OPERATIONS AND APPLICATIONS MANUAL

MODEL NUMBER PAD56

5 KV AC / 6 KV DC HIGH POTENTIAL TESTER WITH MEGOHMMETER

Version 2.1

LO/bjf
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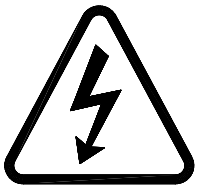
CAUTION



HIGH VOLTAGE

This equipment is capable of providing POTENTIALLY LETHAL VOLTAGES! Improper operation or test practices may result in injury or death to the operator or surrounding personnel.

The operation of High Voltage test equipment should only be performed by personnel familiar with HIGH VOLTAGE testing and safety procedures. The operator of this equipment must be aware of all hazards associated with High Voltage testing. The operator is responsible for himself and others in close proximity of the testing area.

Some General Safety Practices for working with High Voltage Test Equipment have been listed below for your reference.

- Become familiar with your instrument before performing an actual test
- Know your work area, check that all circuits are de-energized and locked out.
- Never work alone; always work with another qualified worker.
- Mark off entire work area with barriers and warning tape.
- Make all personnel aware of your testing activities.
- Be aware of dangerous conditions that may arise from energizing a test specimen.
- Never modify test equipment, modifications to equipment could introduce an unknown hazard or hinder a designed-in safety feature.
- DO NOT operate damaged equipment. Remove power, and do not use the equipment until safe operation can be verified by service-trained personnel.

Phenix Technologies, Inc. assumes no liability for unsafe or improper use of test equipment.

PRODUCT INFORMATION

CAUTION: Contact with the test leads on this equipment can cause harmful or fatal electrical shock. Do not touch test leads while a test is in process.

SAFETY AND CAUTION NOTES

1. Contact with the test leads on this equipment can cause harmful or fatal electrical shock. Do not touch test leads while a test is in process.

2. Insure that the tester is properly grounded before proceeding with a test.

3. Turn the tester off before reaching inside. Damage to the tester and hazardous shock to personnel will result if this procedure is not followed.

4. Insure that the equipment to be tested is deenergized and properly isolated.

5. Insure that the equipment to be tested has been properly grounded using a hot stick and rubber gloves.

6. Insure that barriers and warning signs are erected in order that personnel in the test area are protected. Use an assistant operator where appropriate to keep non-essential personnel away from the test site.

7. When testing cables, the conductors at the distant end should be isolated from each other and taped.

8. When testing a faulted cable, it is advisable to first make an insulation resistance measurement before proceeding with the high voltage test.

9. Use care to avoid damaging the tester during disassembly and reassembly procedures.

10. This unit should only be operated by someone familiar with high voltage testing and safety procedures.

DESCRIPTION

The PAD56 tester is capable of producing voltages as high as 6 kV DC (5 kV AC) into a variety of insulated electrical apparatus. The unit will measure leakage current flow through (or insulation resistance levels of) the ground insulation of the test sample. Leakage current as low as .01 microamperes DC (.1 milliamperes AC) and as high as 5000 microamperes DC (5 milliamperes AC) can be read directly from the testers front panel meter. Insulation resistance values up to 1,000,000 megohms may also be read directly at test voltages of 2.5 or 5 kV DC (a factor scale for insulation resistances at other test voltages is also provided).

PRODUCT INFORMATION

The unit incorporates an overcurrent trip circuit which will instantly de-energize the high voltage power supply if such a condition is encountered. The level of sensitivity at which trip-out will occur is controlled by the front panel adjustment labeled “Min-Max”. The trip setting can be as low as 10% or as high as approximately 110% of full scale reading. Overcurrent trip is indicated by an audible alarm.

SPECIFICATIONS

Description:
AC/DC High Potential Tester with Megohmmeter

Primary Application:
Dielectric withstand testing and insulation resistance measurement of motors, cables, and
transformers.

Input:
120 Volts AC, 50/60 Hz, single phase, .3 Amps
or
220 Volts AC, 50/60 Hz, single phase, .15 Amps

Output:
0-6 kV DC (0-5 kV AC), continuously adjustable with manual control
Negative Output, Positive Ground

Voltmeter:
2%, 3.5”, analog meter, 0-3/6 kV

Currentmeter/Megohmmeter:
2%, 3.5”, analog meter,
0-.5/5/50/500/5000 microamperes DC
0-5 milliamperes AC

0-.5-50/500/5000/50,000/500,000 megohms at 2.5 kV DC
1-100/1000/10,000/100,000/1,000,000 megohms at 5 kV DC

Termination:
Input: Standard modular 3-wire cord mating to fused input module
High Voltage: 10’ attached cable with clip and insulator
Return: 10’ separate cable with insulated clip (metered and guard)
Ground: 10’ separate cable with clip

Dimensions:
18” W x 11” D x 11.5” H (457 mm W x 279 mm D x 292 mm H)

Weight:
22 lbs. (10 kg) 120 VAC
23 lbs. (10.5 kg) 220 VAC

CONTROLS AND CONNECTIONS

FRONT PANEL CONTROLS AND METERS

Raise Voltage:

Clockwise rotation of this control increases the tester's output voltage. The tester's output range is 0-6,000 volts DC or 0-5,000 volts AC. This control must be returned to the "0" (full counter clockwise position) before a test can be initiated if either the "Power" or "High Voltage" switches have been previously disengaged, or if an overcurrent condition has been encountered.

Power:

When depressed and locked, this illuminated pushbutton switch (green lens) supplies AC power to all tester components with the exception of the high voltage power supply.

High Voltage:

When depressed and locked, this illuminated pushbutton switch (red lens) supplies AC power to the tester's high voltage power supply. In normal operation this switch will illuminate when depressed if the "Raise Voltage" control has been set to "0". Illumination of this switch indicates that high voltage output is available.

Currentmeter-Megohmmeter:

The currentmeter range is selected by the seven position rotary switch. The switch setting indicates the full scale current of the currentmeter and the megohmmeter multiplier. AC and DC operation is automatically changed depending on the position of the rotary switch. If a DC range is selected, the output is switched to DC. If the 5 mA AC range is selected, the output is automatically switched to AC. The table below shows the full scale currentmeter range with each switch setting.

Currentmeter Ranges

Switch Setting	Currentmeter Ranges
.5 microamps	0-.5 microamps
5 microamps	0-5 microamps
50 microamps	0-50 microamps
500 microamps	0-500 microamps
5000 microamps	0-5000 microamps
5 milliamps AC	0-5 milliamps AC

The megohm multiplier is selected by the same seven position switch as the currentmeter range. This allows direct megohm readings at 2.5 and 5 kV. In order to read megohms directly, the kilovolt meter must be set to either 2.5 or 5 kV. The megohms are then read from the right hand meter, megohms at 5 kV on the top scale and megohms at 2.5 kV on the middle scale. The table below shows the megohm range for each switch setting and kilovolt range.

Megohmmeter Ranges

Switch Setting	2.5 kV	5 kV
x10K	5,000 - 500,000 megohms	10,000 - 1,000,000 megohms
x1K	500 - 50,000 megohms	1,000 - 100,000 megohms
x100	50 - 5,000 megohms	100 - 10,000 megohms
x10	5 - 500 megohms	10 - 1,000 megohms
x1	.5 - 50 megohms	1 - 100 megohms

CONTROLS AND CONNECTIONS

FRONT PANEL CONTROLS AND METERS (continued)

Guard:

The guard function is selected by a binding post jumper. When the jumper is connected to "Return", leakage current or insulation resistance values associated with the "Ground" terminal will be measured. When the jumper is connected to "Guard", leakage current or insulation resistance associated with the "Ground" terminal will not be measured. (See connection diagram at end of this section.)

Voltmeter Range:

This two position rotary switch scales the DC kilovolt meter. When the switch is rotated to "3", the kilovolt meter range is 0-3 kV and the lower black scale is read in order to determine output voltage. When the switch is rotated to "6", the kilovolt meter range is 0-6 kV and the upper red scale is read in order to determine output voltage.

Current Trip:

This control, located below the currentmeter range select switch, allows the operator to set the level of leakage current measured by the instrument before high voltage shutdown occurs. At its highest level (full clockwise) approximately 110% of full scale current will be allowed. At its lowest level (full counterclockwise) approximately 10% of full scale current will be allowed before shutdown.

CONTROLS AND CONNECTIONS

INPUT/OUTPUT CONNECTIONS

Return:

Leakage current or insulation resistance values associated with this terminal is measured by the "DC Microammeter".

Guard:

Leakage current or insulation resistance values associated with this terminal is always bypassed around the "DC Microammeter".

Ground:

Leakage current or insulation resistance values associated with this binding post terminal may be either measured by the "DC Microammeter" or bypassed around the "DC Micro-ammeter" depending on the position of the binding post jumper.

NOTE: The ground binding post jumper must always be connected to Ground and Guard (Guard Mode) or Ground and Return (Grounded Return Mode). DO NOT operate without jumper properly installed.

Also, if the low potential side of the test specimen connected to Return cannot or will not be isolated from ground, the Ground post jumper must be connected to Return. Guard mode cannot be used under these circumstances or the current meter will not function properly. (See the connection diagram on the following page.)

AC Line:

This cord supplies input power to the tester.

Output:

This test lead with clip and insulation boot supplies the testers output to the apparatus under test.

Fuse:

If this protective fuse opens, AC power to the tester is interrupted.

INSTALLATION AND OPERATION INSTRUCTIONS

INSTALLATION

Install the tester as follows:

1. Turn the main “Power” switch off (out position, non-illuminated).
2. Turn the “High Voltage” power switch off (out position, non-illuminated).
3. Connect the “AC Line” cord to a 115 Volt source.
4. Make necessary grounding connections.
5. Set all switches and controls present on your tester as listed below for initial start-up:

“Raise Voltage”	0 (zero)
“Ammeter/Megohm” Range	X1/5000 (or 5 for AC test)
“Ground Jumper”	Jumped to Return or Guard as required by test
“KV Meter”	6 kV
“Current Trip”	Mid-range

6. Connect the test leads to the specimen to be tested. See Test Lead Connections section for information on how to connect the test leads.

OPERATION

1. Turn the unit on by pressing the “Power” switch. The switch will illuminate and remain recessed.
2. Energize the High Voltage power supply by pressing the “High Voltage” power switch. The switch will illuminate and remain recessed.

   NOTE: If the “Raise Voltage” control has not been set to “zero”, the overcurrent alarm will sound. To silence this alarm insure that the raise voltage control is in its full counter-clockwise position.
3. Rotate the “Raise Voltage” control clockwise until the desired test voltage is observed on the “Kilovolt” meter. Maintain output voltage at the desired level for the required amount of time. If the test was initiated on the “6” scale and a more accurate voltage reading is required (3 kV or below), select “3” on the “KV Meter” range switch.

   NOTE: If an overcurrent condition is encountered before required test voltage is reached and it is desirable to achieve a higher test voltage, adjust the “Min-Max” to a more clockwise position.

INSTALLATION AND OPERATION INSTRUCTIONS

OPERATION (continued)

4. Observe and record the resultant leakage current or insulation resistance value on the "Microamperes/Megohms" meter. If no current reading is indicated, select a lower sensitivity range until an observable reading is obtained at less than full scale on the "DC Micro- amperes/Megohms" meter.

   NOTE: The megohmmeter is scaled to read megohms directly at two test voltages; 2.5 kV (lower megohm scale) and 5 kV (upper megohm scale). If any other test voltage is used, the megohm reading must be taken normally by reading megohm scale corresponding to the voltmeter range setting, multiplied by the megohm range multiplier and then multiplied by the factor read on the "Multiply Megohm Reading By" scale of the voltmeter. For example, if a test voltage of 1 kV is used and the meter is on the 2.5 kV scale, the lower megohm scale reading and range multiplier result reading must be multiplied by .4. Similarly if a test voltage of 1 kV is used on the 5 kV scale, the corresponding upper megohm scale reading and range multiplier result must be multiplied by .2

   NOTE: Be sure that the "Ground" jumper is in the desired position. Certain test conditions may require that leakage currents associated with the "Ground" post be measured by the microammeter.

5. When testing is completed, return the "Raise Voltage" control to its zero (0) or fully counter-clockwise position.

6. Observe that the "Kilovolt" meter indicates zero (0) output.

7. Turn off the high voltage power supply by depressing the "High Voltage" power switch. Observe that this switch is no longer illuminated and is in its out position.

8. If continued testing is required, return to step 2 above.

   NOTE: Further testing cannot be accomplished once either or both of the power switches have been disengaged unless the "Raise Voltage" control has been reset to its zero or full counter-clockwise position.

9. Turn the tester off by depressing the "Power" switch. Observe that this switch is no longer illuminated and that it is in its out position.

INSTALLATION AND OPERATION INSTRUCTIONS

TEST LEAD CONNECTIONS

An understanding of the function of the three current return terminals (return, ground, guard) on the tester will allow the operator to properly connect the test leads for a variety of configurations.

The following points should be kept in mind when determining the proper connections for a given test requirement:

1. Always attach the high voltage test lead to the high side of the test specimen.

2. Any current flowing through the test lead attached to the “Return” terminal on the tester will always be measured by the “DC Microammeter”.

3. Any current flowing through the test lead attached to the “Guard” terminal on the tester will never be measured by the “DC Microammeter”.

4. Current flowing through the test lead attached to the “Ground” terminal on the tester will be measured by the “DC Microammeter” only when the “Ground” jumper is connected to Return. Ground current associated with the “Ground” terminal will not be measured if the “Ground” jumper is connected to “Guard”.

5. To use the Guard mode, the specimen must be isolated from Ground. If the low potential side of the specimen will not or cannot be isolated from ground, only the Return mode can be used (Ground jumper connected to Return).

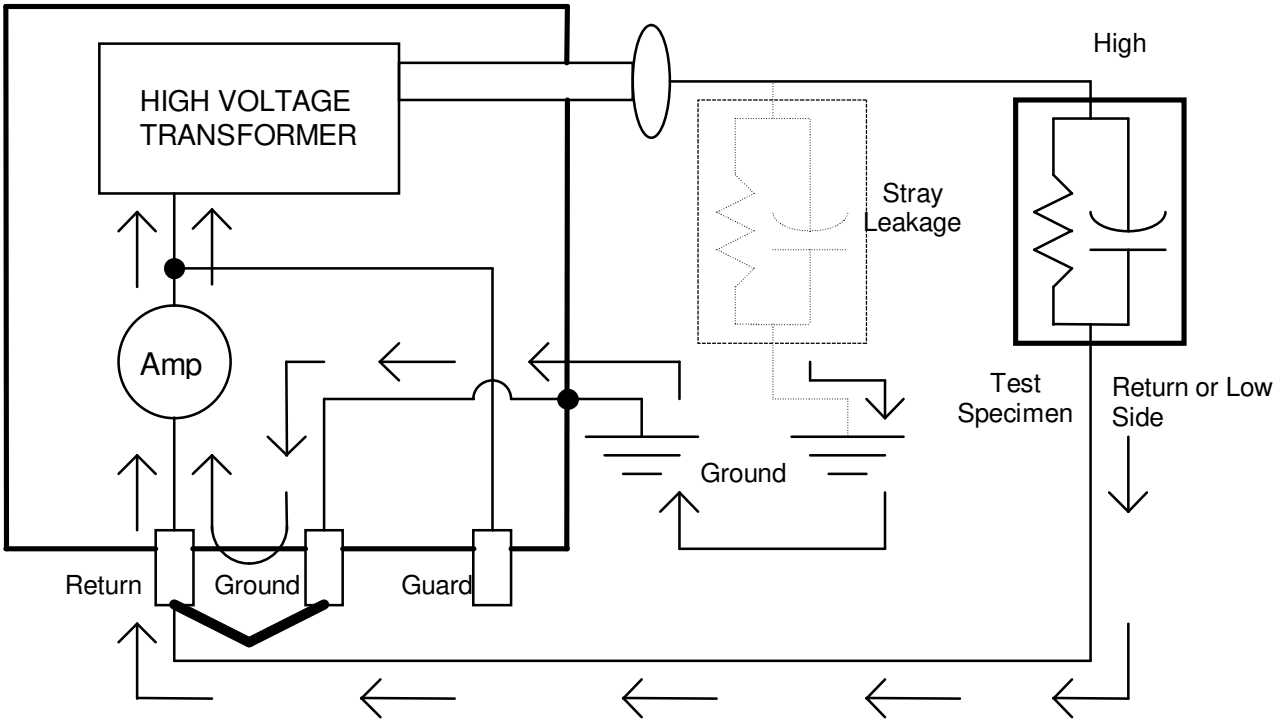
   NEVER OPERATE UNIT WITHOUT THE GROUND JUMPER CONNECTED TO EITHER RETURN OR GUARD. See diagram at end of Controls and Connections section.

INSTALLATION AND OPERATION INSTRUCTIONS

NOTES CONCERNING THE USE GUARD AND GROUND

NORMAL MODE CONFIGURATION

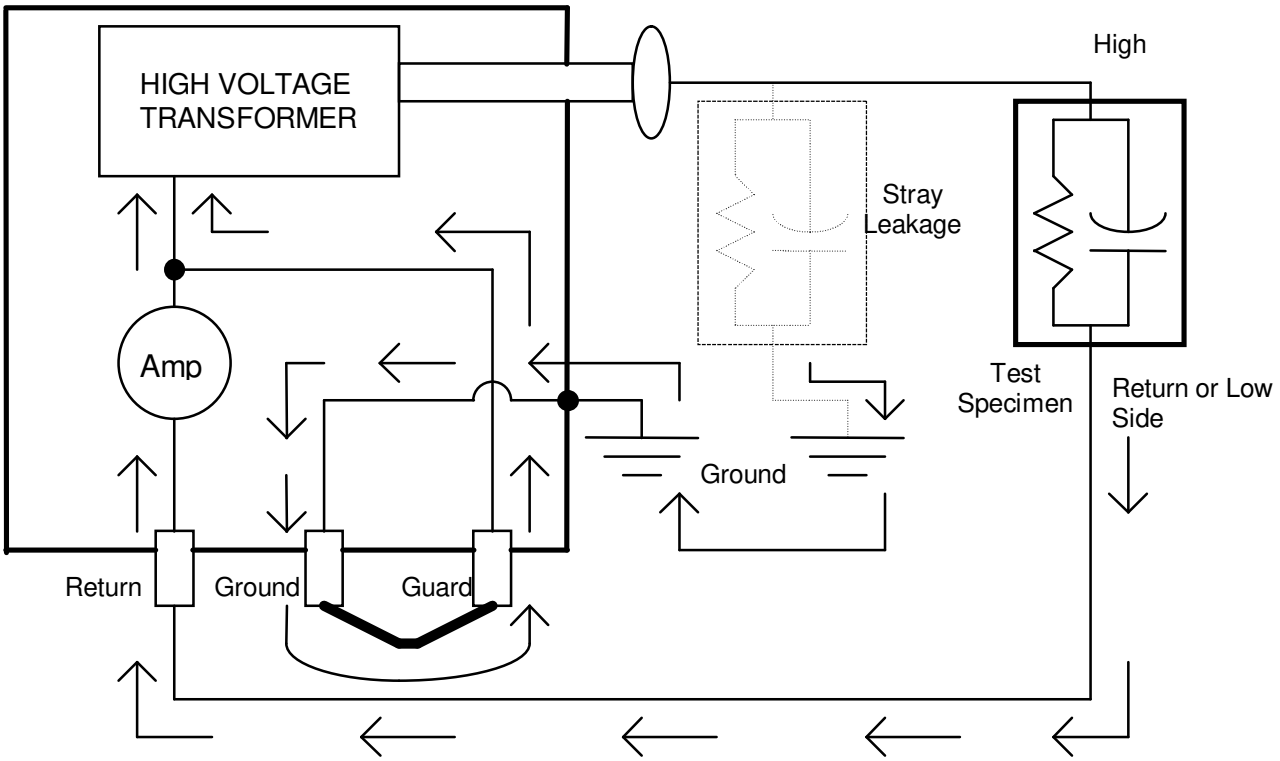
In this configuration the **Return** and **Ground** is connected together with an external jumper or a switch internal to the Test Set, depending on the design. Nothing is connected to the **Guard**. Both stray leakage to earth ground and leakage through the Test Specimen is indicated on the current meter. This configuration should be used if it is not possible to isolate the return side of the Test Specimen from earth ground.



INSTALLATION AND OPERATION INSTRUCTIONS

GUARD MODE CONFIGURATION

In this configuration the **Guard** and **Ground** is connected together with an external jumper or a switch internal to the Test Set, depending on the design. Any current associated with the **Return** is indicated on the current meter. Any current associated with the **Guard** bypasses the current meter. Leakage current through the test specimen is indicated on the current meter. Stray leakage to earth ground is not indicated on the current meter. This configuration cannot be used if it is not possible to isolate the return side of the Test Specimen from earth ground.



SCHEMATIC

Drawing Number	Description
9109070	PAD56

PARTS LIST
PAD56

ITEM	DESCRIPTION	QTY	PART NO.
	CONTROLS SECTION		
F1A,B	FUSE, 2A, GDC	2	1603702
	CORCOM INPUT CONN.	1	1152590
	INPUT CORD	1	1077170
M1,2	METER, 50UA	2	1501012
SW1,2	SWITCH, 1 POLE	2	1860260
LMP1,2	BULB, 60V EAO	2	1420150
	LENS, EAO, GREEN	1	1422151
	LABEL, “POWER”	1	
	LENS, EAO, RED	1	1422150
	LABEL, “HV ON”	1	
	PROTECTIVE GROMMET	1	
SW3	SWITCH, ROTARY, 2 POLE	1	1863047
SW4	SWITCH, ROTARY, 4 POLE	1	1863045
	KNOB FOR ROTARY SWITCH	2	1355310
R23	POT, 10K, SENSITIVITY ADJ	1	1761092
	KNOB, FOR ABOVE POT		1355305
PCB	PAD56 MAIN PCB ASSY PCB	1	31116904
	REGULATOR/HV SECTION		
	BINDING POST RED (RETURN)	1	1351102
	BINDING POST, BLK (GROUND)	1	1351100
K4-5	HV RELAY	2	1701330
	BINDING POST, WHITE (GUARD)	1	1351104
	SHORTING LINK	1	1351110
	BLACK BOOT	1	1353001
	RED BOOT	2	1353000
	ALLIGATOR CLIPS	3	1353002
	RUBBER FEET BUMPERS	4	2109500
MOV4-6 (120V)	130V MOVISTORS	3	1606100
MOV4 (220V)	275V MOVISTOR	1	1606110
MOV5,6 (220V)	130V MOVISTORS	2	1606100
	¼” SPACER	1	1350101
	3 POS TERM STRIP	1	1156050

PARTS LIST

ITEM	DESCRIPTION	QTY	PART NO.
T2	VARIAC 120V PRI., 0-120V, 1.75A, SEC. .231KVA	1	1890100
T3	TRANSFORMER, 120V PRI., 6000V SEC.,	1	1896050
	130VA, JEFFERSON ELECTRIC #720-33		
T4	50VA AUTO XFMR 230V:115V (220V INPUT ONLY)	1	1894425
	STANCOR P-8620		
	CASE	1	2100513
	SMALL TEST LEAD WIRE (RED)	10’	
	SMALL TEST LEAD WIRE (BLK)	10’	
	RG8U, OUTPUT LEAD	10’	
D9	DIODE, 40KV, 25MA	1	1782010
	EDAL INDUSTRIES B412-40-25		
C7,8	CAP., .05UF, 15KV	2	1092565
R35	RES., 47M, ROX1, 6W, 1%	1	1746940
R36	RES., 10K, 10W, 10%	1	1742190
R37	RES., 45M, 6W, 1%	1	1746850
R38	RES., 50K, 100W	1	1743005

PARTS ORDERING INFORMATION

Replacement parts are available from Phenix Technologies, Inc.

Changes to Phenix Technologies' products are sometimes made to accommodate improved components as they become available, and to give you the benefit of the latest technical improvements developed in our Engineering Department. It is, therefore, important when ordering parts to include the serial number of the unit as well as the part number of the replacement part. When your purchase order is received at our office, a representative of Phenix Technologies will contact you to confirm the current price of the part being ordered. If a part you order has been replaced with a new or improved part, an Applications Engineer will contact you concerning any change in part number.

Your order for replacement parts should be sent to:

Replacement Parts Department
Phenix Technologies, Inc.
75 Speicher Drive
Accident, Maryland 21520

RETURNED MATERIAL

If for any reason it should become necessary to return this equipment to the factory, the Service Department of Phenix Technologies, Inc. must be given the following information:

Name Plate Information
Model Number
Serial Number
Reason for Return
Cause of Defect

If Phenix Technologies, Inc. deems return of the part appropriate, it will then issue an "Authorization for Return".

If return is not deemed advisable, other inspection arrangements will be made.

NOTE: Material received at this plant without the proper authorization shall be held as "Customer's Property" with no service until such time as the proper steps have been taken.

Your cooperation is requested in order to ensure prompt service.