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# FS-409 SPECIFICATIONS

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## CRT

**Type** : 6-inch rectangular with integral graticule,  
P31 phosphor.

**Display Area** : 8 x 10 div (i div = 1 cm).

**Accelerating Voltage** : 2 kV.

**Phosphor** : P31.

**Trace Rotation** : Electrical, front panel adjustable.

## VERTICAL AMPLIFIERS (CH 1 and CH 2)

**Sensitivity** : 5 mV/div to 5 V/div, 1 mv/div to 1 V/div  
at X5 MAG.

**Attenuator** : 10 calibrated steps in 1-2-5 sequence.  
Variable control provides fully adjustable  
sensitivity between steps; range 1/1 to at  
least 1/3.

**Accuracy** :  $\pm 3\%$ , 5 mV to 5 V/div; 5%, at X5 MAG.

**Input Resistance** :  $1\text{ M}\Omega \pm 2\%$ .

**Input Capacitance** :  $25\text{ pF} \pm 10\text{ pF}$

### Frequency Response :

5 mV/div to 5 V/div:

DC to 40 MHz (-3 dB).

X5 MAG :

DC to 10 MHz (-3 dB).

### Rise Time :

8.8 nS; 35 nS at X5 MAG.

**Overshoot** : Less than 5%.

### Operating Modes :

CH 1 : CH 1, single trace.

CH 2 : CH 2, single trace.

DUAL : CH 1 and CH 2, dual trace.

Alternate or Chop selectable at  
any sweep rate.

ADD : Algebraic sum of CH 1+ CH 2.

**Chop Frequency** : Approximately 500KHz.

**Polarity Reversal** : CH 2 invert.

**Maximum Input Voltage** : 400 V (dc + ac peak).

## HORIZONTAL AMPLIFIER

(Input through channel 1 input)

### X-Y mode :

CH 1=X axis.

CH 2 = Y axis.

**Sensitivity** : Same as vertical channel 2.

**Input Impedance** : Same as vertical channel 2.

### Frequency Response:

DC to 1 MHz(-3 dB).

**X-Y Phase Difference** :  $3^\circ$  or less at 50 kHz.

**Maximum Input Voltage** : Same as vertical channel 1.

## SWEEP SYSTEM

### Operating Modes :

Main Time Base, X-Y Operating.

**Main Time Base** : 0.1  $\mu$ S/div to 2.0 S/div in 1 -2-5  
sequence, 23 steps. Variable control provides fully  
adjustable sweep time between steps.

**Accuracy** :  $\pm 3\%$ , except  $\pm 6\%$  on 0.2 S/div and  $\pm 20\%$   
on 0.1 $\mu$ S/div.

**Sweep Magnification** : X10  $\pm 10\%$ .

**Holdoff** : Continuously adjustable for main time base f  
NORM to 5 times normal.

## TRIGGERING

### Trigger Modes :

AUTO (free run), NORM, TV-V, TV-H.

### Trigger Source :

CH 1, CH 2, Alternate, EXT, LINE.

### Slope :

(+)or(-)

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## Trigger Coupling :

- AUTO : Sweep free-runs in absence of suitable trigger signal.
- NORM : Sweep triggered only by adequate trigger signal.
- TV-V : Video vertical sync pulses are selected. Also usable for high frequency reject.
- TV-H : Video horizontal sync pulses are selected. Also usable for low frequency reject.

## Trigger Sensitivity :

- AUTO : 1.5 div (internal)  
>0.5 Vp-p (external)  
100 Hz -40 MHz
- NORM : 1.5 div (internal)  
20.5 Vp-p (external)  
100 Hz -40 MHz
- TV-V : 1.0 div (internal)  
>0.5 Vp-p (external)  
DC -1KHz
- TV-H : 1.0 div (internal)  
>0.5 Vp-p (external)  
1KHz-100 KHz

## Maximum External Trigger Voltage :

300 V (dc + ac peak).

## FUNCTION GENERATOR

### GENERAL SPECIFICATIONS :

- Frequency : 0.5Hz ~ 5MHz in 6 steps,  
controlled by one push switch.
- Output Waveform : Sine, Square, Triangle,  
3 waveforms total.
- Stability : 0.1% - 15minutes after power-on.  
0.2% - 24hrs after power-on.
- Limits of Operation : 0°C~40°C,10~80%R.H.
- Storage Environment : -20°C~70°C,0~90%R.H.

## TRIANGLE WAVE :

- Frequency : 0.5Hz - 5MHz.
- Symmetry : 50% (rise wave) to 50% (fall wave),  
< 2%, 1Hz ~ 100KHz.
- Linearity : < 1%, 1Hz ~ 100KHz.

## SINE WAVE :

- Frequency : 0.5Hz ~ 5MHz.
- Distortion : < 2%, 1Hz ~ 100KHz.
- Harmonic Ratio : < 30dB, 100KHz ~ 5MHz.
- Frequency Response : < 0.1dB up to 100KHz.  
< 1dB 100KHz to 5MHz.

## SQUARE WAVE :

- Frequency : 0.5Hz ~ 5MHz.
- Symmetry : 50% (positive half) to 50%  
(negative half), < 2%,  
1Hz ~ 100KHz.
- Rise Time : < 60ns.

## MAIN OUTPUT :

- Output Impedance : 50Ω, < 2% Accuracy.
- Max. Output : 20 Vp-p (No load), ±1V?  
10 Vp-p (50Ω load),±0.5V ?
- Min. Output : 0.1Vp-p (No load) and 0.05V  
(50Ω load)
- Attenuator : one -20dB switch, < 2% Accuracy.

## SYNCHRONOUS OUTPUT :

- Output Impedance : 50Ω, < 2% Accuracy.
- Output Level : TTL level, > 3Vp-p fixed amplitude.
- Fanout : > 20.
- Rise Time : < 60ns(no load).

## FREQUENCY COUNTER

### DISPLAY :

- 5digits, 0.36" Red LED, Display at "Hz" or "KHz"  
unit, Auto range.

## GATE TIME :

- Auto Select** : form 10S to 0.25S According to the  
frequency of the input signal Auto select.

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**Auto Detect** : The gate time LED will "FLASH" when with input and will "OFF" without input signal, Auto Detect,

**Auto re-set** : The data will hold 10S Max. after the input signal is stop and then Auto re-set,

**RESOLUTION** : 0.001Hz to 1KHz according to the frequency of the input signal. Auto Select.

**MAX.COUNTER RANGE** : 0.1Hz to 50MHz

**ACCURACY** : + 0.01% + 1digit or 1/99999 +1digit

**TIME BASE** : 18.432MHz + 10ppm(23}C ± 5}C )

**SENSITIVITY** :

**NOTE** : 1.The counter must be set at "DC COUPLING" operation when the input signal is less than 10Hz.

2.The counter are operated by the "Triggle Sourace" CH1, CH2 or EXT. But can not by "ALT" source.

MODE	RANGE	SENSITIVITY
INT	2Hz~40MHz	<input type="checkbox"/> 1DIV
	1Hz~45MHz	<input type="checkbox"/> 2DIV
	0.2Hz~50MHz	<input type="checkbox"/> 3DIV
EXT	10Hz~50MHz	<input type="checkbox"/> 200mVrms
	1Hz~50MHz	<input type="checkbox"/> 400mVrms

### OTHER SPECIFICATIONS

**Cal/Probe Compensation Voltage** : 2 V p-p +3% square wave, 1KHz nominal.

**CH 2 (Y) Output** : 50 mV/div (nominal into 50 ohm load).

**Output Impedance** : Approximately 50 ohms.

**Frequency Response** : 20 Hz to 30 MHz, -3 dB.

**Power Requirement** : 10~130 VAC or 200-260 VAC, 50/60 Hz, 50 watts.

**Dimensions (H x W x D)** :

5.2" x 12.8" x 15.7"

(132 x 324 x 398 mm).

**Weight** : 18.7 lbs (8.5 kg).

**Environment** :

**Within Specified Accuracy** : +10" to +350 C, 10-80%

**Full Operation** : 0" to +50" C, 10-80% relative humidity.

**Storage** : -30" to +70" C, 10-90% relative humidity.

**ACCESSORIES SUPPLIED** :

Two Switchable X1/X10 Probes.

Instruction Manual.

AC Line Cord.