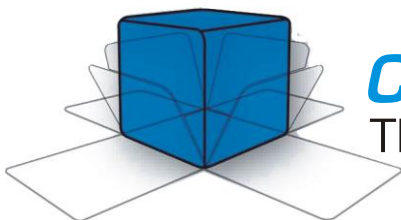


MegaPulse

IMPULSE TESTER

Defib-5PF-002

Instruction Manual



COMPLIANCE WEST USA

The blue box that tests. And tests.

Dear Customer:

Congratulations! Compliance West USA is proud to present you with your MegaPulse Defib-5PF-002 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.

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Section 1

Introduction to MegaPulse

The impulse test is designed to simulate impulse surges which occur in everyday life due to nearby lightning strikes, switching transients, and other high-frequency faults on the power distribution network. Impulse testing is the fundamental method for empirical verification of the adequacy of insulation. Other methods of ensuring adequate insulation (AC or DC Dielectric Withstand testing, measurement of over-surface creep age, through-air clearance, or distance-through-insulation) are all extrapolated from the results of impulse testing. The impulse test is performed to ensure that the insulation in question will be able to function properly when subjected to similar impulse surges in the field.

Safety Precautions

The impulse withstand test can generate voltages up to 5000V peak at potentially lethal current levels. Currents of as little as 5mA at 120 volts can cause death; the MegaPulse can deliver currents of more than 10 Amps peak for 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 impulse 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 Defib-5PF-002 can be shut off at any time by turning OFF the rear power switch. Always press TRIGGER to discharge the tester before turning OFF.

The MegaPulse tester is provided with a digital **VOLTAGE ADJUST** knob on the front panel. This should always be adjusted 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. Note that the CHARGE process will stop after 2 minutes if the TRIGGER button is not pressed.

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

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).

Note that the peak amplitude of the measured output waveform is proportional to the voltage that is read on the front panel of the MegaPulse, but it will always be somewhat lower. This is because the meter on the MegaPulse is measuring the voltage on the main impulse storage capacitor. This voltage will intentionally dissipate to some extent before reaching the output leads. Therefore, it is important to measure the peak amplitude of the output waveform, and adjust the output of the MegaPulse accordingly.

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

This manual contains complete operating, maintenance and calibration information for the Compliance West USA MegaPulse Defib-5PF-002 Impulse Tester.

- In case of trouble, the test can be immediately terminated at any time by turning the rear-panel power switch to the OFF position.
- Before the test can commence, the unit must be armed by pressing the **CHARGE** Button. The test will not begin until the **TRIGGER** Button is pushed.
- Operator instructions are printed on the rear panel for quick reference.
- Voltage is discharged by a resistor bank within the MegaPulse tester upon test completion. Discharge progress is shown on the front panel meter.

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

Specifications

Specifications for the MegaPulse Defib-5PF-002 are listed in the table below and the component designations are shown in Figure 1 and Figure 2. For impulse waveform look at Figure 33 and Figure 4.

ELECTRICAL	
Output Voltage:	0 - 5000 V tolerance $\pm 1\%$
Main Capacitance:	0.13 μF $\pm 10\%$ Type A, 0.50 μF $\pm 10\%$ Type B (600,000 cycles life)
Voltage Control:	Digital Set point adjusted by frontal VOLTAGE knob or by PC TestMinder.
Voltage Display:	4 Digit LED Display.
Voltage Meter resolution:	2V
Duty Cycle:	1 pulse every 20s.
Selectable Input Voltage:	120V~ 60Hz 240V~ 50Hz
ENVIROMENTAL	
Operating Temperature:	15 - 40 °C
Relative Humidity Range:	0 - 90% non-condensing
Altitude	0 - 3000 meters
GENERAL	
Dimensions:	17" wide x 15.75" high x 17" in deep
Weight:	50 lbs. approx.

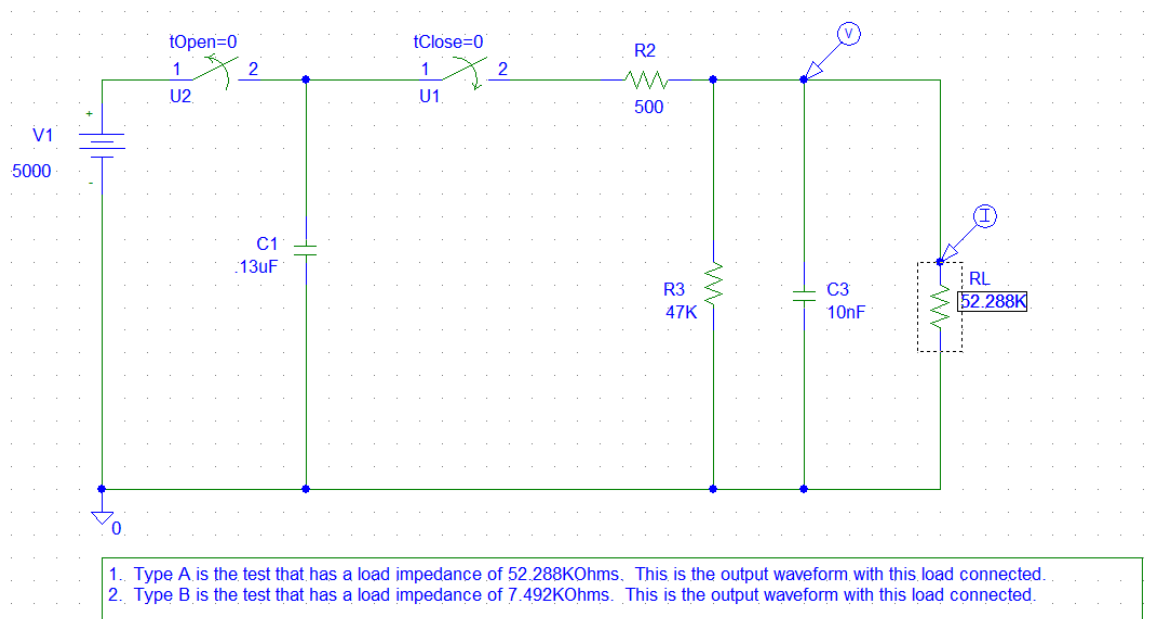


Figure 1. Type A Diagram.

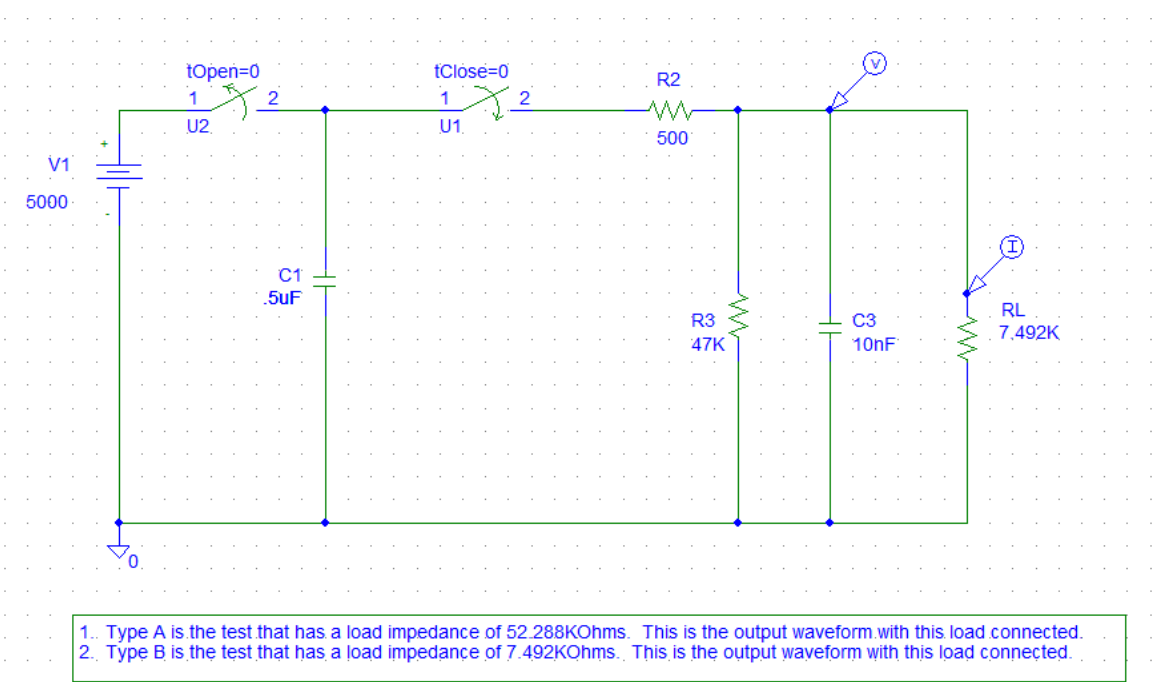


Figure 2. Type B Diagram.

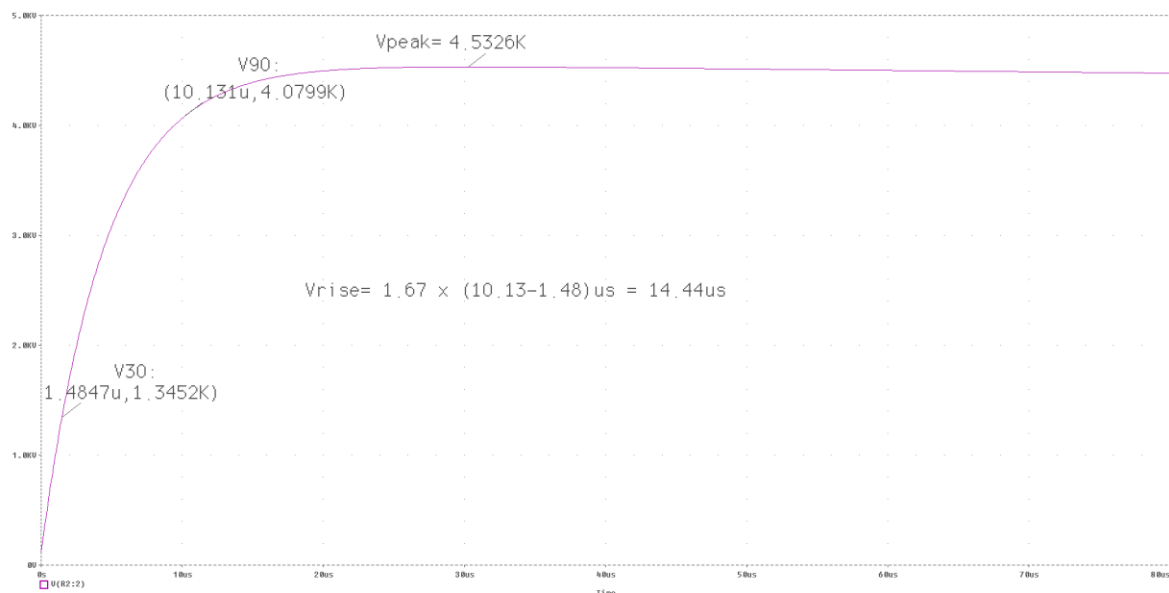


Figure 3. Impulse waveform type A.

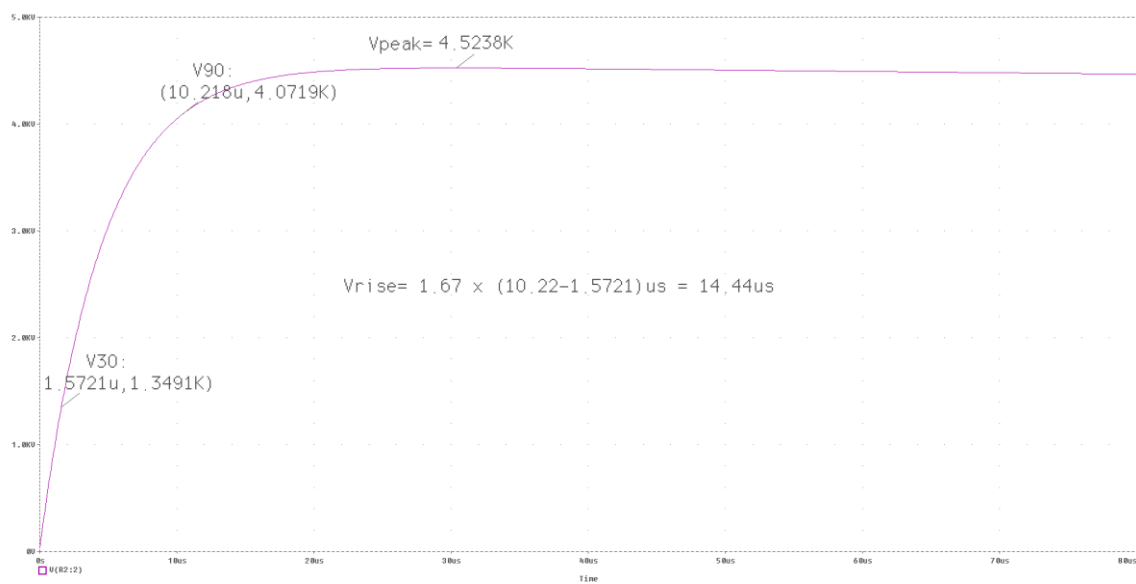


Figure 4. Impulse waveform type B.

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 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:

- Qty 1 MegaPulse Defib-5PF-002 Tester
- Qty 10 PN:00-HVTL-R (High Voltage Test Lead Red)
- Qty 1 PN: 70-101 (Power Cord 18 AWG)
- Qty 1 Defib-5PF-002 Instruction Manual
- Qty 1 Testminder set
- Qty 1 External Load (52.299k Ω and 7.492k Ω +/-5%)

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. 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. A second fuse can be found next to the input voltage selector switch

Use the following procedure to replace a fuse:

1. Turn the power switch to the OFF position.
2. Unplug the instrument from the source of supply.
3. Remove the power inlet cord from the instrument.
4. Open the fuse holder door.
5. Replace the fuse with a new one of the correct rating.
6. Replace the fuse holder 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 and described in Table 1. The rear panel features of the MegaPulse are shown in Figure and described in Table 2.

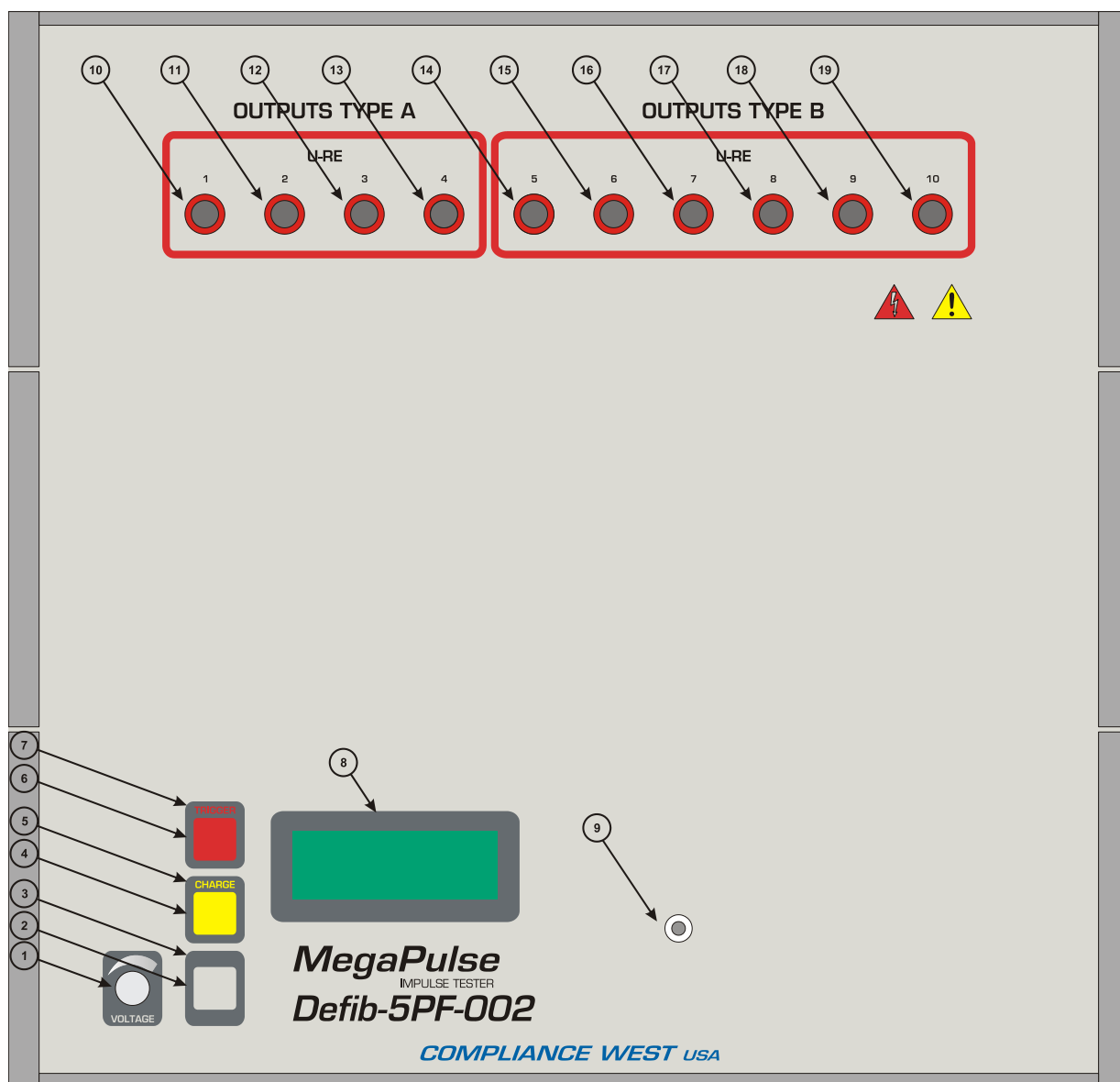


Figure 5. MegaPulse Defib-5PF-002 Front Panel

ITEM	NAME	FUNCTION
1	VOLTAGE Adjust Knob	Adjust the digital voltage set point in the tester. Press the voltage knob to display the voltage set point. This setting will blink for a few seconds on the front meter. Turn Clockwise to increase the setting Voltage Setting Point before pressing CHARGE button.
2	POLARITY switch	Disable
3	NOR REV indicator	Indicates the state of the Output Polarity switch. NOR indicates Normal (Positive) position. REV indicates Reverse (Negative) position.
4	CHARGE switch	Starts the charge process of the tester capacitor. The CHARGE indicator will turn off after the CHARGE switch is pressed, and the TRIGGER indicator will turn on. The charge process will stop after 2 minutes if the TRIGGER button is not 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. CHARGE indicator is lit when the tester is turn ON an after pressing TRIGGER button. CHARGE indicator will go out after pressing CHARGE button. CHARGE and TRIGGER Indicators will be blinking if the Interlock Switch is open. (Only testers with Interlock Switch Option)
6	TRIGGER switch	Triggers the output impulse waveform. The impulse waveform will appear across the output leads.
7	TRIGGER indicator	This Red indicator is lit to show that the tester can be trigger. TRIGGER indicator is lit for 2 minutes after the CHARGE button is pressed. TRIGGER indicator will go out after pressing TRIGGER button. TRIGGER and CHARGE Indicators will be blinking if the Interlock Switch is open (Only testers with Interlock Switch Option) TRIGGER indicator will blink at when the Voltage. This effect will remain on until the TRIGGER switch is pressed. (Only testers with PC Interface option)
8	VOLTAGE meter	Displays the output voltage set point. The voltage reading will increase from zero to the voltage set point when the CHARGE button 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. Note that the peak amplitude of the measured output waveform is proportional to the voltage that is read of the front panel of the MegaPulse, but it will always be somewhat lower. This is because the meter on the MegaPulse is measuring the voltage on the main impulse storage capacitor. This voltage will intentionally dissipate to some extent before reaching the output leads. The meter will start to flash at 7100V to indicate that voltage is in the maximum limits. If unit includes PC Interface and the Keyboard is locked, the display will show OFF when a button is pressed.
9	500:1 BNC	500:1 reference to verify delivery of pulse
10-19	OUTPUTS	10 Channel multiplexer outputs, each channel capable of delivering the pulse, channel activation is via commands on the back of the unit.

Table 1. MegaPulse Defib-5PF-002 Front Panel

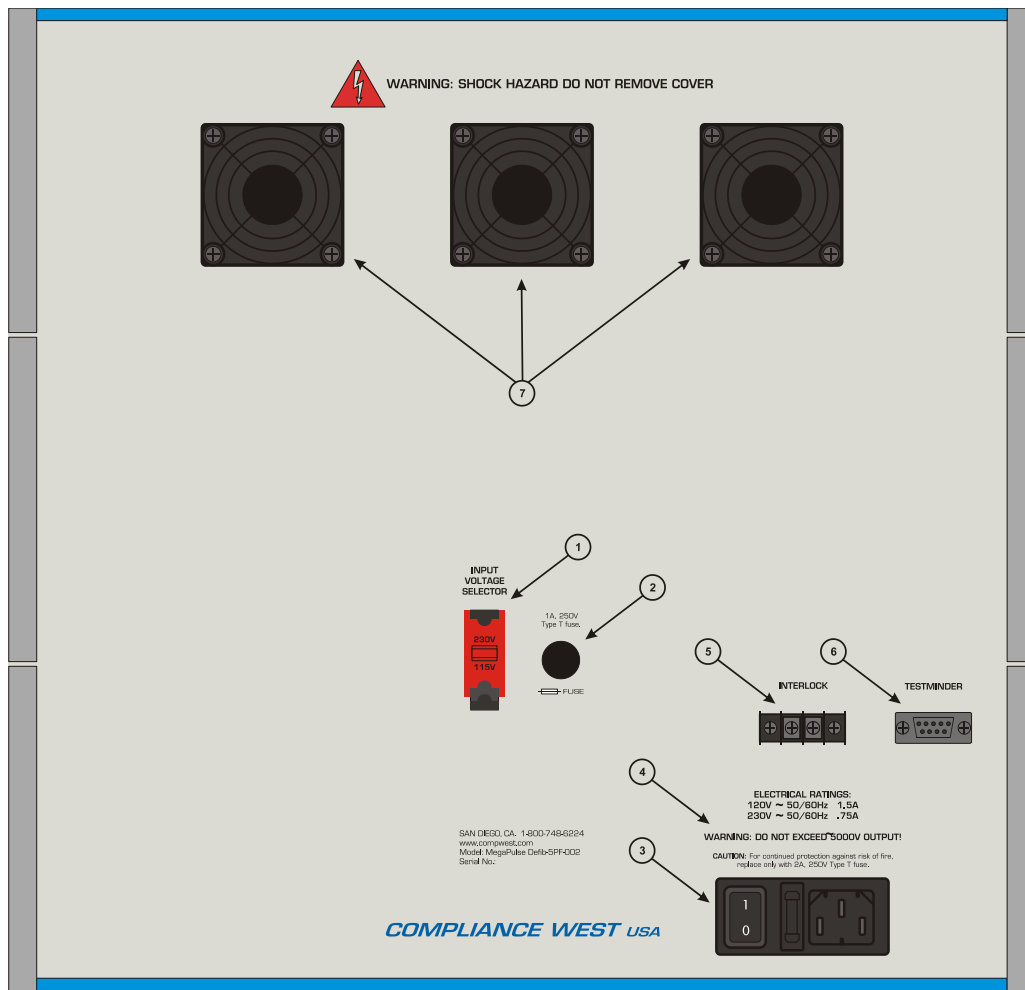


Figure 6. MegaPulse Defib-5PF-002 Rear Panel

ITEM	NAME	FUNCTION
1	INPUT Switch	The switch allows the selection of 115V or 230V input
2	Fuse B	The fuse B is to protect the unit when supplying 230V.
3	Appliance Inlet	Use supplied cordset to connect the MegaPulse Defib-5PF-002 tester to an appropriate source of supply.
4	Fuse replacement warning / Rating of power supply	Specifies replacement fuse and required supply voltage for 115V input.
5	Interlock Switch	Emergency Stop Close: Enables the tester buttons for operation. Open: Stops any process in the tester and disables the buttons. The TRIGGER and CHARGE Indicators will be blinking
6	RS-232 Interface (Optional)	Allow the communication between the tester and computer interface; a RS-232 to USB is available.
7	FANS	The Fans on the rear panel maintain the air flow to cool down the tester. CAUTION: When installing equipment, make sure not to cover the fans and have it on a proper ventilated area.

Table 2. MegaPulse Defib-5PF-002 Rear Panel

Initial Checkout Procedure

The following procedure will verify that the MegaPulse Defib-5PF-002 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) is rated for the voltage involved, and that the frequency response of the instrument and probe is capable of measuring the output waveform of the MegaPulse Defib-5PF-002 tester. A measuring instrument or probe with a low frequency response will result in erroneous readings that could be mis-read.

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
2. Plug a pair of leads to the Output on the front panel. Use channel 1 and 2 for this test.
3. Connect the leads to an appropriate measuring instrument (typically an oscilloscope with a high-voltage probe). Note that the **RETURN** lead is referenced to the chassis ground of the tester, in this case we will connect channel 1 to the return of the probe, connect channel 2 to the High Voltage of the probe.
4. Turn the Tester on. And connect the computer to the TestMinder port on the rear panel of the tester.
5. For the following steps refer to the commands table.
 - 5.1 Send command to select channel 2 output
 - 5.2 Send command to set voltage at 500V
 - 5.3 Send command to charge
 - 5.4 Send command to trigger
6. Capture de waveform on the oscilloscope.

Note that the peak amplitude of the measured output waveform is proportional to the voltage that is read of the front panel of the MegaPulse, but it will always be somewhat lower. This is because the meter on the MegaPulse is measuring the voltage on the main impulse storage capacitor. This voltage will intentionally dissipate to some extent before reaching the output leads.
7. Repeat step 5 charging at 5000V.
8. Manual control checkout. Note: Multiplexor control can only be set via commands
 - 8.1 Turn the VOLTAGE knob to 500V and press the knob to set the voltage
 - 8.2 Press the charge button, verify the meter reach the set voltage.
 - 8.3 Press TRIGGER to discharge.
9. Capture the waveform on the oscilloscope.
- 10 Repeat step 8 at 5000V.

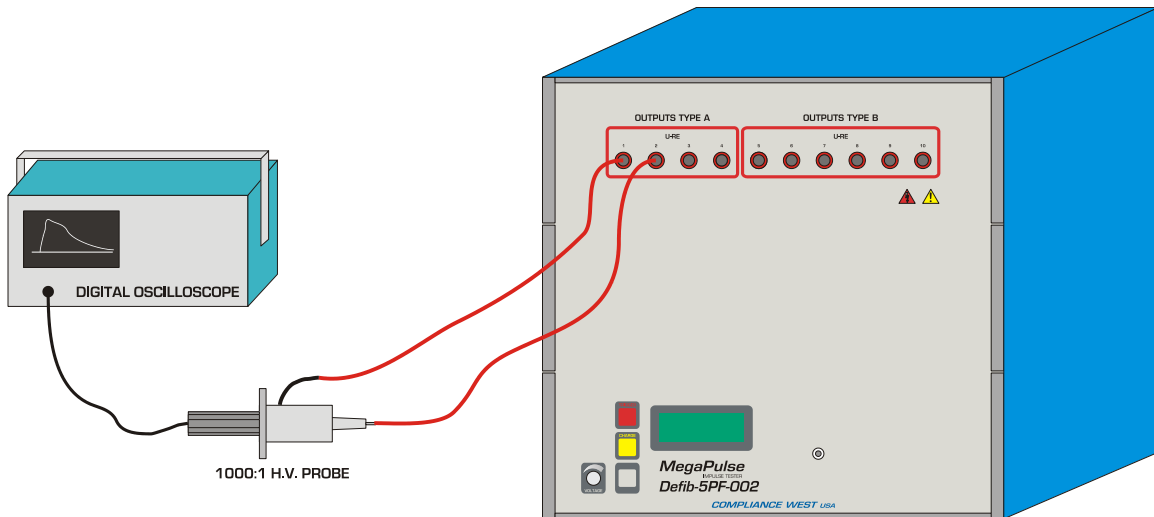


Figure 7. Waveform Measurement Setup

Testing

This section describes how the MegaPulse Defib-5PF-002 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. Select the input voltage (115V or 230V) from the switch on the back and connect the tester to a proper source of supply using the included 18AWG power supply cord.
2. Plug the leads to the Outputs of the tester
3. Connect the ends of the test leads to the equipment under test.
4. Connect the Computer to the TestMinder port on the back of the tester
5. Turn the Tester on.
5. Use table of commands to operate the tester.
6. Set desired voltage.
7. Select multiplexor channel.
8. Charge.
9. Trigger

Note: Polarity is disable and the multiplexor can only be operated via commands.

Section 4

Technical Assistance

Technical Assistance from Compliance West USA is available:

Phone: (800) 748-6224

Hours: 8:30 AM - 4:30 PM Pacific Time.

Also available on our web site at: **www.compwest.com**

Contact:

Compliance West USA
650 Gateway Center Way, Suite D
San Diego, CA, 92102
United States of America.

Phone: (619) 878-9696

FAX: (619) 794-0404

Section 5

Maintenance and Calibration

WARNING

MAINTENANCE AND CALIBRATION INSTRUCTIONS ARE FOR QUALIFIED PERSONNEL ONLY. TO AVOID ELECTRIC SHOCK, DO NOT PERFORM ANY SERVICING OTHER THAN THE CONTAINED IN THE OPERATING INSTRUCTIONS.

Introduction

This section of the manual contains maintenance information for the MegaPulse Defib-5PF-002 impulse tester. A 1-year calibration cycle is recommended to maintain the specifications of the factory. The test equipment required for the performance test is a digital oscilloscope, high voltage oscilloscope probe, digital meter and a high voltage probe.

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. Mail 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

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.

WARNING

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

Cleaning

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)

CAUTION

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

Calibration Information

The Calibration Procedure should be performed annually and any time the instrument has been repaired. The calibration procedure should be performed at an ambient temperature of $23^{\circ}\text{C} \pm 5^{\circ}\text{C}$ ($73.4^{\circ}\text{F} \pm 9^{\circ}\text{F}$). The procedure consists on internal components tolerance verification and calibrating the meter reading to agree with the capacitor bank. The Calibration procedure must be performed by qualified personnel, for more information contact Compliance West USA.

Voltage Stop Disable / Keyboard Enable by Keyboard.

If the MegaPulse Defib-5PF-002 tester includes TestMinder option and has the Voltage Stop by the PC command activated, it is possible to disable it using the next keyboard sequence:

Note: Disabling Voltage Stop enables the keyboard.

Turn OFF the MegaPulse P tester.

Hold in the **TRIGGER** and **NOR-REV** buttons.

Turn ON the MegaPulse PF tester.

Wait until the display shows **rESE**.

Release the **TRIGGER** and **NOR-REV** buttons.

Appendix 1

Commands table

Bytes -> 1 5 10 15 20 25 30 35 40 45
 - xxxx - xxxx - xxxx - xxxx - xxxx - xxxx - xxxx - xxxx -
 Group-> 1 2 3 4 5 6 7 8 9

Item		Description	32 bit word		Return Numbers	New
			High	Low		
			Command	Data		
1	Reset	Reset 2nd group of four digits to "0000"	10	11	1011-0000	
	Charge button		18	CC	18CC-0000 18CC-18C1 18CC-18CC 18CC-18C2 18CC-18C3 18CC-18C5	
	Trigger button		18	71	1871-0000 1871-1872 1871-1871	
	Charge & Trigger		18	75	1875-0000 1875-18C1 1875-1872 1875-1871 1875-18C2 1875-18C3 1875-18C5	
	Polarity	Positive	11	01	1101-0000 1101-1103 1101-1101 1101-1105	
		Negative	11	02	1102-0000 1102-1103 1102-1102 1102-1105	
	Voltage set RAM memory	Select voltage from 10V to 13000 volts	12	xx HI	12xx-0000 12xx-12xx	
			13	xx LOW	13xx-0000 13xx-13xx	
	Voltage set EEPROM memory	Select voltage from 10V to 13000 volts	14	xx HI	14xx-0000 14xx-14xx	
			15	xx LOW	15xx-0000 15xx-15xx	
	Keyboard	Enable	20	01	2001-0000 2001-2001	
		Disable	20	03	2003-0000 2003-2003	
	Safety Interlock	ON	40	01	4001-0000 4001-4001	
		OFF	40	03	4003-0000 4003-4003	
	Main Reset	Reset the USB microcontroller	EE	CC	Remain same numbers	
	USB Read Monitor	Enable If PC doesn't read the USB port in less of 500mS, the microcontroller will execute a reset and USB monitor will be disabled automatically	EE	01	EE01-xxxx	
		Disable	EE	03	EE03-xxxx	
	error	Error communication between pics	---	---	xxxx-EEEE	
	start	Initial condition when USB is plug in	---	---	xxxx-8888	
	Rest PIC	Reset on the pic Central	---	---	xxxx-AAAA	

Note: Each time a new command is sent it is necessary to wait for the complete return numbers.
 The returned numbers will show up in this order **Blue** -> **Red** -> **Green** -> **Purple**.
 First the blue number will come, this means the USB pic already has the number.
 After a short delay a red number will come, this means the second PIC (master microcontroller) already recognizes the command.

Bytes -->	1	5	10	15	20	25	30	35	40	45	50
	- xxxx	- xxxx	- xxxx	- xxxx	- xxxx	- xxxx	- xxxx	- xxxx	- xxxx	- xxxx	-
Group-->	1	2	3	4	5	6	7	8	9	10	

Group	Bytes	Description	32 bit word		DATA (HEX)	ADDR
			High	Low		
3	11-14	Voltage meter	00000V	00	00	
			30000V	32	C8	
4	16-19	Voltage stop set RAM	50V	00	32	
			30000V	32	C8	
5	21-24	Voltage stop set EEPROM	50V	00	32	
			30000V	32	C8	
6	26	Keyboard status	Enabled	1x	xx	
			Disabled	3x	xx	
	27	Polarity	Positive	x7	xx	
			Polarity Disabled	x1	xx	
			Negative	xF	xx	
	28	Free		xx	xx	
7	31	Light Trigger	Enable	xx	x1	
			Disabled	xx	x3	
	32	Light Charge	Off	3x	xx	
			On	1x	xx	
	33	Light Positive	Off	x3	xx	
			On	x1	xx	
	34	Light Negative	Off	xx	3x	
			On	xx	1x	
8	36	Interlock by Hardware	Enabled	1x	xx	
			Disabled	3x	xx	
	37	Interlock by PC	Enabled	x7	xx	
			Disabled	xF	xx	
9	41-44	Voltage at trigger moment	Enabled	xx	1x	
			Disabled	xx	3x	
10	46-49	Free	"R" relay selected	xx	xR	

Bytes --> 1 5 10 15 20 25 30 35 40 45 50
 - xxxx - xxxx - xxxx - xxxx - xxxx - xxxx - xxxx - xxxx - xxxx - xxxx
 Group-> 1 2 3 4 5 6 7 8 9 10

Item		Description	32 bit word		Return Numbers	New
			High	Low		
1	Reset	Reset 2nd group of four digits to "0000"	10	11	1011-0000	
2	Trigger 1 Duration Only if option Enable	Set Trigger 1 Time Duration (from 1mS to 9999 mS) Time = (xx) x (1mS)	90	xx	90xx-0000 90xx-90xx	
		Read Trigger 1 Time Duration(from 1mS to 9999mS) Time = (xx) x (1mS)	91	07	9107-0000 9107-91xx	
3	Trigger 2 Duration Only if option Enable	Set Trigger 2 Time Duration (from 1mS to 9999 mS) Time = (xx) x (1mS)	92	xx	90xx-0000 90xx-90xx	
		Read Trigger 2 Time Duration(from 1mS to 9999mS) Time = (xx) x (1mS)	93	07	9107-0000 9107-91xx	
4	Energy Only if option Enable	Read Energy - Last pulse Energy = (xxxx) Joules	95	07	9507-0000 9507-xxxx 9507-95AA 9507-95BB	
5	External Relay Only if option Enable	Activate relay xx it will be the number of the relay to be activated Example: The command 5003, it will activate the relay 3	50	xx	50xx-0000 50xx-50xx	
	Main Reset	Reset the USB microcontroller	EE	CC	Remain same numbers	
	USB Read Monitor	Enable If PC doesn't read the USB port in less of 500mS, the microcontroller will execute a reset and USB monitor will be disabled automatically	EE	01	EE01-xxxx	
		Disable	EE	03	EE03-xxxx	
	error	Error communication between pics	---	---	xxxx-EEEE	
	start	Initial condition when USB is plug in	---	---	xxxx-8888	
	Rest PIC	Reset on the pic Central	---	---	xxxx-AAAA	

Note: Each time a new command is sent it is necessary to wait for the complete return numbers.

The returned numbers will show up in this order **Blue --> Red --> Green --> Purple.**

First the blue number will come, this means the USB pic already has the number.

After a short delay a red number will come, this means the second PIC (master microcontroller) already recognizes the command.