

USER MANUAL

MULTI-PRO 2000



**Electrical Safety Analyzer
&
Multi-Parameter Simulator**



110 Toledo Street, Farmingdale, NY 11735
www.Netech.Org

Dear User,

We appreciate your purchase of Netech's Multi-Pro 2000, Electrical Safety Analyzer. Properly used, the MULTI-PRO 2000 delivers more performance and accuracy than any other Electrical Safety Analyzer in its price range. This manual has been designed as a tool to help you get the most from your MULTI-PRO 2000. We suggest that you carefully read this manual so that you will be able to properly use and maintain this product. We welcome any comments you may have that could help us improve the MULTI-PRO 2000 and this manual.

Netech is recognized as an innovator and manufacturer of advanced affordable instruments. When you buy our products we guarantee absolute satisfaction. Your business is important to us and we are dedicated to provide you with the best service possible.

We are pleased you selected the MULTI-PRO 2000 to meet your needs. We hope you will consider us again when you have a requirement for accurate, reliable, versatile, and yet affordable instruments.

*Sincerely,
President*

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GENERAL DESCRIPTION

The Multi-Pro 2000 is a compact, precision, Electrical Safety Analyzer designed to be used for the quick and easy measurement of Electrical Leakage Current, and Power Cord Ground Resistance of any electrically operated equipment. In addition to the case leakage, leads leakage, isolation leakage and power cord resistance measurement functions, MultiPro incorporates a 12 lead EKG and performance waveform including sine, square, triangle, and pulse.

There are two leakage current modes. The first mode measures leakage current from equipment chassis to ground (case leakage). The second measures leakage current between EKG leads and ground or to the LL lead. In both modes the leakage current may be measured under normal polarity reverse polarity and open neutral. EKG lead isolation testing is performed by applying isolated AC voltage to leads and by measuring the leakage current from the leads to ground or to the LL lead.

The power cord resistance is measured using a Kelvin cable and an internal current source.

PREPARATION FOR USE

The Multi-Pro 2000 is shipped with a power cord and Kelvin Cable. First, connect the Multi-Pro 2000 to an AC outlet (110 or 220 Volt depending on the model purchased).

Next, connect the Kelvin cable to the connector on the rear panel of the MultiPro 2000.

Turn on the power via the main power switch on the right side of the MultiPro. “NETECH” and the software revision will be displayed. The display will then display “MAIN MENU, Int, Ext, Cfg. (Int:- Internal measurement, Ext:- External Measurement Option, Cfg:- Configuration Option).

MAIN MENU					
INT	EXT	CFG			
F1	F2	F3			

From the tactile keypad select the function desired. “Case Leakage, Lead Leakage, Simulator, Resistance Measurement or F1 for Internal Measurement” (Internal Measurement allows the user to accurately measure line voltage and line polarity)

See section for control operation / description.

CONTROL DESCRIPTION

DISPLAY:

The Multi-Pro 2000 incorporates a vacuum florescent display. The display ensures high readability even under the lowest ambient light conditions.

KEYPAD:

The keypad utilizes soft touch tactile keypads, Providing a fluid resistant barrier to the internal circuitry.

POWER SWITCH:

The power switch located on the right hand side of the Multi-Pro is a rugged 20 Amp switch. This switch turns the power on/off to the Multi-Pro and the test outlet.

TEST OUTLET:

The test receptacle used in the Multi-Pro is rated for 20 Amp. It will accept all standard line cords as well as horizontally oriented neutral prongs on 20 Amp line cords. Power to the test receptacle defaults to the off mode. Manual selection of normal or reverse polarity must be selected to energize the test receptacle.

FRONT PANEL CONTROLS

There are 16 tactile switches on the front panel that control all internal functions and measurement parameters. An audio tone is heard as confirmation that a key command was received by the microprocessor.

OUTLET POWER:

Three switches control the AC power supplied to the test receptacle. “Normal Polarity, Off, and Reverse Polarity”. Depressing the “Normal Polarity” switch will energize the test receptacle with normal polarity AC power. Depressing the “Reverse Polarity” switch will energize the test receptacle and reverse the polarity. Depressing the “Off” (“Off Outlet”) switch will remove power from the test receptacle.

INTERNAL MEASUREMENT:

As previously indicated, as part of the self-test/default setup, the display will read “Int – Select Function”. The Int command (Internal Measurement) is located above the F1 key. Depressing the F1 key at this time will display the “Internal Measurement” menu. Three options will be displayed. VOL (F1) for line voltage measurement, CUR (F2) for optional function and POL (F3) for line polarity

determination. Depressing F1 at this time will display the line voltage in “Volts AC”. There is a 3 second delay to allow for sampling time. Depressing F2 will give you optional function. Depressing F3 will activate the polarity determination circuit. At this time “Checking” will be displayed. The polarity will then be displayed as “Normal Polarity” or “Reverse Polarity”. Should “Error” be displayed, there may be a problem with the outlet the Multi-Pro is attached to, or the line cord for the Multi-Pro may be defective.

CASE LEAKAGE:

The switch labeled “Case Leakage”, enables the chassis or case leakage measurement function of the Multi-Pro. Electrical leakage current, measured in micro amps, is measured from the device under test chassis or case to earth ground through the line cord of the device under test. The display will read “CASE LEAKAGE Select Polarity”.

Using the outlet power polarity selection switches, select the polarity condition required to measure. Selecting Normal Polarity will enable the leakage current measurement mode. Leakage current will be displayed after 2 seconds. The value displayed will read “X .XX Micro Amp”, “NoP” and “Normal Polarity” will also be displayed to indicate the reading displayed is for the normal polarity condition.

Depressing the Reverse Polarity switch also enables the leakage current measurement mode. However, “RvP” and “Reverse Polarity” will be displayed on the display.

Open neutral tests can be performed by depressing the F6 switch after the polarity is selected. The auto-range feature of the MultiPro will select the appropriate range automatically. For reading in excess of 100 microamps, the decimal point will not be displayed. The user can switch between Reverse and Forward Polarity at any time to verify readings or, to determine if any service action performed on the device under test affects the readings.

CASE LEAKAGE: Using External Leads

Select case leakage. Attach the external lead (red) to the input jack of the Multipro. Connect the other end of the lead to the case of the unit under test. Case leakage measurements can be made for various line conditions, power on, off, normal or reverse polarity, closed or open ground, Closed or open neutral.

Following the initial “OPEN GROUND” leakage measurement:(App. 20 seconds) measurement mode is switched to “CLOSED GROUND” leakage. In this mode , external leakage on closed ground systems can be measured using the external lead. (*Red INPUT jack on the ECG output panel*)

LEADS LEAKAGE:

Depressing the Leads Leakage switch will display the Leads Leakage menu.

LEADS LEAKAGE					
GND	LLR	ISO			

F1	F2	F3	F4	F5	F6
-----------	-----------	-----------	-----------	-----------	-----------

The following options are available: GND (F1), LLR (F2), ISO (F3) . Depressing F1 (GND) enables the “LEADS TO GND LEAKAGE” menu.

LEADS TO GND LEAKAGE					
ALL	RL	RA	LA	LL	V1-6

F1	F2	F3	F4	F5	F6
-----------	-----------	-----------	-----------	-----------	-----------

Using the function keys (F1 – F6) select the desired lead for the Lead Leakage mode of the Multi-Pro.

F1 will measure “ALL” leads to ground and will display the reading as “X .XX Micro Amp” as with Case Leakage “NoP” will also be displayed when normal polarity lead leakage is selected. “RvP” will be displayed if reverse polarity lead leakage is selected. “Leads Leakage * ALL to GND *” will also be displayed. Right Leg, RL(F2) Right Arm, RA (F3)

Left Arm, LA (F4) Left Leg, LL (F5) and Chest Leads, V1 – 6 (F6) also read in the same way with both forward and reverse polarity leakage readings to ground indicated. With readings in excess of 100 microamps the decimal point will not be displayed. There is a 2-second read time on all lead leakage measurements.

From the main “LEADS LEAKAGE” menu depressing F2 enables the “LEADS TO LL LEAKAGE” menu.

LEADS TO LL LEAKAGE					
ALL	RL	RA	LA		V1-6

F1	F2	F3	F4	F5	F6
----	----	----	----	----	----

This function measures all or selected leads to LL (Left Leg).

Depressing F3(From main “LEADS LEAKAGE” menu) activates the Isolation Leakage test. The line voltage is applied to all leads while lead leakage is measured. The leakage is displayed as ” X XX Micro Amp” and is displayed within 2-seconds.

This test verifies that the isolation system on the device under test is operating properly.

PATIENT SAFETY PRECAUTION:

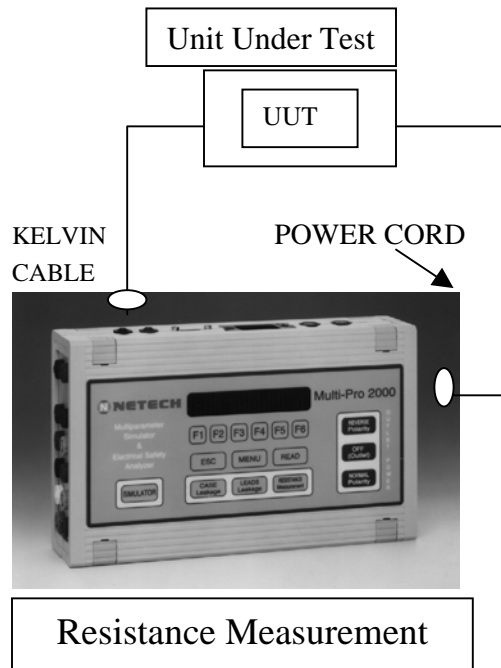
SINCE THE TEST METHOD INJECTS POTENTIALLY HAZARDOUS CURRENT LEVELS INTO THE ELECTROCARDIOGRAPH AND THE RELATED POWER SYSTEM , DO NOT CONDUCT TESTS IN AN OCCUPIED PATIENT LOCATION OR WHILE THE PATIENT IS CONNECTED TO A RELATED POWER SYSTEM BRANCH CIRCUIT.

CAUTION:

THE EKG ISOLATION VOLTAGE IS 120 VAC AND ALTHOUGH IT IS CURRENT LIMITED TO 1 mA, IT IS POTENTIALLY LETHAL.

**POWER CORD GROUND
RESISTANCE**

To measure line cord ground resistance for the device under test, depress the switch labeled “RESISTANCE Measurement”. The display will read “POWER CORD RESISTANCE/Connect Kelvin Cable”. Once Kelvin cable is attached to a suitable ground on the device under test, press the “READ” switch on the front panel the unit will determine the resistance in 3 seconds. Ground resistance will be displayed in whole numbers “XX mOhms/Cord Resistance”. An open ground condition will result in the “Check Ground!!!” error message.



NOTE:

Power is removed from the test outlet during this test. This is done to prevent any damage to the MultiPro or device under test in the event of a ground fault or faulty wiring of the device under test.

SIMULATOR:

Depressing the SIMULATOR switch will enable the simulator menu.

NSR	SIN	SQR	TRI	PLS	
F1	F2	F3	F4	F5	

NSR: Normal Sinus Rhythm (F1), Depressing F1 will open up the “NORMAL SINUS” menu

RTE					AMP
F1					F6

The user can now select the rate “RTE” and amplitude “AMP” of the normal sinus rhythm wave form.

Depressing F1 will open the rate menu. Using the function keys F1-F6 the rate can be adjusted from 30 BPM to 300 BPM.

NORMAL SINUS XXX BPM					
30	60	70	80	90	>

F1	F2	F3	F4	F5	F6
-----------	-----------	-----------	-----------	-----------	-----------

F6 will advance the rate selection to the next level.

<	100	120	150	180	>
F1	F2	F3	F4	F5	F6

F6 will advance the rate selection to the next level again. F1 will return the user to the previous rate menu.

<	210	240	270	300	
F1	F2	F3	F4	F5	F6

To enable the amplitude (AMP) menu, depress the F6 switch from the "NORMAL SINUS" menu. The amplitude is adjustable from 0.1mv to 4.5mv. The display will read as follows:

NORMAL SINUS X.XXmV					
0.1	0.2	0.3	0.4	0.5	

F1	F2	F3	F4	F5	F6
-----------	-----------	-----------	-----------	-----------	-----------

Similar to the rate menu, the F6 switch will advance the amplitude menu to the next level.

<	1mV	1.5	2mV	2.5	>
F1	F2	F3	F4	F5	F6

F6 will advance the amplitude selection to the next level again. F1 will return the user to the previous amplitude menu.

<	3mV	3.5	4mV	4.5	
F1	F2	F3	F4	F5	

Sine, Square, Triangle, and Pulse function waveforms all operate in a fashion identical to the normal sinus rate and amplitude however, there are 29 possible rate selections for each function waveform ranging from .1 HZ to 100 HZ. The amplitude range is from 0.1mv to 4.5 mv in increments matching the normal sinus rhythm menu.

Escape (ESC):

This switch when depressed will return the user to the main Power up menu at any time.

MENU:

This switch when depressed will return you to the menu last selected.

POWER CORD RECEPTACLE:

The power cord plugs into this receptacle. Plug the power cord to AC supply to 110 VAC rated for 20 Amps. Remove the power cord when storing the unit in the *supplied carrying case*.

FUSE:

Two separate fuses are provided.

Outlet - 20 A Max

Device - .25 A

Kelvin Cable:

The Kelvin cable is a two-conductor cable used to measure the ground wire resistance of the line cord for the device under test. This system ensures an accurate measurement due to the nulling effect on the test cable length.

STANDARD MODELS

<u>Part No.</u>	<u>Description</u>	<u>Model</u>
550-110	<i>110V / 60HZ</i>	<i>MULTI-PRO 2000</i>
550-200	<i>220V/ 50 Hz</i>	<i>MULTI-PRO 2000</i>

ACCESSORIES

551	<i>Soft Carrying Case</i>
552	<i>AC Power Cord 15 Amp</i>
553	<i>AC Power Cord 20A</i>
553	<i>Test Lead (Kelvin Cable)</i>
1000	<i>EKG snap stud to banana plug</i>

Netech manufactures a wide variety of Biomedical test equipment including; Patient Simulators, Pacemaker analyzer, Defibrillator analyzer, Pressure/vacuum meters, SpO2 analyzers, Infusion device analyzers etc.

Please call 1-800-547-6557 for a catalog or visit our main Website www.Netech.Org

For the latest Safety analyzers visit
www.Electricalsafetyanlyzer.com

MAINTENANCE:

The MULTI-PRO 2000 requires only minimum maintenance. In order to ensure the accuracy, it is recommended that the unit be checked periodically. Re-calibration is required on an annual basis. Field calibration is not recommended. Netech factory personnel should perform re-calibration. Netech recalibration charges are very low compared to the industry standard.

Clean the keypad with liquid eyeglass cleaner. Do not use abrasives, solvents, or ammonia. Use light pressure to prevent window from being pressed out of position.

FUNCTIONAL DESCRIPTION

AAMI Load:

A simulated patient load is recommended by the Association for the Advancement of Medical Instrumentation & Safe current limit standard (ANSI/AAMI ESI-1993). The AAMI standard test load provides a constant 1uA/mV output independent of frequency. The current to be measure is routed directly to the AAMI load, which is then connected to the input Amplifier.

RMS Converter and Amplifier:

The programmable amplifier amplifies the input signal. The RMS converter generates a DC voltage equal to the RMS value at its input. The Amplifier then sets the gain for the measurements. When leakage current measurement is selected by the front panel switch, the AAMI LOAD is connected in front of the INPUT AMPLIFIER, and the voltage developed across it from the leakage current is measured.

Current Source and Amplifier:

Resistance is measured by connecting the current source to the resistance under measurement and measuring the voltage with the input amplifier.

SPECIFICATIONS

CASE LEAKAGE:

Current Range:

0 - 20.0, 20.00 – 200.0, 200.0 - 2000 Micro-amps.

The Multi-Pro 2000 automatically selects the correct range based on the initial measurement.

Accuracy: Electrical Measurement

Current: +/- 1% of full scale DC to 1 kHz

+/- 2.0% of full scale 1 kHz to 100 kHz

+/- 4% of full scale 100 kHz to 1 MHz

Resistance: +/- 2% of range.

Voltage: +/- 5% of range.

All Current measurements are made through a standard AAMI Load. The meter readings correspond to the RMS value of the current measured. All components of the AAMI load are 1% tolerance.

POWER CORD RESISTANCE:

Resistance measurement ranges are 0 - 20.00 , 20.00 - 200.0, 200.0 – 2000.0 mOhms. The Multi-Pro 2000 automatically selects the correct range based on the initial measurement. Values are obtained using the supplied Kelvin cable. Accuracy is at +/- 2%.

LEAD LEAKAGE:

Current Range:

0 - 20.00, 20.00 - 200.0, 200.0 – 2000 Micro-amps.
The MultiPro 2000 automatically selects the correct range based on the initial measurement.

Accuracy: +/- 1% of full scale DC to 1 kHz,

+/- 2.5% of full scale 1 kHz to 100 kHz,

+/- 5% of full scale 100 kHz to 1 MHz,

Isolation Test:

120 Volts AC applied to the leads through a 120K ohm current limiting resistor. Current is limited to 1mA.

SIMULATOR:

Normal Sinus Rhythm, Full 12 lead configuration
Amplitude selections from 0.1 to 4.5 mV in 13 step increments. Frequency selections from 30 to 350 Beats per minute in 14 steps.

PERFORMANCE WAVEFORMS:

Amplitude selections from .1 to 4.5 mv in 13 step increments. Frequency selections from .1 to 60 Hz.

TEST LEAD JACKS:

The Case Ground and Reference Ground are standard banana jacks.

EKG JACKS:

10 separate Jacks are provided for connecting the EKG leads for simulation and leakage measurement.

POWER REQUIREMENTS:

110 VAC (220 VAC Optional) 50-60Hz, 20 Amps maximum rated for the test outlet and 0.1 Amps rated for the unit.

PHYSICAL DIMENSIONS:

Size: 10.25" X 6.25" X 2.5"

Weight: 4 lbs.

AMBIENT TEMPERATURE:

Operating range:

59-95 Degrees F (15-35°C)

Storage Temperature: 32-122 Degrees F (0-50°C)

INSTRUCTION FOR PRODUCT RETURN

Damaged in Transit:

All shipments are carefully examined by NETECH and carefully packaged for shipment. They are insured in the customer's name with the carrier. On receipt, if the shipping container appears to have been damaged during shipment, the instrument should be thoroughly inspected. The delivering carrier's paper should be signed noting the apparent damage. If the instrument is damaged beyond use, a new order should be placed with NETECH while awaiting reimbursement from the carrier for the damage instruments.

Malfunction:

Please follow these steps for repair or re-calibration of your NETECH instrument:

1. Telephone NETECH 1-631-531-0100 for cost of repair or Re-calibration, Repair Authorization number (RA) and shipping instruction.
2. Obtain a purchase order number from your purchasing department showing instruments model number and cost of repair and/or re-calibration.

3. Securely package your instruments in a strong box surrounded by at least two inches of suitable shock absorbing material. Include the purchase order, or reference your purchase order on your packing slip.
4. Mark the outside of the shipping box with the supplied RMA number.
5. Forward the instrument prepared to Netech

NETECH CORP
110 Toledo Street
Farmingdale, NY 11735
ATTN: SERVICE DEPT.

Proud to be of your service since 1987



Operating Instructions for Multipro 2000 Storage and Printing

The Multipro 2000 is capable of printing test measurement results directly to an optional printer or PC display, and of storing test measurement results for later printing or display.

When measurements are made, the Multipro 2000 automatically stores them in its main memory. This main memory is volatile memory and is cleared whenever the Multipro 2000 is turned off. Test measurement results may be saved in one of three non-volatile registers that will retain the results when the Multipro 2000 is turned off. This stored data may be printed or displayed at a later time.

RS 232 Setup:

Setting up the Hyper Terminal on your PC: (Windows XP)

1. Go to Startup – All Programs – Accessories – Communications – HyperTerminal
2. When you click on Hyper Terminal a window will pop up and it will ask you to configure a New Connection.
3. Select the first Icon and Enter the name as Multipro 2000 and hit ok
4. Another “Connect to” Window will pop up.
5. In that window select the port you want in the “connect using” tab. Select COM1 generally. Hit ok
6. A new window named “ COM 1 Properties” will pop up. Specify the following in it
 - Bits per second: 9600
 - Data Bits: 8
 - Parity: None
 - Stop Bit = 1
 - Flow Control: Hardware

And hit ok

7. Now follow the below mentioned procedure.
8. You can save the HyperTerminal connection for future use so you don't have to follow these steps again.

The MultiPro 2000 can be connected to a printer or a PC via the RS 232C SERIAL PORT located on the side of the instrument.

A. Performing Tests and Printing Results:

1. Turn on the Multipro 2000 and perform the desired tests following the instrument's standard instructions.
2. When all desired tests have been performed, the measurement results may be printed directly to an optional printer or displayed on a PC by pressing the PRN 'F5' key.

		MAIN	MENU		
				PRN	MEM
F1	F2	F3	F4	F5	F6

3. Results may be printed with or without a header.
4. To print the header, press the HEAD 'F1' key.

To Print Header

'F1' Key Pressed

		PRINT	MENU		
HEAD		RESULT			
F1	F2	F3	F4	F5	F6

Header:

DEVICE INFORMATION

TYPE:

MODEL:

CONTROL #:

MANF:

SERIAL:

LOC:

PHYSICAL INSPECTION

5. To print the measurement results press the RESULT 'F3' key.

To Print Measurement Results

'F3' Key Pressed

HEAD		RESULT			
F1	F2	F3	F4	F5	F6

Example of Measurement Results:

Case Leakage Normal Pol: 2498.8 Micro Amp
 Case Leakage Reverse Pol: 2498.8 Micro Amp
 Case Leakage Power Off: 2498.8 Micro Amp
 Leads Leakage All to GND: 2498.8 Micro Amp

B. Storing Measurement Results:

Test results may be stored in three non-volatile memory registers for later printing or display.

1. Press MEM 'F6' from the Main Menu of the Multipro 2000.

Memory Selected**'F6' Key Pressed**

				PRN	MEM
F1	F2	F3	F4	F5	F6

2. Press STO 'F1' key.

Store Selected**'F1' Key Pressed**

		MEMORY	MENU		
STO	RCL	CLR			
F1	F2	F3	F4	F5	F6

3. Select the desired register for storage by pressing the 'F1', the 'F2', or the 'F3' key. The display will then indicate that the data has been stored.

Results Stored in Register 2.**'F2' Key Pressed**

STORE	TO:				
1	2	3			
F1	F2	F3	F4	F5	F6

C. Printing Stored Results:

Test measurements that have been stored in registers 1, 2, and 3 may be printed or displayed later.

1. Press the MEM 'F6' key from the main menu.

Select Memory from Main Menu**'F6' Key Pressed**

					MEM
F1	F2	F3	F4	F5	F6

2. Press the RCL 'F2' key.

Select Recall			'F2' Key Pressed		
STO	RCL	CLR			
F1	F2	F3	F4	F5	F6

3. Press the 1 'F1', 2 'F2', or 3 'F3' key to print the stored results.

Select Stored Memory to Print from register 1			'F1' Key Pressed		
1	2	3			
F1	F2	F3	F4	F5	F6

D. Clearing the Memory

The stored information may be cleared. All three registers will be cleared simultaneously.

1. Press the MEM 'F 3' key from the Main Menu.
2. Press the CLR 'F' key.

To Clear the Memory			CLR 'F3' Key Pressed		
STO	RCL	CLR			
F1	F2	F3	F4	F5	F6

3. The display will momentarily indicate MEMORY CLEARED.

Memory Cleared					
		MEMORY	MENU		
MEMORY	CLEARED				
F1	F2	F3	F4	F5	F6

WARRANTY

Netech warrants to the original purchaser that the MULTI-PRO 2000, as purchased from a Netech distributor or dealer, will conform to the written specification as of the date of its manufacture, for a period of one year from the date of purchase. Netech Offers an additional second year warranty if the unit is send to Netech for annual recalibration. Netech warrants this MULTI-PRO 2000 against faulty workmanship and defective materials for a period of one year from the date of purchased. If the MULTI-PRO 2000 fails to conform to these warranties, Netech will repair or replaced the MULTI-PRO 2000 and/or it's components within a reasonable period of time in the MULTI-PRO 2000 is returned to Netech's facility at Farmingdale, NY, USA within the warranty period as expressed above. These warranties are made upon the expressed condition that:

- 1. The purchaser promptly notifies Netech in writing of any non-conformity with the above warranty including a detailed explanation of the alleged deficiencies.*
- 2. The MULTI-PRO 2000 is returned to Netech at the buyer's expenses only after obtaining the proper authorization from Netech.*
- 3. Netech will not be liable for any incidental or consequential damages.*
- 4. In the opinion of Netech upon inspection, the MULTI-PRO 2000 has not been misused, altered, or damaged due to the abnormal handling and/or operation.*
- 5. Repairs to the MULTI-PRO 2000 and/or its components have not been made by anyone other than Netech or one of its authorized repair agents.*
- 6. The MULTI-PRO 2000 has not been modified, altered, or changed in any manner by anyone other than Netech or one of its authorized repair agents.*
- 7. All shipping and handling charges will be billed to the purchaser.*

THIS WARRANTY EXCLUDES ALL OTHER WARRANTIES, WHETHER EXPRESSED OR IMPLIED, ORAL OR WRITTEN, INCLUDING WITHOUT LIMITATION WARRANTIES OF MERCHANTABILITY AND / OR FITNESS FOR A PARTICULAR PURPOSE.

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