions will be supplied at that time.
4. Retrieve Data (available with Ethernet connection only): Stored data can be easily accessed via Ethernet connection from the *RheoVac* instrument to the UIC.

The *RheoVac* software creates a new data file each day. The file name is in the following format:

MMDDYY - P.dat
where MM = two digit month
DD = two digit day
YY = two digit year
P = probe designator (1, 2, or 3)
.dat = file extension

These data files are stored in tab delimited text format. See SECTION 3.5 to process data.

To copy a file for analysis, you must access the files on the *RheoVac* instrument. Open Windows Explorer on the UIC. Type \\Network ID\RHEOVAC\DATA (*Network ID* is generally "R" plus the first 5 digits of the serial number; see section A.5) on the address line and press enter. **Be careful not to alter any support files in this data folder.** Use the copy/paste functions (copy - Ctrl C; paste - Ctrl V) to put data files (.dat) on the UIC.

5. Monitor Data (available with Ethernet or RS-232 connection): Once RS-232 or Ethernet is selected, the first screen, Figure B, shows the most recent value for each parameter.

Click on the small graph image to view a historical graph of that parameter. Select from all available probes by clicking on the **Probe S/N** menu.

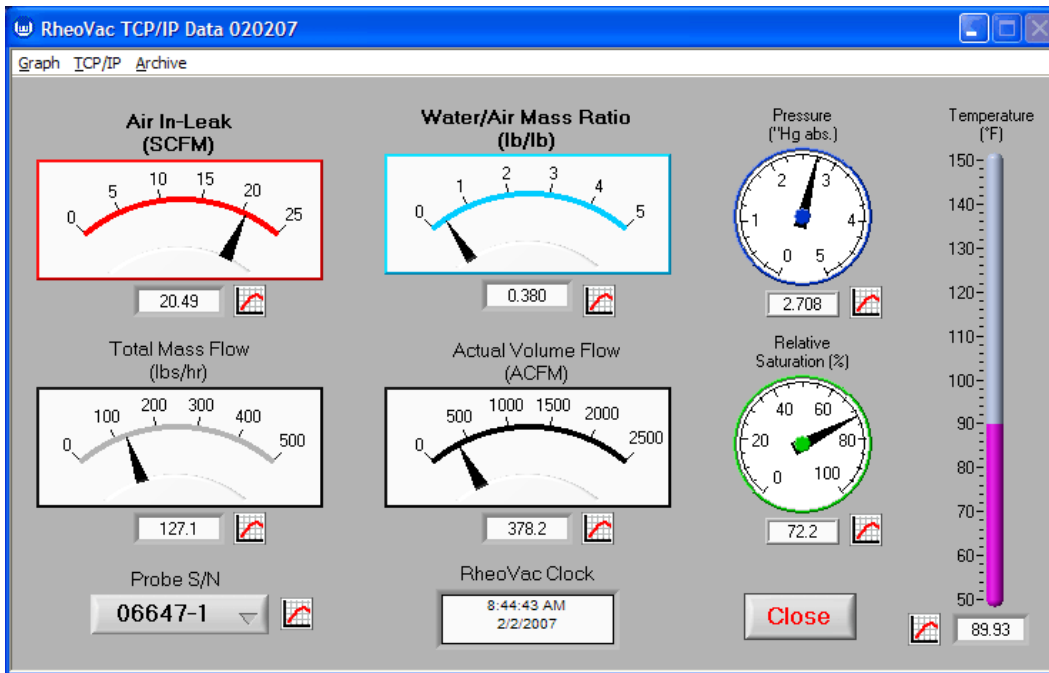


Figure B - User Interface Software Data Monitor Feature

To do real-time graphing, select from the graph menu. The screen shown in Figure C appears.

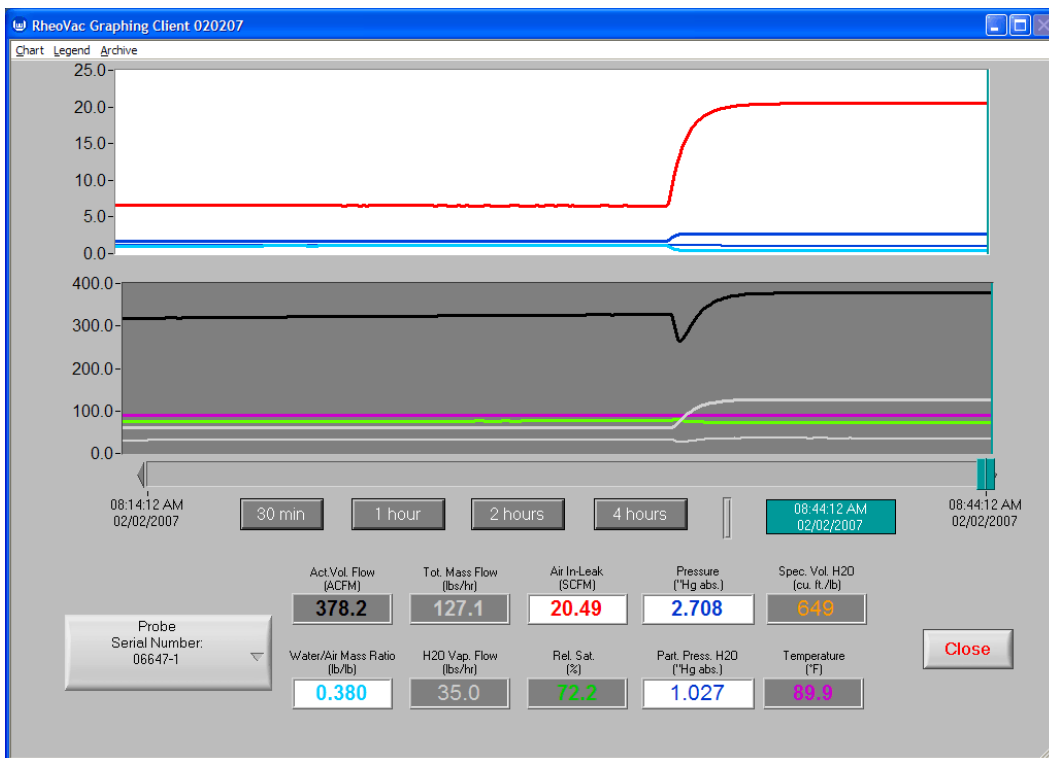


Figure C - User Interface Software Graph Feature

This screen can be divided into four parts:

1. The Chart (or charts)
2. The X-Axis Controls
3. The Legend
4. The User Menu

These four parts work together in the following ways: As soon as the software is opened and valid communication is established, the data collected for each probe is plotted on the chart(s). The newest data points are displayed on the right of the chart and push older data points to the left, much like many old-style strip chart recorders.

The horizontal scroll bar immediately below the chart(s) can be used to select which data points (i.e., data from a specific timestamp) from the chart are displayed on the legend below. Data points can be selected either by clicking-and-dragging the scroll bar pointer or by simply single-clicking a spot on the scroll bar.

The four buttons below and to the left of the scroll bar labeled **30 min**, **1 hour**, **2 hour**, and **4 hour** can be used to quickly set the x-axis range of the chart(s) and the scroll bar. When using these buttons keep in mind that the maximum x-axis value is always used as a reference and only the minimum displayed x-axis value will be changed. You can also change both the minimum and maximum x-axis value by double-clicking them with your mouse and entering a new value with your keyboard. Changing the range of the chart (X or Y axis) changes only the data that is displayed and does not delete or alter the data in any way.

The blue block (time/date) to the right of the **4 hour** button displays the timestamp for the data point currently being pointed to by the horizontal scroll bar. If the scroll bar is in the right-most position, this value will automatically update when new data is received from the connected instrument.

The legend at the bottom of the screen displays the value of the data being pointed to by the scroll bar and also is used to control where each data parameter is plotted. To access this feature single-click on any parameter in the legend. Two things will happen. First, the background color of the selected parameter will change in the legend, and second, the parameter will disappear from the chart if you are in single-chart mode or jump from one chart to the other if you are in dual-chart mode.

Single-chart and dual-chart modes are the first two selections available in the chart user menu. Also available in the chart menu are selections to choose between manual and auto scaling for the y-axis and to reset the maximum x-axis value to the most recently collected data point.

The legend menu is used to select which parameter or which probe is displayed. If a parameter is chosen from this menu, that parameter will be displayed for all probes connected to the instrument. If a probe is selected, then all parameters for that probe will be displayed.

The archive menu is used to set the rate that data will be archived to the hard disk of the computer on which the user has installed the User Interface Software. These selections have no effect on the data that is stored every minute on the hard disk of the *RheoVac* instrument itself. Data archived

to the user's hard disk is stored in the "C:\RHEOVAC\DATA\" directory. The data is subdivided into folders for each probe. A new file for each probe will be created each day that data is archived.

A.7 WARRANTY REGISTRATION/TECHNICAL SUPPORT

Sending Data to Intek: **!!!! IMPORTANT !!!!**

If the instrument is equipped with a portable USB data storage device as shown in Figure 5 (in the main manual), remove this storage device after one week of operation and send to "Intek, Inc., 751 Intek Way, Westerville, OH 43082" to activate/secure warranty registration. This storage device is programmed to capture the initial baseline data recorded by the *RheoVac* instrument.

The following paragraph is applicable to *RheoVac* 950 instrument users only:

The availability of plant data for periods corresponding to the *RheoVac* data are important to proper diagnostic evaluation. Plant data of interest to the factory for the same time period are: turbine back pressure, hotwell temperature, load, and inlet and outlet circulation water temperatures. The plant data is necessary for correlating *RheoVac* measured data. The availability of this information at the factory is very important to Intek's ability to assist you in troubleshooting your instrument and/or to respond to inquiries. This provides a baseline for the system and will help us support you should future system problems arise. Our experienced support engineers can access the "before" and "after" effects of an upset and work with you to identify and understand the problem, and develop solutions. Additionally, most air removal piping conditions that are detrimental to probe operation can be diagnosed before probe damage occurs. For this reason, we require a data download one week after the *RheoVac* system is placed into service. The download activates the one year warranty service.

Alternately, you may send to the factory an initial week or so of data (zipped format is preferred). The simplest way is to copy all data files and the 'event.log' file to your UIC and send it via email to techsupport@intekflow.com.

Note: Windows is a registered trademark of Microsoft Corporation in the United States and other countries.

APPENDIX B - *RheoVac* Model 950 Networking

B.1 INTRODUCTION

Use these instructions when making a peer-to-peer Ethernet connection between the *RheoVac* 950 and the User Interface Computer (UIC), or an Ethernet connection between the *RheoVac* 950 and a Local Area Network (LAN). Locate the section that covers your operating software.

B.2 WINDOWS 98 OR WINDOWS ME OPERATING SYSTEM

1. Ethernet Cable:
 - a. UIC Connection: use CAT5 network crossover cable (supplied by Intek) to connect the Ethernet port of the UIC to the Ethernet port on the *RheoVac* 950.
 - b. LAN Connection: use CAT5 straight high noise-immune Ethernet cable (not supplied) with RJ45 plug to connect the Ethernet port of the LAN to the Ethernet port of the *RheoVac* 950.
2. Workgroup Identification: Unless otherwise requested, the Workgroup identification for the *RheoVac* 950 will be WORKGROUP, which is the Windows 98 default setting. To check/set the workgroup name: Right click on the Network Neighborhood icon on the UIC desktop. Select **Properties** from the menu that appears. Select the **Identification** tab of the Network dialog box that appears. Verify that Workgroup is WORKGROUP.
3. Check for Installed Network Components: Right click on the **Network Neighborhood** icon on the UIC or LAN computer desktop. Select **Properties** from the menu that appears. Select the **Configuration** tab of the Network dialog box that appears. In the list under “The following network components are installed” there should be all three of the following: Client for Microsoft Networks, Ethernet adapter, and NetBEUI (with the Ethernet adapter identified on the same line next to it). Each will have a different icon associated with it; the ‘Client’ icon looks like a computer screen, the ‘Adapter’ icon looks like an adapter card, and the ‘NetBEUI’ protocol icon looks like a cable in a “T” shape. If these components are not installed, one or more of the following installations may be necessary. Note: The Windows installation disk may be needed.
 - a. Installing Client for Microsoft Networks: If Client for Microsoft Networks is not in the list of “The following network components are installed,” then do the following:
 - i. Click the **Add** button next to the list.
 - ii. The Select Network Component Type dialog box will appear.
 - iii. Select **Client** from the list then click the **Add** button.
 - iv. Select **Microsoft** from the Manufacturers list.
 - v. Select **Client for Microsoft Networks** in the Network Clients list.
 - b. Installing NetBEUI: If the NetBEUI (with the Ethernet adapter identified on the same line next to it) is not in the list of “The following network components are installed,” then do the following:
 - i. Search the installed network components list for the installed Ethernet adapter.
 - ii. Select the Ethernet adapter and click the **Add** button below the list.
 - iii. Select **Protocol** from the Select Network Component Type dialog box.
 - iv. Click the **Add** button next to the list.
 - v. The Select Network Protocol dialog box will appear.
 - vi. Select **Microsoft** from the Manufacturers list.
 - vii. Select **NetBEUI** from the Network Protocols list.

4. Networking with the *RheoVac* 950: If all of the items above are completed successfully, the UIC or LAN computer should be able to network with the *RheoVac* 950. To search for the *RheoVac* 950 from the UIC or LAN computer:

Method 1

- a. Open **Network Neighborhood**.
- b. Each *RheoVac* instrument is identified by a unique Network ID. The ID is “R” plus the first five digits of the serial number found on the unit. (*RheoVac* Model 950 devices which have not been serviced by the factory since August, 2003 may use the serial numbers or “RheoVac 950” as the Network ID).
- c. Look for the Network ID of your *RheoVac* 950. If the expected Network ID (see previous paragraph) does not show up in the list, then type in the appropriate Address line (either “\\RHEOVAC 950” or “\\R” and the first five digits of the serial number) and click the **Go** button. This may take several seconds and then a RHEOVAC folder will appear, which is the hard drive of the *RheoVac* 950.
- d. Open the RHEOVAC folder then open the DATA folder. The *Network ID* \RHEOVAC\DATA folder contains all the stored data. Use copy/paste functions (copy - Ctrl C; paste - Ctrl V) to save the data files to the UIC or LAN computer.

Method 2

- a. Open **My Computer**
- b. Type in the Address line: *Network ID* (*Network ID* is defined above) and click the **Go** button. This may take several seconds and then a RHEOVAC folder will appear, which is the hard drive of the *RheoVac* 950.
- c. Open the RHEOVAC folder then open the DATA folder. The *Network ID* \RHEOVAC\DATA folder contains all the stored data. Use copy/paste functions to save the data files to the UIC or LAN computer.

B.3 WINDOWS NT OR WINDOWS 2000 OPERATING SYSTEM

1. Ethernet Cable:
 - a. UIC Connection: use CAT5 network crossover cable (supplied by Intek) to connect the Ethernet port of the UIC to the Ethernet port on the *RheoVac* 950.
 - b. LAN Connection: use CAT5 straight high noise-immune Ethernet cable (not supplied) with RJ45 plug to connect the Ethernet port of the LAN to the Ethernet port of the *RheoVac* 950.
2. Workgroup Identification: Unless otherwise requested, the Workgroup identification for the *RheoVac* 950 will be WORKGROUP. To check/set the workgroup name: Right click on the **My Computer** icon on the UIC or LAN computer desktop. Select **Properties** from the menu that appears. Select the **Network Identification** tab of the System Properties dialog box that appears. Verify that Workgroup is WORKGROUP.
3. Check for Installed Network Components: Click the **Start** button, select **Settings**, select **Network and Dial-up Connections**. Or, right click **My Network Places** and select **Properties**. Highlight the Local Area Connection that represents the Ethernet adapter. Right click on **Local Area Connection** and select **Properties**. Under “Components checked are used by this connection:” look for **Client for Microsoft Networks** and **NetBEUI Protocol**. If these components are not installed, one or more of the following installations may be

necessary. Note: The Windows installation disk may be needed as well as administrator security rights.

- a. Installing Client for Microsoft Networks: If Client for Microsoft Networks is not in the list of “The following network components are installed,” then do the following:
 - i. Click the **Install** button below the list.
 - ii. The Select Network Component Type dialog box will appear.
 - iii. Select **Client** from the list then click the **Add** button.
 - iv. Select Microsoft from the Manufacturers list.
 - v. Select **Client for Microsoft Networks** in the Network Client list.
 - vi. Click **OK**.
 - b. Installing NetBEUI: If the NetBEUI (with the Ethernet adapter identified on the same line next to it) is not in the list of “The following network components are installed,” then do the following:
 - i. Click the **Install** button below the list.
 - ii. The ‘Select Network Component Type’ dialog box will appear.
 - iii. Select **Protocol** and click the **Add** button.
 - iv. The ‘Select Network Protocol’ dialog box will appear.
 - v. Select **NetBEUI** from the Network Protocol list.
 - vi. Click **OK**.
4. Networking with the *RheoVac* 950: If all of the items above are completed successfully, the UIC or LAN computer should be able to network with the *RheoVac* 950. To search for the *RheoVac* 950 from the UIC or LAN computer:
- a. Open My Computer
 - b. Each *RheoVac* instrument is identified by a unique Network ID. The ID is “R” plus the first five digits of the serial number found on the unit. (*RheoVac* Model 950 devices purchased prior to August, 2003 may use the serial numbers or “RheoVac 950” as the Network ID.)
 - c. Look for the Network ID of your *RheoVac* 950. If the expected Network ID (see previous paragraph) does not show up in the list, then type in the appropriate Address line (either ‘\\RHEOVAC 950’ or ‘\\’ and the first five digits of the serial number) and click the **Go** button. This may take several seconds and then a RHEOVAC folder will appear, which is the hard drive of the RHEOVAC 950.
 - d. Open the RHEOVAC folder and then open the DATA folder. The *Network ID*\RHEOVAC\DATA folder contains all the stored data. Use copy/paste functions (copy - Ctrl C; paste - Ctrl V) to save the data files to the UIC or LAN computer.

B.4 WINDOWS XP OPERATING SYSTEM

1. Ethernet Cable:
 - a. UIC Connection: use CAT5 network crossover cable (supplied by Intek) to connect the Ethernet port of the UIC to the Ethernet port on the *RheoVac* 950.
 - b. LAN Connection: use CAT5 straight high noise-immune Ethernet cable (not supplied) with RJ45 plug to connect the Ethernet port of the LAN to the Ethernet port of the *RheoVac* 950.
2. Workgroup Identification: Unless otherwise requested, the Workgroup identification for the *RheoVac* 950 will be WORKGROUP. To check/set the workgroup name: Click the **Start** button and select **Control Panel**. Right click on the **System** icon and select **Open**. Select the **Computer Name** tab. Verify that Workgroup is WORKGROUP. Use the **Change** button to type in a new Workgroup if needed.

3. Check for Installed Network Components: Click the **Start** button and select **Control Panel**. Right click on the **Network Connections** icon and select **Open**. Or, click the **Start** button, select **Connect To**, then select **Show all connections**. Highlight the Local Area Connection that represents the Ethernet adapter. Right click the icon and select **Properties**. In the new window that pops up, under “This connection uses the following items:,” look for Client for Microsoft Networks, NWLink NetBIOS, and NWLink IPX/SPX/NetBios protocols. If these components are not installed, one or more of the following installations may be necessary. Note: The Windows installation disk may be needed as well as administrator security rights.
 - a. Installing Client for Microsoft Networks: If Client for Microsoft Networks is not in the list of “This connection uses the following components:,” then do the following:
 - i. Click the **Install** button below the list.
 - ii. The Select Network Component Type dialog box will appear.
 - iii. Select **Client** from the list then click the **Add** button.
 - iv. Select **Microsoft** from the Manufacturers list.
 - v. Select **Client for Microsoft Networks** in the Network Client list.
 - vi. Click **OK**.
 - b. Installing NWLink NetBIOS: If NWLink NetBIOS is not in the list of “This connection uses the following components:,” then do the following:
 - i. Click the **Install** button below the list.
 - ii. The Select Network Component Type dialog box will appear.
 - iii. Select **Protocol** and click the **Add** button.
 - iv. The Select Network Protocol dialog box will appear.
 - v. Select **NWLink NetBIOS** from the Network Protocol list.
 - vi. Click **OK**.
 - c. Installing NWLink IPX/SPX/NetBIOS: If NWLink IPX/SPX/NetBIOS is not in the list of “This connection uses the following components:,” then do the following:
 - i. Click the **Install** button below the list.
 - ii. The Select Network Component Type dialog box will appear.
 - iii. Select **Protocol** and click the **Add** button.
 - iv. The Select Network Protocol dialog box will appear.
 - v. Select **NWLink IPX/SPX/NetBIOS** from the Network Protocol list.
 - vi. Click **OK**.
4. Networking with the *RheoVac 950*: If all of the items above are completed successfully, the UIC or LAN computer should be able to network with the *RheoVac 950*. To search for the *RheoVac 950* from the UIC or LAN computer:
 - a. Open My Computer.
 - b. Each *RheoVac* instrument is identified by a unique Network ID. The ID is “R” plus the first five digits of the serial number found on the unit. (*RheoVac* Model 950 devices purchased prior to August, 2003 will use the Network ID “RheoVac 950.”)
 - c. Look for the Network ID of your *RheoVac 950*. If the expected Network ID (see previous paragraph) does not show up in the list, then type in the appropriate Address line (either ‘\\RHEOVAC 950’ or ‘\\’ and the first five digits of the serial number) and click the **Go** button. This may take several seconds and then a RHEOVAC folder will appear, which is the hard drive of the *RheoVac 950*.
 - d. Open the *RHEOVAC* folder and then open the DATA folder. The *Network ID**RHEOVAC*\DATA folder contains all the stored data. Use copy/paste functions (copy - Ctrl C; paste - Ctrl V) to save the data files to the UIC or LAN computer.