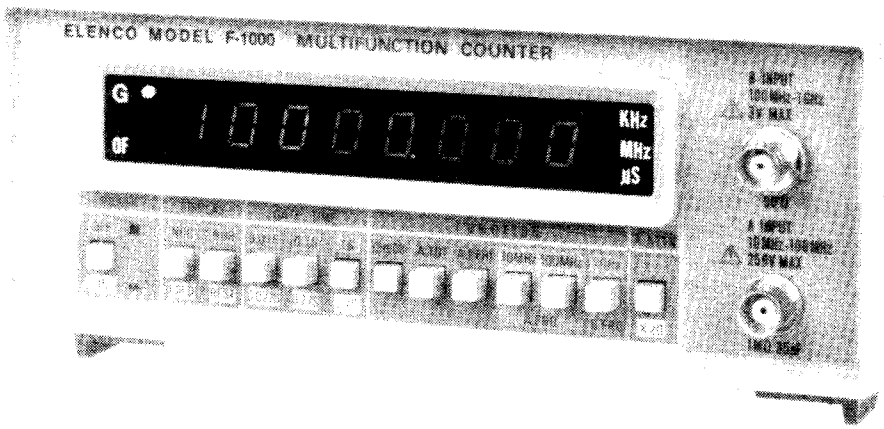
ELENCO PRECISION

INSTRUCTION MANUAL



1GHz MULTIFUNCTION COUNTER

MODEL F-1000

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INTRODUCTION

The Elenco model F-1000 is a 10Hz to 1000MHz multiple-function counter that features a temperature control crystal oven for high accurate readings. Other features are eight high brightness seven segment LED display, low power consumption circuit design and full input signal conditioning. The F-1000 is also small in size and light weight for easy portability.

The model F-1000 has four functions in one. It is a 1000MHz frequency counter with accuracy of .3Hz/million per month. This accuracy is achieved because of the temperature control crystal oven. It also has a self-test function which allows checking the output for proper operation. The third function is a period measurement which allows you to measure time interval between pulses. The fourth function is a totalizer counter which allows you to count pulses. All these functions are accomplished by a single LSI integrated circuit. The input signal is AC or DC coupled and can be conditioned by attenuation of the signal.

The location of controls, indicators, connectors and other information on this model is provided in this manual. It is recommended that you read and understand all information in this manual before attempting to operate this instrument.

SPECIFICATIONS :

MEASURING MODE

Frequency measurements

CHANNEL A.

- ☐ *Range:* 10Hz to 10MHz direct counter
  10MHz to 100MHz prescaled by 10.
- ☐ *Resolution: Direct counter:* 1, 10, 100Hz switch selectable.
  Prescaled: 10, 100, 1000Hz switch selectable.
- ☐ *Gate Time:* 0.01S, 0.1S, 1S switch selectable.
- ☐ *Accuracy:* ± 1 count ± time base error.

CHANNEL B.

- ☐ *Range:* 100MHz to 1GHz.
- ☐ *Resolution:* 100Hz, 1KHz, 10KHz switch selectable.
- ☐ *Gate Time:* 0.027S, 0.27S, 2.7S switch selectable.
- ☐ *Accuracy:* ± 1 count ± time base error.

Period Measurements (Channel A)

- ☐ *Range:* 10Hz to 2.5MHz.
- ☐ *Resolution:* 10^{-7}S, 10^{-8}S, 10^{-9}S switch selectable.
- ☐ *Accuracy:* ± 1 count ± time base error.

Totalize Measurements (Channel A)

- ☐ *Range:* 10Hz to 10MHz.
- ☐ *Resolution:* ± 1 count of input.

INPUT CHARACTERISTICS

CHANNEL A.

- ☐ *Input Sensitivity:* 25mV RMS sine wave or 70mV p-p.
- ☐ *Attenuation:* × 1, × 20 fixed.
- ☐ *Impedance:* Approx. 1M ohm less then 35 pF.
- ☐ *Maximum voltage:* 250V (DC + AC rms). Exceeding this limit is not recommended.

CHANNEL B.

- ☐ *Input Sensitivity:* 15mV RMS sine wave or 50mV p-p.
- ☐ *Impedance:* Approx. 50 ohm.
- ☐ *Maximum voltage:* 3V. Exceeding this limit is not recommended.

TIME BASE

- ☐ *Frequency:* 10MHz, 3.90625MHz Temperature Control Oven.
- ☐ *Aging Rate:* $\pm 3 \times 10^{-7}$/month.
- ☐ *Temperature:* $\pm 1 \times 10^{-6}$, 0°C to 40°C.
- ☐ *Line Voltage:* $\pm 1 \times 10^{-7}$ for 10% change.
- ☐ *Warm-up time:* 20 minutes when cold started at 25°C.

GENERAL

- ☐ *Display:* 8 digits, 7mm red LED display with decimal point, gate, overflow, KHz, MHz and uS indication.
- ☐ *Check:* Counts internal 10MHz time base oscillator.
- ☐ *Power Requirement: Line:* 115/230V ± 15%, 45Hz-70Hz.
  Internal Battery: Option.
- ☐ *Temperature: Rated range of use:* – 5°C - + 50°C.

OPERATION

INTRODUCTION

This section provides complete operating information needed for the F-1000 multi-function counter. It includes a description of all front panel controls, connectors, indicators, operating instructions and operators maintenance.

PREPARATION FOR USE

1) *Power Requirements.*
   The F-1000 requires a power source of 115 or 230VAC, 45 to 70Hz single phase. Power consumption is 10 watts maximum.
2) *Line Voltage Selection*
   Line voltage selection is determined by the position of the line voltage selector switch located on the rear panel. Line voltage is preset at the factory for 115V (100 to 130V). Should 230V operations be desired, preset the line selector switch to 230V.
3) Wait about 20 minutes for more accurate measurement until the crystal oven oscillator gets stable in aging.

FRONT PANEL FEATURES

Figure 1 shows the front panel of the F-1000.

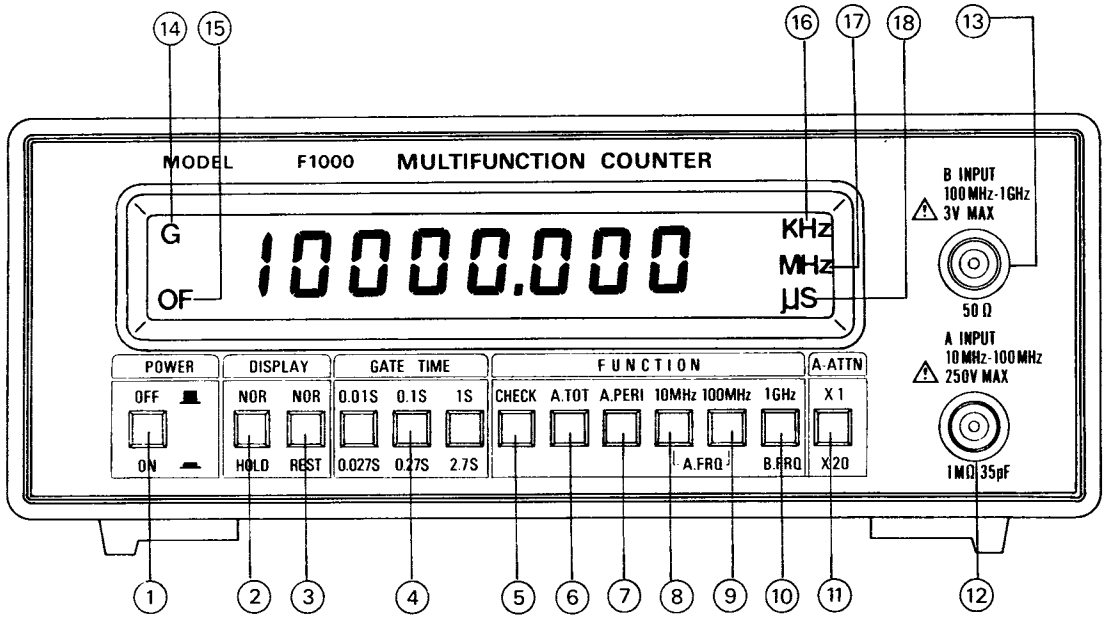


Figure 1

1) *POWER SWITCH*
   To turn on, depress push-button. To turn off, again depress push-button.
2) *HOLD*
   In HOLD, switch IN, the measurement (except for totalize) in progress is stopped.
3) *RESET*
   When pressed, immediately reset the counter to begin a new measurement. Usually used in the totalize mode to begin a new measurement.

4) *GATE TIME*
For frequency measurement, this switch is used to change gate time. When in the period measurement mode, it is used to change the multiplier factors. Each range is as follows;

CHANNEL A INPUT MODE

FREQUENCY RESOLUTION			PERIOD RESOLUTION	
GATE TIME	10MHz RANGE	100MHz RANGE	GATE TIME	.1 micro-sec.
0.01S	100Hz resolution	1KHz resolution	0.01S	.01 micro-sec.
0.1S	10Hz resolution	100Hz resolution	0.1S	1 nano-sec.
1S	1Hz resolution	10Hz resolution	1S	.1 nano sec.

CHANNEL B INPUT MODE

GATE TIME	RESOLUTION
0.027S	10KHz
0.27S	1KHz
2.7S	100Hz

5) *CHECK*
When pressed, counts internal 10MHz time base oscillator.

6) *A.TOT.*
Totalizer measurement

7) *A.PERI.*
With this switch in, the F-1000 is placed in period mode.

8) *A.FREQ.10MHz*
With this switch in, the F-1000 is placed in 10MHz range frequency mode.

9) *A.FREQ.100MHz*
With this switch in, the F-1000 is placed in 100MHz range frequency mode.

10) *B.FREQ.1GHz*
With this switch in, the F-1000 is placed in 1GHz range frequency mode.

11) *ATT*
Input signal attenuator switch. When pressed, the sensitivity of the input signal is attenuated by a factor of 20.

12) *A.INPUT*
Channel A input BNC connector places a signal in to measure 10Hz-100MHz frequency, period or totalize.

13) *B.INPUT*
Channel B input BNC connector places a signal in to measure 100MHz-1GHz frequency.

14) *GATE indicator*
Displays the opened or closed state of the GATE. When GATE is open, indicator is lit.

15) *OVERFLOW indicator*

16) *KHz annunciator*

17) *MHz annunciator*

18) *uS annunciator*

REAR VIEW

Figure 2 shows the rear panel of the F-1000.

1. AC Inlet for power connecting
2. Selecting switch for AC 115V/230V
3. Engraved Caution
4. Ground Terminal

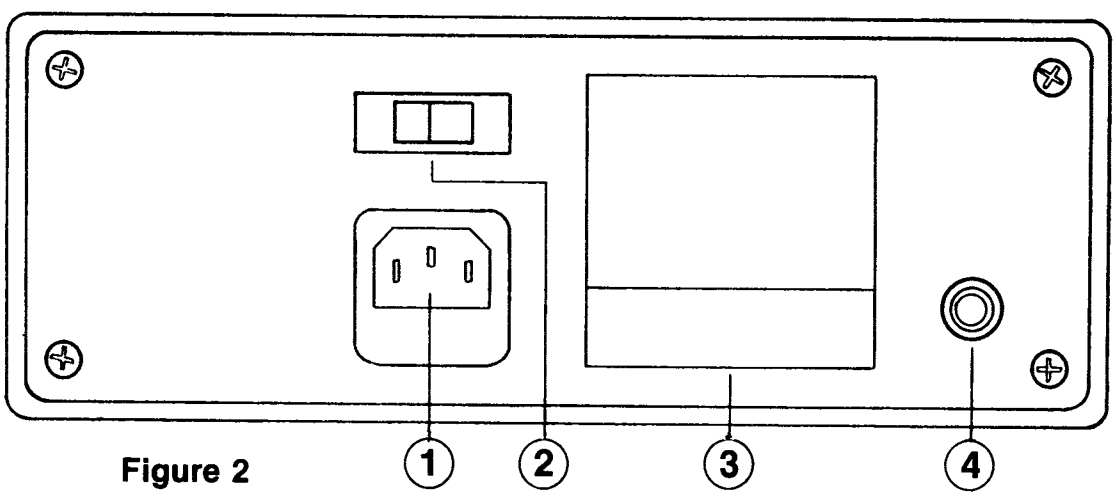


Figure 2

OPERATING CHARACTERISTICS

The following paragraphs describe the operating ranges and resolution for frequency, period, totalize and check function.

Frequency Measurements

Perform frequency measurements as follows:

1) Press the POWER switch to the ON position.
2) Press the FREQ. switch to select the frequency mode of operation.
3) Select the desired gate time.
4) Connect the input signal to the front-panel BNC connector.
5) Set ATT. to desired position. If input signal level is greater than 300mV, depressing the ATT switch will decrease the triggering sensitivity of the input section by 20 times and reduces possible noise errors.
6) Read the frequency on display and observe the unit of measurement indication to the left of the display.

Period Measurements

Perform period measurements as follows:

1) Press the POWER switch to the ON position.
2) Press the A.PERI switch to select the period mode of operation.
3) Select the desired PERI MULTI (period multiplier).
4) Connect the input signal to the front-panel A.INPUT BNC connector.
5) Set ATT. to desired position. If input signal level is greater than 300mV, depressing the ATT switch will decrease the triggering sensitivity of the input-section by 20 times and reduces possible noise errors.
6) Read the period time on display and observe the unit of measurement indication to the left of the display.

Totalize Measurements

Perform totalize measurements as follows:

1) Press the POWER switch to the ON position
2) Press the A.TOT switch to select the totalize mode of operation and the RESET switch to initialize the counter.
3) Connect the input signal to the front-panel A.INPUT BNC connector.
4) Set ATT to desired position. If input signal level is greater than 300mV, depressing the ATT switch will decrease the triggering sensitivity of the input section by 20 times and reduce possible noise errors.
6) Read the accumulated total on display. Press the hold switch in to freeze the accumulated total.

Check Mode

The self-check mode provides a means of verifying proper overall operation of counter, excluding the input section, time base accuracy and time base dividers used in the period mode.

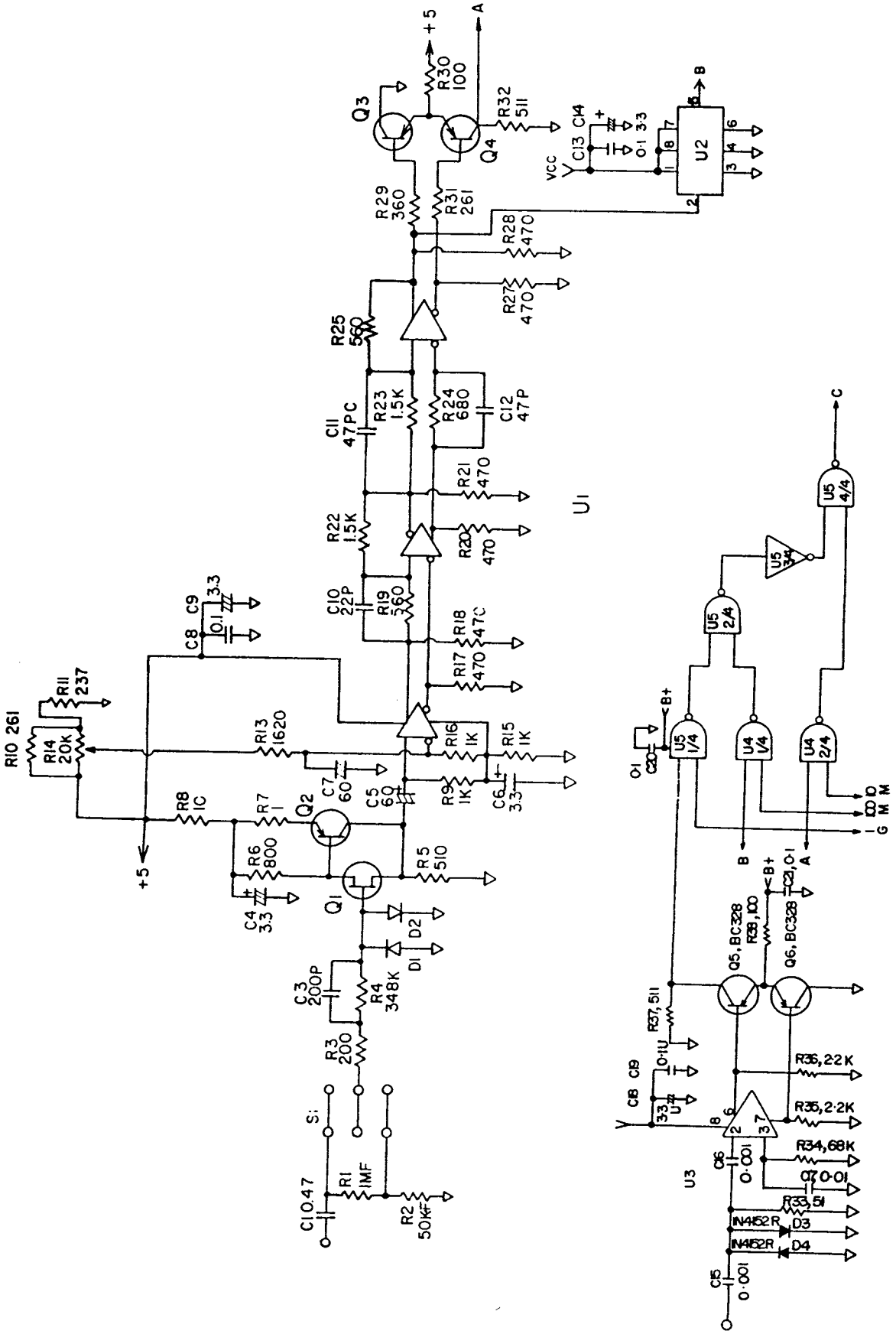
1) Press the POWER switch to the ON position.
2) Press the CHECK switch to select the self-check mode.
3) Press the 1S GATE TIME selector; the display should read 10000.000 with the instrument gating once every second.
4) Press the 0.1S GATE TIME selector; the display should read 10000.00 with a 100-millisecond gate time.
5) Press the 0.01S GATE TIME selector; the display should read 10000.0 with a 10-millisecond gate time.

CALIBRATION

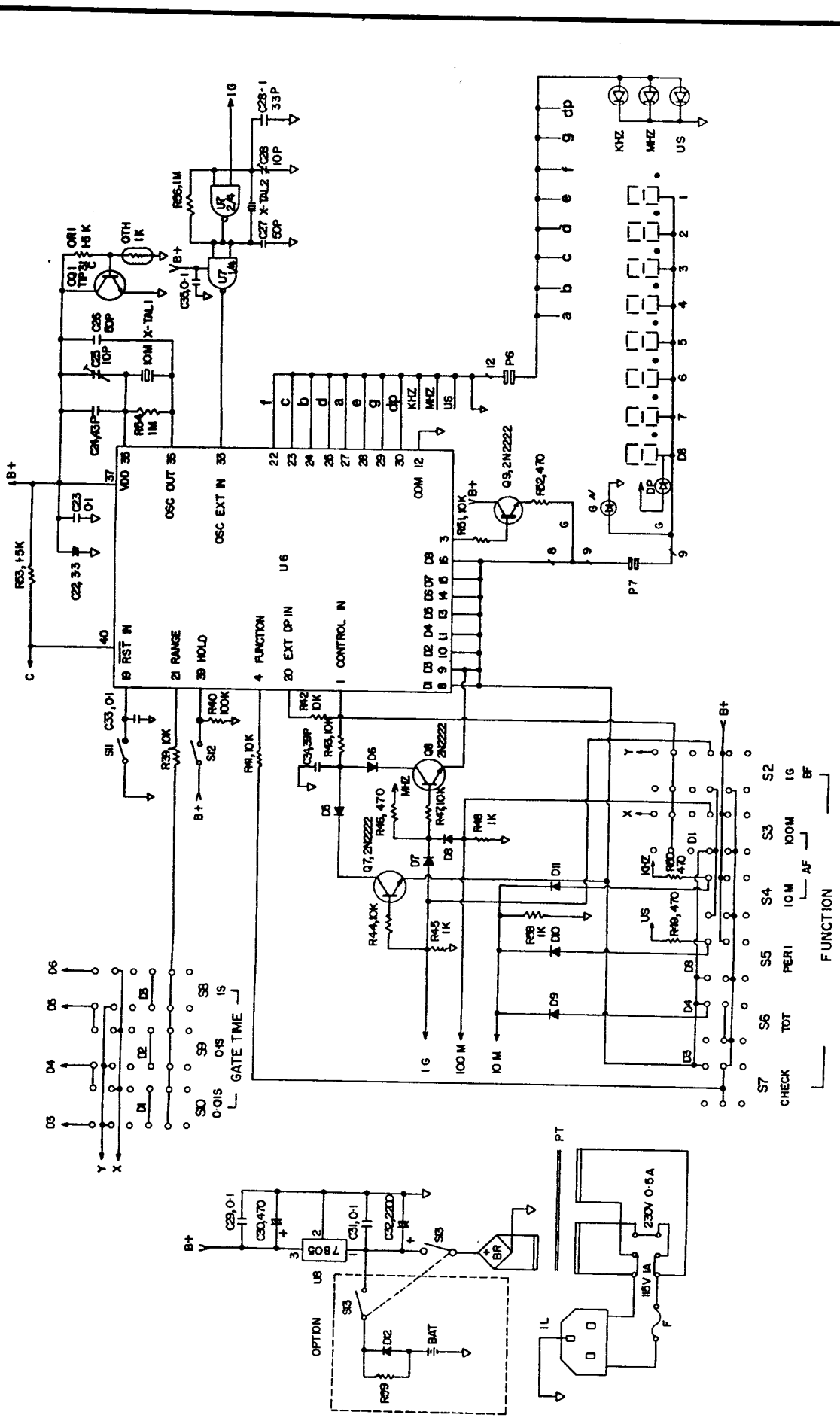
INTRODUCTION

Calibration of the Model F-1000 is limited to adjustment of the time base oscillator frequency and the trigger level. You will need a accurate 10MHz crystal oscillator standard to perform this test. If none is available you can use another accurate counter. If neither is available do not attempt to calibrate the unit. Send it to Elenco service dept. for calibration.

Time base oscillator adjustment should be made whenever the oscillator is repaired or whenever it is determined that accuracy of the counter is not within the accuracy desired. Perform time base oscillator adjustment in an environment having an ambient temperature of +22°C to +25°C (72°F to 77°F). Allow the instrument to warm up at least 30 minutes with case cover on before adjusting the time base.



ELENCO F-1000 INPUT AMPLIFIER AND PRE SCALER



ELENCO F-1000 LOGIC AND POWER SUPPLY

PARTS LIST

SYMBOL	DESCRIPTION
	SEMICONDUCTORS
Q3,4,5,6	Transistor, PNP. BC328
Q2	Transistor, PNP. BF509
Q7,8,9	Transistor, NPN. 2N2222
OQ1	Transistor, NPN. TIP31C
Q1	F.E.T. BF256A
D5-11	Diode, 1N4148
D1,2,3,4	Diode, SW. 1N4152R
BR	Diode, Bridge Rectifier W02
U6	LSI, Counter ICM7226B
U7	IC, 74HC04
U4,U5	IC, 74LS00
U3	IC, U666B
U1	IC, MC10216P
U2	IC, uPB551C
U8	IC, Voltage Reg. MC7805
	RESISTORS
OTH1	Thermistor, 1K TD5-C225D
R30,34	Resistor, 100 OHM ¼W
R9,15,16,45,48,58	Resistor, 1K OHM ¼W
R39,41,42,43,44,51	Resistor, 10K OHM ¼W
R40	Resistor, 100K OHM ¼W
R54,56	Resistor, 1M OHM ¼W
R22,23,53,OR1	Resistor, 1.5K OHM ¼W
R7	Resistor, 1 OHM ¼W
R3	Resistor, 200 OHM ¼W
R35,36	Resistor, 2.2K OHM ¼W
R31	Resistor, 260 OHM ¼W
R29	Resistor, 360 OHM ¼W
R17,18,20,21,27,28	Resistor, 470 OHM ¼W
R5,32,37	Resistor, 510 OHM ¼W
R19,25	Resistor, 560 OHM ¼W
R24	Resistor, 680 OHM ¼W
R34	Resistor, 68K OHM ¼W
R6	Resistor, 800 OHM ¼W
R8	Resistor, 10 OHM ¼W
R33	Resistor, 51K OHM ¼W
R1	Resistor, 1M OHM ½W
R2	Resistor, 50K OHM ¼W
R4	Resistor, 348K OHM ½W
R13	Resistor, 1620 OHM ¼W
R11	Resistor, 237 OHM ¼W
R10	Resistor, 261 OHM ¼W
R14	Resistor Variable, 20K

SYMBOL	DESCRIPTION
	CAPACITORS
C15,16	Capacitor, Ceramic 0.001uF 50V
C17	Capacitor, Ceramic 0.01uF 50V
C3	Capacitor, Ceramic 200pf 100V
C1	Capacitor, Ceramic 0.47uF 400V
C10	Capacitor, Ceramic 22pf 50V
C34	Capacitor, Ceramic 39pf 50V
C11,12	Capacitor, Ceramic 47pf 50V
C32	Capacitor, Electrlytic 2200uF 25V
C4,6,9,14,18,22	Capacitor, Electrolytic 3.3uf 50V
C30	Capacitor, Electrolytic 470uf 25V
C7	Capacitor, Electrolytic 60uf 25V
C5	Capacitor, Tantalum 60uf 25V
C8,13,19,20,21,23,29	Capacitor, Met. Poly. MKS2
C25,28	Capacitor, Trimmer 10pf
C26,28-1	Capacitor, Mica. 33pf 50V
C24	Capacitor, Mica. 43pf 50V
C27	Capacitor, Mica. 50pf 50V
	MISCELLANEOUS
X-TAL	Crystal, 10MHz 20PPM
X-TAL2	Crystal 3.90625MHz 20PPM
PT	Transformer, Power
LD1-LD8	LED Display, 7mm, D200PK
L1,2,3,4,5	LED, Red CQY85N
S15	Voltage Selector SW, Sx2-40
S14	Switch, Slide 3P2
S1-S11	Switch Set
J1,2	Connector, BNC
J3	Binding Post, Metal
1	Connector Ass'y (C)
1	Connector Ass'y (D)
1	Connector Ass'y (E)
2	Mould Foot
2	Rubber Foot
1	Heat Sink
1	X-tal Heat Sink
2	Fuse, 250V 1A
14	Push Switch with Knob
1	Filter, Acryle (red)