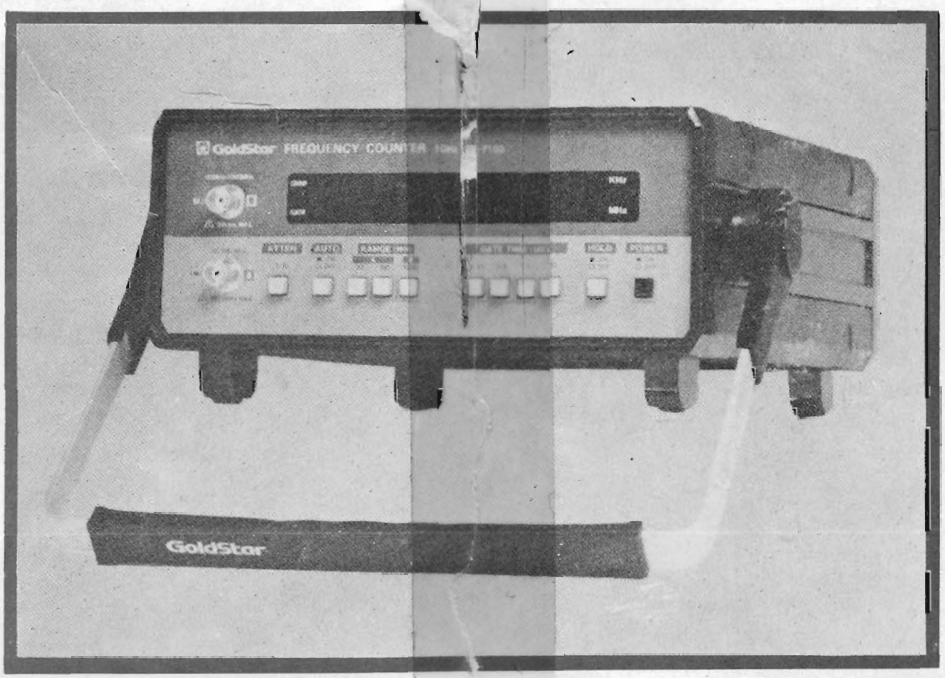
OPERATOR'S MANUAL

FREQUENCY COUNTER

FC-7011, 7012, 7013
FC-7051, 7052, 7053
FC-7101, 7102, 7103



READ THIS OPERATOR'S MANUAL
BEFORE USING THE FREQUENCY COUNTER

GoldStar

1. INTRODUCTION

GoldStar frequency counters are advanced-class counter having wide measurement range of 1Hz-100MHz. By use of the most up-to-date LSI, this series frequency counters have the following features;

(1) High performance and reliability
(2) Easy to use
  - Employment of the AUTO range and HOLD function makes users easier to measure the input signal frequency
(3) High stability in reference oscillator
(4) High performance in the noise rejection of AC power line
(5) Compact size and light weight

The pre-scaler circuit extends measuring range to 60MHz – 550MHz in FC-7051, 7052, 7053, and 60MHz–1GHz in the FC-7101, 7102, 7103.

2. SPECIFICATIONS

100MHz FREQUENCY COUNTER SPECIFICATIONS

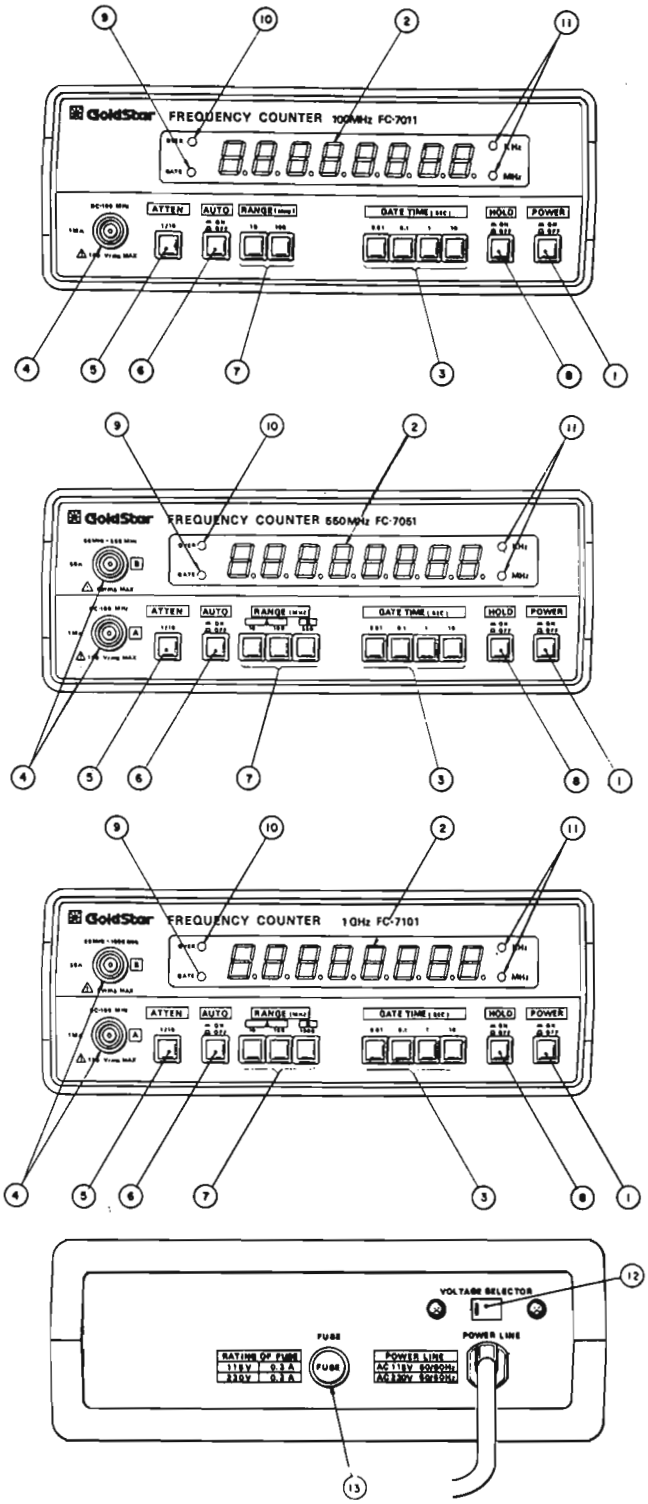
MODEL		FC-7011	FC-7012	FC-7013
DISPLAY		8 DIGIT, LED	8 DIGIT, LED	8 DIGIT, LED
FREQUENCY	RANGE	1 Hz – 100 MHz	1 Hz – 100 MHz	1 Hz – 100 MHz
	RESOLUTION	0.1, 1, 10, 100 Hz	0.1, 1, 10, 100 Hz	0.1, 1, 10, 100 Hz
	GATE TIME	10S, 1S, 100mS, 10mS	10S, 1S, 100mS, 10mS	10S, 1S, 100mS, 10mS
	ACCURACY	±(1Hz+1DIGIT+Time Base Error)	±(1Hz+1DIGIT+Time Base Error)	±(1Hz+1DIGIT+Time Base Error)
INPUT CHARAC-TERISTIC	SENSITIVITY (RMS)	10Hz – 60MHz : 10mV 60MHz – 100MHz : 20mV	10Hz – 60MHz : 10mV 60MHz – 100MHz : 20mV	10Hz – 60MHz : 10mV 60MHz – 100MHz : 20mV
	INPUT IMPEDANCE	1MΩ / 100pF	1MΩ / 100pF	1MΩ / 100pF
	MAX. INPUT VOLTAGE	150V RMS	150V RMS	150V RMS
REFERENCE OSCILLATOR	FREQUENCY	10MHz, CRYSTAL	10MHz, TCXO	10MHz, TCXO
	STABILITY	5PPM (0°C – 50°C)	1 PPM (0°C – 50°C)	1PPM (0°C – 50°C)
	AGING	1 PPM / 1 Week	0.1PPM / Week	0.1PPM / Week
INPUT POWER		AC 110V / 220V, ±10%	AC 110V / 220V, ±10%	AC 110V / 220V, ±10%
SIZE (mm)		210(W)× 260(L)× 76(H)	210(W)× 260(L)× 76(H)	222(W)× 345(L)× 94(H)
WEIGHT		1.8kg	1.8kg	2.6kg
BODY MATERIAL		PLASTIC	PLASTIC	ALUMINIUM

550MHz FREQUENCY COUNTER SPECIFICATIONS

MODEL			FC-7051	FC-7052	FC-7053
DISPLAY			8 DIGIT, LED	8 DIGIT, LED	8 DIGIT, LED
FREQUENCY	RANGE	CH A	1 Hz – 100 MHz	1 Hz – 100 MHz	1 Hz – 100 MHz
		CH B	60 MHz – 550 MHz	60 MHz – 550 MHz	60 MHz – 550 MHz
	RESOLUTION		0.1, 1, 10, 100 Hz	0.1, 1, 10, 100 Hz	0.1, 1, 10, 100 Hz
	GATE TIME		10S, 1S, 100mS, 10mS	10S, 1S, 100mS, 10mS	10S, 1S, 100mS, 10ms
	ACCURACY		±(1Hz+1DIGIT+Time Base error)	±(1Hz+1DIGIT+Time Base error)	±(1Hz+1DIGIT+Time Base error)
INPUT CHARAC-TERISTIC	SENSITIVITY (RMS)	CH A	10 Hz – 60 MHz : 10mV 60 MHz – 100 MHz : 20mV	10 Hz – 60MHz : 10mV 60MHz – 100MHz : 20mV	10MHz – 60 MHz : 10mV 60MHz – 100 MHz : 20mV
		CH B	60 MHz – 150 MHz : 20mV 150 MHz – 250 MHz : 30mV 250 MHz – 500 MHz : 100mV 500 MHz – 550 MHz : 150mV	60 MHz – 150MHz : 20mV 150 MHz – 250MHz : 30mV 250 MHz – 500MHz : 100mV 500 MHz – 550MHz : 150mV	60MHz – 150MHz : 20mV 150MHz – 250MHz : 30mV 250MHz – 500 MHz : 100mV 500MHz – 550 MHz : 150mV
	INPUT IMPEDANCE	CH A	1MΩ / 100pF	1MΩ / 100pF	1MΩ / 100pF
		CH B	50Ω	50Ω	50Ω
	MAX. INPUT VOLTAGE	CH A	150V RMS	150V RMS	150V RMS
		CH B	5V RMS	5V RMS	5V RMS
REFERANCE OSCILLATOR	FREQUENCY		10MHz, CRYSTAL	10MHz, TCXO	10MHz, TCXO
	STABILITY		5PPM (0°C – 50°C)	1PPM (0°C – 50°C)	1PPM (0°C – 50°C)
	AGING		1 PPM / Week	0.1PPM / Week	0.1 PPM / Week
OPERATING TEMP.			0°C – 50°C	0°C – 50°C	0°C – 50°C
INPUT POWER			AC 110V / 220V± 10 %	AC 110V / 220V± 10 %	AC 110V / 220V± 10 %
SIZE (mm)			210(W)× 260(L)× 76(H)	210(W)× 260(L)× 76(H)	222(W)× 345(L)× 94(H)
WEIGHT			1.8kg	1.8kg	2.6kg
BODY MATERIAL			PLASTIC	PLASTIC	ALUMINIUM

1GHz FREQUENCY COUNTER SPECIFICATIONS

MODEL			FC-7101	FC-7102	FC-7103
DISPLAY			8 DIGIT, LED	8 DIGIT, LED	8 DIGIT, LED
FREQUENCY	RANGE	CH A	1Hz – 100MHz	1Hz – 100MHz	1Hz – 100MHz
		CH B	60MHz – 1GHz	60MHz – 1GHz	60MHz – 1GHz
	RESOLUTION		0.1, 1, 10, 100Hz	0.1, 1, 10, 100Hz	0.1, 1, 10, 100Hz
	GATE TIME		10S, 1S, 100mS, 10mS	10S, 1S, 100mS, 10mS	10S, 1S, 100mS, 10mS
	ACCURACY		±(1Hz+1 DIGIT+ Time Base error)	±(Hz+1 DIGIT+ Time Base error)	±(1Hz+1 DIGIT+ Time Base error)
INPUT CHARAC-TERISTIC	SENSITIVITY (RMS)	CH A	10Hz – 60MHz : 10mV 60MHz – 100MHz : 20mV	10Hz – 60MHz : 10mV 60MHz – 100MHz : 20mV	10Hz – 60MHz : 10mV 60MHz – 100MHz : 20mV
		CH B	60MHz – 300MHz : 20mV 300MHz – 600MHz : 30mV 600MHz – 1GHz : 50mV	60MHz – 300MHz : 20mV 300MHz – 600MHz : 30mV 600MHz – 1GHz : 50mV	60MHz – 300MHz : 20mV 300MHz – 600MHz : 30mV 600MHz – 1GHz : 50mV
	INPUT IMPEDANCE	CH A	1MΩ / 100pF	1MΩ / 100pF	1MΩ / 100pF
		CH B	50Ω	50Ω	50Ω
	MAX. INPUT VOLTAGE	CH A	150V RMS	150V RMS	150V RMS
		CH B	5V RMS	5V RMS	5V RMS
REFERANCE OSCILLATOR	FREQUENCY		10MHz, CRYSTAL	10MHz, TCXO	10MHz, TCXO
	STABILITY		5PPM (0°C – 50°C)	1PPM (0°C – 50°C)	1PPM (0°C – 50°C)
	AGING		1 PPM / Week	0.1 PPM / Week	0.1 PPM / Week
OPERATING TEMP			0°C – 50°C	0°C – 50°C	0°C – 50°C
INPUT POWER			AC 110V / 220V± 10 %	AC 110V / 220V± 10 %	AC 110V / 220V± 10 %
SIZE (mm)			210(W)× 260(L)× 76(H)	210(W)× 260(L)× 76(H)	222(W)× 345(L)× 94(H)
WEIGHT			1.8kg	1.8kg	2.6kg
BODY MATERIAL			PLASTIC	PLASTIC	ALUMINIUM



(Fig 1) FRONT PANEL & REAR PANEL

3. FUNCTIONAL DESCRIPTIONS

1) Power
When red knob is pushed, the instrument is turned on.

2) Display
Measured frequency is displayed on the 8 digit LEDs of seven segments.

3) Gate time selection switch
This switch selects a gate time among 0.01, 0.1, 1 or 10 seconds. It determines the sampling time for the input signal.

4) Input "A" and "B" terminals
Input signal is connected to either "A" or "B" terminal except model FC-7011, 7012, 7013.
Input "A" terminal frequency range is for 1 Hz -100 MHz, in all models and "B" is for 60 MHz -550 MHz in FC-7051, 7052, 7053, and for 60 MHz -1 GHz in FC-7101, 7102, 7103.

5) Attenuation switch
This switch is used when either input signal is too high (>400mV rms) or noise level is high. When this switch is pushed, the attenuation ratio is 20dB (1/10 attenuation) in volts.

6) Auto ranging switch
Input frequency is measured automatically when AUTO switch is pushed. It is very useful when input frequency is unknown.

7) Range switch
This switch is used when higher frequency resolution is required.
- 10 MHz switch : When the input frequency is below 10 MHz, this switch is used.
- 100 MHz switch : When the input frequency is between 10 MHz and 100-MHz, this switch is used.
- 550 MHz switch : This switch exists in model FC-7051, 7052, 7053 only.
- 1 GHz switch : This switch exists in model FC-7101, 7102, 7103 only.

8) Hold switch

This switch is used when measured frequency is required to be held. When hold switch is pushed, the display is not up-dated.

9) Gate time indication LED

During counting gate is opened in the circuit and input frequency is being counted, gate LED is lit.

10) Overrange indication LED

When the frequency of input signal is larger than the selected frequency range, the overrange LED is lit. At this time the frequency range and gate time must be changed.

11) KHz, MHz indication LEDS

This LED denotes the frequency unit in KHz or MHz.

12) AC power selection switch

Operator must select the AC input line voltage either 110V AC or 220V AC by this switch.

13) Fuse

When the input line voltage is 110V AC, 0.3A fuse must be used. When 220V AC, 0.2A fuse must be used.

4. PRECAUTIONS

1) Check the line voltage and fuse rating before applying power.
   This instrument is set to 110V AC/50-60Hz in factory.

2) Do not apply an excessive input signal voltage to avoid instrument damage.
   When the input is connected to "A" terminal (1MΩ impedance), the maximum voltage which can be applied to the input depends on frequency as shown Fig-2.
   When the input is connected to "B" terminal (50Ω impedance), the maximum voltage which can be applied to the input is 5V RMS, without regard to the frequency.

3) Avoid a heavy shock to this instrument

4) Do not use in an extremely hot or cold temperature.
   The operating temperature is 0°C – +50°C, and the storage temperature is –55°C – +70°C.

5. MEASUREMENT PROCEDURE

1) Preparations before use
   Connect a cable with BNC connector to the BNC connector terminal on the front panel, and set the attenuation switch to 1/10 position. (push the attenuation switch)

2) Push the power switch to turn on.

3) Select range switch in accordance with measuring frequency.
   If overrange indication LED is lit, change range switch.

4) Select the gate time in accordance with resolution requirement of input signal frequency. The resolution versus gate time and range is shown in table 1 and table 2.

Table 1. Resolution versus gate time and range

RANGE / GATE TIME	10MHz	100MHz	550M, 1GHz
0.01S	XXXXXXX.X	XXXXX.XXX	XXXXXX.XX
0.1S	XXXXXX.XX	XXXX.XXXX	XXXXX.XXX
1S	XXXXX.XXX	XXX.XXXXX	XXXX.XXXX
10S	XXXX.XXXX	XXXXX.XXX	XXX.XXXXX

Table 2. Frequency unit LED to be displayed

RANGE / GATE TIME	10MHz	100MHz	550M, 1GHz
0.01S	KHz	MHz	MHz
0.1S	〃	〃	〃
1S	〃	〃	〃
10S	〃	K Hz	〃

5) If the input is displayed and LED remains Zero, set attenuation switch to 1:1 position. (Release attenuation switch)

6) To freeze the LED display for stable reading, push the "HOLD" switch.

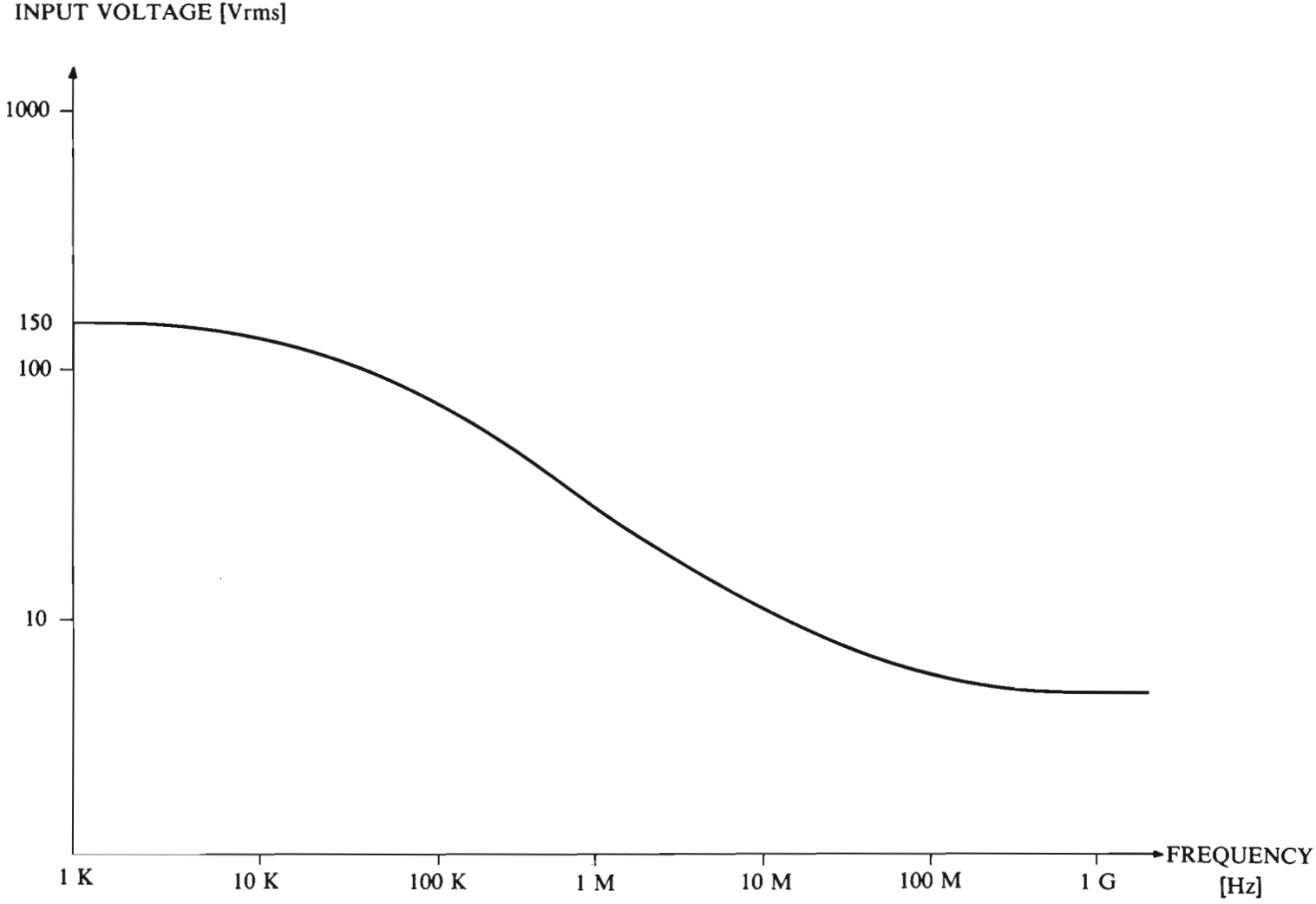
6. CALIBRATION

The frequency of the internal reference oscillator must be calibrated in every 6 months.

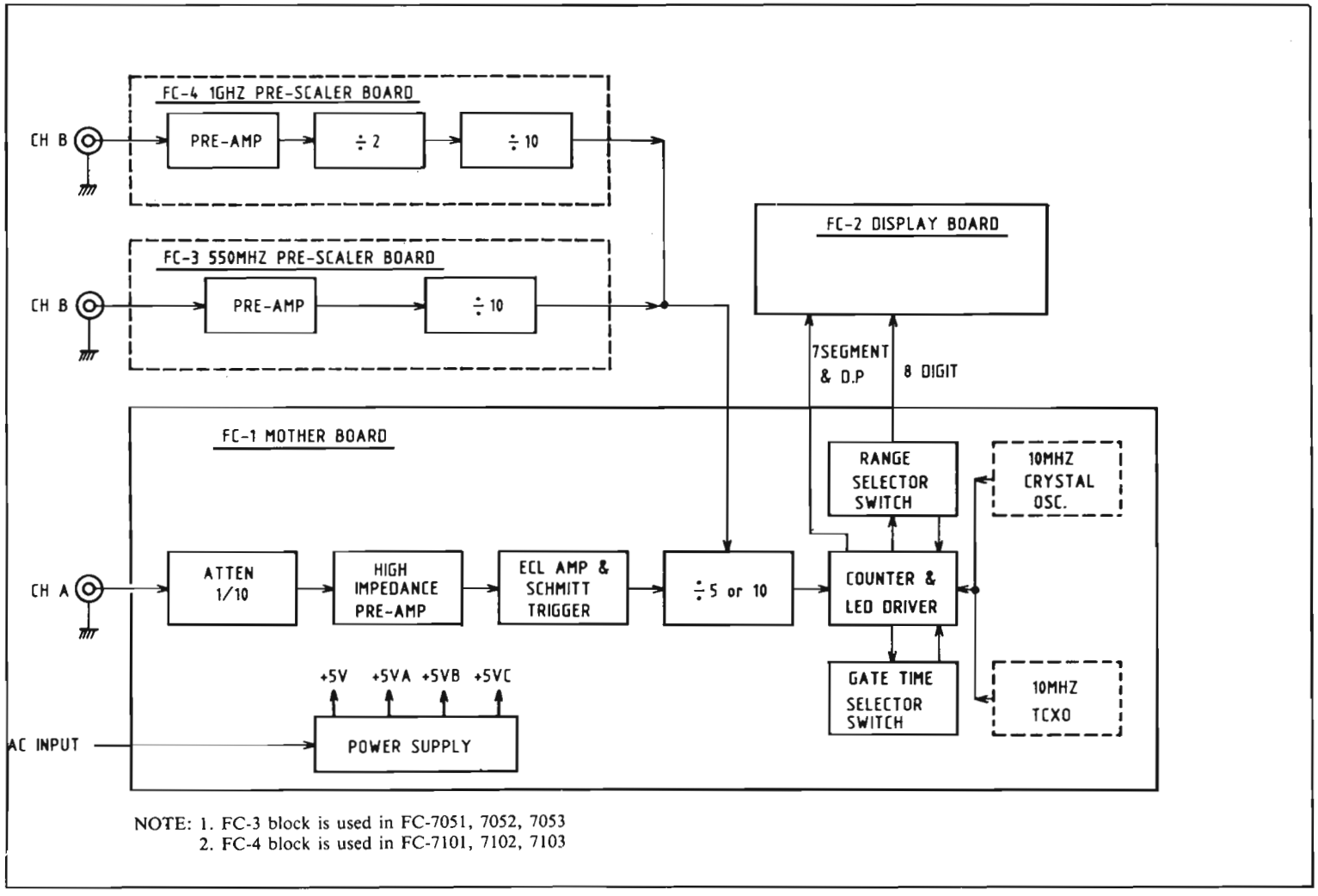
It must be calibrated after more than 30 minutes warm-up.

Use high accuracy counter having an accuracy of over 1×10^{-7} as the calibration instrument.

Apply the calibrating frequency signal of 10 MHz to the input "A" terminal of the frequency counter, and adjust internal trimmer capacitor C113 or TCXO through 10 MHz adjusting hole so that the display becomes 10,000 KHz.

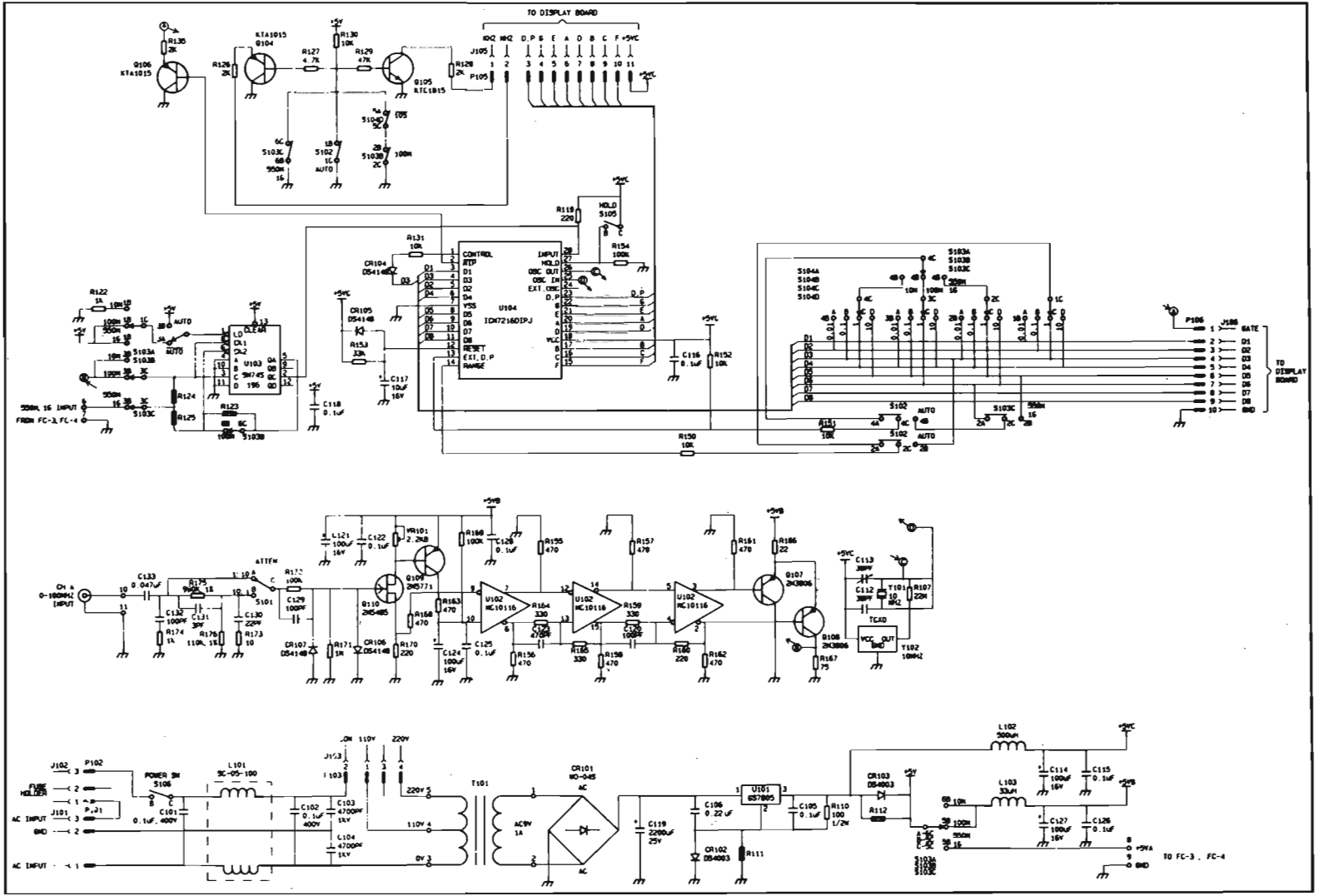


(Fig 2) MAXIMUM INPUT VOLTAGE VS FREQUENCY

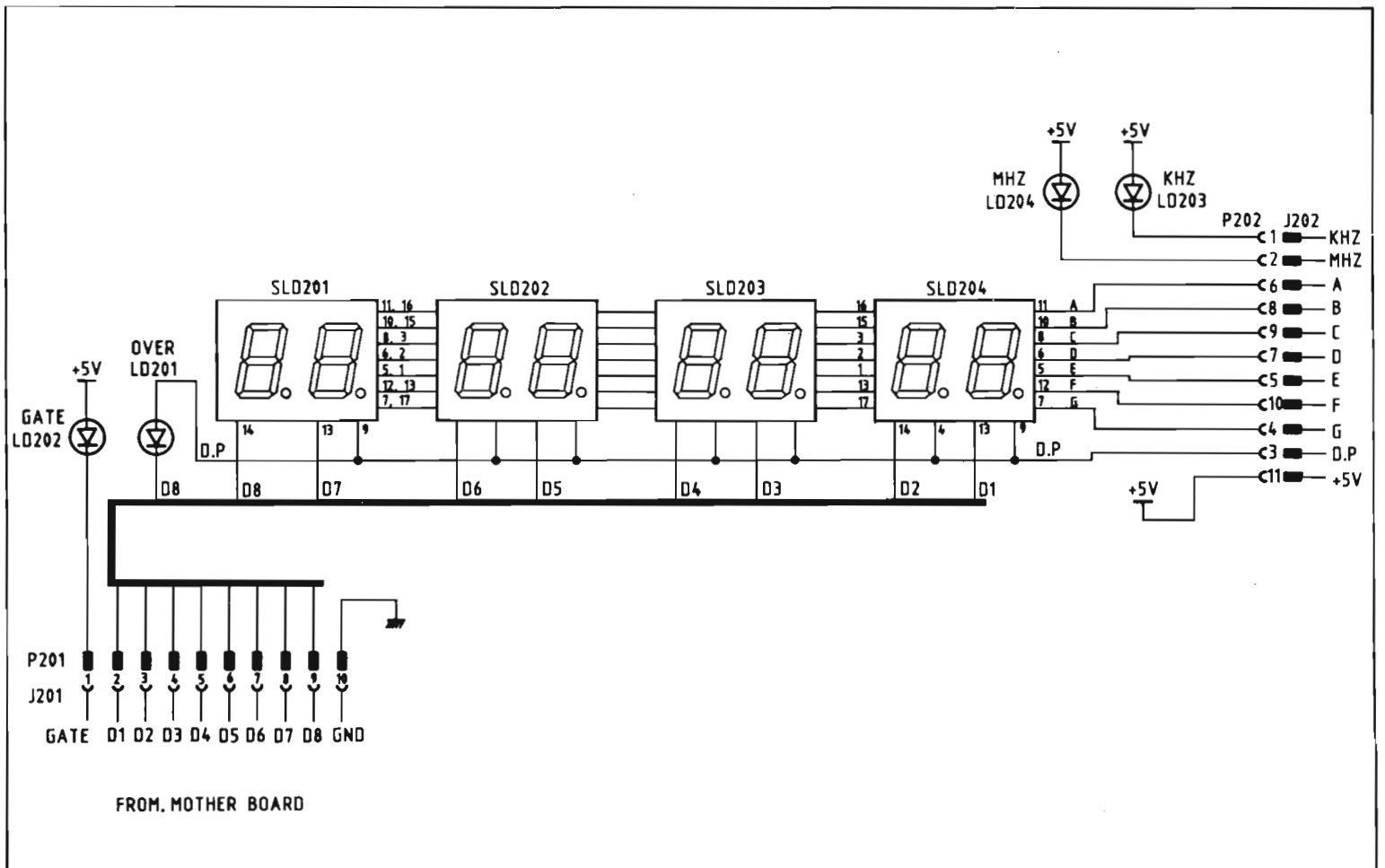


NOTE: 1. FC-3 block is used in FC-7051, 7052, 7053
2. FC-4 block is used in FC-7101, 7102, 7103

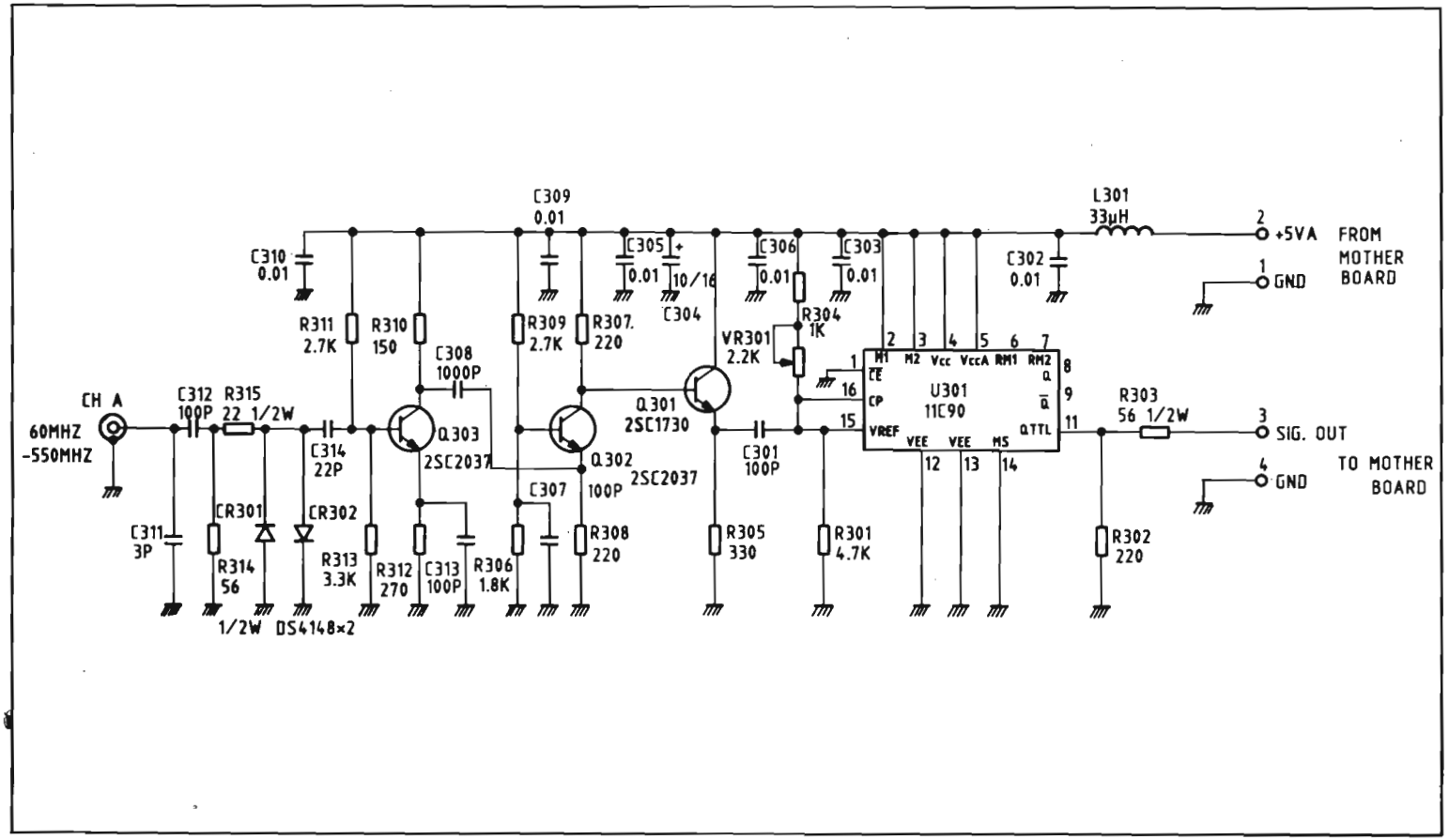
(Fig 3) FUNCTIONAL BLOCK DIAGRAM



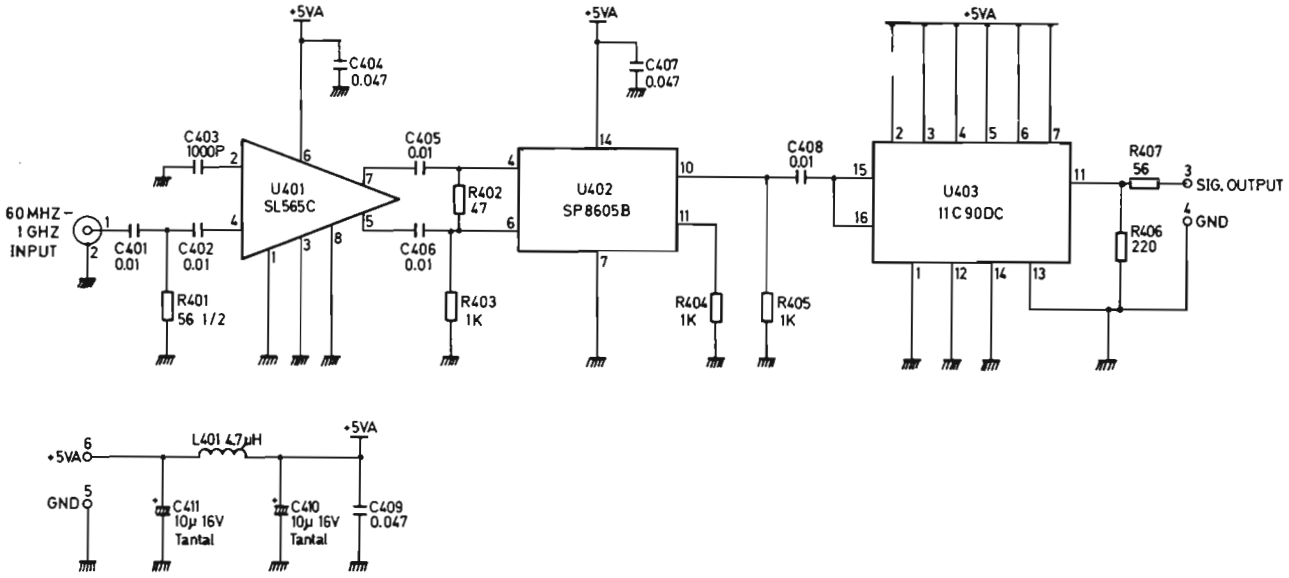
(Fig 4) FC-1 MOTHER BOARD CIRCUIT DIAGRAM



(Fig 5) FC-2 DISPLAY BOARD CIRCUIT DIAGRAM



(Fig 6) FC-3 550 MHz PRE-SCALER BOARD CIRCUIT DIAGRAM



(Fig 7) FC-4 1GHz PRE-SCALER

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