161

COMPANY CONFIDENTIAL

TYPE 161

FACTORY CALIBRATION PROCEDURE

RECOMMENDED EQUIPMENT

160A Power Supply.
180 Time Mark Generator.
162 Waveform Generator.
Square wave generator with variable output (a 50K potentiometer across the scope calibrator will do.)
500 series scope with a CA plug-in.

PRELIMINARY CHECK

Check for unsoldered joints, rosin joints, connections on rear sockets, loose hardware, components projecting beyond the edges of the frame, and wire dress for shorts, etc..

PRESET ALL POTS AND TRIMMERS

Preset all pots and trimmers to mid-range and preset front panel controls as follows:

	162 - Operating mode - Recurrent.	
	Vernier - Calibrated.	
	Waveform Duration	1.0
	Multiplier	10.0
161	Trigger Selector	Neg. Sawtooth
	Output pulse delay	Mid-range
	Pulse Width	.1
	Pulse Width Mult.	Approximately 10
	Pulse polarity	Positive
	Pulse Amplitude	50
Scope	Trigger	AC External
	Sweep Time/CM	1 millisecond/CM
	CA mode	Alternate

Connect the SAWTOOTH OUT of the 162 to the INPUT of the 161, the external trigger of the scope and to one of the inputs of the CA plug-in. Set the VOLTS/CM switch of this channel to 20 and turn the red VARIABLE knob to minimum gain.

Connect a 10X probe to the other input and set the VOLTS/CM switch to 2. This gives 20 VOLTS/CM on this channel.

1. ADJUST POS. PULSE AMPL. ADJ.

Connect the 10X probe to the PULSE OUT jack and adjust the PULSE AMPLITUDE knob on its shaft so that the zero on the dial coincides with no output from the jack. Now rotate the knob to the 50 position and adjust the Pulse Ampl. Adj. pot (right hand side of Chassis) for 50 volts output. At the same time adjust C10 and C12 for best square wave shape. Check the Pulse Amplitude pot at 25 for linearity. This will normally be less than 5% error.

2. ADJUST NEG. DELAY LIMIT AND POS. DELAY LIMIT

Turn the OUTPUT PULSE DELAY knob counter clockwise until the leading edge of the pulse reaches the left hand end of the Sawtooth and drops out. Adjust the POS. DELAY LIMIT pot so that this point will coincide with 0 on OUTPUT PULSE DELAY dial. Turn the knob CW until the pulse drops out. Set the NEGATIVE DELAY LIMIT pot so that this occurs at 1.0 on the dial. These two adjustments interact so it may take several adjustments to get both to fall at their proper points. Now set the dial

2. (continued)

to 0.5 and see that the leading edge of the pulse falls between 4 and 6 on the scope graticule or between 40% and 60%.

3. ADJUST NEG. PULSE AMPLITUDE ADJ.

Switch the PULSE POLARITY toggle switch to the negative position and adjust the Neg. Pulse Ampl. Adj. pot, (right hand side, rear) for a negative pulse output of 50 volts amplitude with the PULSE AMPLITUDE pot set at 50. This adjustment will normally run close to the maximum end of the pot but should have at least 2 volts of range left. Picking tubes for V5 will generally give the desired result. Adjust C11 for negative pulse shape.

4. CHECK TRIGGER SENSITIVITY

use another 161 or 163

Apply three volts of square wave from the calibrator through a pot or any other convenient source to the INPUT of the 161. Switch the TRIGGER SELECTOR switch to POS. PULSE. Using the output PULSE DELAY/POS. TRIGGER BIAS, triggering control, see that the 161 triggers on 3 volts or less. (generally it will trigger on 2 volts and this can be obtained directly from the calibrator)

5. ADJUST PULSE WIDTH CAL. AND CALIBRATE PULSE WIDTH MULTIPLIER DIAL

Connect the +GATE OUTPUT from the scope to the INPUT of the 161. Connect the output of the 180 to the input of the CA and to the external trigger input. Adjust the gain of the channel for proper display. Connect the 10X probe on the other channel to the pulse out of the 161. Set the time/CM of the scope to 0.1 milliseconds and the PULSE WIDTH switch on the 161 to 0.1 milliseconds. Apply 100 μsec Markers from the 180. Adjust the dial on the shaft so that 1 will fall on the second mark displayed (±1%) and adjust the PULSE WIDTH CAL. so that the 10 on the dial will coincide with the eleventh marker displayed. (The right hand edge of the graticule) These two adjustments interact so should be gone over several times before the dial is tightened down tightly as the set screw will mark the shaft and may make slight changes difficult. After the 1 and 10 are set, the dial should be checked at all marks between and should fall ±5% on all the proper marks. There should be no skips between 1 and 10 due to rough action of the carbon pot element.

6. CHECK PULSE WIDTH OF 1 AND 10 MILLISECOND RANGES

Set the PULSE WIDTH MULTIPLIER DIAL at 10 and the PULSE WIDTH switch at 1.0. The pulse width at the eleventh displayed marker should be ±3%. Use 1 millisecond markers from the 180. Set the scope at 1 millisec/CM. Set the PULSE WIDTH MULTIPLIER dial at 10 and the PULSE WIDTH switch at 10. The pulse width at the eleventh displayed marker should be ±3%. Use 10 millisecond markers from the 180. Set the scope at 10 millisec/CM. Make certain that the pos. trigger bias control is properly set or the pulse width may appear too short.

7. ADJUST C6

Set the scope at 10 μsec/CM, the PULSE WIDTH switch at .01, and the pulse WIDTH MULTIPLIER at 10. Display 10 microsecond markers from the 180 and adjust C6 for 10 divisions of pulse width. Now turn the Pulse Width Multiplier dial to the CCW end and see that the pulse does not drop out. (It may be necessary to touch up the adjustment of C10 if it does.)

8. CHECK RISETIME

Check the risetime of the leading edge of the negative and positive pulses for a risetime of less than 0.5 μsec.

9. CHECK GATE OUT

Check to see that the gate out is greater than 50 volts and of the proper wave-shape.

10. CHECK FOR BURST OF PULSES

Switch the TRIGGER SELECTOR to NEG. SAWTOOTH and with the pulse width to the narrowest setting, apply a sawtooth to the INPUT from a 162 running at it's slowest rate and see that the 161 puts out only one pulse per sawtooth. If it does not, and the trouble is not tubes, it is generally because R15 is too small, R16 is too large, or R13 is too small.