MegaPulse series
Impulse Tester
DF-1 (Fig.A.2)

Instruction Manual

COMPLIANCE WEST USA

Dear Customer:

Congratulations! Compliance West USA is proud to present you with your MegaPulse Impulse Tester. Your instrument features a groundbreaking logic-controlled circuit design and ergonomic front panel and represents the latest in high voltage impulse testing.

To fully appreciate all the features of your new instrument, we suggest that you take a few moments to review this manual. Compliance West USA stands by your instrument with a full one-year warranty. If the need arises, please don't hesitate to call on us.

Thank you for your trust and confidence.

Table of Contents

Section 1

This MegaPulse manual describes the general operation and proper connection of the MegaPulse DF-1 (Fig.A.2)

Safety Precautions

The impulse withstand test can generate high voltages at potentially lethal current levels. Currents of as little as 5 mA at 120 volts can cause death; and any MegaPulse model can deliver lethal current levels for a very short time duration. The potential for serious injury or death exists and personnel should be aware when they conduct this test.

Test Personnel

Personnel require special training to conduct the impulse test. They should understand electrical fundamentals clearly, and be aware that high voltage is adept and creative at completing a path to ground. Instructions should include a warning against any metal jewelry. Operators should not allow others in the testing area, especially when tests are being conducted. Organization is to be stressed. The operator should keep the area free of unused leads and equipment.

Testing Area

The area used for conducting the dielectric withstand test should be as remote as possible from normal production line activities. Only personnel actually conducting the test should be allowed in the area, and it should be taped or roped off to preclude casual entry by other employees. In addition, the area should be marked "WARNING - HIGH VOLTAGE TESTING" or the equivalent to warn others of the nature of the testing taking place.

The bench being used should be non-conductive, and any exposed metal parts should be tied together and grounded. If a conductive surface must be used, it should be grounded.

Because of sparking during an impulse test failure, it is not safe to conduct impulse testing in combustible atmospheres.

It is imperative that a good ground be provided to the MegaPulse tester. Before connecting the equipment, ensure that the building wiring provides a low-resistance ground. If the MegaPulse tester is used on a high-resistance grounding circuit, dangerous high voltages may be present to the operator. In addition, the power to the Testing Area should be provided with an easily reached shutoff switch which can be actuated by personnel outside the Area if needed.

Safety Techniques

The high voltage circuit of the MegaPulse can be shut off at any time by turning OFF the rear power switch. Note that there are residual voltages inside the equipment that may take up to 5 minutes to bleed off to safe levels.

The MegaPulse tester is provided with a **VOLTAGE ADJUST** knob on the front panel. This should always be adjusted fully counterclockwise to the minimum position at the start of testing. In addition, this knob should be adjusted back to the minimum position at the completion of all testing.

The MegaPulse tester is provided with a **CHARGE** switch that is in the unarmed "Standby" setting when the tester is first turned ON. When the yellow **CHARGE** button is lit, the tester will not provide high voltage until the **CHARGE** Button and the **TRIGGER** Button have been pressed in order. To prevent inadvertent operation, the operator should be instructed not to press the **CHARGE** Button until the test is ready.

The MegaPulse tester has been designed for one-touch operation with the right hand. If possible, it should be set up to the left and in front of the equipment under test. The equipment under test should be connected to the MegaPulse tester and then left alone by the operator. After the operator is clear of the Tester and the equipment under test, the operator should turn the rear-panel power switch to ON, press the **CHARGE** Button, adjust the voltage to the desired level (as displayed on the front panel meter), then press

the **TRIGGER** Button, with his right hand. This will allow the greatest separation between the operator and the test being conducted.

The MegaPulse tester is designed to bleed the high voltage away after the test has concluded. In order to ensure that any voltage present in the equipment being tested has been completely bled away, the operator should not unplug the equipment under test from the MegaPulse until the front panel meter reads a safe level (40 volts or less is generally considered a safe level). Pressing the TRIGGER button before disconnecting main power (or turning the equipment off) will ensure that the internal capacitors are discharged as much as possible.

Using the MegaPulse Impulse Tester

The impulse withstand test involves high voltage and caution should be exercised when using the Tester. The **RETURN** lead is referenced to building ground when properly connected. However, both the **OUTPUT** and **RETURN** leads must always be treated as Hazardous whenever the power switch of the MegaPulse is in the ON position.

The MegaPulse impulse tester generates the impulse waveform only; it does not determine Passing or Failing results.

It is Operator's responsibility to monitor the output waveform and determine Passing or Failing results. In monitoring the impulse waveform, consider the following points:

1. Measurement Considerations: The Impulse waveform is high voltage, and high frequency (short duration). Always ensure that the measuring instrument (usually an oscilloscope with a high-voltage probe) is rated for the voltage involved, and that the frequency response of the instrument and probe are capable of measuring the output waveform of the MegaPulse Impulse Tester. A measuring instrument or probe with a low frequency response will result in erroneous readings that could be mis-read. In order to ensure proper waveform readings, we recommend using a calibrated and properly adjusted Tektronix P6015 1000:1 probe directly connected to the MegaPulse outputs. It is imperative to adjust the P6015 for use with your particular oscilloscope in accordance with the Tektronix procedure described in the P6015 manual. This adjustment must be conducted every time a different oscilloscope is used; otherwise results will be erroneous.

CAUTION: Do not use the RETURN jack for any measurements. It is not at proper reference potential. It is for connection to the Reference Electrode as shown in Figure 3 only. If the RETURN jack is used for any measurement, erroneous results will be obtained from the Current BNC jack, and voltage values may vary slightly.

NOTE: If current readings are to be obtained using the MegaPulse BNC Current output, and voltage readings are to be obtained using an external oscilloscope probe directly connected to the MegaPulse OUTPUT jack, follow the directions of the correct Procedure below. Please note:
1. The probe must be 100:1 minimum, rated for 1500V and acceptable for connection to the oscilloscope being used; and
2. The ground connection of the probe must not be connected. (Proper Return reference to provide accurate voltage measurement is provided by the BNC Current connection.)

2. Polarity Considerations: Pressing the POLARITY switch on the front panel can change the polarity of the output waveform. The polarity is Normal when the **NOR** indicator is lit. In this case, the High Voltage will appear on the **OUTPUT** as a positive pulse relative to the **RETURN** jack. When the polarity switch is in the Reverse position (**REV** indicator is lit), the High voltage will appear on the **OUTPUT** as a negative pulse relative to the **RETURN** jack. The polarity switch only operates when the **CHARGE** LED is lit, i.e. the output is not charged.

3. Voltage Meter Considerations: Note that the Voltage meter may indicate that some residual voltage is present on the main storage capacitor, even when the tester is first turned ON. This is due to inherent charging of the internal capacitors. Pressing the **TRIGGER** switch will discharge the capacitors (be sure not to touch the output and return leads when pressing the trigger switch).

4. Inductance Considerations: In order to minimize inductance, the output leads should always be twisted together with approximately 4 complete turns per foot. If the leads are not twisted in this manner, the timing and amplitude of the waveform can change.

5. Meter reading: The MegaPulse DF-1 (Fig.A.2) displays the peak value of the pulse on the front panel meter.

6. Test Results: Determination of Passing and Failing results can prove difficult. To obtain the most accurate results, it is generally necessary to perform multiple impulse tests on a few different test samples (that have adequate insulation to pass the impulse test). Take note of the impulse waveshape, amplitude, and duration. Also note how much variance there is in the waveshape from test to test. Also (if possible), perform impulse testing on some test samples that are known to have inadequate (or damaged) insulation. Take note of the impulse waveshape, amplitude, and duration, when an insulation breakdown occurs.

Section 2

Introduction and Specifications

Introduction

This manual contains complete operating, maintenance and calibration instructions for the Compliance West USA MegaPulse series Impulse Tester.

? The surge output is extremely short in duration, but voltages and currents can be lethal. Be sure of your test setup before you energize the MegaPulse.

? Before the test can commence, the unit must be armed by pressing the **CHARGE** Button. Voltage can be set using the front panel knob.

? Voltage will flow through the front panel jacks when the **TRIGGER** button is pressed.

? After the **CHARGE** button is pressed, and before the **TRIGGER** button is pressed, hazardous voltages exist on internal parts. For safety's sake, make it a habit to disconnect any leads and press the **TRIGGER** button to discharge internal voltages if the MegaPulse is to be left idle for an extended period.

Your Tester is warranted for a period of one year upon shipment of the instrument to the original purchaser.

Specifications

Specifications for each individual model in the MegaPulse series are listed in Table 1. Component designations referenced in Table 1 are as shown in Figure 1.

Tolerances

When Standard authorities specify accuracy in the defining document, that accuracy criteria is used for MegaPulse calibration.

Voltage peak: (0% to +3%) with a load of 75Kohm
Voltage Rise Time: 1.5uS ± 0.5 ($t_{10} - t_{90}$)
Voltage Duration: 18mS (+1%)
Voltage peak at 18mS: 50%Vpeak (+3%) with a 75Kohm load.

Most Standards do not specify accuracy. In that case, we use IEC 1180-1:
Voltage Peak Value: ±3%
Voltage Rise Time: ±30%
Voltage Duration: ± 20%
Vrise = $1.67(t_{90} - t_{30})$
Vdur, Idur = Time from virtual origin to 50% peak voltage on trailing edge.
Current Peak Value: ±10%
Current Rise Time: ± 20%
Current Duration: ± 20%
Irise= $1.25(t_{90} - t_{30})$

Model	Waveform*	Max. Voltage	C1	R1	R2	C2	R3
DF-1 (Fig.A.2)	1.5x18000uSec with truncation	1500V	Not specified	Not specified	Not specified	Not specified	Not specified

* Legend: A x B/C x D A= Voltage rise time B= Voltage duration C= Current rise time D= Current duration

Voltage rise time (A) is defined as follows (per ANSI/IEEE C62.41 and other standards): trise = $1.67(t_{90} - t_{30})$, where t_{90} and t_{30} = the times of the 90% and 30% amplitude points on the leading edge of the waveform.

Voltage duration (B) is defined (per ANSI/IEEE C62.41 and other standards) as the time between virtual origin and the time of the 50% pint on the tail. The virtual origin is the point where a straight line between the 30% and 90% points on the leading edge of the waveform intersects the V = 0 line.

Common specifications:			
Meter Accuracy: 1500V output: ±20 V	Environmental: 15-40°C operating temperature 0-90% Relative Humidity, non-condensing	Electrical: Input Voltage: 120 V, 60 Hz Input Current: 2.5 A	Mechanical: Weight: Approx. 35 lbs. Dimensions: 17"W x 17"D x 5.75H

Table 1. MegaPulse specification

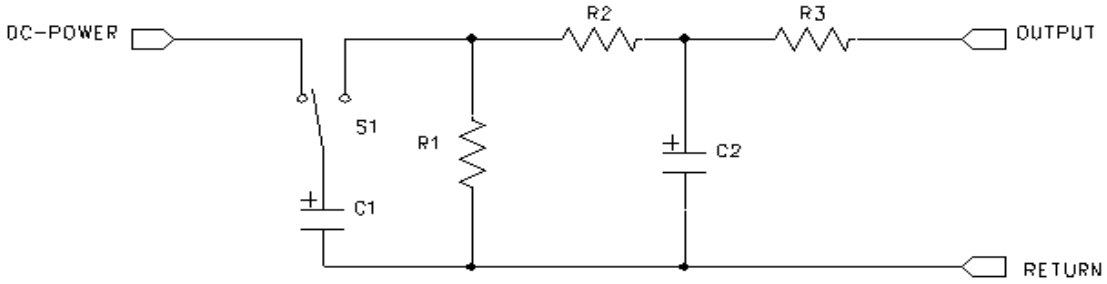


Figure 1.

Section 3

Operation

This section describes how to set up and make measurements with your Tester. We recommend that you read the entire section carefully so that you can use all of the features of your Tester.

Setting up your Tester

Your Tester is shipped in a special protective container that should prevent damage to the instrument during shipping. Check the shipping order against the contents of the container and report any damage or short shipment to Compliance West USA. The container should include the following:

? The MegaPulse Impulse Tester

? Two high-voltage test leads

? An 18 AWG Line Power Cord

? This Instruction Manual

If reshipment of the instrument is necessary, please use the original shipping container. If the original shipping container is not available, be sure that adequate protection is provided to prevent damage during shipment. We recommend that the instrument be surrounded by at least three inches of shock-absorbing material on all sides of the container.

Remove the Tester from its container and place it on a test bench.

AC Line Voltage Requirements

AC line voltage requirements for your Tester are noted on the rear panel of the instrument. Do not connect the instrument to a different voltage source.

Selection of a Suitable Power Cord

The cord packaged with your MegaPulse Tester is for use in the United States. If another power cord must be used, the cord must be rated for the maximum current noted on the rear panel. It must also meet the requirements of IEC 227 or IEC 245, and mains cords that are certified or approved by any recognized national test house are regarded as meeting this requirement.

Fuse Replacement

There is a user-replaceable fuse (F1) located on the rear panel of the instrument. It is located behind a door in the Power Inlet-Power Switch-Fuse Holder device. The fuse rating is noted on the rear panel. Do not attempt to replace it with a fuse of any other rating.

Use the following procedure to replace the fuse F1:

1. Turn the power switch to the O or off position.
2. Unplug the instrument from the source of supply.
3. Remove the power inlet cord from the instrument.
4. Using a small screwdriver, pry open the fuse holder door.
5. Replace the fuse with a new one of the correct rating.
6. Replace the fuse holder door and power inlet cord.

Front and Rear Panel Features

Before using your Tester, take a few minutes to become familiar with the use of its controls, indicators and connectors. The front panel features of the MegaPulse are shown in Figure 2 and described in Table 2. The rear panel features of the MegaPulse are shown in Figure 3 and described in Table 3.

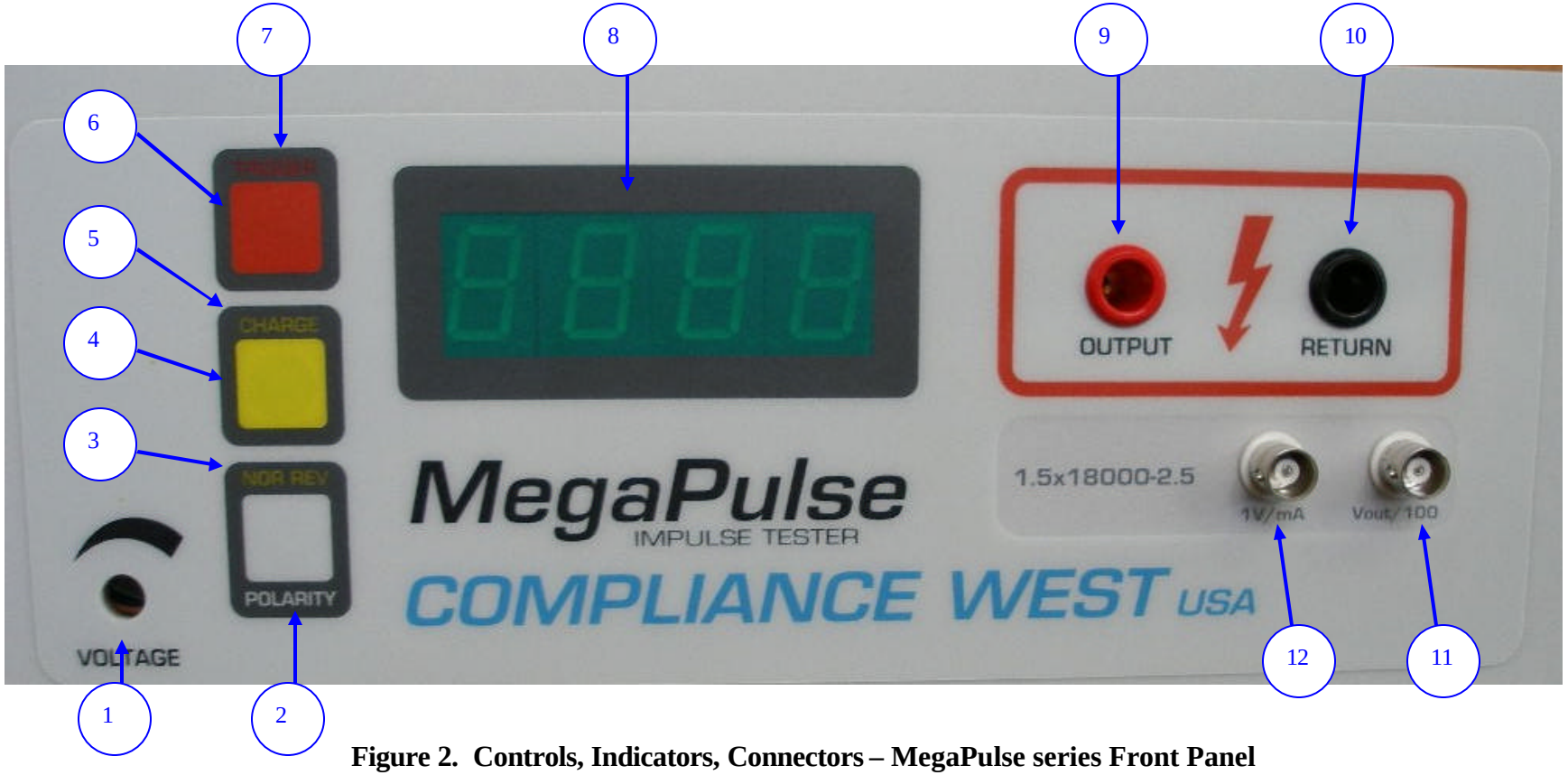


Figure 2. Controls, Indicators, Connectors – MegaPulse series Front Panel

ITEM	NAME	FUNCTION
1	**VOLTAGE** Adjust Knob	Turn Clockwise to increase the output voltage after the **CHARGE** button has been pressed. Turn the knob fully counterclockwise (lowest voltage setting) before the start of each test, and after the end of each test.
2	**POLARITY** switch	The polarity switch only operates when the **CHARGE** indicator is lit, i.e. the output is not charged. The polarity of the output waveform can be changed by pressing the **POLARITY** switch on the front panel. Press this switch to toggle the output polarity from Normal to Reverse. The polarity is Normal when the **NOR** indicator is lit. In this case, the High Voltage will appear on the **OUTPUT** as a positive pulse relative to the **RETURN** jack. When the polarity switch is in the Reverse position (**REV** indicator is lit), the High voltage will appear on the **OUTPUT** as a negative pulse relative to the **RETURN** jack.
3	**NOR REV** indicator	Indicates the state of the Output Polarity switch. **NOR** indicate Normal position, **REV** indicates Reverse position.
4	**CHARGE** switch	Press this switch to begin charging the impulse storage capacitor (C1 in Figure 1). The **CHARGE** indicator will turn off after the **CHARGE** switch is pressed, and the **TRIGGER** indicator will turn on. The voltage on the capacitor will appear on the LED Display, Item 8. This voltage will appear across the output leads when the **TRIGGER** switch is pressed. Note that the **POLARITY** switch is prevented from operating after the **CHARGE** switch has been pressed.
5	**CHARGE** indicator	This Yellow indicator is lit to show that pressing the **CHARGE** switch is the next logical step in a test sequence. Pressing the Charge switch causes the **CHARGE** indicator to go out.
6	**TRIGGER** switch	Press this switch (after pressing the **CHARGE** switch to charge the storage capacitor) to trigger the output impulse waveform. The impulse waveform will appear across the output leads.
7	**TRIGGER** indicator	This Red indicator is lit to show that pressing the **TRIGGER** switch is the next logical step in a test sequence. This indicator will turn on after the **CHARGE** switch is pressed, and will remain on until the **TRIGGER** switch is pressed. Pressing the **TRIGGER** switch causes the **TRIGGER** indicator to go out.
8	**VOLTAGE** meter	Displays the output voltage set point. This voltage is the open-circuit peak voltage that will appear across the output leads when the trigger button is pressed. The voltage reading will increase from zero to the voltage set point when the Charge switch is pressed. Note that the Voltage meter may indicate that some residual voltage is present on the main storage capacitor, even when the tester is first turned ON. This is due to inherent charging of the internal capacitors. Pressing the **TRIGGER** switch will discharge the capacitors (be sure to disconnect the output and return leads when discharging the capacitors).
9	**OUTPUT** jack	The red output lead is connected between this jack and the EUT. Always twist this lead and the RETURN lead together with approximately 4 turns per foot to minimize inductance.
10	**RETURN** jack	The black return lead is connected between this jack and the EUT. Always twist this lead and the RETURN lead together with approximately 4 turns per foot to minimize inductance.
11	**Vout/100** BNC	Used to measure the test voltage at the Output Jack. The output is scaled at 100:1, i.e. 10mV/V. For connection to an oscilloscope for waveform verification.
12	**0.1V/mA** BNC	Used to measure the test current. The output is scaled at 1:100, i.e. 0.1V/mA.

Table 2. Controls, Indicators, Connectors – MegaPulse series Front Panel

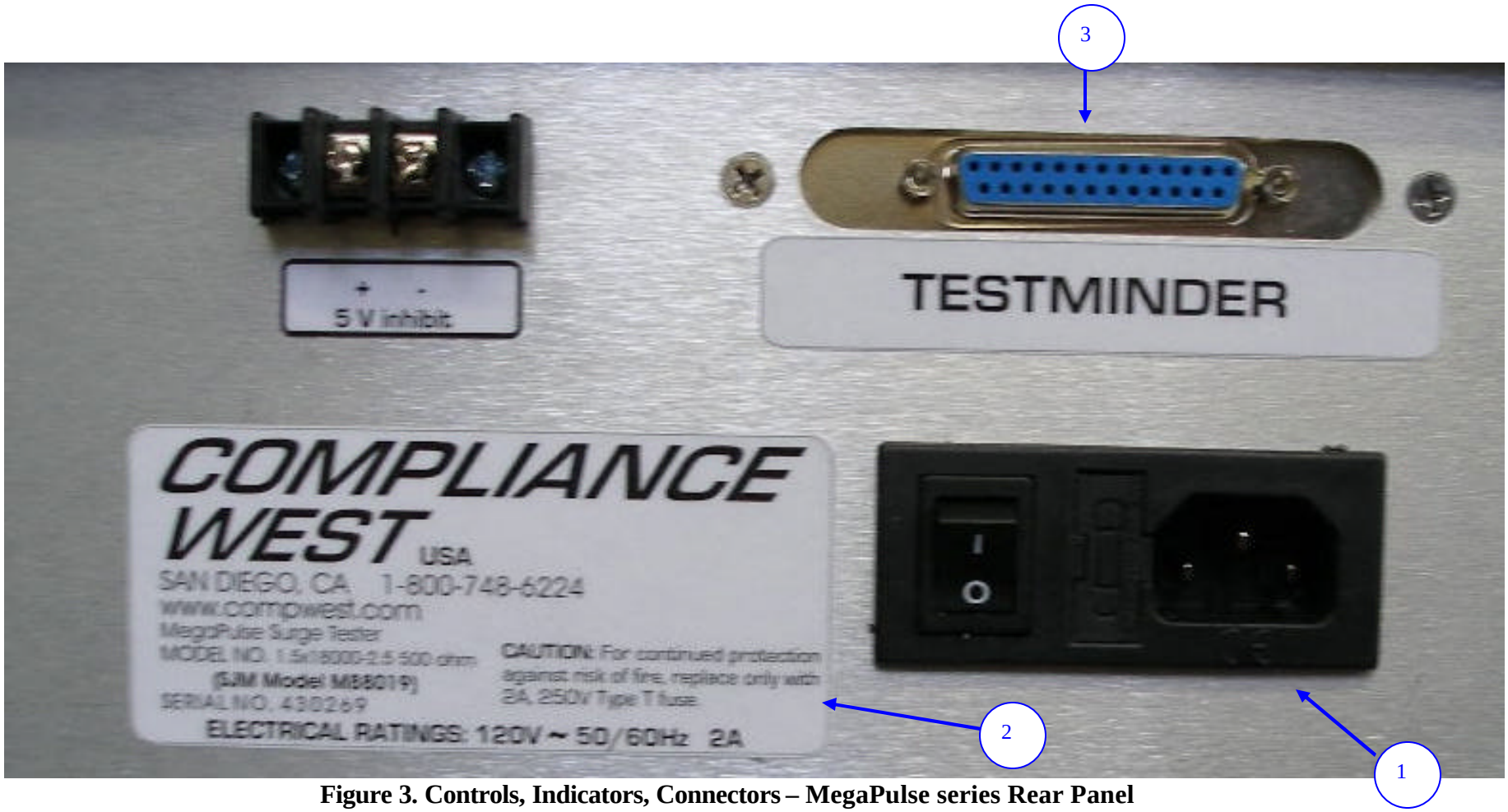


Figure 3. Controls, Indicators, Connectors – MegaPulse series Rear Panel

Table 3. Control, Indicators, Connectors – MegaPulse series Rear Panel

ITEM NO.	NAME	FUNCTION
1	Appliance Inlet / Fuse holder / Power Switch	Use supplied cord set to connect Tester to appropriate source of supply. Fuse holder provides access for Fuse replacement, and the Power Switch is used to turn the tester ON and OFF.
2	Fuse replacement warning / Rating of supply	Specifies replacement fuse and required supply voltage.
3	TestMinder	For connection of a computer running TestMinder software. See TestMinder Manual for further information.

Initial Checkout Procedure

The following procedure will verify that the Tester is working correctly. We recommend that this procedure be conducted periodically to ensure proper operation of the Tester.

The following items are needed to conduct this procedure:

A measuring instrument to monitor the output waveform. Always ensure that the measuring instrument (usually an oscilloscope with a high-voltage probe such as the Tektronix P6015) is rated for the voltage involved, and that the frequency response of the instrument and probe are capable of measuring the output waveform of the MegaPulse Impulse Tester. A measuring instrument or probe with a low frequency response will result in erroneous readings.

CAUTION

High voltage generated by the MegaPulse tester is exposed during this test. A risk of shock exists. Exercise care when using the MegaPulse tester.

1. Connect the Tester to a proper source of supply using the included 18 AWG power supply cord. Make sure that the front panel **VOLTAGE** adjust knob is turned fully counterclockwise.
2. Plug the Output and Return test leads in to the jacks on the front panel. Twist them together with approximately 4 turns per foot.
3. Connect the ends of the test leads to an appropriate measuring instrument (typically an oscilloscope with a high-voltage probe such as the Tektronix P6015). Note that the **RETURN** lead is not referenced to the chassis of the MegaPulse tester.
4. Turn the Tester on. Toggle the **POLARITY** switch if necessary so that the **NOR** indicator is lit.
5. Note that the Voltage meter may indicate that some residual voltage is present on the main storage capacitor, even when the tester is first turned ON. This is due to inherent charging of the internal capacitors. Pressing the **TRIGGER** switch will discharge the capacitors (be sure not to touch the output and return leads when pressing the trigger switch).
6. Push the yellow **CHARGE** button. Verify the red **TRIGGER** indicator is now lit.
7. Adjust the **VOLTAGE** knob so that the front panel LED display is reading 1500V. Push the red **TRIGGER** button, and view the resulting impulse waveform on the measuring instrument.
8. Repeat steps 5 through 7, except this time toggle the **POLARITY** switch so that the **REV** indicator is lit. Note that the impulse waveform will now be a negative pulse, so it will probably be necessary to make adjustments to the measuring instrument to get a proper reading.
9. Adjust the **VOLTAGE** knob fully counterclockwise, to the minimum position. Turn the rear-panel power switch OFF.

Testing

This section describes how the MegaPulse Tester is used to conduct a test. The test can be stopped immediately at any time by turning OFF the rear-panel power switch.

1. Connect the Tester to a proper source of supply using the included 18 AWG power supply cord. Make sure that the front panel **VOLTAGE** adjust know is turned fully counterclockwise.
2. Plug the Output and Return test leads in to the jacks on the front panel. Twist them together with approximately 4 turns per foot of cable length.
3. Connect the ends of the test leads to the equipment under test.
4. Connect the voltage and current BNC outputs to an oscilloscope.
5. Turn the Tester on. Toggle the **POLARITY** switch as needed so that the **NOR** or **REV** indicator is lit.
6. Note that the Voltage meter may indicate that some residual voltage is present on the main storage capacitor, even when the tester is first turned ON. This is due to inherent charging of the internal capacitors. Pressing the **TRIGGER** switch will discharge the capacitors (be sure not to touch the output and return leads when pressing the trigger switch).
7. Push the yellow **CHARGE** button. Verify the red **TRIGGER** indicator is now lit.
8. Adjust the **VOLTAGE** knob so that the front panel LED display is reading 1500V. Push the red **TRIGGER** button, and view

the resulting impulse waveform on the measuring instrument.

Voltage Output BNC Jack

The MegaPulse is equipped with BNC voltage sense jacks which report the waveform, attenuated 100:1, so the 1500V output is displayed on the scope as 15V.

Current Output BNC Jack

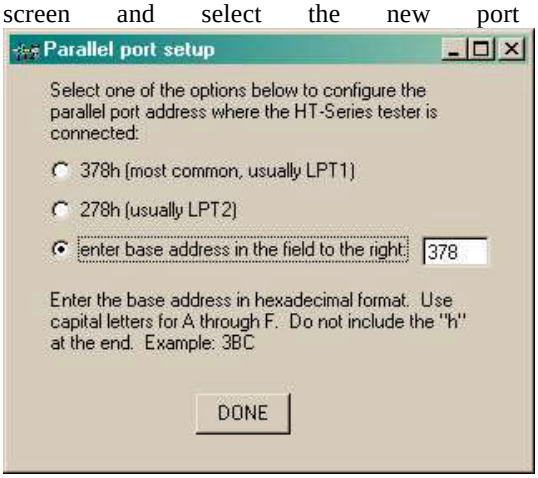
1. The MegaPulse is equipped with BNC current sense jacks which report the current output. The calibration of this jack is 0.1V/mA, and anticipates a resistance of the EUT of approximately 100kohm. If 15mA flows through the circuit, then a 15V signal is output from the Current Output BNC Jack.

TestMinder Operation

The TestMinder MegaPulse is an option that allows testing to be started and stopped from a Windows-equipped computer. Multiple tests using the same output voltage a jacks can also be conducted. A record of the test is sent to a file on the computer. The record can be set to be a .txt file or a .csv file. The .csv file can be read by Microsoft Excel.

File Installation and Program Setup

1. Insert the CD "Compliance West USA TestMinder MegaPulse" into the drive on your computer and follow the prompts. If the CD does not start automatically, browse to the CD and click the file "Setup.exe." The files will be installed to the location of your choice.
2. Browse to the CD again, and select the directory "DLPortIO", click it, and run the installation program "Port95nt.exe".
3. Using the computer's Setup Utility, configure the parallel port to SPP or PS/2. This is important as some parallel port emulations will not allow proper operation of TestMinder MegaPulse. For detailed information on this step, please see the readme.txt file on the CD.
4. Further configuration of the parallel port is available on the TestMinder MegaPulse screen. For most cases, the default parallel port 378H (LPT 1) will be used. If this needs to be changed, click the LPT Setup button on the screen and select the new port assignment. Click DONE when finished.

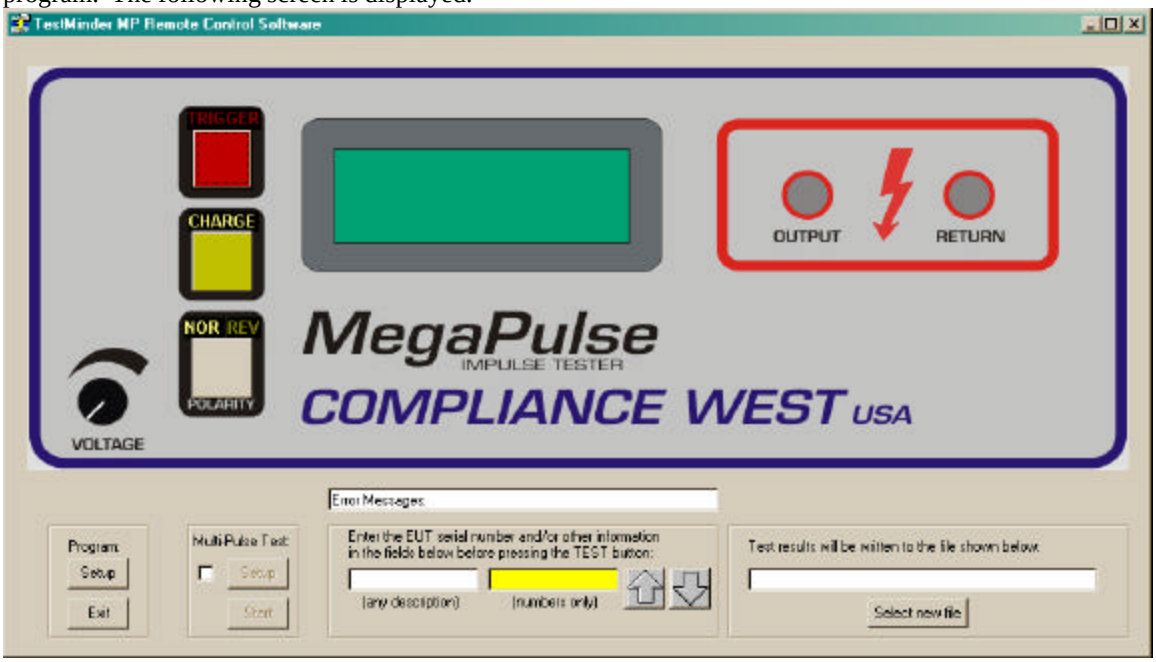


5. Connect the parallel port of the computer to the MegaPulse using the supplied parallel printer cable. Be sure to use the same computer LPT port specified in item 4 above.
6. Further operational assistance is available through the popup windows as the mouse is moved over the program window.

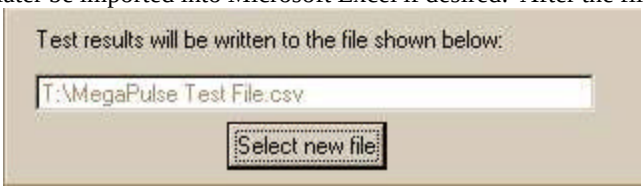
Test operation using TestMinder MegaPulse

Manual Operation from the Computer

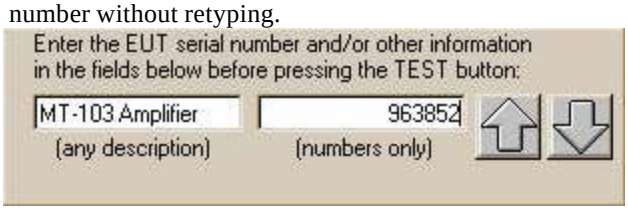
1. Click Start, Programs, TestMinder MP V1.2b, TestMinder MP V1.2b on the Windows main screen to start the program. The following screen is displayed.



2. The MegaPulse may be run in manual mode from the computer. To conduct a manual test, first enter a test result file in the window at the lower right hand part of the screen.
3. Click on "Select New File" to show the Open File dialog box. Select a file name and suffix. .txt and .csv files can be saved. .csv files can later be imported into Microsoft Excel if desired. After the file is selected, the box will show the file location:



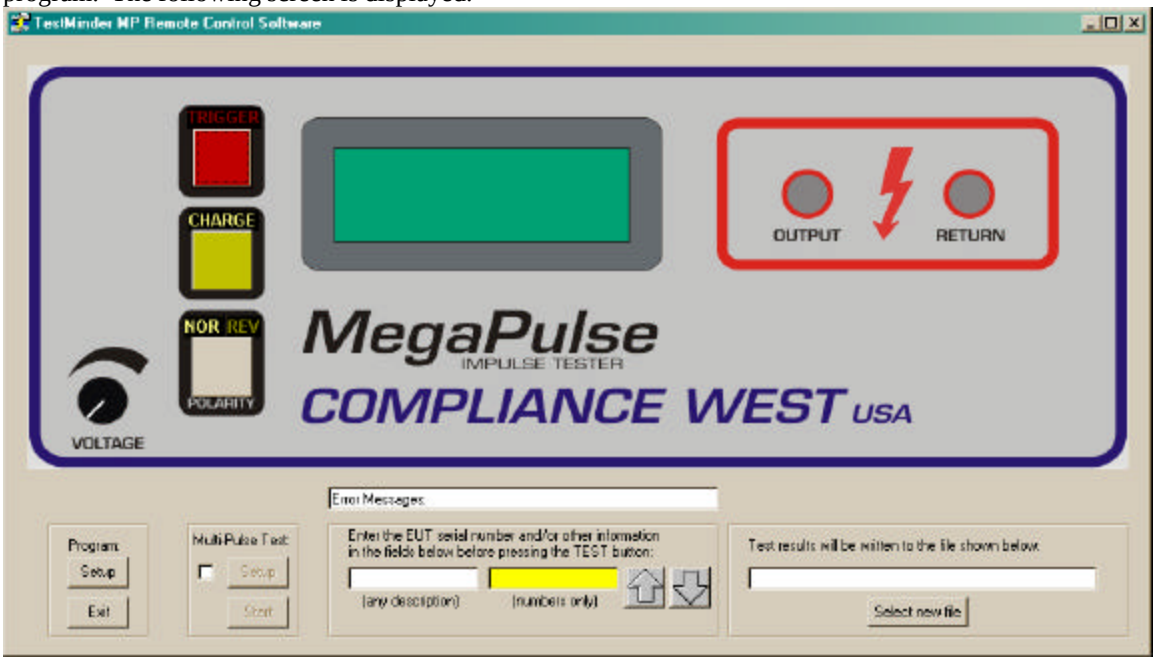
4. For reference, enter a description and/or Serial Number for the EUT can be entered in the lower center portion of the screen. The up and down arrows allow the user to increment or decrement a previously entered serial number without retyping.



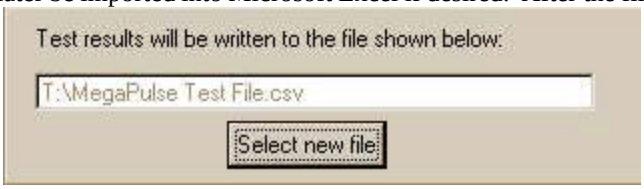
5. To conduct the test, select either positive or negative polarity by clicking on the Polarity button. As it is clicked, it alternates between Normal (positive) and Reverse (negative) polarity. Polarity selection must be entered before clicking on the Charge Button. After the Charge Button has been clicked, the Polarity button is disabled.
6. Press the Charge button. Make sure the voltage meter on the front panel reads the voltage desired.
7. Press the Trigger button to discharge the voltage into the EUT.

Automatic Operation in Multi-Pulse Mode

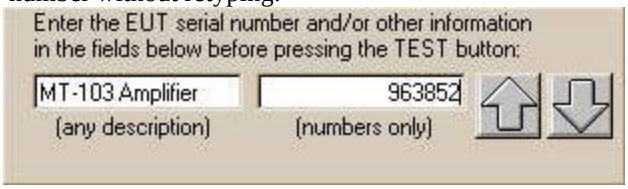
1. Click Start, Programs, TestMinder MP V1.2b, TestMinder MP V1.2b on the Windows main screen to start the program. The following screen is displayed.



2. The MegaPulse is run in multipulse mode only from the computer. To conduct an automatic test, first enter a test result file in the window at the lower right hand part of the screen.
3. Click on "Select New File" to show the Open File dialog box. Select a file name and suffix. .txt and .csv files can be saved. .csv files can later be imported into Microsoft Excel if desired. After the file is selected, the box will show the file location:



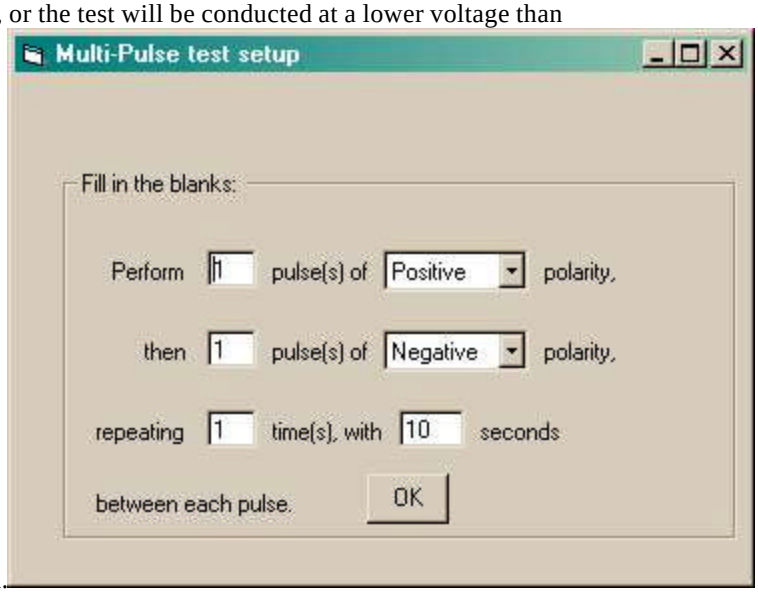
4. For reference, enter a description and/or Serial Number for the EUT can be entered in the lower center portion of the screen. The up and down arrows allow the user to increment or decrement a previously entered serial number without retyping.



5. To set the number of pulses and repetition rate, first check the box in the "Multi-Pulse Test" box. Two buttons will become available; "Setup" and "Start" . Click on the "Setup" button.

6. The setup screen is displayed. There is capability to define a test, defined as a number of repeating positive pulses followed by a number of negative pulses. This test can be repeated up to 99 times. NOTE: If negative pulses are required to be run first, click on the arrow, and the pulse polarity can be switched. NOTE: It is possible to set the repetition time faster than the charge time of the MegaPulse. Care must be taken to assure that time is allowed for the MegaPulse to reach full voltage on its front panel meter before the Trigger button is

pressed, or the test will be conducted at a lower voltage than planned.



7. After Multi-Pulse Test Parameters are correctly entered, click on the OK button to return to the TestMinder Main Screen.
8. To conduct a Multi-Pulse test, click on the “Start” button in the Multi-Pulse Test box. The test commences immediately, and status is shown on the Main Screen. Note that the test can be stopped at any time by pressing the space key.

Section 4

Technical Assistance

For Technical Assistance
Phone: (800) 748-6224

Technical Assistance is available from Compliance West USA between the hours of 8:30 AM and 4:30 PM Pacific Time.

Compliance West USA
2120 Jimmy Durante Blvd., Suite 124
Del Mar, CA 92014

Phone: (858) 481-6454
FAX: (858) 481-8527

Or email support@compwest.com

Technical information is also available on our web site at: www.compwest.com

Section 5

Maintenance and Calibration

WARNING

THESE SERVICE INSTRUCTIONS ARE FOR USE BY QUALIFIED PERSONNEL ONLY. TO AVOID ELECTRIC SHOCK, DO NOT PERFORM ANY SERVICING OTHER THAN THAT CONTAINED IN THE OPERATING INSTRUCTIONS UNLESS YOU ARE QUALIFIED TO DO SO.

Introduction

This section of the manual contains maintenance information for the MegaPulse series impulse tester. This maintenance information is divided into service information, general maintenance, a performance test, and a calibration procedure. The performance test is recommended as an acceptance test when the instrument is first received, and later as a preventative maintenance tool to verify proper instrument operation. A 1-year calibration cycle is recommended to maintain the specifications given in Section 1. The test equipment required for the performance test is an oscilloscope and high voltage probe, and a calibrated current shunt. The test equipment required for the calibration procedure is a DMM able to read the maximum specified peak output voltage of the MegaPulse tester.

Service Information

The MegaPulse tester is warranted to the original purchaser for a period of 1 year. This warranty does not cover problems due to misuse or neglect.

Malfunctions which occur within the limits of the warranty will be corrected at no charge. Ship the instrument post paid to the manufacturer. Dated proof of purchase is required for all in-warranty repairs.

The manufacturer is also available for calibration and / or repair of instruments that are beyond their warranty period. Contact the manufacturer for a cost quotation. Ship the instrument and your remittance according to the instructions given by the manufacturer.

General Maintenance

Interior Access

NOTE

To avoid contaminating the PWB with oil from your fingers, handle it by the edges or wear gloves. If the PWB becomes contaminated, refer to the cleaning procedures given later in this section.

Calibration Access

Use the following procedures to gain access to the calibration adjustments of your instrument.

1. Set Line Power switch to OFF.
2. Disconnect the power cord from the rear of the instrument.
3. Remove the four upper screws on each side of the unit.
4. Slide the top of the enclosure towards the rear of the unit to expose the inside of the MegaPulse tester.
5. All calibration adjustments are now accessible.

NOTE

With the power cord replaced, the instrument is operational for service.

WARNING

Dangerous voltages exist when energized. Exercise extreme care when working on an energized circuit.

6. To reassemble, reverse steps 1-4 above.

Cleaning

CAUTION

Do not use aromatic hydrocarbons or chlorinated solvents for cleaning. These solutions will react with the plastic materials used in the instrument.

Clean the front panel and case with a mild solution of detergent and a damp sponge. Clean dust from the PWB with clean, dry, low pressure (<20 psi).

Performance Test

The performance test evaluates the performance of your instrument to ensure that the logic, lights and high voltage sections are working properly. This test is recommended for incoming inspection, as a preventative maintenance check, and to verify proper operation during the calibration procedure. It is not necessary to disassemble the instrument to conduct these tests. If the instrument fails any part of the performance test, repair is indicated.

Allow the instrument to stabilize and perform the test at an ambient temperature of 23?C ?5?C (73?F ?9?F).

1. Connect the Tester to a proper source of supply using the included 18 AWG power supply cord. Make sure that the front panel **VOLTAGE** adjust know is turned fully counterclockwise (to the minimum).
2. Plug the Output and Return test leads into the jacks on the front panel. Twist them together over their run at approximately 4 wraps per foot to minimize inductance.
3. Connect the ends of the test leads to an appropriate measuring instrument (typically an oscilloscope with a high-voltage probe suitable for reading high frequency waveforms, such as a Tektronix P6015). Note that the **RETURN** lead is not referenced to the chassis of the MegaPulse tester.
4. Turn the Tester on. Toggle the **POLARITY** switch if necessary so that the **NOR** indicator is lit.
5. Note that the Voltage meter may indicate that some residual voltage is present on the main storage capacitor, even when the tester is first turned ON. This is due to inherent charging of the internal capacitors. Pressing the **TRIGGER** switch will discharge the capacitors (be sure not to touch the output and return leads when pressing the trigger switch).
6. Push the yellow **CHARGE** button. Verify the red **TRIGGER** indicator is now lit.
7. Adjust the **VOLTAGE** knob so that the front panel LED display is reading 1500 volts. Push the red **TRIGGER** button, and view the resulting impulse waveform on the measuring instrument.
8. A copy of the actual voltage waveforms (Vpeak, Ipeak, Idur, Irise) that were measured on your instrument before shipping are included with the Calibration Certificate that was originally shipped with the MegaPulse. These waveforms are identified by the serial number of your MegaPulse tester. Compare the impulse waveform to these "as shipped" waveforms, as well as the ideal waveforms as shown in Section 6 of this Manual. If the measured waveform is significantly different than the ideal waveform, then additional evaluation and/or repair of the MegaPulse tester is required.
9. Adjust the **VOLTAGE** knob fully counterclockwise, to the minimum position. Turn the rear-panel power switch OFF.

If the results of the performance test are not in accordance with the above, service is required. Remove the Tester from service and contact the manufacturer for servicing information. If the results of the tests above are correct, proceed with the Calibration Procedure.

Calibration Procedure

The Calibration Procedure should be performed annually and any time the instrument has been repaired. The calibration procedure consists of calibrating the meter reading to agree with the voltage output.

The Performance test in the previous section should be performed with satisfactory results before conducting the Calibration procedure.

Before starting the Calibration procedure, perform the Calibration access procedure given earlier in this Section.

NOTE

Allow the instrument to stabilize for approximately five minutes. Perform all calibration adjustments at an ambient temperature of 23?C ?5?C (73?F ?9?F).

WARNING:
Calibration Adjustments Are Performed On Live Circuits. Exercise Caution At All Times, And Use A Non-Conductive Tool For All Adjustments.

Voltage and Current Calibration Adjustment

Use the following procedure to calibrate the output voltage. Pot R6 and R7 are located on the back side of the front panel LED display board. Verify the location of these two potentiometers after the top cover of the tester has been removed, but before the power cord has been plugged into the tester.

1. Plug in the power cord. Adjust the front panel **VOLTAGE** knob fully counterclockwise to the minimum position. Turn the rear-panel power switch ON. The **CHARGE** indicator should be lit.
2. Adjust R6 so that the voltage reading on the front panel LED display is as close to zero. Note that the display may read some residual voltage of approximately 10 volts.
3. Plug the Output and Return test leads in to the jacks on the front panel. Twist them together over their run at approximately 4 wraps per foot to minimize inductance.
4. Connect the ends of the test leads a load of 75Kohm and an appropriate measuring instrument (typically an oscilloscope with a high-voltage probe suitable for reading high frequency waveforms, such as a Tektronix P6015). The Oscilloscope needs to be floated from ground because the **RETURN** lead is not referenced to the chassis of the MegaPulse tester.
5. Press the **CHARGE** button and wait for the meter voltage to stabilize. Use the **VOLTAGE** adjustment knob to increase the meter voltage to 1500V.
6. Press the **TRIGGER** button. Note the maximum output voltage appearing on the oscilloscope.

   Press the **CHARGE** button again and wait for the meter voltage to stabilize.
7. Using a non-conductive screwdriver, adjust R7 so that the voltage reading on the front panel LED display agrees with the peak voltage reading on the oscilloscope.
8. Using steps 5-7, retest until the peak voltage and the meter voltage agree.
9. Using a 1:1 probe, verify the Vout/100 BNC output on the front panel has a 15V ±3% output voltage peak when the front panel voltage meter reads 1500V. This is a precision voltage divider and no adjustments are available. If this output is out of tolerance, service is required.
9. Using the settings shown in the original calibration photos, record and capture the following waveforms, for future reference. These pictures should be kept with the MegaPulse.
   Ipeak
   Idur
   Irise
   Vpeak
10. Disconnect the oscilloscope probe from the output leads.
11. Connect a 15Kohm load in the test leads. Connect a 1:1 BNC cable between the 0.1V/mA BNC connector on the front panel and an oscilloscope. Connect a calibrated current probe clamped around one of the test leads.
12. Press **CHARGE** and wait for the voltage meter to stabilize. Set the voltage meter to 1500V using the voltage adjust knob on the front panel.
13. Set the scope for a single trigger event, and press **TRIGGER** on the MegaPulse. Verify the current in the BNC concurs with the current in the probe with a tolerance less than +/-3%.
14. Turn the **VOLTAGE** adjust knob back down to zero. Allow the output voltage to decay down to a safe level (this may take a few minutes). Remove the test leads.
15. Turn the rear-panel power switch OFF, and replace the top cover of the MegaPulse tester.

If the results of the calibration procedure are not in accordance with the above, service is required. Remove the Tester from service and contact the manufacturer for servicing information. If the results of the tests above are correct, the tester may be put back into use