Randall Price

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MULTIPURPOSE TEST STATION

M.P.T.S.

PULSE GENERATOR

INSTRUCTION MANUAL

Tektronix, Inc.
P.O. Box 500
Beaverton, Oregon 97077

Serial Number 3

Ø62-6497-ØØ PORTABLE MPTS TEST ENG. FIRST PRINTED Ø5-Nov-84

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OPERATORS SAFETY SUMMARY

The general safety information in this part of the summary is for both operating and servicing personnel. Specific warnings and cautions will be found throughout the manual where they apply, but may not appear in this summary.

TERMS

In This Manual

CAUTION statements identify conditions or practices that could result in damage to the equipment or other property.

WARNING statements identify conditions or practices that could result in personal injury or loss of life.

As Marked on Equipment

CAUTION indicates a personal injury hazard not immediately accessible as one reads the marking, or a hazard to property including the equipment itself.

DANGER indicates a personal injury hazard immediately accessible as one reads the marking.

SYMBOLS

In This Manual

This symbol indicates where applicable cautionary or other information is to be found.

As Marked on Equipment

DANGER — High voltage.

Protective ground (earth) terminal.

ATTENTION — refer to manual.

Power Source

This product is intended to operate in a power module connected to a power source that will not apply more than 250 volts rms between the supply conductors or between either supply conductor and ground. A protective ground connection by way of the grounding conductor in the power module power cord is essential for safe operation.

Grounding the Product

This product is grounded through the grounding conductor of the power module power cord. To avoid electrical shock, plug the power cord into a properly wired receptacle before connecting to the product input or output terminals. A protective ground connection by way of the grounding conductor in the power module power cord is essential for safe operation.

Danger Arising From Loss of Ground

Upon loss of the protective-ground connection, all accessible conductive parts (including knobs and controls that may appear to be insulating) can render an electric shock.

Use the Proper Fuse

To avoid fire hazard, use only the fuse of correct type, voltage rating and current rating as specified in the parts list for your product.

Refer fuse replacement to qualified service personnel.

Do Not Operate in Explosive Atmospheres

To avoid explosion, do not operate this product in an explosive atmosphere unless it has been specifically certified for such operation.

Do Not Operate Without Covers

To avoid personal injury, do not operate this product without covers or panels installed. Do not apply power to the plug-in via a plug-in extender.

SERVICE SAFETY SUMMARY

FOR QUALIFIED SERVICE PERSONNEL ONLY

Refer also to the preceding Operators Safety Summary.

Do Not Service Alone

Do not perform internal service or adjustment of this product unless another person capable of rendering first aid and resuscitation is present.

Use Care When Servicing With Power On

Dangerous voltages exist at several points in this product. To avoid personal injury, do not touch exposed connections and components while power is on.

Disconnect power before removing protective panels, soldering, or replacing components.

Power Source

This product is intended to operate in a power module connected to a power source that will not apply more than 250 volts rms between the supply conductors or between either supply conductor and ground. A protective ground connection by way of the grounding conductor in the power module power cord is essential for safe operation.

STATIC-SENSITIVE COMPONENTS

The following precautions are applicable when performing any maintenance involving internal access to the instrument.

CAUTION

Static discharge can damage any semiconductor component in this instrument.

This instrument contains electrical components that are susceptible to damage from static discharge. Table 6-1 lists the relative susceptibility of various classes of semiconductors. Static voltages of 1 kV to 30 kV are common in unprotected environments.

When performing maintenance, observe the following precautions to avoid component damage:

1. Minimize handling of static-sensitive components.

2. Transport and store static-sensitive components or assemblies in their original containers or on a metal rail. Label any package that contains static-sensitive components or assemblies.

3. Discharge the static voltage from your body by wearing a grounded antistatic wrist strap while handling these components. Servicing static-sensitive components or assemblies should be performed only at a static-free work station by qualified service personnel.

4. Nothing capable of generating or holding a static charge should be allowed on the work station surface.

5. Keep the component leads shorted together whenever possible.

6. Pick up components by their bodies, never by their leads.

Table 6-1
Susceptibility
to Static Discharge Damage

Semiconductor Classes	Relative Susceptibility Levels[a]
MOS or CMOS microcircuits or discretes, or linear microcircuits with MOS inputs. (Most Sensitive)	1
ECL	2
Schottky signal diodes	3
Schottky TTL	4
High-frequency bipolar transistors	5
JFETs	6
Linear microcircuits	7
Low-power Schottky TTL	8
TTL (Least Sensitive)	9

[a]Voltage equivalent for levels: (Voltage discharged from a 100 pF capacitor through a resistance of 100 Ω.)

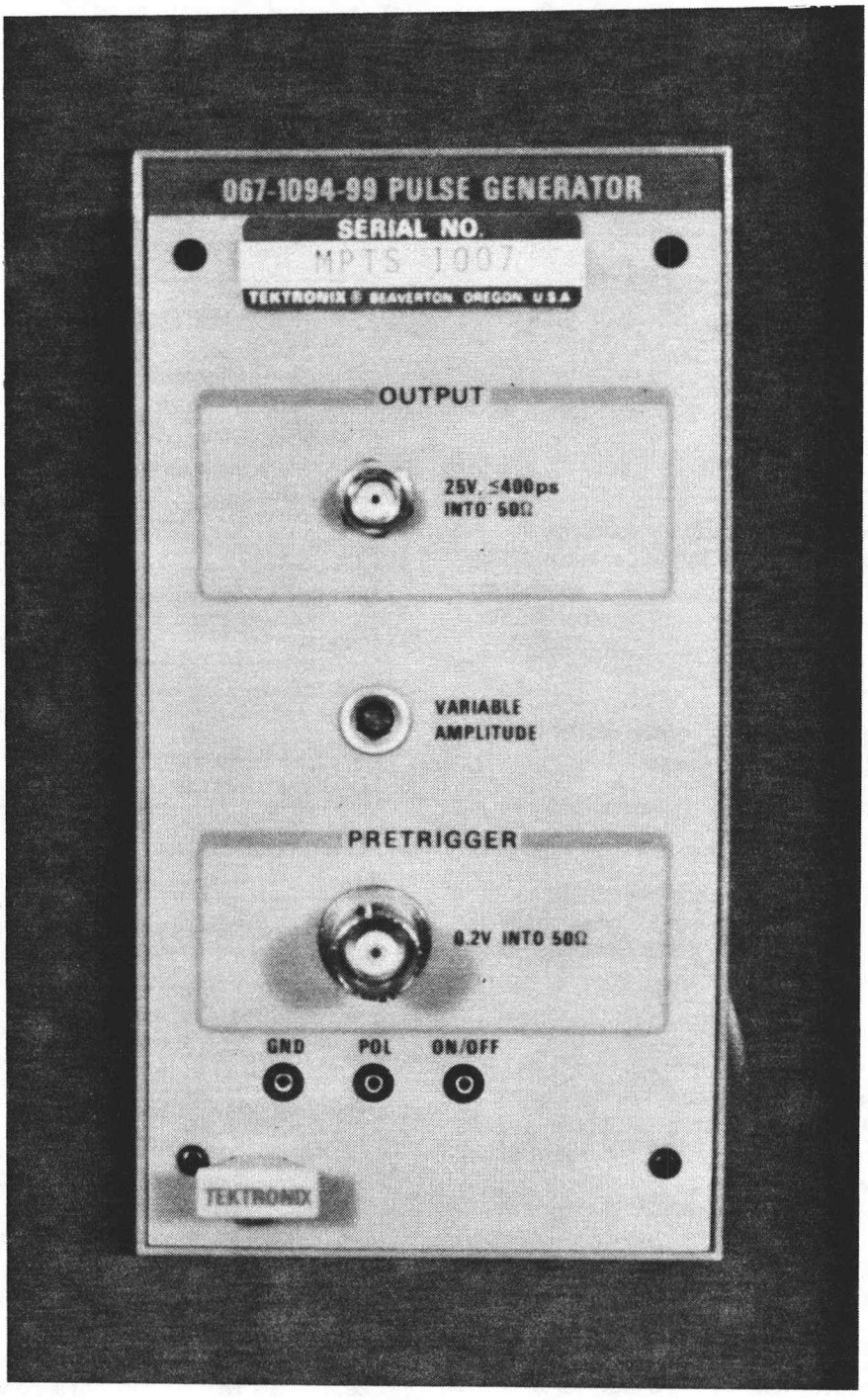
1 = 100 to 500 V 4 = 500 V 7 = 400 to 1000 V(est.)
2 = 200 to 500 V 5 = 400 to 600 V 8 = 900 V
3 = 250 V 6 = 600 to 800 V 9 = 1200 V

7. Do not slide the components over any surface.

8. Avoid handling components in areas that have a floor or work-surface covering capable of generating a static charge.

9. Use a soldering iron that is connected to earth ground.

10. Use only approved antistatic, vacuum-type desoldering tools for component removal.



Front panel of Fastrise Pulse Gen.
FRONTISPIECE

SECTION 1

SPECIFICATION

1.1 Purpose and Function

For M.P.T.S., the High Amplitude Pulse Generator (Ø67-1Ø94-99) is often called the Fastrise Pulse Generator, or simply Pulse Generator. It is used for testing amplifier and attenuator step-response aberrations and flatness of the IUT. The generator is capable of creating 25 volt rectangular pulses 4Ø nanoseconds wide of either polarity. The risetime is 4ØØ picoseconds or less and the repetition rate is nominally 5Ø kHz.

In M.P.T.S., the Fastrise Pulse Generator is used in combination with the GPIB Programmable Attenuator to give a series of discrete pulse amplitudes. The Fastrise Pulse Generator by itself is not a programmable instrument.

1.2 Connectors, Indicators, and Controls

The only external control is the Variable Amplitude control on the front panel. The pretrigger output is a BNC connector, and the pulse output is an SMA. The pretrigger is used as a oscilloscope trigger during calibration. There are three pin jacks on the front panel labeled: GND, POL, and ON/OFF.

Connecting POL and GND produces a negative pulse. It is not used on MPTS. ON/OFF is not connected.

The internal adjustments are discussed in Section 4, Calibration.

1.3 Specifications

PULSE GENERATOR SPECIFICATIONS
TABLE 1-1

ITEM	SPEC.	NOTES
Amplitude accuracy	+/- 10%	Measured into 50 ohms.
Amplitude Values	10 25 50 100 mV 250 500 mV 1 2.5 5 10 25 V	Into 50 ohms. These discrete values are available at the MPTS Prog. Atten. output when it is connected to the output of the Pulse Generator
Polarity	+ or -	MPTS does not spec. or use negative polarity.
Rise Time	<= 400 ps	Measured into 50 ohms in a 11.5 GHz system.
Pulse Width:	> 35 ns	40 ns typical.
Repetition Rate	50 kHz	Typical.
Aberrations		
First 10 ns After 10 ns	2% of p-p V 1% of p-p V	Referenced to a 067-0681-01 tunnel diode pulser measured in a 1 GHz system into a 50 ohm load. The 0% reference point is 35 ns after the 50% point of the first transition.
Flatness	<= 1%	After 10 ns, referenced to a 067-0681-01 Tunnel Diode pulser measured in a 1 GHz system into 50 ohm load.

SECTION 2

OPERATOR INSTRUCTIONS

2.1 Installation and Removal

The Ø67-1Ø94-99 PULSE GENERATOR is designed to operate in any plug-in compartment of TEKTRONIX TM-5ØØØ mainframes. The TM5ØØØ should be turned off before installation or removal of the plug-in. To install the Ø67-1Ø94-99 into a plug-in compartment, push the plug-in in until it is seated flush against the front panel. To remove, pull the release latch to disengage the plug-in. Continue to pull the release latch to remove the plug-in from the mainframe. Connecting and disconnecting SMA connectors is implied.

2.2 Functional Check

Equipment: TDR system

7S12
S-6
S-53
7K mainframe
4Ø dB X1ØØ attenuator
DMM
485 scope

Verify that the 25 volt p-p pulse is within specifications when the output is terminated into 5Ø ohms.

SECTION 3

THEORY OF OPERATION

3.1 Block Diagram Overview

The Pulse Generator has the following major blocks: Clock and Pretrigger, Variable Delay and Strobe Generator, Output Pulse and Regulator, Charge Line, and Power Supply. See the Block Diagram in Section 6.

The Clock and Pretrigger determine the repetition rate and generate a pretrigger for an oscilloscope or other instrumentation. The Output Pulse Generator and Regulator together with the 5Ø ohm Charge Line produce the output pulse, and determine its polarity and amplitude. The Charge Line determines the pulse length.

3.2 Circuit Description

3.2.1 Clock and Pretrigger

The Schmitt trigger, Q3Ø and Q35, together with Q45 form a Schmitt Oscillator that produces a low duty cycle, positive going pulse at the collector of Q3Ø. The repetition rate (about 5Ø kHz is determined by Q4Ø, a Ø.8 mA current source and the factory selected capacitor in its collector (typically 1Ø nF). A positive ramp (+2 V, 18 usec risetime and a Ø.5 usecond fall) is supplied to the base of Q35 turning it off when the base goes more positive than the base of Q3Ø. The voltage step at the collector of Q3Ø turns on Q45 discharging the collector capacitor of Q4Ø and resetting Q3Ø and Q35. A Ø.5 usecond, 3 volt pulse also appears at the emitter of Q45 to drive a second Schmitt trigger, Q5Ø and Q55.

The collector circuit of Q55 supplies a nominal +Ø.2 volt, Ø.5 usecond, positive pretrigger pulse into 5Ø ohms at J55.

3.2.2 Variable Delay

The positive going pretrigger pulse (1.25 volt, Ø.5 usec) turns off Q6Ø and Q65. This allows the 68 pF capacitor in the collector of current source Q7Ø to start charging in a negative direction. When the voltage becomes negative enough to turn on the 151-Ø457-ØØ Schottky diode in the emitter of Q75, the current from Q7Ø is switched to Q75. A Pulse is coupled from Q75 to the base of Q8Ø through the transformer, turning on Q8Ø. The Variable Delay pot (optional, not used in MPTS) in the base of Q75 varies the voltage where Q75 turns on and, therefore, the time after the pretrigger pulse.

The baseline of the pretrigger pulse is at zero volts. This allows Q6Ø to conduct which turns on Q65 discharging the 68 pF capacitor. The two 152-Ø141-Ø2 diodes and 152-Ø457-ØØ diode keeps Q65 from saturating and ensures a fast turn off.

3.2.3 Strobe Generator

Q8Ø is biased to operate in the avalanche mode. The emitter is at -16 volts while the collector varies from +1ØØ to +124. It is fed from Q95 and Q9Ø which form a power supply from the + 15Ø unregulated. The voltage of this power supply is varied by the front panel Amplitude Control via the 22K resistor in the emitter of Q9Ø. The reason for this is explained under the next heading.

Q8Ø will avalanche when a pulse forward biases its base emitter junction producing a 1 nsec rise, 8Ø volt pulse across R1ØØ and R2ØØ.

This pulse is produced by Q8Ø switching the 22 pF capacitor at its emitter in series with R1ØØ and the 51 ohm resistor connected to the collector. A portion of this pulse is supplied via R1ØØ and a transformer to the base of Q1ØØ, the positive output switching transistor. This pulse also is supplied via R2ØØ and another transformer to the base of Q2ØØ, the negative output switching transistor.

3.2.4 Positive Output Pulse Generator and Regulator

Q1ØØ is biased to operate as an avalanche transistor switch which discharges a 5Ø ohm coaxial cable (charge line) into 5Ø ohm load when conducting.

The output pulse amplitude is regulated, and varied in amplitude, by controlling the voltage at the collector of Q1ØØ and thus, the voltage that is on the charge line.

The output pulse is peak detected and applied to one gate of Q135. This is compared with a voltage connected to the other gate from the collector of Q15Ø. The amplifier consisting of Q's 1Ø5, 11Ø, 115, 12Ø, 125, 13Ø, 135, 145 and 15Ø

will adjust the voltage at the collector of Q1ØØ until the Output Pulse is the same as the reference voltage obtained from Q15Ø.

Varying the amplitude control at the negative input of U4Ø will vary the voltage at the collector of Q15Ø from 21.5 volts to 25 volts with a 169k feedback resistor. This will vary the output pulse voltage by the same amount. The 5k amplitude control adjusts both the positive and negative pulse amplitudes. R4Ø adjusts the maximum voltage limit of the amplitude control. R3Ø matches the negative pulse to the positive pulse.

Varying the voltage on the collector of Q1ØØ,and Q2ØØ to control the Output changes the voltage needed to trigger Q1ØØ,and Q2ØØ into conduction. This has the undesirable effect of changing the front corner of the Output Pulse. The variable output voltage is fed to the emitter of Q9Ø via the 22k to reduce the voltage to Q8Ø and thus, the pulse amplitude to Q1ØØ when the voltage is low. This tends to minimize the change in the front corner.

The 8.2 volt Zener from the base of Q1Ø5 limits the current to approximately 8 mA. The 62 volt Zener and 152-Ø241-ØØ diode to the gate of Q145 limits the voltage to + 85 volts at the collector of Q1ØØ in the absence of an output pulse. If the diodes are absent, the voltage can go to the unregulated voltage, + 15ØV at high line.

CAUTION: THESE HIGH VOLTAGES ARE PRESENT ON THE CHARGE LINE.

3.2.5 Negative Output Pulse Generator and Regulator

Negative pulses are not used on M.P.T.S.

If the line going to the base of Q18Ø is grounded or pulled below +1.5 Volts, the amplifier consisting Q18Ø, Q175, Q165, and Q17Ø cause enough current to flow through relay K1 to switch it to Q2ØØ. K1 connects the output to Q1ØØ for positive pulses and Q2ØØ for negative pulses. The charge line is switched with the same relay.

Both Q1ØØ and Q2ØØ are selected for a break down voltage of 76 to 82 VDC. Both are biased to operate as avalanche transistor switches which discharge the 5Ø ohm coaxial cable (charge line) into a 5Ø ohm load when conducting.

The output pulse amplitude is regulated, and varied in amplitude, by controlling the voltage at the base of Q2ØØ and thus, the voltage that is on the charge line.

The output pulse is peak detected and applied to one gate of Q185. This is compared with a voltage connected to the other gate from the collector of Q155. The amplifier consisting of Q's155, 185, 19Ø, 195, 2Ø5, 21Ø, and 215 will adjust the voltage at the base of Q2ØØ until the output pulse is the same as the reference voltage obtained from Q155.

The 8.2 volt Zener from the base of Q21Ø limits the current to approximately 8 mA. The 62 volt Zener and 152-Ø241-ØØ diode to the gate of Q185 limits the voltage to - 85 volts at the base of Q2ØØ in the absence of an output pulse. If the diodes are absent, the voltage can go to the unregulated voltage, - 15Ø volts at high line.

CAUTION: THESE HIGH VOLTAGES ARE PRESENT ON THE CHARGE LINE.

3.2.6 Charge Line

The Charge line can be any good quality, 5Ø ohm coaxial cable. The pulse width is twice the electrical length of the line. Minimum aberrations occur when the charge line is one piece with one end connected directly to the EC board. This configuration is used on MPTS. If the charge line is inside the module, there is a practical limit on the size of the line, and, therefore, on the pulse width.

The charge line, Q1ØØ, the attenuator, and the cabling, all tend to roll off the pulse. C1ØØ through C1Ø3 with appropriate resistors, are in parallel with the charge line and add peaking at different times from the front corner. The longest one is 5 to 4Ø nsec back from the front corner, and thus puts a limit on the length of lossy line that can be made flat. Fourteen feet of Ø.25Ø inch semi-rigid can be coiled up inside a one-wide TM5ØØ module. This gives a pulse width of 4Ø ns and can be made quite flat.

Air lines are the preferred charge line. They can produce longer, fairly flat pulses. Unfortunately they are large and must be connected outside the module with short cables. And all cables and connectors must be carefully selected and matched to the Pulse Generator, or aberrations will be the inevitable result.

Furthermore, unless Q1ØØ is selected, pulses longer than 1ØØ nsec may cause a "glitch" and roll off at the top of the falling edge of the pulse.

3.2.7 Power Supplies

The + 15Ø unregulated voltage is made by stacking some of the TM5ØØ AC windings and then doubling the result. The voltage is + 15Øv with 118v AC in a TM5Ø3 module with the line selector at high line. Other modules will give different voltages.

The plus and minus 18 volt supplies are conventional series pass with the reference and adjustment in the plus 18v. The adjustment should be made to adjust the minus 18 to - 18.ØØ volts as this will make the Variable Amplitude range proper.

SECTION 4

CALIBRATION

4.1 Test Equipment Required

1. Variac, 60 Hz capable of supplying a TM500 main frame with 100 to 130 VAC.
2. DVM (Digital Voltmeter)
3. Test Oscilloscope, bandwidth >= 100 MHz. (A 7S12, or a 2465 tuned very flat is acceptable).
4. A 067-0681-01 Tunnel Diode pulser.
5. TM 500 main frame.
6. Extender cable 067-0645-01 (optional).
7. Two 10X, BNC attenuators.
8. A special 6 foot precision coaxial cable, with a BNC connector on one end and an SMA connector on the other. (Or two 012-0482-00 connected together).

4.2 Preliminary Inspection and Connections

1. Inspect the circuit board for good workpersonship, missing parts etc.
2. Center R10.
3. Set R100 fully counterclockwise.
4. Plug the Pulse Generator into a TM500 main frame, or connect it with a TM500 extender cable 067-0645-01.

4.3 Power Supply Voltages

CAUTION: PLUS AND MINUS 15Ø VOLTS DC ARE PRESENT ON THIS UNIT. THESE ARE DANGEROUSLY HIGH VOLTAGES. TAKE PROPER PRECAUTIONS.

1. Connect a DVM from the -18 test point to GND. Adjust R1Ø for -18.ØØ volts. Even though R1Ø is in the +18 volt regulator in will adjust the -18 volt power supply, because it sets most of the biases.

2. Measure the +18 volt supply. It should be +18.ØØ +-Ø.18

3. Connect the DVM to the +25 volt test point. Vary the amplitude control, R15 The CCW position should produce a voltage between 22 and 23 volts, and the CW position should produce a voltage between 25.5 and 26.3 volts.

4. The 15Ø volt supply should be:

   approx. +13Ø at an input line voltage of 1ØØ volts.

   approx. +175 at an input line voltage of 13Ø volts.

   The above voltages will vary somewhat depending on which TM5ØØ is used and the settings on the line selector block.

4.4 Power Supply Ripple

Set the test scope to 5 milliseconds/division and trigger on the line source. Connect the vertical amplifier to the supplies listed below and measure the 12Ø Hz ripple while varying the line voltage from 1ØØ volts to 13Ø volts. The point where the supplies go out of regulation will vary depending on the TM5ØØ module and the line selector settings. The amplitude in the regulated region should be:

SUPPLY	GAIN SETTING (AC COUPLED)	DISPLAY AMPLITUDE
+15Ø V	1 V/Division	2.5 V approx.
+18 V	5 mV/Division	<= 1 mV
-18 V	5 mV/Division	<= 1 mV
+25 V	5 mV/Division	<= 2 mV
Q115 Collector	5 mV/Division	Neg. 8 V pulses typical

4.5 Bias Adjustment

NOTE: Each time a new Pulse Generator is installed in a M.P.T.S. it is necessary to re-verify the pulse response. The pulse response is system dependent.

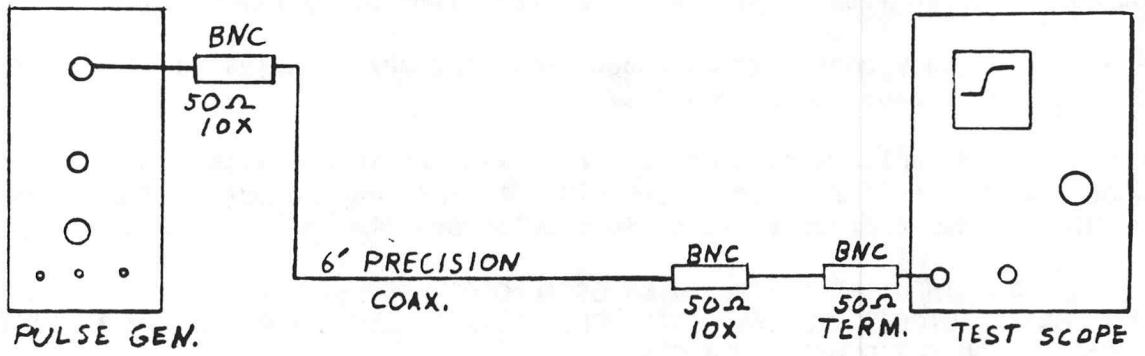


Figure 4-1: Bias Adj. Setup

Connect a test oscilloscope with a bandwidth of >= 1ØØ MHz to the Pulse Generator output jack making sure the two 1ØX BNC attenuators, the 6 foot precision coaxial cable, and the BNC 5Ø ohm termination shown in Figure 4-1 are connected as shown. One attenuator is connected directly to the Pulse Generator. The termination is connected directly to the Test Scope input, and the other attenuator is connected directly to it. The 6 foot precision coaxial cable is the only cable to be used in this line. This cable length will simulate the path length found in the M.P.T.S.

Set the test scope to 5 mV/division, 5Ø nanoseconds/division, DC coupled. Adjust the triggering and position controls for a 5 division display centered on the graticule.

Turn R1ØØ CW until the display grows dim and observe the rise on the front corner. Turn R1ØØ CCW until the front corner just stops moving. Adjusting R1ØØ beyond this point may reduce the risetime.

Adjust the Amplitude control (R155) from the full CCW to full CW and watch the corner. If the corner moves, adjust R1ØØ slightly CW and try again. The correct adjustment will be approximately 8 o'clock on the pot.

4.6 Compensating Capacitors Adjustment

The compensating capacitors are adjusted until the pulse is well within specifications. If necessary, the values of R1Ø2 through R1Ø5 and R2Ø2 through R2Ø5 also may be changed. The values given on the schematic are good ones with which to start out. Since the adjustments are somewhat interdependent, the following suggestions may need modification in practice.

The compensating capacitor, C1Ø3 is adjusted while observing with a real time scope with the vertical amplifier tuned very flat using the PG5Ø6.

The high frequency compensating capacitor, C1Ø2 may be adjusted with a 7S12 and a S6 head, or a 2465 tuned very flat.

The board C in series with R1Ø5 may be sufficient to compensate the corner. If needed, a Ø.3 to 1.2 pF capacitor (281-Ø138-ØØ) may be soldered into the board with R1Ø5 soldered directly to it to provide adjustment.

CAUTION: THE INPUT TO THE SAMPLING OSCILLOSCOPES MUST NOT EXCEED 5 VOLTS OR THE INPUT BRIDGE DIODES WILL BE DESTROYED. ALWAYS KEEP A X1Ø, 5Ø OHM ATTENUATOR ON THE CABLE FROM THE PULSE GENERATOR.

Connect the Pulse Generator through a X1Ø attenuator and the precision cable to CH. 1 of a 7S14 sampling plug-in. Set the controls as follows:

CH. 1 INPUT: 5Ø mV/division
VERTICAL MODE: CH. 1
DELAYING T/D (inner knob): 1Ø ns
DELAYED T/D (out knob): 5 ns
SWEEP MODE: out
TRIGGER SELECTOR: CH. 1
HF SYNC: out
AUTO TRIG: out
+ SLOPE: in
REP: in
DELAY TIME MULT: set to zero
TRIGGER CONTROL: Approx. 2 o'clock
SCAN: mid range
DELAY ZERO: CCW

The calibration and flatness of the 7S12 should be checked with a Ø67-Ø681-Ø1 tunnel diode pulser and a 2X, 5Ø ohm attenuator before continuing the calibration.

Adjust CH. 1 offset and trigger controls as necessary to obtain a trace on the screen. Note the slow roll off of the waveform and adjust C1Ø2 to continue the slope of the roll off. Do not spike the corner. If C1ØØ needs adjustment, or Q1ØØ has been changed, a S-6 must be used as the 7S14 is not fast enough.

Apply side cover with access holes in it. Reconnect the Pulse Generator to the test scope and use C1Ø3 and R1ØØ to adjust for best overall flatness while insuring that the corner does not change with the variable amplitude. It is better to have the corner down slightly (rather than up) as this will make the bias more stable with temperature.

On the schematic, additional R and C combinations are shown. These may be needed to give the desired pulse response.

The negative pulse is compensated in much the same way.

4.7 Frequency Check

If the distance between pulses is close to 20 microseconds, the frequency will be close to the desired 50kHz. On M.P.T.S. this is not critical.

4.8 Rise Time Measurement

Connect the Pulse Generator with the X10 attenuator to a S-2 or S-6 head in an appropriated sampling oscilloscope. Set scope to 200 ps/division and adjust the variable amplitude control for exactly 5 divisions. Measure the 10% to 90% rise time. It should be =< 400 ps (300 to 350 ps is typical).

4.9 Pre-trigger Check

Connect the PRETRIGGER OUTPUT to CH 1 of the test scope with a BNC cable and a 50 ohm termination. Trigger the test scope on CH 1 only. The pulse amplitude should be about 0.2 volts and the duration should be approximately 0.5 microseconds.

SECTION 5

DIAGNOSTICS AND REPAIR SUGGESTIONS

5.1 Equipment Required

TDR system

- 7S12
- S-6
- S-53
- 7K mainframe
- 4Ø dB X1ØØ attenuator
- DMM
- 485 scope

5.2 Technique

CAUTION: PLUS AND MINUS 15Ø VOLTS DC ARE PRESENT ON THIS UNIT. THESE ARE DANGEROUSLY HIGH VOLTAGES. TAKE PROPER PRECAUTIONS.

One of the best methods of trouble shooting this instrument is to compare ohmmeter readings with those on a known good unit. Because + and - 15Ø VDC is all over the unit, good components may become defective if the power is turned on when a defective component, or an incorrectly replaced component, is present. Power up, only after the ohmmeter readings check out. This will save time and energy.

SECTION 6

REPLACEABLE PARTS LISTS

6.1 Parts ordering information

Replacement parts are available from or through your local Tektronix Inc. Field Office or representative.

It is important, when ordering parts, to include the following information in your order: Part number, instrument type or number, serial number, and modification number if applicable.

Change information, if any, is located at the rear of this manual.

6.2 Component Number System

A list of assemblies can be found at the beginning of the Electrical Parts List. The assemblies are listed in numerical order. When the complete component number is known, this list will identify the assembly in which the part is located.

A numbering method has been used to identify assemblies, subassemblies, and parts. For example the Component Number:

A1C14Ø

consists of Assembly Number, A1 followed by Circuit Number, C14Ø. Read: Capacitor 14Ø of Assembly A1.

Only the circuit number will appear on the diagrams and circuit board illustrations. Each diagram is marked with the assembly number.

The Electrical Parts List is divided and arranged by assemblies in numerical sequence (e.g., assembly A1 with its subassemblies and parts, precedes assembly A2 with it subassemblies and parts).

Chassis-mounted parts have no assembly number prefix and are located at the end of the Electrical Parts List.

REPLACEABLE ELECTRICAL PARTS Ø67-1Ø94-99

COMPONENT NUMBER	PART NUMBER	DESCRIPTION	NOTES
A1	67Ø-7831-ØØ	Pulse Gen. Board Assy	
	388-8171-ØØ	RAW BOARD	
	(G1228XB)	Film Number	
CØØ1	29Ø-Ø569-ØØ	CAP 5Ø uF 25ØV	
CØØ2	29Ø-Ø569-ØØ	CAP 5Ø uF 25ØV	
CØØ3	29Ø-Ø569-ØØ	CAP 5Ø uF 25ØV	
CØØ4	29Ø-Ø569-ØØ	CAP 5Ø uF 25ØV	
CØ1Ø	281-Ø773-ØØ	CAP Ø.Ø1 uF	
CØ11	281-Ø775-ØØ	CAP Ø.1 uF	
CØ12	281-Ø775-ØØ	CAP Ø.1 uF	
CØ13	281-Ø775-ØØ	CAP Ø.1 uF	
CØ14	29Ø-Ø517-ØØ	CAP 6.8 uF 35V	
CØ15	281-Ø775-ØØ	CAP Ø.1 uF	
CØ2Ø	285-Ø598-ØØ	CAP Ø.Ø1uF 1ØØv	
CØ21	281-Ø775-ØØ	CAP Ø.1 uF	
CØ22	281-Ø775-ØØ	CAP Ø.1 uF	
CØ35	285-Ø598-ØØ	CAP Ø.Ø1uF	
CØ36	281-Ø797-ØØ	CAP 15 pF	
CØ4Ø	281-Ø775-ØØ	CAP Ø.1 uF	
CØ5Ø	281-Ø814-ØØ	CAP 1ØØ pF	
CØ51	281-Ø814-ØØ	CAP 1ØØ pF	
CØ56	281-Ø775-ØØ	CAP Ø.1 uF	
CØ57	29Ø-Ø517-ØØ	CAP 6.8 uF 35V	
CØ65	281-Ø775-ØØ	CAP Ø.1 uF	
CØ66	281-Ø785-ØØ	CAP 68 pF	
CØ75	281-Ø786-ØØ	CAP 15Ø pF	
CØ76	281-Ø788-ØØ	CAP 47Ø pF	
CØ8Ø	281-Ø656-ØØ	CAP 22 pF	
CØ81	281-Ø775-ØØ	CAP Ø.1 uF	
CØ82	281-Ø773-ØØ	CAP Ø.Ø1 uF	
CØ91	281-Ø788-ØØ	CAP 47Ø pF	
C1ØØ	281-Ø213-ØØ	VAR. CAP Ø.8-3.5pF	(Or 281-Ø214-ØØ) *
C1Ø1	283-Ø2Ø8-ØØ	DISCAP Ø.22uF 2ØØV	
C1Ø2	281-Ø578-ØØ	CAP 18 pF 5ØØV	Select value for best pulse*
C1Ø3	281-Ø151-ØØ	VAR.CAP 1-3pf	
C111	281-Ø797-ØØ	CAP 15 pF	
C12Ø	281-Ø775-ØØ	CAP Ø.1 uF	
C121	29Ø-Ø517-ØØ	CAP 6.8 uF 35V	

REPLACEABLE ELECTRICAL PARTS Ø67-1Ø94-99

COMPONENT NUMBER	PART NUMBER	DESCRIPTION	NOTES
C125	281-Ø814-ØØ	CAP 1ØØ pF	
C126	281-Ø788-ØØ	CAP 47Ø pF	
C131	281-Ø788-ØØ	CAP 47Ø pF	
C15Ø	281-Ø773-ØØ	CAP Ø.Ø1uF	
C175	281-Ø775-ØØ	CAP Ø.1 uF	
C181	281-Ø814-ØØ	CAP 1ØØ pF	
C182	281-Ø773-ØØ	CAP Ø.Ø1uF	
C184	281-Ø775-ØØ	CAP Ø.1 uF	
C183	29Ø-Ø517-ØØ	CAP 6.8 uF 35V	
C185	281-Ø797-ØØ	CAP 15 pF	
C19Ø	281-Ø788-ØØ	CAP 47Ø pF	
C2ØØ	281-Ø214-ØØ	VAR. CAP Ø.6-3pF	Usually omitted.
C2Ø1	281-Ø578-ØØ	CAP 5.6 pF	Value is selected.
C2Ø2	281-Ø213-ØØ	CAP Ø.8-3.5 pF	
C2Ø3	281-Ø214-ØØ	CAP Ø.6-3 pF	Usually not needed
C2Ø5	281-Ø788-ØØ	CAP 47Ø pF	
C21Ø	283-Ø2Ø8-ØØ	DISCAP Ø.22uF 2ØØV	
CRØØ1	152-Ø1Ø7-ØØ	DIODE	
CRØØ2	152-Ø1Ø7-ØØ	DIODE	
CRØØ3	152-Ø1Ø7-ØØ	DIODE	
CRØØ4	152-Ø1Ø7-ØØ	DIODE	
CRØ1Ø	152-ØØ66-ØØ	DIODE	
CRØ2Ø	152-ØØ66-ØØ	DIODE	
CRØ35	152-Ø141-Ø2	DIODE	
CRØ4Ø	152-Ø141-Ø2	DIODE	
CRØ6Ø	152-Ø141-Ø2	DIODE	
CRØ61	152-Ø141-Ø2	DIODE	
CRØ65	152-Ø141-Ø2	DIODE	
CRØ66	152-Ø141-Ø2	DIODE	
CRØ67	152-Ø457-ØØ	DIODE, SCHOTTKY	
CRØ7Ø	152-Ø141-Ø2	DIODE	
CRØ75	152-Ø457-ØØ	DIODE, SCHOTTKY	
CRØ8Ø	152-Ø141-Ø2	DIODE	
CR111	152-Ø323-Ø1	DIODE	
CR125	152-Ø323-Ø1	DIODE	
CR165	152-Ø141-Ø2	DIODE	
CR181	152-Ø323-Ø1	DIODE	
CR21Ø	152-Ø141-Ø2	DIODE	
CR215	152-Ø323-Ø1	DIODE	
JØ55			Pretrigger. (JØ65 unused)

REPLACEABLE ELECTRICAL PARTS Ø67-1Ø94-99

COMPONENT NUMBER	PART NUMBER	DESCRIPTION	NOTES
J1ØØ			Output
J18Ø			POL, polarity control
J2ØØ			Charge line
KØØ1	xxx-xxxx-xx	Relay, 26.5VDC, 7ØØ Ohms, Cont. 2A. (J82Ø6C Ø2289 223)	HI-G Co. Inc. J 2k-473Ø,2Ø9L M 39Ø16/6-2Ø9L
QØ1Ø	151-Ø19Ø-ØØ	TRANSISTOR	
QØ2Ø	151-Ø188-ØØ	TRANSISTOR	
QØ3Ø	151-Ø188-ØØ	TRANSISTOR	
QØ35	151-Ø188-ØØ	TRANSISTOR	
QØ4Ø	151-Ø188-ØØ	TRANSISTOR	
QØ45	151-Ø19Ø-ØØ	TRANSISTOR	
QØ5Ø	151-Ø369-ØØ	TRANSISTOR	
QØ55	151-Ø369-ØØ	TRANSISTOR	
QØ6Ø	151-Ø19Ø-ØØ	TRANSISTOR	
QØ65	151-Ø188-ØØ	TRANSISTOR	
QØ7Ø	151-Ø3Ø2-ØØ	TRANSISTOR	
QØ75	151-Ø19Ø-ØØ	TRANSISTOR	
QØ8Ø	151-Ø3Ø2-ØØ	TRANSISTOR	
QØ9Ø	151-Ø347-Ø1	TRANSISTOR	
QØ95	151-Ø35Ø-ØØ	TRANSISTOR	
Q1ØØ	151-Ø1Ø8-Ø1	TRANSISTOR	Select from Motorola 2N25Ø1 (SM1527) for 78V=> B(subCBØ) <=85V
Q1Ø5	151-Ø311-ØØ	TRANSISTOR	
Q11Ø	151-Ø35Ø-ØØ	TRANSISTOR	
Q115	151-Ø35Ø-ØØ	TRANSISTOR	
Q12Ø	151-Ø347-Ø1	TRANSISTOR	
Q125	151-Ø347-Ø1	TRANSISTOR	
Q13Ø	151-Ø347-Ø1	TRANSISTOR	
Q135	151-1Ø41-ØØ	TRANSISTOR	
Q14Ø	151-Ø347-Ø1	TRANSISTOR	
Q145	151-Ø35Ø-ØØ	TRANSISTOR	
Q15Ø	151-Ø347-Ø1	TRANSISTOR	
Q155	151-Ø35Ø-ØØ	TRANSISTOR	
Q16Ø	151-Ø35Ø-ØØ	TRANSISTOR	
Q165	151-Ø188-ØØ	TRANSISTOR	
Q17Ø	151-Ø19Ø-ØØ	TRANSISTOR	
Q175	151-Ø188-ØØ	TRANSISTOR	
Q18Ø	151-Ø188-ØØ	TRANSISTOR	
Q185	151-1Ø41-ØØ	TRANSISTOR	

REPLACEABLE ELECTRICAL PARTS Ø67-1Ø94-99

COMPONENT NUMBER	PART NUMBER	DESCRIPTION	NOTES
Q19Ø	151-Ø35Ø-ØØ	TRANSISTOR	
Q195	151-Ø35Ø-ØØ	TRANSISTOR	
Q2ØØ	151-Ø1Ø8-Ø1	TRANSISTOR	Select from Motorola 2N25Ø1 (SM1527) for 78V=> B(subCBØ) <=85V
Q2Ø5	151-Ø347-Ø1	TRANSISTOR	
Q21Ø	151-Ø311-ØØ	TRANSISTOR	
Q215	151-Ø347-Ø1	TRANSISTOR	
RØØ1	315-Ø474-ØØ	RES 47Øk	
RØØ2	315-Ø474-ØØ	RES 47Øk	
RØØ3	315-Ø474-ØØ	RES 47Øk	
RØØ4	315-Ø474-ØØ	RES 47Øk	
RØ1Ø	311-1225-ØØ	VAR RES 1K	
RØ11	315-Ø432-ØØ	RES 4.3k	
RØ12	321-Ø2Ø1-ØØ	RES 1.21k	
RØ13	315-Ø182-ØØ	RES 1.8k	
RØ14	321-Ø277-ØØ	RES 7.5Øk	
RØ15	321-Ø277-ØØ	RES 7.5Øk	
RØ16	3Ø7-Ø112-ØØ	RES 4.3ohhm 5%	
RØ17	315-Ø182-ØØ	RES 1.8k	
RØ2Ø	321-Ø816-ØØ	RES 5k	
RØ21	321-Ø6Ø3-Ø7	RES 15k Ø.1%	
RØ22	321-Ø6Ø3-Ø7	RES 15k Ø.1%	
RØ23	315-Ø432-ØØ	RES 4.3k	
RØ24	315-Ø182-ØØ	RES 1.8k	
RØ25	315-Ø182-ØØ	RES 1.8k	
RØ26	321-Ø6Ø3-Ø7	RES 15k Ø.1%	
RØ27	321-Ø6Ø3-Ø7	RES 15k Ø.1%	
RØ3Ø	311-1Ø35-ØØ	VAR RES (tweek) 5Øk	
RØ31	321-Ø4Ø7-ØØ	RES 169k	
RØ32	315-Ø1Ø5-ØØ	RES 1 Meg	
RØ33	315-Ø822-ØØ	RES 8.2k	
RØ35	315-Ø822-ØØ	RES 8.2k	
RØ36	315-Ø152-ØØ	RESISTOR 1.5k	
RØ37	315-Ø332-ØØ	RES 3.3k	
RØ38	315-Ø471-ØØ	RES 47Ø ohm	
RØ39	315-Ø471-ØØ	RES 47Ø ohm	
RØ4Ø	311-1Ø35-ØØ	VAR RES (tweek) 5Øk	
RØ41	321-Ø277-ØØ	RES 7.5Øk	
RØ42	321-Ø277-ØØ	RES 7.5Øk	
RØ43	315-Ø432-ØØ	RES 4.3k	
RØ44	315-Ø222-ØØ	RES 2.2k	

REPLACEABLE ELECTRICAL PARTS Ø67-1Ø94-99

COMPONENT NUMBER	PART NUMBER	DESCRIPTION	NOTES
RØ45	315-Ø1Ø1-ØØ	RES 1ØØ ohm	
RØ5Ø	315-Ø682-ØØ	RES 6.8k	
RØ51	315-Ø621-ØØ	RES 62Ø ohm	
RØ52	317-Ø561-ØØ	RES 56Ø ohm, 1/8W	
RØ53	315-Ø56Ø-ØØ	RES 56 ohm	
RØ55	315-Ø221-ØØ	RES 22Ø ohm	
RØ56	3Ø3-Ø271-ØØ	RES 27Ø ohm 1w 5%	
RØ57	315-Ø682-ØØ	RES 6.8k	
RØ58	315-Ø62Ø-ØØ	RES 62 ohm	
RØ59	315-Ø62Ø-ØØ	RES 62 ohm	
RØ6Ø	315-Ø332-ØØ	RES 3.3k	
RØ65	315-Ø561-ØØ	RES 56Ø ohm	
RØ66	315-Ø512-ØØ	RES 5.1k	
RØ67	315-Ø681-ØØ	RES 68Ø ohm	
RØ7Ø	315-Ø681-ØØ	RES 68Ø ohm	
RØ71	315-Ø474-ØØ	RES 47Øk	
RØ72	315-Ø512-ØØ	RES 5.1k	
RØ73	315-Ø332-ØØ	RES 3.3k	
RØ75	315-Ø473-ØØ	RES 47k	
RØ76	315-Ø1Ø1-ØØ	RES 1ØØ ohm	
RØ8Ø	317-Ø51Ø-ØØ	RES 5.1 1/8 W	
RØ81	317-Ø51Ø-ØØ	RES 5.1 1/8 W	
RØ82	315-Ø2Ø2-ØØ	RES 2k	AB ONLY
RØ83	315-Ø472-Ø3	RES 4.4k	AB only
RØ84	315-Ø391-ØØ	RES 39Ø ohm	
RØ85	3Ø7-Ø1Ø3-ØØ	RES 2.7ohm 5%	
RØ91	315-Ø753-ØØ	RES 75k	
RØ92	315-Ø223-ØØ	RES 22k	
RØ93	315-Ø622-ØØ	RES 6.2k	
RØ95	315-Ø682-ØØ	RES 6.8k	
RØ96	315-Ø1Ø3-ØØ	RES 1Øk	
R1ØØ	311-1258-ØØ	VAR RES 5Ø ohm	
R1Ø1	315-Ø472-Ø3	RES 4.7k	AB only
R1Ø2	317-Ø471-ØØ	RES 47Ø ohm 1/8 W	Starting values, select
R1Ø3	317-Ø561-ØØ	RES 56Ø ohm 1/8 W	for best shape pulse *
R1Ø4	317-Ø181-ØØ	RES 18Ø ohm 1/8 W	" *
R1Ø5	317-Ø1ØØ-ØØ	RES 1Ø ohm 1/8 W	" *
R1Ø6	317-Ø51Ø-ØØ	RES 51 ohm	
R1Ø7	317-Ø751-ØØ	RES 75Ø ohm	
R1Ø8	317-Ø751-ØØ	RES 75Ø ohm	
R1Ø9	315-Ø1Ø2-ØØ	RES 1k	

REPLACEABLE ELECTRICAL PARTS Ø67-1Ø94-99

COMPONENT NUMBER	PART NUMBER	DESCRIPTION	NOTES
R11Ø	315-Ø184-ØØ	RES 18Øk	
R111	315-Ø1Ø5-ØØ	RES 1 Meg	
R112	315-Ø471-ØØ	RES 47Ø ohm	
R113	315-Ø474-ØØ	RES 47Øk	
R114	315-Ø473-ØØ	RES 47k	
R115	315-Ø1Ø2-ØØ	RES 1k	
R116	315-Ø474-ØØ	RES 47Øk	
R117	315-Ø332-ØØ	RES 3.3k	
R121	315-Ø1Ø3-ØØ	RES 1Øk	
R125	315-Ø335-ØØ	RES 3.3 Mohm	
R126	317-Ø392-ØØ	RES 3.9k 1/8W	
R127	315-Ø1Ø5-ØØ	RES 1 Meg	
R128	315-Ø332-ØØ	RES 3.3k	
R131	315-Ø683-ØØ	RES 68k	
R132	315-Ø473-ØØ	RES 47k	
R133	315-Ø332-ØØ	RES 3.3k	
R135	315-Ø1Ø4-ØØ	RES 1ØØk	
R136	315-Ø1Ø3-ØØ	RES 1Øk	
R14Ø	315-Ø753-ØØ	RES 75k	
R145	315-Ø273-ØØ	RES 27k	
R146	315-Ø683-ØØ	RES 68k	
R15Ø	321-Ø4Ø7-ØØ	RES 169k	
R151	321-Ø775-ØØ	RES 45k	
R152	315-Ø1Ø5-ØØ	RES 1 Meg	
R153	315-Ø1Ø3-ØØ	RES 1Øk	
R154	315-Ø1Ø3-ØØ	RES 1Øk	
R155	311-1332-ØØ	VAR AMP 5k POT	
R156	315-Ø184-ØØ	RES 18Øk	
R157	315-Ø273-ØØ	RES 27k	
R165	315-Ø133-ØØ	RES 13k	
R166	315-Ø1Ø4-ØØ	RES 1ØØk	
R167	315-Ø273-ØØ	RES 27k	
R17Ø	315-Ø1Ø3-ØØ	RES 1Øk	
R171	315-Ø133-ØØ	RES 13K	
R175	315-Ø473-ØØ	RES 47k	
R176	315-Ø1Ø4-ØØ	RES 1ØØk	
R177	315-Ø1Ø3-ØØ	RES 1Øk	
R18Ø	315-Ø332-ØØ	RES 3.3k	
R181	315-Ø335-ØØ	RES 3.3 Mohm	
R182	317-Ø392-ØØ	RES 3.9k 1/8W	
R183	315-Ø332-ØØ	RES 3.3k	

REPLACEABLE ELECTRICAL PARTS Ø67-1Ø94-99

COMPONENT NUMBER	PART NUMBER	DESCRIPTION	NOTES
R184	315-Ø1Ø5-ØØ	RES 1 Meg	
R185	321-Ø4Ø7-ØØ	RES 169k	
R186	315-Ø332-ØØ	RES 3.3k	
R187	315-Ø1Ø4-ØØ	RES 1ØØk	
R188	315-Ø273-ØØ	RES 27k	
R191	315-Ø223-ØØ	RES 22k	
R192	315-Ø1Ø3-ØØ	RES 1Øk	
R193	315-Ø1Ø2-ØØ	RES 1k	
R194	315-Ø1Ø3-ØØ	RES 1Øk	
R2ØØ	311-1258-ØØ	VAR RES 5Ø ohm	
R2Ø1	317-Ø751-ØØ	RES 75Ø ohm	
R2Ø2		RES 36Ø 1/8 W	Starting values. Select
R2Ø3		RES 11Ø 1/8 W	for best pulse shape
R2Ø4		RES 11Ø 1/8 W	"
R2Ø5		RES 1Ø 1/8 W	"
R2Ø6	317-Ø751-ØØ	RES 75Ø ohm	
R2Ø7	315-Ø472-Ø3	RES 4.7k	AB only
R2Ø8	317-Ø51Ø-ØØ	RES 51 ohm	
R2Ø9	315-Ø473-ØØ	RES 47k	
R21Ø	315-Ø1Ø2-ØØ	RES 1k	
R211	315-Ø1Ø4-ØØ	RES 1ØØk	
R212	315-Ø222-ØØ	RES 2.2k	
R213	315-Ø332-ØØ	RES 3.3k	
R214	315-Ø184-ØØ	RES 18Øk	
R215	315-Ø1Ø3-ØØ	RES 1Øk	
R216	315-Ø471-ØØ	RES 47Ø ohm	
R217	315-Ø1Ø4-ØØ	RES 1ØØk	
R218	315-Ø473-ØØ	RES 47k	
R219	315-Ø471-ØØ	RES 47Ø ohm	
TØ8Ø	12Ø-Ø55Ø-ØØ	TRANSFORMER	
T1ØØ	12Ø-Ø544-ØØ	TRANSFORMER	
T2ØØ	12Ø-Ø544-ØØ	TRANSFORMER	
UØ1Ø	156-ØØ67-ØØ	IC 741 IC	
UØ2Ø	156-ØØ67-ØØ	IC 741 IC	
UØ3Ø	156-ØØ67-ØØ	IC 741 IC	
UØ4Ø	156-ØØ67-ØØ	IC 741 IC	
VRØ1Ø	152-Ø212-ØØ	DIODE, Zener 9V	
VRØ11	152-Ø149-ØØ	DIODE	
VRØ2Ø	152-Ø149-ØØ	DIODE	
VR1Ø5	152-Ø217-ØØ	DIODE, ZENER 8.2V	

REPLACEABLE ELECTRICAL PARTS Ø67-1Ø94-99

COMPONENT NUMBER	PART NUMBER	DESCRIPTION	NOTES
VR111	152-Ø285-ØØ	DIODE, ZENER 62V	
VR12Ø	152-Ø241-ØØ	DIODE, ZENER 33V	
VR145	152-Ø285-ØØ	DIODE, ZENER 62V	
VR2Ø5	152-Ø217-ØØ	DIODE, ZENER 8.2V	
VR215	152-Ø285-ØØ	DIODE, ZENER 62V	
WØØ1	131-Ø566-ØØ	Ø ohm	
WØØ2	131-Ø566-ØØ	Ø ohm	

REPLACEABLE MECHANICAL PARTS Ø67-1Ø94-99

COMPONENT NUMBER	PART NUMBER	QTY PER	DESCRIPTION	NOTES
	1Ø5-Ø718-ØØ	1	LATCH RELEASE BAR	
	1Ø5-Ø719-ØØ	1	RETAINING LATCH	
	131-Ø6Ø8-ØØ	4	SQ PIN	Mounts on Board
	131-Ø663-ØØ	1	SCREW ON RECEPTACLE	
	131-Ø774-ØØ	1	SMA CONNECTOR	
	131-1ØØ3-ØØ	1	PELTOLA RECEPTACLE	Mounts on Board
	131-1315-ØØ	1	BNC	
	131-2117-ØØ	1	SMA CONNECTOR	
	131-2623-ØØ	4	BERG CONN.	*Part of Berg Cable Assy
	136-Ø252-ØØ	1Ø	BERG SOCKET	Mounts on Board
	136-Ø387-ØØ	3	PROBE JACK	
	175-Ø825-ØØ	6.5"	2 CONDUCTOR WIRE 26AWG	*Part of Berg Cable Assy
	175-1Ø45-ØØ	1	3 3/4" 5Ø ohm	CONFIGURED AS PER
	175-1Ø45-ØØa		Semi-Rigid Cable	CABLE DOC.
	175-12Ø2-ØØ	7"	5Øohm CABLE	Part of Peltola C. Assy
	2ØØ-1273-ØØ	1	FRT PANEL SUPPT,METAL	(BLANK)
	21Ø-Ø438-ØØ	4	NUT 1-72	FNT PANEL SECURE
	21Ø-Ø471-ØØ	1	HEX THD SPACER	
	21Ø-Ø774-ØØ	2	OUTER EYELET PELTOLA	Part of Peltola C. Assy
	21Ø-Ø775-ØØ	2	INNER EYELET PELTOLA	Part of Peltola C. Assy
	211-Ø125-ØØ	4	SRW 1-72 BLK	FNT PANEL SECURE
	213-Ø146-ØØ	4	SRW TAPPING 6-2Ø	BOARD SECURE
	213-Ø229-ØØ	4	SRW TAPPING 6-2Ø	FRT SUB PANEL SECURE
	213-Ø254-ØØ	1	SRW TAPPING 2-32	LATCH SECURE
	214-Ø579-ØØ	4	Test Point	
	337-1399-ØØ	1	ELEC. SHIELD	SIDE COVERS
	352-Ø169-ØØ	2	1X2 TERMINAL CONN	*Part of Berg Cable Assy
	358-Ø342-ØØ	1	FNT PANEL BUSHING	
	366-169Ø-ØØ	1	LATCH KNOB	
	386-24Ø2-ØØ	1	FRT SUB PANEL,PLASTIC	(BLANK)
	386-3657-Ø1	2	PLUG-IN SUPPORT	
	426-Ø725-ØØ	1	FRAME SEC.-TOP	
	426-Ø726-ØØ	1	FRAME SEC.-BOTTOM	
	XXX-XXXX-XX	1	FRT PANEL	
	XXX-XXXX-XX	1	BERG-CABLE ASSEMBLY	Made of parts marked*
	XXX-XXXX-XX	1	PELTOLA CABLE ASSEM	Made of parts marked
	XXX-XXXX-XX	1	1/4" Dia,5Ø ohm,14.5'	Charge line: 14'
	XXX-XXXX-XX		Semi-Rigid Cable	gives approx 4Ø ns.

SECTION 7

DIAGRAMS

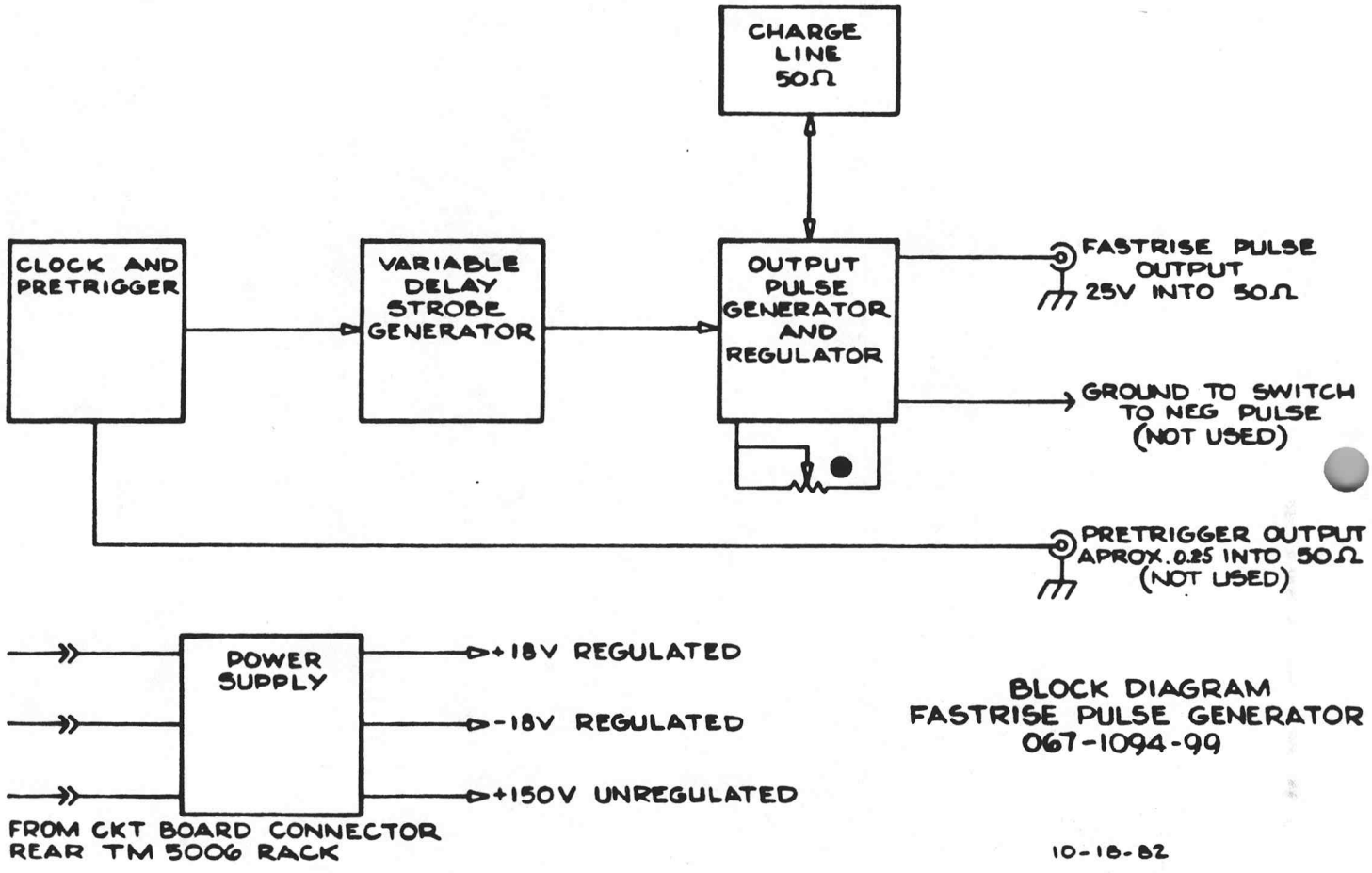


Figure 7-1: Pulse Generator Block Diagram

Figure 7-2: Pulse Generator Schematic

SECTION 8

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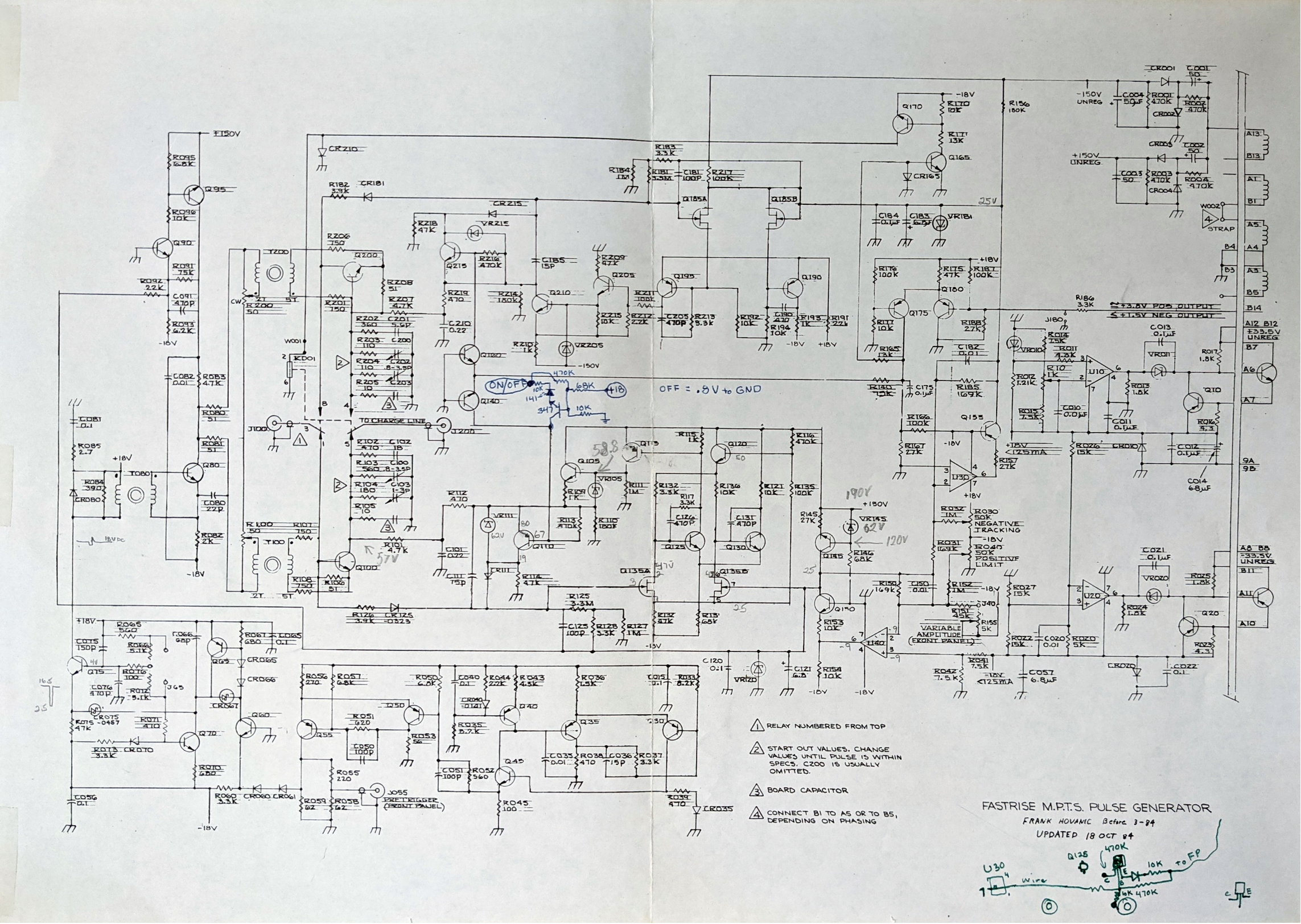
FASTRISE M.P.T.S. PULSE GENERATOR
FRANK HOVANIC Before 3-84
UPDATED 18 OCT 84
1 RELAY NUMBERED FROM TOP
2 START OUT VALUES. CHANGE VALUES UNTIL PULSE IS WITHIN SPECS. C200 IS USUALLY OMITTED.
3 BOARD CAPACITOR
4 CONNECT B1 TO A5 OR TO B5, DEPENDING ON PHASING
ON/OFF
OFF = .8V to GND
+3.8V POS OUTPUT
-1.5V NEG OUTPUT
+33.5V UNREG
-33.5V UNREG
+150V UNREG
-150V UNREG
R030 50K NEGATIVE TRACKING
R040 50K POSITIVE LIMIT
VARIABLE AMPLITUDE (FRONT PANEL)
TO CHARGE LINE
PRETRIGGER (FRONT PANEL)
STRAP
U30
Wire
Q125
470K
10K
to FP
1K 470K