

SERVICE MANUAL

FC-8150U
1.5GHz Universal Frequency Counter

UNISOURCE CORPORATION

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1. PERFORMANCE CHECK PROCEDURE

1-1. GENERAL

This section contains the Procedures required to check and maintain specified instrument performance. The adjustments should be performed at an ambient temperature of $23^{\circ}\text{C} \pm 5^{\circ}\text{C}$ and a relative humidity of less than 60%. It allows the instrument to stabilize at this environment for a minimum of 30 minutes.

1-2. EQUIPMENT'S REQUIRED

Table 1-1 is shown test equipment's required.

Table 1-1 Equipment's required

No.	Equipment name	Specification	Remark
1.	10MHz SIGNAL SOURCE	10MHz STANDARD	
2.	TEST OSCILLATOR	0.1Hz to 10MHz,	
2.	RF SIGNAL GENERATOR	100kHz to 3.0 GHz	
3.	50-ohm TERMINATION	100 MHz BANDWIDTH	
4.	D.M.M.		
5.	OSCILLOSCOPE	V: 5mV H:50nS	

1-3. PERFORMANCE CHECK

1-3-1. FREQUENCY RESPONSE AND SENSITIVITY

A. INPUT A

SPECIFICATION ;

- Frequency Range ; 0.1Hz to 100MHz(DC Coupled)
30Hz to 100MHz(AC Coupled)
- Sensitivity ; 30mVrms(0.1Hz to 100MHz)

1. Set the front panel controls as follows;

- FUNCTION : FREQ. A
- GATE TIME : 1S
- SLOPE(A,B) :  (PULL OUT)
- ATTN.(A,B) : 1/1 (PULL OUT)
- COUPLE(A,B) : DC (PULL OUT)
- SEP/COM A : SEP (PULL OUT)
- TRIG LEVEL : MIDRANGE

2. Connect the Test Oscillator to INPUT A with a BNC cable and 50Ω feed through.

3. Vary the out-put frequency of Test Oscillator from 0.1Hz to 10MHz, maintaining a 30mVrms signal level and check the counter display the correct frequencies.

4. Connect the RF Signal Generator to INPUT A with a BNC cable and 50Ω feed through.
5. Vary the out-put frequency of RF Signal Generator from 10MHz to 100MHz, maintaining a 30mVrms signal level and check the counter display the correct frequencies.

B. INPUT B

SPECIFICATION ;

- Frequency Range ; 0.1Hz to 100MHz(DC Coupled)
30Hz to 100MHz(AC Coupled)
- Sensitivity ; 30mVrms (0.1Hz to 100MHz)

1. Repeat step A 1. Set the function to FREQ. B.
2. Connect the Test Oscillator to INPUT B with a BNC cable and 50Ω feed through.
3. Vary the out-put frequency of Test Oscillator from 0.1Hz to 10MHz, maintaining a 30mVrms signal level and check the counter display the correct frequencies.
4. Connect the RF Signal Generator to INPUT B with a BNC cable and 50Ω feed through.
5. Vary the out-put frequency of RF Signal Generator from 10MHz to 100MHz, maintaining a 30mVrms signal level and check the counter display the correct frequencies.

C. INPUT C

SPECIFICATION ;

Frequency Range	Sensitivity
80MHz – 2.4GHz	25mVrms from 80 MHz to 150 MHz 20mVrms from 150MHz to 2.0 GHz 60mVrms from 2.0GHz to 3.0 GHz

1. Set the front panel controls as follows;
 - FUNCTION : FREQ. C
 - GATE TIME : 1S
2. Connect the RF Signal Generator to INPUT C with a BNC cable and 50Ω feed through.
3. Vary the out-put frequency of RF Signal Generator from 80MHz to 150MHz, maintaining a 25mVrms signal level and check the counter display the correct frequencies.
4. Vary the out-put frequency of RF Signal Generator from 150MHz to 2.0GHz, maintaining a 20mVrms signal level and check the counter display the correct frequencies.
5. Vary the out-put frequency of RF Signal Generator from 2.0GHz to 3.0GHz, maintaining a 60mVrms signal level and check the counter display the correct frequencies.

1-3-2. PERIOD

SPECIFICATION ;

10 nS to 10 S

1. Repeat step 1-3-1. A 1. Set the function to PERIOD A.
2. Connect the Test Oscillator to INPUT A with a BNC cable and 50 Ω feed through.
3. Vary the out-put frequency of Test Oscillator from 0.1Hz to 10MHz, maintaining a 30mVrms signal level and check the counter display the correct period of all frequencies in specified range.
4. Connect the RF Signal Generator to INPUT A with a BNC cable and 50 Ω feed through.
5. Vary the out-put frequency of Signal Generator from 10MHz to 100MHz, maintaining a 60mVrms signal level and check the counter display the correct period of all frequencies in specified range.

1-3-3. TOTALIZE

SPECIFICATION ;

10Hz to 30 MHz , 30mVrms

1. Set the front panel controls as follows;
 - FUNCTION : PERIOD A
 - HOLD : NORM(PULL OUT)
 - GATE TIME : 1S
 - SLOPE(A,B) :  (PULL OUT)
 - ATTN.(A,B) : 1/1 (PULL OUT)
 - COUPLE(A,B) : DC (PULL OUT)
 - SEP/COM A : SEP (PULL OUT)
 - TRIG LEVEL : MIDRANGE
2. Set the Test Oscillator to 10 Hz at 30mVrms and connect the Test Oscillator to INPUT A with a BNC cable and 50 Ω feed through.
3. Observe the display upcounting at a 10 Hz rate.
4. Press the HOLD switch IN and check the display stops upcounting.
5. Release the HOLD switch (OUT Position) and check the updated display and a resume in counting.
6. Set the test oscillator to 30 MHz 30mVrms and check the display is counting "OF" after totalizing fully(999 999 999).

1-3-4. A/B RATIO

SPECIFICATION ;

Input A : 0.1 Hz to 10 MHz , 30mVrms

Input B : 0.1 Hz to 10 MHz , 30mVrms

1. Set the front panel controls as follows;

- FUNCTION : A/B RATIO
- MULTIPLIER : 100
- SLOPE(A,B) :  (PULL OUT)
- ATTN.(A,B) : 1/1 (PULL OUT)
- COUPLE(A,B) : DC (PULL OUT)
- SEP/COM A : SEP (PULL OUT)
- TRIG LEVEL : MIDRANGE

2. Connect the Test Oscillator to INPUT A with a BNC cable and 50Ω feed through.

3. Connect the function generator to INPUT B with a BNC cable and 50Ω feed through.

4. Set the Test Oscillator for 10MHz at 30mVrms and the Function Generator to 2MHz at 30mVrms.

5. Check the display is "5.00".

1-3-5. A → B TIME INTERVAL

SPECIFICATION ;

0.1μs to 10 S , 30mVrms

1. Set the front panel controls as follows;

- FUNCTION : A→B T.I.
- MULTIPLIER : 1
- SLOPE(A) :  (PULL OUT)
- SLOPE(B) :  (PUSH IN)
- ATTN.(A,B) : 1/1 (PULL OUT)
- COUPLE(A,B) : DC (PULL OUT)
- SEP/COM A : COM A (PUSH IN)
- TRIG LEVEL : MIDRANGE

2. Connect the Test Oscillator to INPUT A with a BNC cable and 50Ω feed through.

3. Set the Test Oscillator for 1MHz at 100mVrms(~285mVp-p).

4. Check the display is "0.5 μs ± 100nS".

2. ADJUSTMENT PROCEDURE

2-1. PRELIMINARY SET-UP

Remove top cover. Apply power, and allow at least 30 minutes for warm-up.

2-2. POWER SUPPLY

a. Check the voltage in each position according to table 2-1.

Table 2-1 Power supply outputs

Check position	Supplying Voltage	Tolerance	Remark
U16 OUT-PUT	+ 5 V	$\pm 0.5V$	
U17 OUT-PUT	+ 5 V	$\pm 0.5V$	

2-3. TIME BASE FREQUENCY ADJUSTMENT

NOTE ; If this adjustment is to be considered valid, the unit should have a half-hour warm-up and the line voltage should be within $\pm 5 \%$.

2-3-1. Method #1

1. Apply an external signal of known frequency(10MHz standard signal) and suitable amplitude(minimum 30mVrms) to Input A terminal.

2. Set the front panel controls as follows ;

- FUNCTION : FREQ. A
- GATE TIME : 1S
- SLOPE(A,B) :  (PULL OUT)
- ATTN.(A,B) : 1/1 (PULL OUT)
- COUPLE(A,B) : DC (PULL OUT)
- SEP/COM A : SEP (PULL OUT)
- TRIG LEVEL : MIDRANGE

The approximate input frequency should be in the display with an update once a second.

3. Adjust "TC0" slowly until the display shows the input frequency by using a plastic tuning wand.

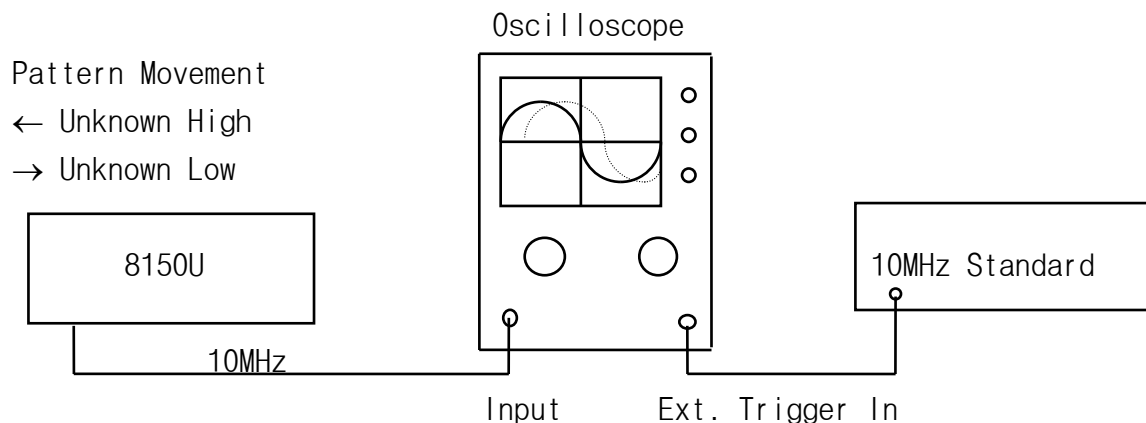
2-3-2. Method #2

This method accomplishes a more accurate adjustment of the time base frequency than Method #1.

1. Connect an Oscilloscope to Internal Oscillator(10MHz) Out-put terminal on rear panel.

2. Connect a 10MHz Standard Signal to the EXT trigger input of Oscilloscope. Refer to the diagram below.

Every few months, the oscillator should be checked to a standard signal. When adjustment is required, use the oscilloscope method shown. Using the appropriate sweep speed, adjust the oscillator until the movement of the pattern(wave form) is stopped.



3. Set the controls of the oscilloscope as follows;

- Coupling : AC
- Input Impedance : 1 Mohm
- Hor. Trigger : EXT.
- Time Base : 0.1 uS/div

4. Adjust Vertical Gain for a full screen waveform. The waveform should be moving either to the left or to the right.

5. Adjust "TC0" until the waveform is stationary. The accuracy of frequency adjustment can be determined by referring the following table.

Table 2-1. Time Base Adjustment

Movement	SWEEP SPEED			NOTES
	1uS/cm	0.1uS/cm	0.01uS/cm	
1 cm/S	1×10^{-6}	1×10^{-7}	1×10^{-8}	Time scope trace movement with Second hand or Watch or Clock
1 cm/10 S	1×10^{-7}	1×10^{-8}	-	
1 cm/100 S	1×10^{-8}	-	-	

2-4. INPUT SENSITIVITY ADJUSTMENT

2-4-1. INPUT A

SPECIFICATION ;

- Frequency Range ; 0.1Hz to 100MHz(DC Coupled)
30Hz to 100MHz(AC Coupled)
- Sensitivity ; 30mVrms (0.1Hz to 100MHz)

1. Set the front panel controls as follows;
 - FUNCTION : FREQ. A
 - GATE TIME : 1S
 - SLOPE(A,B) :  (PULL OUT)
 - ATTN.(A,B) : 1/1 (PULL OUT)
 - COUPLE(A,B) : DC (PULL OUT)
 - SEP/COM A : SEP (PULL OUT)
 - TRIG LEVEL : MIDRANGE
2. Connect the Test Oscillator to INPUT A with a BNC cable and 50Ω feed through.
3. Set the out-put frequency of Test Oscillator to 100kHz , 10mVrms and adjust "SFR1" for displaying the correct frequency.
4. Check Minimum input voltage from 0.1Hz to 100MHz according to the performance check step "1-3-1. A".

2-4-2. INPUT B

SPECIFICATION ;

- Frequency Range ; 0.1Hz to 100MHz(DC Coupled)
30Hz to 100MHz(AC Coupled)
- Sensitivity ; 30mVrms (0.1Hz to 100MHz)

1. Repeat step 2-4-1. 1. Set the function to FREQ. B.
2. Connect the Test Oscillator to INPUT A with a BNC cable and 50Ω feed through.
3. Set the out-put frequency of Test Oscillator to 100kHz , 10mVrms and adjust "SFR2" for displaying the correct frequency.
4. Check Minimum input voltage from 0.1Hz to 100MHz according to the performance check step "1-3-1. B".

3. Troubleshooting Procedure

3-1. Troubleshooting techniques

3-1-1. Check the function selector and switch setting. Incorrect switch settings can give a false indication of instrument malfunction. If there is any question about the correct function or operation, Refer to OPERATOR'S MANUAL.

3-1-2. Check associated equipment's

Before proceeding, ensure that any equipment's used with 1823A is operating correctly and verify that out and input signals are properly connected and that the interconnecting cables are not defective.

3-1-3. Visual Check

Look for broken terminals, damaged components, mounting status of components, damaged circuit boards, or other clues to the cause of a malfunction.

3-2. Troubleshooting procedure

3-2-1. NO Display

1. Check the "FUSE" and if it is broken, change to new one with same rating.
2. Check the output voltage of power transformer.
 - . 6 to 8 Vac between pin 1 and 2 of CN7, and between pin 2 and 3 of CN7 on main board.
 - . 6 to 8 Vac between pin 1 and 2 of CN13, and between pin 2 and 3 of CN13 on main board.
3. Check the DC Power Voltage.
 - . +5VDC at U16 output
 - . +5VDC at U17 output
4. Check the frequency at pin 19 of U11. It should be "11.0592MHz".
5. Check the DC Power voltage of Counter Circuit, Micro-processor, Driver, Buffer, Scanner (U4,U5,U6,U8,U9,U10,U11,U20,U21,NU20)
6. Check the connector cable from CN4', 4-1'(main board) to CN4,CN4-1(display board).
7. Check the operation of Display controller(U2,U13) on main board.

3-2-2. INPUT A

1. Check the input coaxial(1P shield wire) cable connection.
2. Check the Input Attenuator switch operation.
3. Connect 1MHz , 50mVrms sine wave signal to Input A and check the frequency and waveform at Q2 Emitter. The amplified 1MHz Sine wave should appeared.
4. If not, check the operation of Impedance Converter(Q1,Q2,D3,D4).
5. Check the frequency and wavefore at Q4 Collector. The amplified 1MHz Square wave should appeared.
6. If not, check the operation of ECL Amplifier and TTL Converter(U1, Q3, Q4).
7. Check the frequency at Pin 2 of U21. It should be "10.0000 MHz". If not, check the operation of Time Base Circuit(TC0, Q22, Q23).
8. Check the Waveform at Pin 1 of U21. The burst Signal should be appeared. If not, check the operation of Input Controller(U20,U21).
9. Check the operation of Counter Circuit, Micro-processor(U11), Driver(U4,5), Buffer(U9), Scanner(U12,13), Display Driver(U10).
10. Connect 10MHz , 50mVrms sine wave signal to Input A and check the frequency and waveform at Pin 6 of NU2. The 1.25MHz Square wave signal should be appeared. If not, check the operation of 1/8 Divider(NU2).

3-2-3. INPUT B

1. Check the input coaxial cable connection.
2. Check the Input Attenuator switch operation.
3. Connect 1MHz , 50mVrms sine wave signal to Input B and check the frequency and waveform at Q2 Emitter. The amplified 1MHz Sine wave should appeared.
4. If not, check the operation of Impedance Converter(Q18,Q19,D13,D14).
5. Check the frequency and waveform at Q21 Collector. The amplified 1MHz Square wave should appeared.
6. If not, check the operation of ECL Amplifier and TTL Converter(U18, Q20, Q21).
7. Repeat Step 3-2-2. 7 to 9.
8. Connect 10MHz , 50mVrms sine wave signal to Input B and check the frequency and waveform at Pin 6 of NU19. The 1.25MHz Square wave signal should be appeared. If not, check the operation of 1/8 Divider(NU19).

3-2-4. INPUT C

--- PRESCALER PCB PART ---

1. Check the input cable connection(NJ'-4P shield wire, Main-Prescaler).
2. Check the DC Power voltage of Prescaler Circuit pin 2 of U5, pin 6 of U4, pin 8 of U6 ,NJ1'(4P shield wire pin1 -Red wire) : +5Vdc($\pm 0.5V$) .
3. Check the DC voltage of Prescaler Circuit
pin1 of U4 : 0.83V , pin4 of U4 : 2.71V , pin1 of U5 : 2.57V.
kathode of D6 : 0.16V , pin1 of U6 : 4.35V
4. If not, check the operation of U4,5,6 and D6 .
5. Connect 100MHz , 50mVrms sine wave signal to Input C and check the frequency at Pin 4 of U5(Main-Prescaler). The "0.390625 MHz" should appeared.
6. If not, check the operation of 1/256 Divider(U5).
7. Check the Waveform at Pin 1 of U3. The "0.390625 MHz" should appeared.
If not, check the operation of Input Controller(U3).
8. Check the operation of Counter Circuit, Micro-processor(U11), Driver(U4,5), Buffer(U9), BUS(U6,7), Scanner(U12,13), Display Driver(U10).

--- MAIN PCB PART ---

1. Check the DC Power voltage of Main Circuit pin 14 of NU20, anode of ND15.
2. Connect 100MHz , 50mVrms sine wave signal to Input C and check the frequency at Collector of NQ101(main-board) ,pin3 of NU20(main-board), pin5 of U3.
The "0.390625 MHz" should appeared.
3. If not, check the operation of NQ101,NU20.
4. Repeat Step 3-2-3. 7 to 8.

3-2-5. Function Selector(Period,Total,A/B Ratio, A→B Time Interval)

1. Check the switch operation.

2. Check Diode D9, D10.
3. Check the operation of U12 and U11.

3-2-6. Slope(A,B)

1. Check the switch operation.
2. Check Diode D17, D18,Q9,Q10.
3. Check the operation of U12 and U11.

3-2-7. Gate Time

1. Check the switch operation.
2. Check Diode D11,Q7.
3. Check the operation of U12 and U11.

3-2-8. Trigger Level

1. Check the cable connection of Volume and CN9.
2. Vary the Trigger level VR from Min. to Max. and check the voltage at Pin9 of U1.
It should varied from -350mV to +350mV.
3. If not, check the operation of VR.

3-2-9. EXT/INT Reference Signal

1. Check the Switch operation and Cable connection from switch to main board.
2. Set to INT and check the out frequency at BNC terminal.
3. If not, check the operation of TC0 circuit and cable connection.
4. Set the switch to EXT and connect 10MHz Standard Signal to BNC terminal.
5. Check the frequency at Pin2 of U21. The 10MHz signal from external standard should be appeared.
6. If not, check the operation of Time Base Circuits(Q22,Q23) and cable connection.

4. PARTS LIST

4-1. Main PCB Parts

3U01-BK1823A	MAIN PCB ASS'Y PARTS			BK PRECISION 1823A
PART CODE	PART NAME	SPECIFICATION	Q'TY	REFERENCE NUMBER
3U01-BK1823A-00	MAIN PCB ASS'Y	BK PRECISION 1823A	1.00	
1C120-CE004-50	CER.CAPACITOR.SMD	4pF50V	2.00	C97,98
1C120-CE008-50	CER.CAPACITOR.SMD	8pF50V	2.00	C3,76
1C120-CE030-50	CER.CAPACITOR.SMD	30pF50V	2.00	C95,96
1C120-CE033-50	CER.CAPACITOR.SMD	33pF50V	0.00	C43,44
1C120-CE051-50	CER.CAPACITOR.SMD	51pF50V	4.00	C14,87,C02,C04
1C120-CE102-50	CER.CAPACITOR.SMD	0.001uF50V(1nF)	3.00	C20,93,CC71
1C120-CE103-50	CER.CAPACITOR.SMD	0.01uF50V(10nF)	16.00	C4,6,11,15,17,56,57,78,79,82,88
				C90,34,35,NC94,N194
1C120-CE104-50	CER.CAPACITOR.SMD	0.1uF50V(100nF)	18.00	C9,26,28,30,32,45-55,84,NC100
1C120-CE131-50	CER.CAPACITOR.SMD	130pF50V	4.00	C5,10,77,81
1C120-CE151-50	CER.CAPACITOR.SMD	150pF50V	1.00	C58
1C120-CE2R5-50	CER.CAPACITOR.SMD	2.5pF50V	2.00	C2,75
1C510-MF473-250	M/F CAPACITOR	0.047uF250V(47nF) J	2.00	C1,74
1C710-EC010-16	ELEC.CAPACITOR	10uF16V	1.00	C36
1C710-EC047-16	ELEC.CAPACITOR	47uF16V	12.00	C7,8,12,13,16,18,80,83,85,86,89,91
1C710-EC101-16	ELEC.CAPACITOR	100uF16V	1.00	C59
1C710-EC222-16	ELEC.CAPACITOR	2200uF16V	2.00	C27,31
1C710-EC471-16	ELEC.CAPACITOR	470uF16V	2.00	C29,33
1D120-4148S	SWITCHING DIODE.SMD	1N4148	18.00	D1,2,3,4,9-21,ND15
1D213-4004	RECTIFIER DIODE	1N4004	4.00	D5-8
1D710-P521	PHOTO COUPLER	P521G	2.00	OP1,OP2
1I220-	CHOKE COLE	100uH,1A	1.00	L2
1J110-LW02503	WAFER	3pin,LW064003,한림	2.00	CN7,13
1J110-LW03903	WAFER	3pin,LW114303,한림	2.00	CN10,11
1J110-YW02502	WAFER	2pin,YW02502,연호	1.00	CN6
1J110-YW02504	WAFER	4pin,YW02504,연호	4.00	CN2,3,9,NJ1
1J110-YW02508	WAFER	8pin,YW02508,연호	1.00	CN4'
1J110-YW02513	WAFER	13pin,YW02513,연호	1.00	CN4-1'
1N911-40PIN	I.C.SOCKET		1.00	U11
1Q000-M03640	TRANSISTOR	MPS3640	2.00	Q2,19
1Q111-M03906	TRANSISTOR(MOTO)	2N3906	6.00	Q3,4,20,21,24,NQ101

1Q111-T01730	TRANSISTOR(SAM.FC.)	2SC1730	2.00	Q2,23
1Q121-T01015S	TRANSISTOR,SMD	2SA1015/1266(1504)	13.00	Q5,6,7,8,9,10,11,12,13,14,15,16,17
1Q511-SI5486	FET(SIL.MOTO)	2N5486	2.00	Q1,18
1R122-CF101J	C/F. RESISTOR.SMD	100J, 1/8W	2.00	R22,50
1R122-CF103J	C/F. RESISTOR.SMD	10KJ, 1/8W	2.00	R73,76
1R122-CF104J	C/F. RESISTOR.SMD	100KJ, 1/8W	4.00	R4,8,31,37
1R122-CF105J	C/F. RESISTOR.SMD	1MJ, 1/8W	2.00	R1,62
1R122-CF151J	C/F. RESISTOR.SMD	150J, 1/8W	4.00	R7,13,35,42
1R122-CF220J	C/F. RESISTOR.SMD	22J, 1/8W	3.00	RR21,51,NR101
1R122-CF222J	C/F. RESISTOR.SMD	2.2KJ, 1/8W	5.00	R9,1027,38,39
1R122-CF271J	C/F. RESISTOR.SMD	270J, 1/8W	2.00	R57,60
1R122-CF272J	C/F. RESISTOR.SMD	2.7KJ, 1/8W	4.00	R56,72,74,75
1R122-CF331J	C/F. RESISTOR.SMD	330J, 1/8W	8.00	R14,17,18,43,46,47,58,71
1R122-CF470J	C/F. RESISTOR.SMD	47J, 1/8W	1.00	NR103
1R122-CF471J	C/F. RESISTOR.SMD	470J, 1/8W	15.00	R3,11,12,15,16,19,20,32
				R40,41,44,45,48,49,54
1R122-CF472J	C/F. RESISTOR.SMD	4.7KJ, 1/8W	1.00	R59
1R122-CF511J	C/F. RESISTOR.SMD	510J, 1/8W	7.00	R5,6,33,34,NR102,R02,R04
1R122-CF561J	C/F. RESISTOR.SMD	560J, 1/8W	1.00	R68
1R122-CF562J	C/F. RESISTOR.SMD	5.6KJ, 1/8W	1.00	R55
1R122-CF822J	C/F. RESISTOR.SMD	8.2KJ, 1/8W	1.00	R26
1R15H-067103	SEMI-FIXED RESISTOR	VZ067TH1, 10KB	2.00	SFR1,2
1R213-MF1213F	M/F. RES.	121K 1/4W F	1.00	R2,61
1S160-99101	KEY SWITCH	SPUN60X1C051	1.00	FUNTION 6 KEY.
1S160-99102	KEY SWITCH	SPUN70X1C051	1.00	INPUT A,B 7 KEY.
1S321-JPP2295	POWER SWITCH	JPP2295MDA,250V4A	1.00	P S/W - "UL " : E131425
1U120-M07805	I.C.(SAM.MOTO.NS.)	MC7805	2.00	U16,17
1U151-M010116	I.C.(MOTO.)	MC10116	2.00	U1,18
1U211-TI7400S	I.C.SMD(SIG)	SN7400/SN74S00	1.00	NU20
1U221-TI74245S	I.C.SMD(HAR.HIT.NS.)	SN74HC245	2.00	U6,8
1U221-TI74374S	I.C.SMD(HIT.NS.SGS)	SN74HC374	1.00	U9
1U231-NS191	I.C(NS)	74F191N	2.00	NU2,NU19
1U231-TI74393S	I.C.SMD(NS.HIT.PHI.)	SN74HC393	2.00	U4,5
1U310-AT89C52	I.C.(ATMEL)	AT89C52	1.00	U11
1U271-TI74138S	I.C.SMD(NS.HIT.SGS.)	SN74HC138	3.00	U12,13,20

1U410-TS62783	I.C.(TOSHIBA)	TD62783AP	1.00	U10
1U511-AT22V10	I.C(ATMEL)	GAL22V10B-25PC	1.00	U21
1W763-GW00250	WIRE ASS'Y(1015#22)	GND WIRE,250mm,LUG.	1.00	G1
1W780-IN00130	WIRE ASS'Y(1365#30)	IN PUT CABLE,130mm	2.00	INPUT A,B
1X130-11R05MHZ	CRYSTAL	11.0592Mz(HC-49/U)	1.00	X1
1X250-21A8-10M	TCO	21A8 10MHz5ppm	1.00	TCO
1Z112-8030U-07	MAIN PCB	8030U-MAIN-07	1.00	2001.12.15. -"UL":E103670
2I320-SP0007	SPONGE TAPE	45x25x2T	1.00	MAIN SOLDER SIDE (AC LINE)
2S233-ZN0001	SCREW, TAPPING	T3x6BH,ZN-PL	2.00	HEAT SINK +7805 ASS'Y
2U110-SR0001	SPRING, COIL	6x2x7(SHIELD 용)	1.00	G2
2ZH11-HS0002	HEAT SINK	78SERIES 용(ㄷ자모양)	2.00	7805 ASS'Y

4-2. Display PCB Parts.

3U02-BK1823A-00	DISPLAY PCB ASS'Y	BK PRECISION 1823A	1.00	FC/UC-M02 PCB ASS'Y.
1J110-YW02508	WAFER	8pin,YW02508,연호	1.00	CN4
1J110-YW02513	WAFER	13pin,YW02513,연호	1.00	CN4-1
1L110-HPH513	FND(hp)	HDSP-H513#001	1.00	FND5
1L110-HPK513	FND(hp)	HDSP-K513#001	4.00	FND1-4
1L220-BL-R2130A	LED	BL-R2130A-T(5x5X10)	21.00	LED1-21.
1Z122-FC,UC-M02	DISPLAY PCB(80SER.)	DAG-F/C,U/C-M02	1.00	UC DISPLAY PCB.

4-3. Prescaler PCB Parts

3U07-8030/U-00	PRESCALER PCB ASS'Y	FC/UC-8030.	1.00	8000PS 05 PRESCALER ASS'Y.
1C120-CE010-50	CER.CAPACITOR.SMD	10pF/50V	1.00	C18
1C120-CE102-50	CER.CAPACITOR.SMD	0.001uF50V(1nF)	5.00	C11,12,14,15,17
1C120-CE103-50	CER.CAPACITOR.SMD	0.01uF50V(10nF)	4.00	C6,10,16,20
1C120-CE104-50	CER.CAPACITOR.SMD	0.1uF50V(100nF)	2.00	C8,13
1D120-4148S	SWITCHING DIODE.SMD	1N4148	2.00	D4.5
1D750-1SS315	UHF BAND MIXER	1SS315-TPH3(TOSHIBA)	1.00	D6 (S2)
1R122-CF103J	C/F. RESISTOR.SMD	10KJ, 1/8W	1.00	R11
1R122-CF104J	C/F. RESISTOR.SMD	100KJ, 1/8W	1.00	R12
1R122-CF151J	C/F. RESISTOR.SMD	150J, 1/8W	1.00	R9
1R122-CF224J	C/F. RESISTOR.SMD	220KJ, 1/8W	1.00	R7
1R122-CF331J	C/F. RESISTOR.SMD	330J, 1/8W	1.00	R14
1R122-CF392J	C/F. RESISTOR.SMD	3.9KJ, 1/8W	1.00	R10
1R122-CF510J	C/F. RESISTOR.SMD	51J, 1/8W	1.00	R8
1U110-TI358S	I.C.SMD(SGS.NS.MOTO)	LM358	1.00	U6

1U180-UPC2712T	IC.SMD	UPC2712T/TB(NEC)	1.00	U4
1U230-MC12079S	I.C.SMD(MOTO)	MC12079D	1.00	U5
1W731-SW04180	WIRE ASS'Y(#24)	4pin 180mm 한쪽 sol	1.00	~ MAIN PCB NJ1
1Z172-8013-NEW	PRESCALER PCB	FC-7013,8013,7150	1.00	8000PS-05

4-4. Slide Switch PCB Parts

3U08-8037-00	SLIDE S/W PCB ASS'Y	FC-8037	1.00	SLIDE S/W PCB ASS'Y
1C120-CE103-50	CER.CAPACITOR.SMD	0.01uF50V(10nF)	2.00	C34,35
1R122-CF101J	C/F. RESISTOR.SMD	100J, 1/8W	1.00	R25
1S180-SS4210	SLIDE SWITCH	4210,BENCH	1.00	INT/EXT TB S/W
1W721-LW02340	WIRE ASS'Y(#24)	2pin 340mm, 한쪽 sol	1.00	CN6
1W731-SW04160	WIRE ASS'Y()	4pin 160mm,1p SWx2	1.00	CN3
1Z182-DAGA	SLIDE SWITCH PCB	SSP1	1.00	FC,UC

4-5. Front Panel Assembly Parts

3E02-BK1823A	FRONT PANEL ASS'Y PARTS			BK PRECISION 1823A
PART CODE	PART NAME	SPECIFICATION	Q"TY	REFERENCE NUMBER
1N110-BNCRB4	BNC CONNECTOR	BNC-RB-4CUTTING	3.00	INPUT A, B, C
1R140-SF103B	VARIABLE RESISTOR		1.00	INPUT A TRIGGER VR.
1W721-LW04150	WIRE ASS'Y(#24)	4pin 150mm	1.00	TRIGGER VR.
1W722-LW08220	WIRE ASS'Y()	8-8pin 220mm	1.00	CN4
1W722-LW13160	WIRE ASS'Y	13-13pin 160mm	1.00	CN4-1
2C120-BR0008	BRACKET, BNC	BN(80SER.)-FC/UC	1.00	BNC BRACKET.
2C120-SC0003	SHIELD CASE	Zn-pl 0.3t 30x25x15	1.00	PRESCALER SHIELD.
2C212-FP0002	FRONT PANEL, ABS	BN(80SER-난연)-12965	1.00	BN 8K.
2K211-KN0018	KNOB,VR,ABS,Phi10x11	BN-DG,8K 12965	1.00	TRIGGER VR ASS'Y
2L210-BK-PP002	FRONT,PLATE,PC	2.4GHz UNI. COUNTER	1.00	2.4GHz UNIVERSAL COUNTER.
2L320-BK-AC002	ACRYL FILTER	BK PRECISION 1823A	1.00	2.4GHz UNI.FREQ.COUNTER.
2N110-AA0001	NUT(VR)		1.00	TRIGGER VR.
2N110-CR0001	NUT(BNC,F)		3.00	INPUT A,B,C BNC .
2S123-NI0002	SCREW, MACHINE	M3x4DH, H5, NI-PL	2.00	FRONT-BNC BRACKET ASS'Y
2S233-NI0002	SCREW, TAPPING	T3x8BH, H6, NI-PL	3.00	MAIN PCB -BOTTOM CASE ASS'Y
2W011-NI0004	WASHER,PLAIN(VR)	7.2x12x0.2t/NI-PL	2.00	TRIGGER VR -FRONT PANEL ASS'Y.
2W011-NI0006	WASHWE,PLAIN	10x13x2t/NI-PL	1.00	FRONT-INPUT C BNC ASS'Y.
2W031-NI0002	WASHER,LATCH(BNC)	9.5x13x0.5t/NI-PL	3.00	"INPUT A,B,C BNC ."
2W051-NI0001	WASHER,PLAIN(BNC S.)	10x13x0.3t/NI-PL	2.00	"INPUT A,B,C BNC ."
3U02-BK1823A-00	DISPLAY PCB ASS'Y	BK PRECISION 1823A	1.00	FC/UC-M02 PCB ASS'Y.
3U07-8030/U-00	PRESCALER PCB ASS'Y	FC/UC-8030.	1.00	8000PS 05 PRESCALER ASS'Y.

4-6. Rear Panel Assembly Parts

3E03-BK1823A	REAR PANEL ASS'Y PARTS			BK PRECISION 1823A
PART CODE	PART NAME	SPECIFICATION	Q"TY	REFERENCE NUMBER
1F250-50F500	FUSE(UL,VDE)	50F,250V500mA(20mm)	1.00	"UL" : E126056
1FH20-R311	FUSE HOLDER	R3-11,BN	1.00	FUSE IN - "UL" : E72169
1N110-BNCRB4	BNC CONNECTOR	BNC-RB-4CUTTING	1.00	INT/EXT CONNECTOR
1N150-TE503	GND CONNECTOR		1.00	GND
1N352-9P-D-SUB	RS-232C CONNECTOR	DE-09SSDUCD1	1.00	RS-322C
1N711-NFU-101	AC INLET(SAM IL)	NFU-101,NOISE FILTER	1.00	AC IN - "UL" : E123275
1S190-HF308	VOLTAGE SELECTOR S/W	HF-308, 10A ,250V	1.00	VOLTAGE SELECTOR - "UL":E128307
1T100-DG7013	POWER TRANS	FC-7013	1.00	AC POWER TRANS
1W110-JUMP	JUMP WIRE	RESISTOR pin,15mm	1.00	SLIDE S/W + BNC
1W510-0001	HEAT TUBE	Pi3 x 15mm	6.00	VOLTAGE SELECTOR
1W510-0003	HEAT TUBE	Pi 12 x 60 mm	1.00	FUSE HOLDER
1W510-0004	HEAT TUBE	Pi4x20mm	4.00	NOISE FILTER
1W510-0005	HEAT TUBE	Pi1x20mm	4.00	RS-232C CONNECTOR
1W720-LW013	LEAD WIRE(22AWG)	AWM 1617 ,100mm RED	1.00	VOLTAGE SELECTOR+MAIN
1W720-LW014	LEAD WIRE(22AWG)	AWM1617, 100mm-BLACK	1.00	VOLTAGE SELECTOR+MAIN
1W720-LW015	LEAD WIRE(22AWG)	AWM1617, 100mm-WHITE	1.00	VOLTAGE SELECTOR+MAIN
1W721-LW04180	WIRE ASS'Y(#24)	4pin 180mm	1.00	232C CONNECTOR
1W763-GW00150	WIRE ASS'Y(1015#22)	GND WIRE,150mm,LUG	2.00	GND CONNECTOR+MAIN,NOISE FILTER
1W790-DW00080	WIRE ASS'Y(1015#22)	DIW,80mm,BLACK	1.00	NOISE FILTER+FUSE HOLDER
1W791-DW03200	WIRE ASS'Y(1015#22)	3pin 2wire 200mm	1.00	NOISE FILTER+FUSE HOLDER
2C120-BR0003	BRACKET, POWER TRANS	BN-DAG, 27x10.5,2T	2.00	TRANS
2C120-RP0015	REAR PANEL ,PRESS	VOLT SELECTOR FC/UC	1.00	VOLTAGE SELECTOR TYPE
2N110-BB0001	NUT(GND TERMINAL)	INCH	2.00	GND TERMINAL ASS'Y
2N110-CR0001	NUT(BNC,F)		1.00	BNC ASS'Y
2N110-NI0001	NUT	M3, NI-PL	4.00	GND WIRE ASS'Y
2S133-BL0001	SCREW, MACHINE	M3x10BH, 흑착색	4.00	AC INLET, VOLTAGE SELECTOR
2S133-NI0004	SCREW, MACHINE	M2.6x4BH, NI-PL	2.00	SLIDE S/W ASS'Y
2S183-NI0001	SCREW, MACHINE	M3x8BH-W, NI-PL	2.00	POWER TRANS ASS'Y
2V210-MP0002	MOUNTING POLE	3x5, 육각,w. M3 N/S	2.00	RS-232C CONNECTOR ASS'Y
2W011-NI0001	WASHER, PLAIN	내경:3,외경:10/NI-PL	4.00	POWER TRANS.NOISE FILTER
2W021-ZN0001	WASHER, SPRING	내경:3,외경:5, ZN-PL	5.00	TRANS,NOISE FILTER,GND CONNECTOR
2W031-NI0001	WASHER, LATCH	4x6.5x0.3t	1.00	GND CONNECTOR ASS'Y
2W031-NI0002	WASHER,LATCH(BNC)	9.5x13x0.5t/NI-PL	1.00	BNC CONNECTOR ASS'Y
2W051-NI0001	WASHER,PLAIN(BNC S.)	10x13x0.3t/NI-PL	1.00	BNC CONNECTOR ASS'Y
3U08-8037-00	SLIDE S/W PCB ASS'Y	FC-8037	1.00	

4-7. Line Assembly Parts

3E01-BK1823A	LINE ASSEMBLY PARTS			BK PRECISION 1823A
PART CODE	PART NAME	SPECIFICATION	Q"TY	REFERENCE NUMBER
1W611-0001	CABLE TIE	100mm, WHITE	7.00	
2C120-SC0008	SHIELD CASE	Zn-PL 40x102x18x0.3t	2.00	MAIN PCB INPUT A,B PART
2C211-BC0004	BOTTOM CASE, ABS	BN(80SER, 난연)-12965	1.00	BOTTOM CASE, ABS
2C211-TC0006	TOP CASE, ABS	BN(80SER, 난연)-12965	1.00	TOP CASE, ABS
2D212-HD0002	HANDLE, ABS	BN(80SER, 난연)-12965	1.00	HANDLE, ABS
2D311-RF0006	RUBBER FOOT	BN-DAG, 37x8.5, 대	2.00	BOTTOM CASE ASS'Y
2D311-RF0007	RUBBER FOOT	BN-DAG, 32x8.5, 소	2.00	TOOP CASE ASS'Y
2D411-FB001	RUBBER BEZEL	BK PRE. BENCH, BLUE	1.00	FRONT PANEL COVER
2I220-SP0005	SHIELD PLATE	BN-DAG, 248X163	2.00	TOP, BOTTOM CASE SHIELD.
2K211-KN0015	KNOB, POWER, ABS	BN-DAG(80SER.)	1.00	POWER S/W ASS'Y
2K211-KN0016	KNOB, PUSH S/W, ABS	BN(80SER.)-12965	13.00	KEY S/W KNOB
2K211-KN0017	KNOB, PUSH S/W, ABS	10.9x10x7.9, RED	1.00	POWER S/W KNOB.
2S133-ZN0002	SCREW, MACHINE	M4x45BH, ZN-PL	4.00	TOP-BOTTOM CASE ASS'Y
2S233-NI0002	SCREW, TAPPING	T3x8BH, H6, NI-PL	3.00	MAIN PCB + BOTTOM CASE
2U110-SR0005	SPRING, COIL	Pi10x6.2, BN-DAG	1.00	TOP CASE - MAIN GND ASS'Y.
2S233-NI0003	SCREW, TAPPING	T3x6BH, NI-PL	1.00	TOP SHILED SPRING COIL ASS'Y.

4-8. Packing Parts

3P00-BK1823A	PACKING PARTS			BK PRECISION 1823A
PART CODE	PART NAME	SPECIFICATION	Q"TY	REFERENCE NUMBER
1F250-50F500	FUSE(UL, VDE)	50F, 250V500mA(20mm)	1.00	F 500mA/250V
1W311-SP102	POWER CORDE(115V)	KKP-30, SVT 3/18AWG "UL"	1.00	"UL" : E58075
1W740-00002	CABLE ASS'Y()	BNC TO BNC	1.00	BNC to BNC, RG-58.
2D411-FB001	RUBBER BEZEL	BK PRE. BENCH, BLUE	1.00	FRONT PANEL COVER
6D000-SG0001	SILICA GEL	3g	1.00	IN BOX IN.
6L110-LS0031	STICKER, S/N	BN, 15W, 115V/230V~	1.00	15W, 115/230V~
6M220-UA0061	MANUAL	BK PRECISION 1823A	1.00	1823A OPERATION MANUAL.
6P20G-PEPAD001	PE PAD	BN, 330x300mm	2.00	IN BOX TOP& BOTTOM SIDE
6P21G-IB0016	IN.BOX(345x315x170)	BK PRECISION BENCH	1.00	BK BENCH. DW .MODEL PRINTING.
6P22G-CB0014	CARTON BOX(무인쇄)	665x365x380	0.25	BN, 4CTN(IN.BOX-345x315x170)
6S40G-VB0001	VINYLE BAG	70x100mm, Zipper Type	1.00	SPARE FUSE
6S40G-VB0004	VINYLE BAG	E4x420x360mm, BENCH 용	1.00	PRODUCT PACKINNG.
6S40G-VB0005	VINYLE BAG	300x195, ZIPPER TYPE	1.00	MANUAL PACKING.

5. CIRCUIT DIAGRAM

Refer to attached PDF file. (Main,Display ,Power ,Prescaler Circuit)

