

SERVICE MANUAL

MODEL FG-8110
SWEEP/FUNCTION GENERATOR

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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°C ±5°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.	Frequency Counter	DC to 60 MHz	
2.	Oscilloscope	DC to 20 MHz	
3.	AC Millivolt Meter	Up to 30 Vrms	
4.	Distortion Analyzer	0.01% 100kHz	
5.	DC Power Supply	DC 0 to 10V	
6.	Signal Generator	200mHz to 110 MHz	
7.	FEEDTHROUGH TERMINATION 50 Ω		

1-3. Performance check

1-3-1. OUTPUT FREQUENCY RANGE

SPECIFICATION

0.1 Hz TO 10 MHz

ACCURACY

+/- 5 % OF SETTING

EQUIPMENT


FREQUENCY COUNTER

BNC CABLE

FEEDTHROUGH TERMINATION 50 Ω (if necessary)

PROCEDURE

2. Set 8210 as follows;

- Function ; SINE WAVE ()
- ATT ; 0 dB(PULL OUT)
- AMPLITUDE ; CENTER
- COUNT ; INT(PULL OUT)
- DC OFFSET ; OFF(PUSH IN)
- SYM ; OFF(PUSH IN)
- SWEEP ; OFF(PUSH IN)

2. Connect the frequency counter to output terminal.
3. Set the frequency counter to frequency measurement.
4. Set the output frequency of this product by FREQUENCY RANGE and DIAL and verify counter frequency reading as follows;

8210 setting		Counter reading
Range	Frequency	
1M	10.000 MHz 100.00 kHz	
100k	1.0000 MHz 10.000 kHz	
10k	100.00 kHz 1.0000 kHz	
1k	10.000 kHz 100.00 Hz	
100	1.0000 kHz 10.000 Hz	
10	100.00 Hz 1.0000 Hz	
1	10.000 Hz 100.00 mHz	

** For reading less than 200 mHz, you can read by period value.

200mHz ; 5.000 sec

100 mHz ; 10.000 sec

1-3-2. AMPLITUDE AND ATTENUATION

SPECIFICATION

Amplitude range ;100mVp-p to 10Vp-p IN TO 50Ω

Attenuation ;20 dB

ACCURACY

Lower than 100mVp-p(IN TO 50Ω) at MIN.

Higher than 10Vp-p(IN TO 50Ω) at MAX.

EQUIPMENT


Oscilloscope

AC Millivoltmeter

BNC CABLE

FEEDTHROUGH TERMINATION 50 Ω

PROCEDURE

1. Set this product as follows;
 - Function ; SINE WAVE ()
 - ATT ; 0 dB(PULL OUT)
 - AMPLITUDE ; CENTER
 - COUNT ; INT(PULL OUT)
 - DC OFFSET ; OFF(PUSH IN)
 - SYM ; OFF(PUSH IN)
 - SWEEP ; OFF(PUSH IN)
2. Connect the oscilloscope through FEEDTHROUGH TERMINATION 50 Ω to output terminal.
3. Set Amplitude Control to Min. position and check the output level is lower than 100mVp-p(less 5div in 20mV/div).
4. Set Amplitude Control to Max. position and check the output level is higher than 10Vp-p(higher than 4div in 5V/div).
5. Set Amplitude Control to Min. position and connect AC Millivoltmeter to output terminal.
6. Set the Range of AC millivoltmeter to 3V range and adjust Amplitude control for 0dB reading on AC millivoltmeter.
7. Push in "20dB ATT switch" and check the reading of AC Millivoltmeter is -20 dB.

1-3-3. SINE WAVE CHARACTERISTICS

SPECIFICATION

Total harmonic Distortion(THD) ; $\leq 1\%$ (10Hz to 100kHz)


EQUIPMENT

Distortion analyzer

BNC CABLE

FEEDTHROUGH TERMINATION 50 Ω (if necessary)

PROCEDURE

1. Set this product as follows;
 - Function ; SINE WAVE ()
 - ATT ; 0 dB(PULL OUT)

- AMPLITUDE ; CENTER
- COUNT ; INT(PULL OUT)
- DC OFFSET ; OFF(PUSH IN)
- SYM ; OFF(PUSH IN)
- SWEEP ; OFF(PUSH IN)

2. Connect the distortion analyzer to output terminal.

3. Check the distortions of output signal are less than 1% from 10Hz to 100kHz.

1-3-4. TRIANGLE/SQUARE WAVE CHARACTERISTICS

SPECIFICATION

Linearity of Triangle Wave ; $\geq 99\%$ (10Hz to 100kHz)

Rise and Fall Time of Square Wave ; Less than 120nS at 10MHz Max. output level

EQUIPMENT


Oscilloscope

BNC CABLE

FEEDTHROUGH TERMINATION $50\ \Omega$ (if necessary)


PROCEDURE

1. Set this product as follows;

- Function ; TRIANGLE WAVE ()
- ATT ; 0 dB(PULL OUT)
- AMPLITUDE ; CENTER
- COUNT ; INT(PULL OUT)
- DC OFFSET ; OFF(PUSH IN)
- SYM ; OFF(PUSH IN)
- SWEEP ; OFF(PUSH IN)

2. Connect the oscilloscope to output terminal.

3. Check the linearity of Triangle wave from 10Hz to 100kHz.

4. Change the function to "SQUARE WAVE()" and check the rise and fall time at 10MHz Max. output level.

1-3-5. TTL OUTPUT

SPECIFICATION

TTL OUTPUT - Rise and Fall Time ; Less than 25nS

- Output Level ; TTL LEVEL ($H \geq 2.4V$, $L \leq 0.4V$)

EQUIPMENT

Oscilloscope

BNC CABLE

PROCEDURE

1. Set this product as follows;

- FREQ. RANGE ; 10k
- FREQ. DIAL ; 10kHz
- COUNT ; INT(PULL OUT)
- DC OFFSET; OFF(PUSH IN)
- SYM ; OFF(PUSH IN)
- SWEEP ; OFF(PUSH IN)

3. Set the oscilloscope to 1V/div, 5uS/div and connect to TTL output terminal.

4. Check the rise and fall time of TTL SQUARE WAVE on CRT(5div).

1-3-5. DC OFFSET CONTROL

SPECIFICATION

MIN. ; lower than -10 V DC (Open circuit)

MAX. ; higher than +10 V DC (Open circuit)


EQUIPMENT

Oscilloscope

BNC CABLE

PROCEDURE

1. Set this product as follows;

- Function ; SQUARE ()
- ATT ; 0 dB(PULL OUT)
- FREQ. RANGE ; 10k
- FREQ. DIAL ; 10kHz
- AMPLITUDE; CENTER

2. Set Oscilloscope to 5V/DIV, 10uS/DIV, DC Coupling and connect to output terminal.

3. Adjust Amplitude Control for 2DIV on CRT.

4. Pull out "DC OFFSET" Control and set to "MIN." position and check the DC OFFSET level is lower than -10V(Lower than -2DIV).

5. Set "DC OFFSET" Control to "MAX." position and check the DC OFFSET level is higher than +10V(Higher than +2DIV).

1-3-6. SYMMETRY CONTROL

SPECIFICATION

MIN. ; lower than 1:10

MAX. ; higher than 10:1


EQUIPMENT

Oscilloscope

BNC CABLE

FEEDTHROUGH TERMINATION 50 Ω (if necessary)

PROCEDURE

1. Set this product as follows;
 - Function ; SQUARE ()
 - ATT ; 0 dB(PULL OUT)
 - AMPLITUDE ; CENTER
 - COUNT ; INT(PULL OUT)
 - DC OFFSET ; OFF(PUSH IN)
 - SYM ; OFF(PUSH IN)
 - SWEEP ; OFF(PUSH IN)
2. Connect the oscilloscope to output terminal.
3. Set the output frequency to 10kHz.
4. Pull out SYM Control and adjust to Min. position. And check the symmetry(duty ratio) is "lower than 1:10".
5. Adjust SYM Control to Max. position and check the symmetry(duty ratio) is "higher than 10:1".

1-3-7. SWEEP FUNCTION

SPECIFICATION

Sweep Width ; 1:1 to 100:1

Sweep Rate ; 0.5Hz to 50Hz(20mS to 2 S)

EQUIPMENT


Oscilloscope

Frequency Counter

BNC CABLE

FEEDTHROUGH TERMINATION 50 Ω (if necessary)

PROCEDURE

1. Set this product as follows;
 - Function ; SINE WAVE ()
 - ATT ; 0 dB(PULL OUT)
 - AMPLITUDE ; CENTER
 - COUNT ; INT(PULL OUT)
 - DC OFFSET ; OFF(PUSH IN)
 - SYM ; OFF(PUSH IN)
2. Connect the oscilloscope and Frequency Counter to output terminal.

3. Set Freq. Range to 10k and adjust Freq. Dial to 1.00 kHz (Start Frequency).
4. Pull out SWIDTH Control and adjust to max. position (100kHz, Stop frequency).
5. Adjust Sweep Rate Control for desired rate and check sweep operating.

1-3-8. VCF IN FUNCTION

SPECIFICATION


Out-put frequency should be changed from minimum frequency to maximum frequency in each frequency range by changing VCF INPUT Voltage from 0 to 10V DC.

EQUIPMENT

Power supply

BNC CABLE

PROCEDURE

1. Set this product as follows;
 - Function ; SINE WAVE ()
 - Frequency Range ; 10K
 - Frequency Control ; Max.
 - ATT ; 0 dB(PULL OUT)
 - AMPLITUDE ; CENTER
 - COUNT ; INT(PULL OUT)
 - DC OFFSET ; OFF(PUSH IN)
 - SYM ; OFF(PUSH IN)
2. Set Power Supply to "0V" and connect to "VCF IN" Terminal.
3. Check the output frequency is "1.00kHz \pm 0.2kHz".
4. Increase the output voltage of Power Supply up to +10V and check the output frequency as following table.

VCF Voltage	Output Frequency	Tolerance
0	1.000 kHz	\pm 0.2kHz
2.000 V	20.00 kHz	\pm 4 kHz
4.000 V	40.00 kHz	\pm 8 kHz
6.000 V	60.00 kHz	\pm 12 kHz
8.000 V	80.00 kHz	\pm 16 kHz
10.00 V	100.00 kHz	\pm 20 kHz

1-3-9. FREQUENCY COUNTER

SPECIFICATION

Frequency range ; 200mHz to 110MHz

Input sensitivity ; 100mVrms

EQUIPMENT

Signal generator

PROCEDURE

1. Set the COUNT to EXT(PUSH IN).
2. Connect the signal generator to EXT COUNT IN terminal.
3. Set the signal generator to 100mVrms, 200mHz and check the reading of 8210.
4. Vary the output frequency from 200mHz to 110MHz and check the 8210 displays correct frequencies.
5. Push in LPF(Low Pass Filter) and check the LPF is working ($-3\text{dB} \pm 0.2\text{dB}$ point at approx. 120kHz).
< Check procedure >
 - a. Apply 120KHz signal with minimum input level into EXT COUNT IN.
 - b. Push in LPF switch and check gate time(Frequency display) is stopped.
 - c. Increase input level and check the gate time(Frequency display) is starting to and check the input level is increased about $3\text{dB}(\pm 0.2\text{dB})$ from "minimum input level".

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
Output Pin of U6,15,20	+ 5 V	$\pm 0.5\text{V}$	U6,15 : Assembled at Rear panel
Output Pin of U5	+ 15 V	$\pm 0.5\text{V}$	
Output Pin of U7	- 15 V	$\pm 0.5\text{V}$	
Anode of ZD1	- 5 V	$\pm 0.5\text{V}$	
Upper leg of R68	+ 21 V	$\pm 2\text{V}$	

2-4. PRE-ADJUSTMENTS

EQUIPMENT

Oscilloscope


BNC CABLE

FEEDTHROUGH TERMINATION 50Ω (if necessary)

PROCEDURE

2-4-1. TRIANGLE WAVE OFFSET

1. Set this product as follows;

- Function ; TRIANGLE WAVE ()
- ATT ; 20 dB(PUSH IN)
- AMPLITUDE ; MIN.
- FREQUENCY ; 10kHz
- COUNT ; INT(PULL OUT)
- DC OFFSET ; OFF(PUSH IN)
- SYM ; OFF(PUSH IN)


2. Set the oscilloscope to 0.5V/DIV, 20uS/DIV , DC Coupling and set the vertical position to horizontal graticule center.

3. Connect the oscilloscope to output terminal.

4. Set "AMPLITUDE" control for 2DIV on CRT and adjust SFR15(OFFSET ADJUSTER) for "0 OFFSET of waveform"(The waveform should be in center. +/- 0.1DIV from horizontal graticule center).

2-4-2. SQUARE WAVE LEVEL

1. Set this product as follows;


- Function ; "SQUARE WAVE ()"
- ATT ; 0 dB(PULL OUT)
- AMPLITUDE ; MAX.
- FREQUENCY ; 10kHz
- COUNT ; INT(PULL OUT)
- DC OFFSET ; OFF(PUSH IN)
- SYM ; OFF(PUSH IN)

2. Change the function to "SQUARE WAVE"

3. Set the oscilloscope to 5V/DIV, 20uS/DIV

4. Check the output level of Square Wave is more than 17Vpp.

2-4-3. SINE WAVE LEVEL Adjust.

1. Set this product as follows;
 - Function ; "SINE WAVE ()
 - ATT ; 0 dB(PULL OUT)
 - AMPLITUDE ; MAX.
 - FREQUENCY ; 10kHz
 - COUNT ; INT(PULL OUT)
 - DC OFFSET ; OFF(PUSH IN)
 - SYM ; OFF(PUSH IN)
2. Change the function to "SINE WAVE"
3. Set the oscilloscope to 5V/DIV, 20uS/DIV
4. Adjust SFR10 , SFR13 for displaying "4DIV" on CRT. (SFR10 : + DIV from horizontal graticule center for up-side of waveform , SFR13 : - DIV from horizontal graticule center for down-side of waveform.

2-4-4. SINE WAVE DISTORTION ADJUST


EQUIPMENT

Distortion Analyzer

BNC CABLE

FEEDTHROUGH TERMINATION 50 Ω (if necessary)

PROCEDURE

1. Set this product as follows;
 - Function ; SINE WAVE ()
 - ATT ; 0 dB(PULL OUT)
 - AMPLITUDE ; Max.
 - FREQUENCY ; 10kHz
2. Connect Distortion analyzer to Output terminal.
3. Adjust SFR8, SFR11, SFR12 for minimum distortion reading on Distortion analyzer.
(less than 0.5 %)

2-4-5. AMPLITUDE CONTROL AND ATTENUATOR CHECK

EQUIPMENT


Oscilloscope

AC Millivoltmeter

BNC CABLE

FEEDTHROUGH TERMINATION 50 Ω

PROCEDURE

1. Set this product as follows ;
 - Function ; SINE WAVE ()
 - ATT ; 0 dB(PULL OUT))
 - AMPLITUDE ; CENTER
 - COUNT ; INT(PULL OUT)
 - DC OFFSET ; OFF(PUSH IN)
 - SYM ; OFF(PUSH IN)
 - SWEEP ; OFF(PUSH IN)
2. Connect the oscilloscope through FEEDTHROUGH TERMINATION 50 Ω to output terminal.
3. Set Amplitude Control to Min. position and check the output level is lower than 1Vp-p(less 5div in 200mV/div).
4. Set Amplitude Control to Max. position and check the output level is higher than 10Vp-p(higher than 4div in 5V/div).
5. Set Amplitude Control to Min. position and connect AC Millivoltmeter to output terminal.
6. Set the Range of AC millivoltmeter to 3V range and adjust Amplitude control for 0dB reading on AC millivoltmeter.
7. Push in "20dB ATT switch" and check the reading of AC Millivoltmeter is -20 dB.
8. Check the amplitude of TRIANGLE & SQUARE WAVE same as paragraph 3 to 7.

2-5. FREQUENCY RANGE ADJUSTMENT


EQUIPMENT

Frequency Counter

BNC CABLE

FEEDTHROUGH TERMINATION 50 Ω

PROCEDURE

1. Set this product as follows;
 - Function ; TRIANGLE WAVE ()
 - ATT ; 20 dB(PULL OUT)
 - AMPLITUDE ; CENTER
 - COUNT ; INT(PULL OUT)

- DC OFFSET ; OFF(PUSH IN)
 - SYM ; OFF(PUSH IN)
 - SWEEP ; OFF(PUSH IN)
2. Connect the Frequency Counter to Output Terminal.
 2. Set Frequency Range to "1M" and Frequency Control(Dial) to MAX. Position.
 3. Adjust SFR1 for 10.500 MHz frequency reading on counter.
 4. Change Frequency Range to "100k" and adjust SFR2 for 1.0500 MHz frequency reading on counter.
 5. Change Frequency Range to "10k" and adjust SFR3 for 105.00 kHz frequency reading on counter.
 6. Change Frequency Range to "1k" and adjust SFR4 for 10.50 kHz frequency reading on counter.
 7. Change Frequency Range to "100" and adjust SFR5 for 1.050 kHz frequency reading on counter.
 8. Change the frequency range to 10 and 1, and check the frequency reading in each range. (10 : 105.00 Hz , 1 : 10.500Hz)
 9. After adjustment, check the frequency Control(Dial) at MIN. and MAX. as following table.

8210 setting		Tolerance
Range	Frequency Control	
1M	MIN. MAX.	Less than 100.0 kHz Higher than 10.5 MHz
100k	MIN. MAX.	Less than 10.0 kHz Higher than 1.05 MHz
10k	MIN. MAX.	Less than 1.0 kHz Higher than 100.5 kHz
1k	MIN. MAX.	Less than 100 Hz Higher than 10.5 kHz
100	MIN. MAX.	Less than 10.0 Hz Higher than 1.0 kHz
10	MIN. MAX.	Less than 1 Hz Higher than 100 Hz
1	MIN. MAX.	Less than 100 mHz Higher than 10 Hz

2-6. SYMMETRY ADJUST

EQUIPMENT


Oscilloscope

BNC CABLE

FEEDTHROUGH TERMINATION 50 Ω (if necessary)

PROCEDURE

1. Set this product as follows;

- Function ; SQUARE ()
- ATT ; 0 dB(PULL OUT)
- AMPLITUDE ; CENTER
- COUNT ; INT(PULL OUT)
- DC OFFSET ; OFF(PUSH IN)
- SYM ; OFF(PUSH IN)
- SWEEP ; OFF(PUSH IN)

2. Connect the oscilloscope to output terminal.
3. Set the output frequency to 100kHz.
4. Pull out SYM Control and adjust to Min. position. And adjust SFR6 the symmetry(duty ratio) is "lower than 1:10".
5. Adjust SYM Control to Max. position and adjust SFR7 the symmetry(duty ratio) is "higher than 10:1".

2-7. FREQUENCY COUNTER ADJUST

EQUIPMENT

10MHz Standard Signal Source
 Signal Generator up to 110MHz
 BNC CABLE
 FEEDTHROUGH TERMINATION 50 Ω (if necessary)

PROCEDURE

1. Set this product as follows;
 - COUNT ; EXT(PUSH IN)
2. Connect 10MHz Standard Signal to the EXT COUNT IN terminal and adjust TC1 for 10.0000 MHz reading on Counter Display.
3. Set Signal generator to 110MHz, 100mVrms and connect the EXT COUNT IN terminal.
4. Adjust SFR16 (Shield Box IN) for 110.0000 MHz reading on Counter Display.
 Reduce the output level of Signal Generator Slowly and adjust SFR16 for Minimum input sensitivity(as possible as less than 100mVrms).
5. Change the out frequency of Signal Generator from 110MHz to 200MHz and check the minimum input voltage is less than 100mVrms.
6. Push in LPF(Low Pass Filter) and check the LPF is working (-3dB +/-0.2dB point at approx. 120kHz).
 - < Check procedure >
 - a. Apply 120KHz signal with minimum input level into EXT COUNT IN.
 - b. Push in LPF switch and check gate time(Frequency display) is stopped.
 - c. Increase input level and check the gate time(Frequency display) is starting to and check the input level is increased about 3dB(+/-0.2dB) from "minimum input level".

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 equipments before proceeding, ensure that any equipments used with this product 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.
 - . 17 to 18 Vac between pin 1 and 2 of CN14, and between pin 2 and 3 of CN14 on main board.
 - . 8 to 10 Vac between pin 1 and 2 of CN4,CN24, and between pin 2 and 3 of CN4,CN24 on main board.
3. Check the DC Power Voltage.
 - . +5VDC at U6 and U15 output(U6,15 Assembled at rear panel)
4. Check the frequency at pin 19 of U12. It should be "10MHz".
5. Check the connector cable from CN12',CN13'(main board) to display board.

3-2-2. Triangle Wave Out-put

1. Check the Function switch operation and select Triangle Wave.
2. Check the DC Power Voltage for Generator Circuit.
 - . +15VDC at U5 output
 - . +5VDC at U6,U15,U20 output (U6,15 :assembled at rear panel)
 - . -5VDC at Anode of ZD1.
 - . -15VDC at U7 output
 - . +21VDC at upper leg of R68
3. Check the waveform at Q7 Emitter. The Triangle Wave should be appeared.
4. If not, check the operation of Amplifier and Triangle oscillator (U1 A/B/D, U2 A/B,

Q1,Q2,Q3,Q4,Q5,Q6,D1,D2,D3,D5,Q7).

5. Check the Range Selector Switch operation and Frequency Control Volume and Cable connection from VR1 to CN2(Main Board).
6. Check the "Amplitude VR4" and Cable connection from VR to CN5 on main board.
7. Check the waveform at R46. The Triangle Wave should be appeared.
8. If not, check the operation of Differential Amplifier(Q12,Q13,Q14,Q15,Q16).
9. Check the Attenuator switch(20 dB) and cable connection from CN7 to Output terminal.

3-2-3. Square Wave Out-put

1. Check the Function switch operation and select Square Wave.
2. Check the waveform at D1(of DD1) Cathode. The Triangle Wave should be appeared.
3. Check the waveform at D2(of DD1) Cathode. The Square Wave should be appeared.
4. If not, check the step 3-2-2. 4 and 5.
5. Check the waveform at 9pin of U3. The Square Wave should be appeared.
6. If not, check the operation of U3.
6. Check the waveform at R45. The Square Wave should be appeared.
7. If not, check the step 3-2-2. 8 and 9.

3-2-4. Sine Wave Out-put

1. Check the Function switch operation and select Sine Wave.
2. Check the waveform at Q7 Emitter. The Triangle Wave should be appeared.
3. If not, check the step 3-2-2. 4 and 5.
4. Check the waveform at Q11 Collector. The Sine Wave should be appeared.
5. If not, check the operation of Sine Shaper(Q8,Q9,Q10,Q11).
6. Check the waveform at R45. The Sine Wave should be appeared.
7. If not, check the step 3-2-2. 8 and 9.

3-2-5. TTL Output

1. Check the connection of cable for TTL Output terminal and Control Volume.
2. Check the waveform at Pin 9 of U3. The Square Wave should be appeared.
3. If not, check the step 3-2-3.
4. Check the waveform at pin 6 of U4. The TTL Level Square Wave should be appeared.
5. If not, check the operation of U4.

3-2-6. Sweep Operation(Width and Rate)

1. Check the cable connection(CN8,CN9) for Width and Rate Control Volume.
2. Vary the Width volume and check the level of Pulse at pin 7 of U2 is varied.
3. Vary the Rate volume and check the period of Pulse at pin 14 of U2 is varied.
4. If not, check the operation of U2 C/D , D9 and Q17.

3-2-7. Frequency Range and Frequency Dial

1. Check the cable connection from CN2(Main Board) to Frequency Control Volume.
2. Check the operation of Range selector switch(Key Switch operation).

3-2-8. Attenuator(20dB)

1. Check the operation of each Attenuator switch.
2. If not working, check the R146,147,148

3-2-9. Frequency Counter(INT/EXT)

1. Check the INT/EXT selector switch operation and set to INT.
2. Check the output frequency at Output terminal by using Frequency counter and check the frequency at R83 is same with output frequency.
3. Check the frequency of reference signal at pin18 and 19 of U12.
It should be "10.000MHz".
4. If not, check Reference Oscillator(X1,T1,C54,).
5. Check the frequency at pin3 of U9 and pin 7of U18.
It should be same as output frequency.
6. If not, check the operation of Input Amplifier and Devider(Q18,Q19,U8,Q20,Q21,U18).
7. Check the cable connection between CN12(main board) and CN13(Display Board).
8. Check the operation of Counter Circuit, Micro-processor(U12), Driver(U4,5), Scanner(U10,11)
9. Check the operation of Display Controller(U13,U14,Q22-28) on Display Board.
10. Check LPF function as follows;
 - a. Check the status of LPF S/W(push in)
 - b. Check the voltage at the left leg of R108. It should be around +5V.
 - c. Check the voltage at the anode of D16. It should be around 1.4-1.5V.
 - d. Check the voltage at cathode of D16. It should be around on 0.7-0.8V.

4. PARTS LIST

4-1.. Main PCB Parts List

Part Name	Specification	q"ty	Referance.
CER.CAPACITOR	0.01uF50V(10nF)	2.00	C100,101
CER.CAPACITOR.SMD	3pF	1.00	C72
CER.CAPACITOR.SMD	15pF50V	1.00	C9
CER.CAPACITOR.SMD	22pF50V	1.00	C87
CER.CAPACITOR.SMD	30pF50V	2.00	C54,C84
CER.CAPACITOR.SMD	33pF50V	1.00	C82
CER.CAPACITOR.SMD	50pF50V	2.00	C01,C02
CER.CAPACITOR.SMD	0.01uF50V(10nF)	12.00	C2,8,15,29,31,33,34,39,45,47,90,91
CER.CAPACITOR.SMD	0.1uF50V(100nF)	25.00	C17-19,49-53,56,59,61,67-71,74-76,78,80,81,94,202
CER.CAPACITOR.SMD	130pF50V	3.00	C10,38,41
CER.CAPACITOR.SMD	150pF50V	2.00	C13,66
CER.CAPACITOR.SMD	1.5pF50V	1.00	C73
CER.CAPACITOR.SMD	470pF50V	1.00	C44
CER.CAPACITOR.SMD	4700pF50V(4.7nF)	2.00	C85,86
TRIMMER CAPACITOR	CTC05F500,50pF/2READ	1.00	T1
MICA CAPACITOR	33pF/63V	1.00	C3
MICA CAPACITOR	680pF/63V	1.00	C4
M/F.CAPACITOR	0.47uF250V	1.00	C37
M/F CAPACITOR(BOX)	0.0068uF/63V(6.8nF)	1.00	C5
M/F CAPACITOR(BOX)	0.068uF/63V(68nF)	1.00	C6
M/F CAPACITOR(BOX)	0.68uF63V(680nF)	1.00	C7
MYLER CAPACITOR	0.22uF100V(220nF)	1.00	C36
ELEC.CAPACITOR	10uF35V	1.00	C55
ELEC.CAPACITOR	22uF16V	10.00	C1,12,14,22,23,25,28,30,32,35
ELEC.CAPACITOR	47uF35V	6.00	C27,40,42,43,46,48
ELEC.CAPACITOR	100uF25V	2.00	C77,79
ELEC.CAPACITOR	1000uF35V	2.00	C21,24
ELEC.CAPACITOR	220uF35V	1.00	C20
ELEC.CAPACITOR	2200uF35V	1.00	C58
ELEC.CAPACITOR	470uF25V	3.00	C60,200,201
SWITCHING DIODE.SMD	1N4148	13.00	D3-11,14,15,16,17
SWITCHING DIODE.SMD	HSMS-2825-TR1	1.00	D1-1

Part Name	Specification	q"ty	Reference.
C/F. RESISTOR.SMD	22J, 1/8W	3.00	28,47,102
C/F. RESISTOR.SMD	220J, 1/8W	3.00	4,29,118
C/F. RESISTOR.SMD	2.2KJ, 1/8W	4.00	9,10,90,91
C/F. RESISTOR.SMD	22KJ, 1/8W	1.00	89
C/F. RESISTOR.SMD	240J, 1/8W	1.00	147
C/F. RESISTOR.SMD	270J, 1/8W	1.00	41
C/F. RESISTOR.SMD	2.7KJ, 1/8W	1.00	11
C/F. RESISTOR.SMD	300J, 1/8W	1.00	39
C/F. RESISTOR.SMD	33J, 1/8W	3.00	27,72,170
C/F. RESISTOR.SMD	330J, 1/8W	4.00	34,95,98,99
C/F. RESISTOR.SMD	33KJ, 1/8W	1.00	40
C/F. RESISTOR.SMD	39KJ, 1/8W	1.00	71
C/F. RESISTOR.SMD	470J, 1/8W	7.00	93,94,96,97,100,101,108
C/F. RESISTOR.SMD	4.7KJ, 1/8W	1.00	30
C/F. RESISTOR.SMD	51J, 1/8W	1.00	114
C/F. RESISTOR.SMD	510J, 1/8W	4.00	86,87,R01,R02
C/F. RESISTOR.SMD	5.1KJ, 1/8W	3.00	74,75,76
C/F. RESISTOR.SMD	62J, 1/8W	2.00	146,148
C/F. RESISTOR.SMD	7.5KJ, 1/8W	2.00	7,73
C/F. RESISTOR.SMD	8.2KJ, 1/8W	1.00	104
SEMI-FIXED RESISTOR	VZ067TH1, 100B	1.00	SFR11
SEMI-FIXED RESISTOR	VZ067TH1, 1KB	2.00	SFR10,13
SEMI-FIXED RESISTOR	VZ067TH1, 10KB	8.00	SFR1,2,3,4,5,6,7,16
SEMI-FIXED RESISTOR	VZ067TH1, 100KB	2.00	SFR12,15
SEMI-FIXED RESISTOR	VZ067TH1, 2KB	1.00	SFR8
M/F. RESISTOR.SMD	1KF, 1/8W	4.00	21,35,37,38
M/F. RESISTOR.SMD	100KF, 1/8W	1.00	117
M/F. RESISTOR.SMD	11KF, 1/8W	2.00	23,25
M/F. RESISTOR.SMD	120F, 1/8W	1.00	136
M/F. RESISTOR.SMD	1.21KF, 1/8W	2.00	12,16 (1.2K,F)
M/F. RESISTOR.SMD	121KF,1/8W	2.00	R13,17
M/F. RESISTOR.SMD	1.5KF, 1/8W	1.00	133
M/F. RESISTOR.SMD	21.5F, 1/8W	2.00	137,139 (22,F)
M/F. RESISTOR,SMD	2.2KF, 1/8W	1.00	135
M/F. RESISTOR.SMD	249F, 1/8W	1.00	R115 (243,F)

Part Name	Specification	q"ty	Reference.
M/F. RESISTOR.SMD	24.9KF, 1/8W	1.00	129 (24.3K,F)
M/F. RESISTOR.SMD	3.32KF, 1/8W	1.00	119 (3.4K,F)
M/F. RESISTOR.SMD	42.2F, 1/8W	1.00	120
M/F. RESISTOR.SMD	430F, 1/8W	2.00	22,24
M/F. RESISTOR.SMD	4.99KF, 1/8W	1.00	132
M/F. RESISTOR.SMD	56.2F, 1/8W	1.00	138 (56,F)
M/F. RESISTOR.SMD	576F, 1/8W	1.00	121
M/F. RESISTOR.SMD	825 1/8W F	2.00	127,130
M/F. RESISTOR	900F, 1/4W	1.00	32
OXIDE FILM RESISTOR	560J, 1W	1.00	66
KEY SWITCH	SPUN90X1CO21	1.00	
KEY SWITCH	SPUN40X1C041	1.00	
POWER SWITCH	JPP2295MPACS72	1.00	P-S/W1
I.C.(TI)	SN75107AN	1.00	U3
I.C.SMD	BA10324AF	2.00	U1,2 Rohm
I.C.(SAM.MOTO.NS.)	MC7805	1.00	U20
I.C.(SAM.MOTO)	MC7815	1.00	U5
I.C.(SAM.MOTO)	MC7915	1.00	U7
I.C.(MOTO.)	MC10116	1.00	U8
I.C.(HAR.RCA)	CA3096AE	1.00	U17
I.C.SMD(SIG)	SN7400/SN74S00	1.00	U4
I.C(NS)	74F191N	1.00	U18
I.C.SMD(NS.HIT.PHI.)	SN74HC393	2.00	U10,11
I.C.SMD(NS.HIT.SGS.)	SN74HC138	1.00	U14
I.C.(TOSHIBA)	TD62783AP	1.00	U13
I.C.(AMD)	GAL16V8	1.00	U9
WIRE ASS'Y(1365#30)	IN PUT CABLE,250mm	1.00	
CRYSTAL	10.0000MHz(HC-49/U)	1.00	10M 20PPM .
MAIN PCB	8210-M12	1.00	
SHIELD CASE	Zn-pl 0.3t 104x40x18	1.00	
NUT	M3, NI-PL	1.00	U15 Ass'y
SCREW, MACHINE	M3x8BH, NI-PL	1.00	U15 Ass'y
SCREW, TAPPING	T3x6BH,ZN-PL	3.00	U37,15,20
SPRING, COIL	6x2x7(SHIELD 용)	0.00	MAIN PCB GND
HEAT SINK	TR 용,내경 8.3,외경 16	2.00	Q16,29 Ass'y
HEAT SINK	78SERIES 용(ㄷ자모양)	2.00	U7,15 Ass'y'
HEAT SINK	8210 ㄷ자 17x9x19	1.00	U20 Ass'y

4-2.. Display PCB Parts List

Part Name	Specification	Q'ty	Reference
WAFER	8pin, YW02508, 연호	2.00	CN12,13
FND(hp)	HDSP-H513#001	1.00	FND(SINGLE)
FND(hp)	HDSP-K513#001	3.00	FND1,2,3
LED	BL-R2130A-T(5x5X10)	5.00	LED 1-5
DISPLAY PCB(80SER.)	8210-DIS-01	1.00	

4-3.. VR PCB Parts List

Part Name	Specification	Q'ty	Reference
WAFER	3pin, YW02503, 연호	5.00	CN8(WIDTH), CN9(RATE), CN2(FREQ), CN5(AMP), CN6(OFFSET)
WAFER	4pin, YW02504, 연호	1.00	CN3(SYM)
VARIABLE RESISTOR	V16L4(7x5)S15KCB10K	1.00	VR5(WIDTH),
VARIABLE RESISTOR	V16L4(7x5)S15KCB5K	1.00	VR4(OFFSET)
VARIABLE RESISTOR	V16L4(7x5)S15KCB50K	1.00	VR2(SYM)
VARIABLE RESISTOR	V16L4N15KCB10K	2.00	VR6(RATE), VR1(FREQ),
VARIABLE RESISTOR	V16L4N15KCB500	1.00	VR3(AMP)
VR PCB(80SER.)	8210-VR-02	1.00	

4-4. Front Panel Assembly Parts.

Part Name	Specification	Q'ty	Reference
BNC CONNECTOR	BNC-RB-4CUTTING	4.00	OUTPUT, TTL SYNC, VCF, EXT COUNTER IN
WIRE ASS'Y()	2pin 150mm	1.00	VCF
WIRE ASS'Y()	2pin 220mm	2.00	TTL.OUTPUT
BRACKET, VR PCB	BN-LGP, 160x25x30	1.00	
BRACKET, BNC	BN(80SER.)-AG/FG	1.00	
FRONT PANEL, ABS	BN(80SER-난연)-12965	1.00	
KNOB, VR, ABS	Pi 10x13mm, DARK-GRAY	6.00	
PLATE, FRONT, PC	8210DAG	1.00	
ACRYLE FILTER	8210-DAG	1.00	
NUT(VR)		6.00	VR
NUT(BNC,F)		4.00	BNC BRACKET
NUT	M3, NI-PL	2.00	BNC BRACKET
SCREW, MACHINE	M3x4BH, NI-PL	2.00	BNC BRACKET
SCREW, TAPPING	T3x8BH, ZN-PL	5.00	VR PCB
WASHER, PLAIN	내경:3, 외경:12/NI-PL	2.00	EXT COUNT IN BNC
WASHER, PLAIN(VR)	7.2x12x0.2t/NI-PL	6.00	VR
WASHER, LATCH(BNC)	9.5x13x0.5t/NI-PL	4.00	BNC
WASHER, PLAIN(BNC S.)	10x13x0.3t/NI-PL	4.00	BNC
DISPLAY PCB ASS'Y	FG-8210/DAGA	1.00	
VR PCB ASS'Y	FG-8210/DAGA	1.00	

4-5. Rear Panel Assembly Parts.

Part Name	Specification	Q'ty	Reference
FUSE(UL,VDE)	50F,250V200mA(20mm)	1.00	FUSE HOLDER IN
FUSE HOLDER	R3-11,BN	1.00	REAR PANEL ASS'Y
EMI GASKET	71TS-FK10-R10-170-00	1.00	REAR PANEL ASS'Y
MOTOR FAN	DC5V,0.5W (40x40)	1.00	REAR PANEL ASS'Y
GND CONNECTOR		1.00	REAR PANEL ASS'Y
AC INLET(SAM IL)	NFU-101,NOISE FILTER	1.00	REAR PANEL ASS'Y
POWER TRANS	FG-8210,8220	1.00	REAR PANEL ASS'Y
I.C.(SAM.MOTO.NS.)	MC7805	2.00	REAR PANEL ASS'Y (U5,U15)
HEAT TUBE	Pi5 x 15 mm	3.00	AC INLET,FUSE HOLDER
HEAT TUBE	Pi 12 x 60 mm	1.00	FUSE HOLDER
WIRE ASS'Y(1015#22)	GND WIRE,180mm,LUG	3.00	REAR PANEL ASS'Y
WIRE ASS'Y(1015#22)	DIW,120mm,BLACK	1.00	AC IN-FUSE
WIRE ASS'Y(1015#22)	3pin 2Wire ,220mm	1.00	
BRACKET, POWER TRANS	BN-DAG, 27x10.5,2T	2.00	TRANS
REAR PANEL PRESS	BN-DAG,FG-8210	1.00	
NUT(GND TERMINAL)	INCH	2.00	GND CONNECTOR
NUT	M3, NI-PL	8.00	TRANS,REGULATOR, FAN
SCREW, MACHINE	M3x10BH, 흑착색	2.00	NOISE FILTER (AC INLET)
SCREW,MACHINE	M3x16BH 흑착색	2.00	FAN
SCREW, MACHINE	M3x8BH-W, NI-PL	2.00	TRANS
WASHER, PLAIN	내경:3,외경:10/NI-PL	4.00	TRANS,AC INLET
WASHER, SPRING	내경:3,외경:5, ZN-PL	2.00	TRANS
WASHER, LATCH	4x6.5x0.3t	1.00	GND CONNECTOR

4-6. Others.

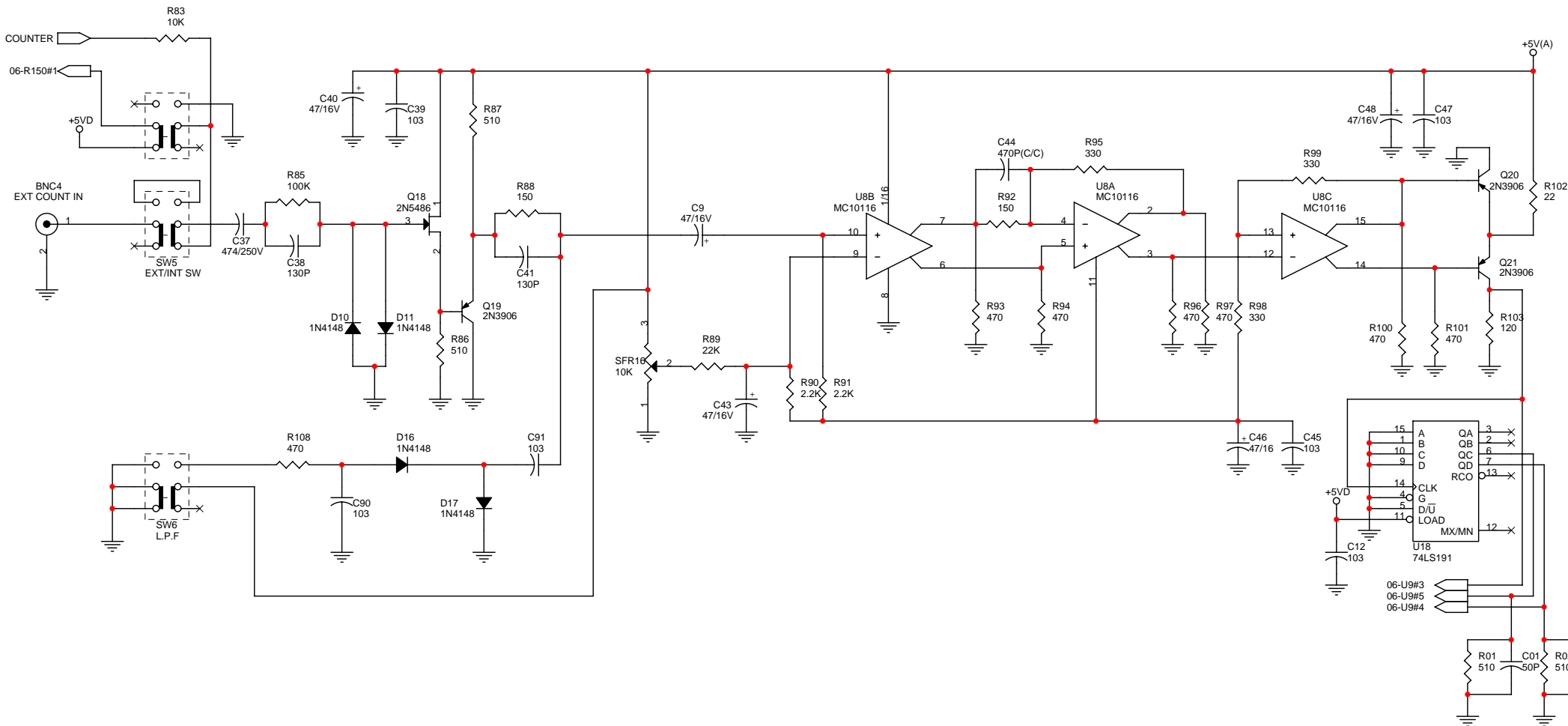
Part Name	Specification	Q'ty	Referance
I.C.(ATMEL)	AT89C52	1.00	U12
CABLE TIE	100mm, WHITE	10.00	
WIRE ASS'Y(#24)	3-3pin 150mm	6.00	
WIRE ASS'Y(#24)	4-4pin 150mm	1.00	
WIRE ASS'Y()	8-8pin 220mm	2.00	
WIRE ASS'Y()	3-3pin 150mm	1.00	
SHIELD CASE 8210 TOP	0.6t 210x202(156)x35	1.00	MOUNT POLE- TOP
SHIELD CASE 8K-BOT	ZnpI 0.6t 210x202x35	1.00	MONUT POLE-BOTTOM
BOTTOM CASE, ABS	BN(80SER.난연)-12965	1.00	
TOP CASE, ABS	BN(80SER.난연)-12965	1.00	
HANDLE, ABS	BN(80SER.난연)-12965	1.00	
RUBBER FOOT	BN-DAG,37x8.5,대	2.00	BOTTOM CASE
RUBBER FOOT	BN-DAG,32x8.5,소	2.00	TOP CASE
EMI GASKET	71TS-FK10-R10-170-00	1.00	BOTTOM SHIELD CASE ASS'Y
SHIELD PLATE	BN-DAG, 248X163	0.00	SHIELD CASE BOTTOM
SPONGE PAD	20x40,5T,한쪽 테이프	6.00	MAIN PCB AC LINE PART
KNOB, POWER, ABS	BN-DAG(80SER.)	1.00	POWER STICK
KNOB, PUSH S/W, ABS	BN(80SER.)-12965	13.00	KEY S/W
SCREW, MACHINE	M3x6BH,H5, NI-PL	0.00	SHIELD TOP + MOUNT POLE
SCREW, MACHINE	M4x45BH, ZN-PL	4.00	TOP+BOTTOM CASE
SCREW, TAPPING	T3x8BH, H6, NI-PL	3.00	PCB -BOTTOM CASE
MOUNTING POLE	Pi3x50,육각 8210MAIN	1.00	MAIN PCB-SHIELD CASE
WASHER, SPRING	내경:3,외경:5, ZN-PL	1.00	SHIELD TOP + MOUNT POLE
EMI AIR VENT FILTER	SUI40-24-125-45-13	2.00	TOP,BOTTOM SHIELD
FRONT PANEL ASS'Y	FG-8210/DAGA	1.00	
REAR PANEL ASS'Y	FG-8210/DAGA	1.00	
MAIN PCB ASS'Y	FG-8210/DAGA	1.00	

4-7. Packing

Part Name	Specification	Q'ty	Referance
FUSE(UL,VDE)	50F,250V200mA(20mm)	1.00	SPARE FUSE.
POWER CORD(230V)	KKP-30,SVT3/18A"VDE"	1.00	"VDE"
CABLE ASS'Y()	BNC TO CLIP()	1.00	
STYROFOAM BOX	BENCH, 300x150x65mm	2.00	
SILICA GEL	3g	1.00	
STICKER, S/N, 230V	BN(80SER.),15W200mA	1.00	15w ,230V/200mA F
MANUAL(8210)	FG8210, DAG 영문	1.00	
INNER BOX (8000SER.)	DAG-BN,340x310x165	1.00	
CARTON BOX(무인쇄)	BN,645x355x365	0.25	4CTN.(IN BOX -340x310x165)
VINYLE BAG	70x100mm,Zipper Type	1.00	SPARE FUSE.
VINYLE BAG	265x400mm	1.00	PRODUCT.

5. CIRCUIT DIAGRAM

- Refer to Attached File.



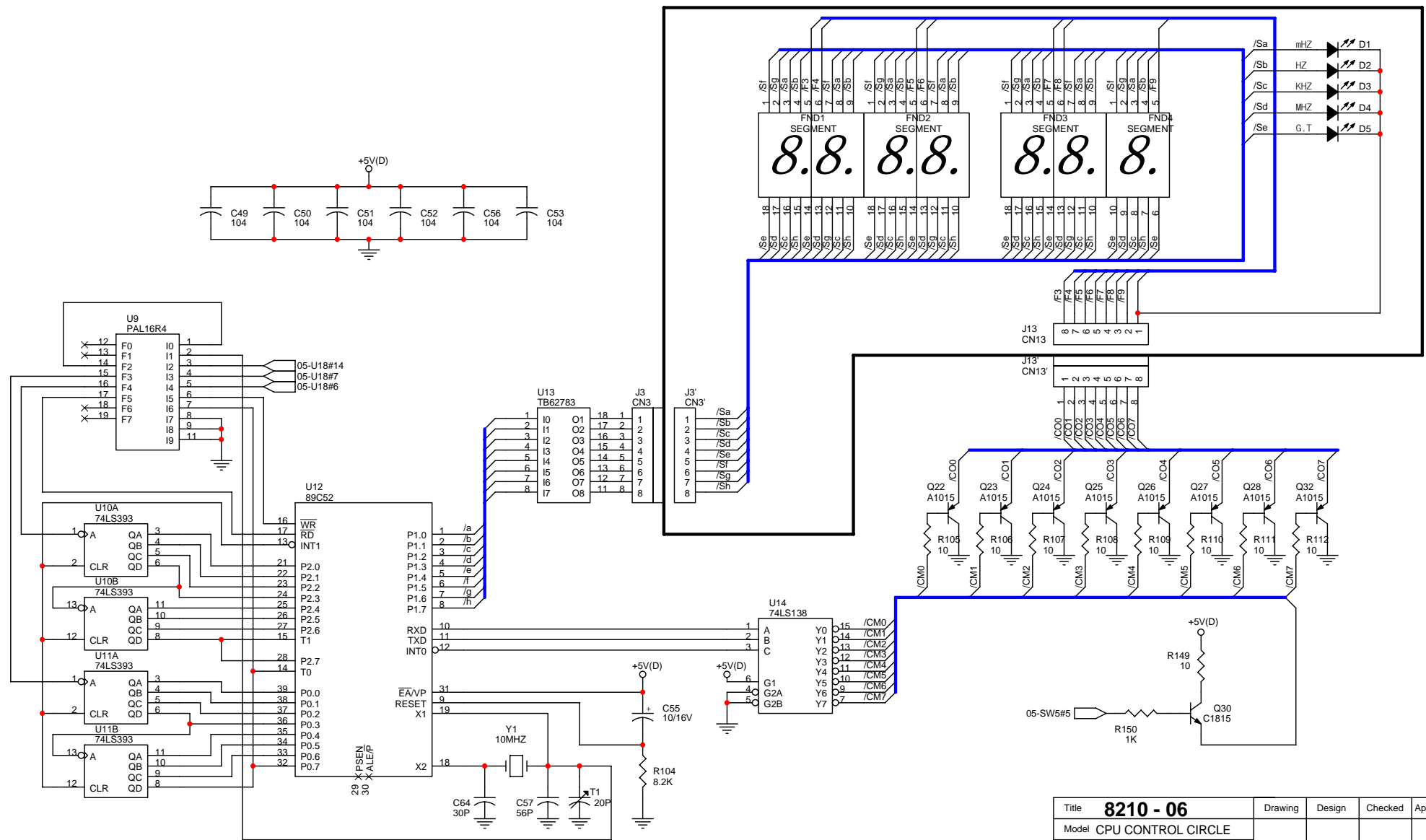
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Model	COUNTER PREAMP CIRCUIT				
Size	A3	Rev	02		

D

C

B

A

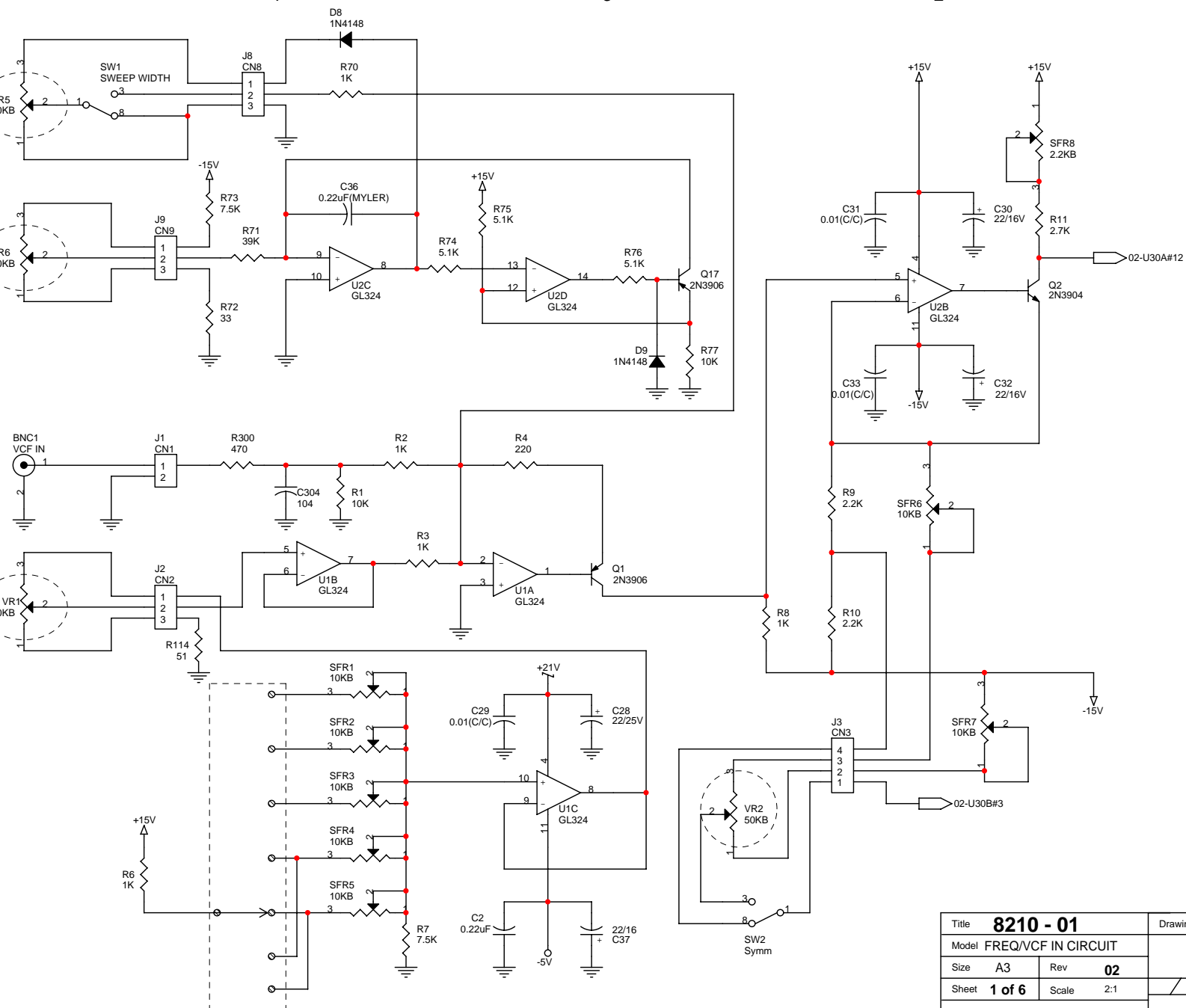


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Model	CPU CONTROL CIRCLE				
Size	A3	Rev	02		
Sheet	6 of 6	Scale	2:1		

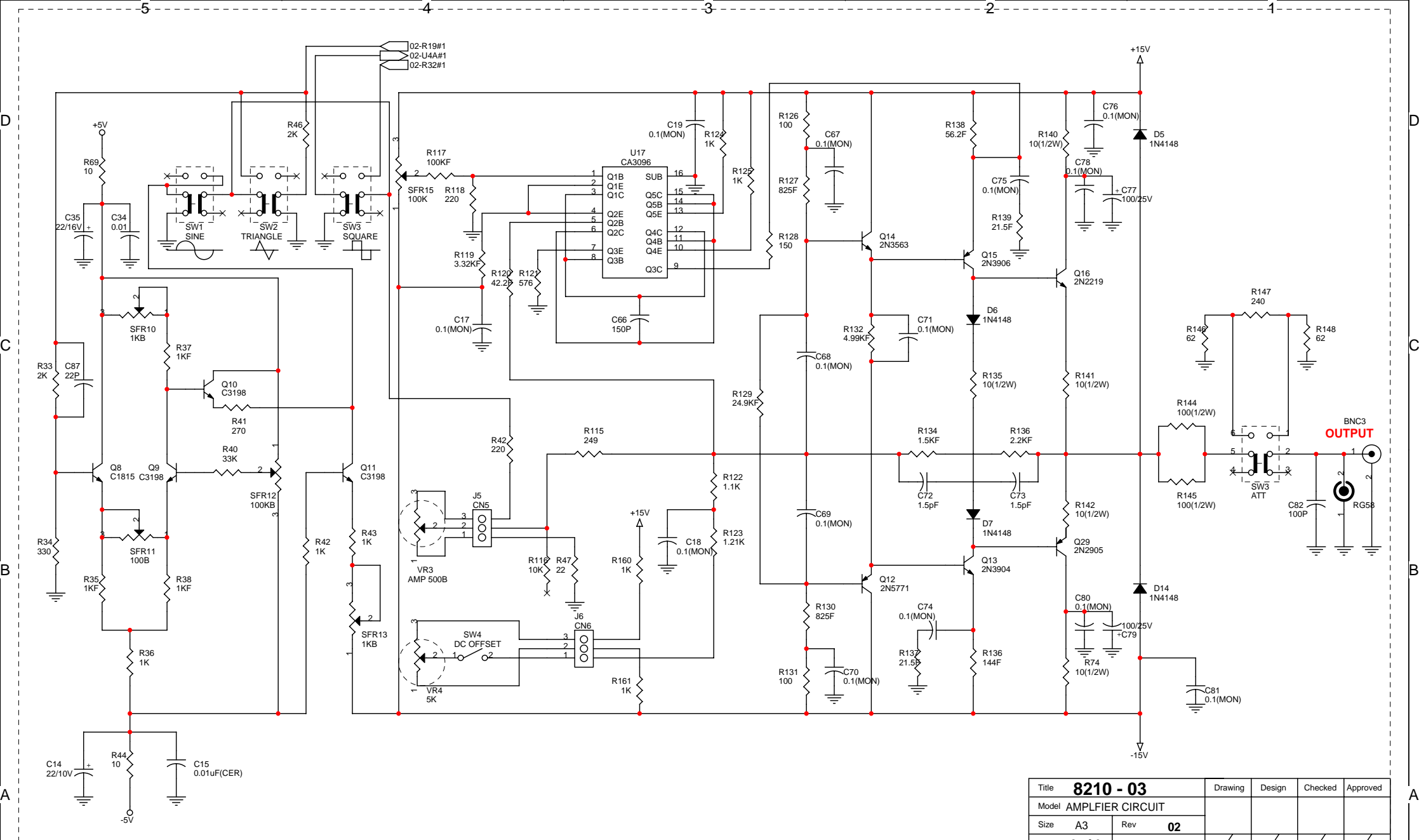
Sweep Width

Sweep Rate

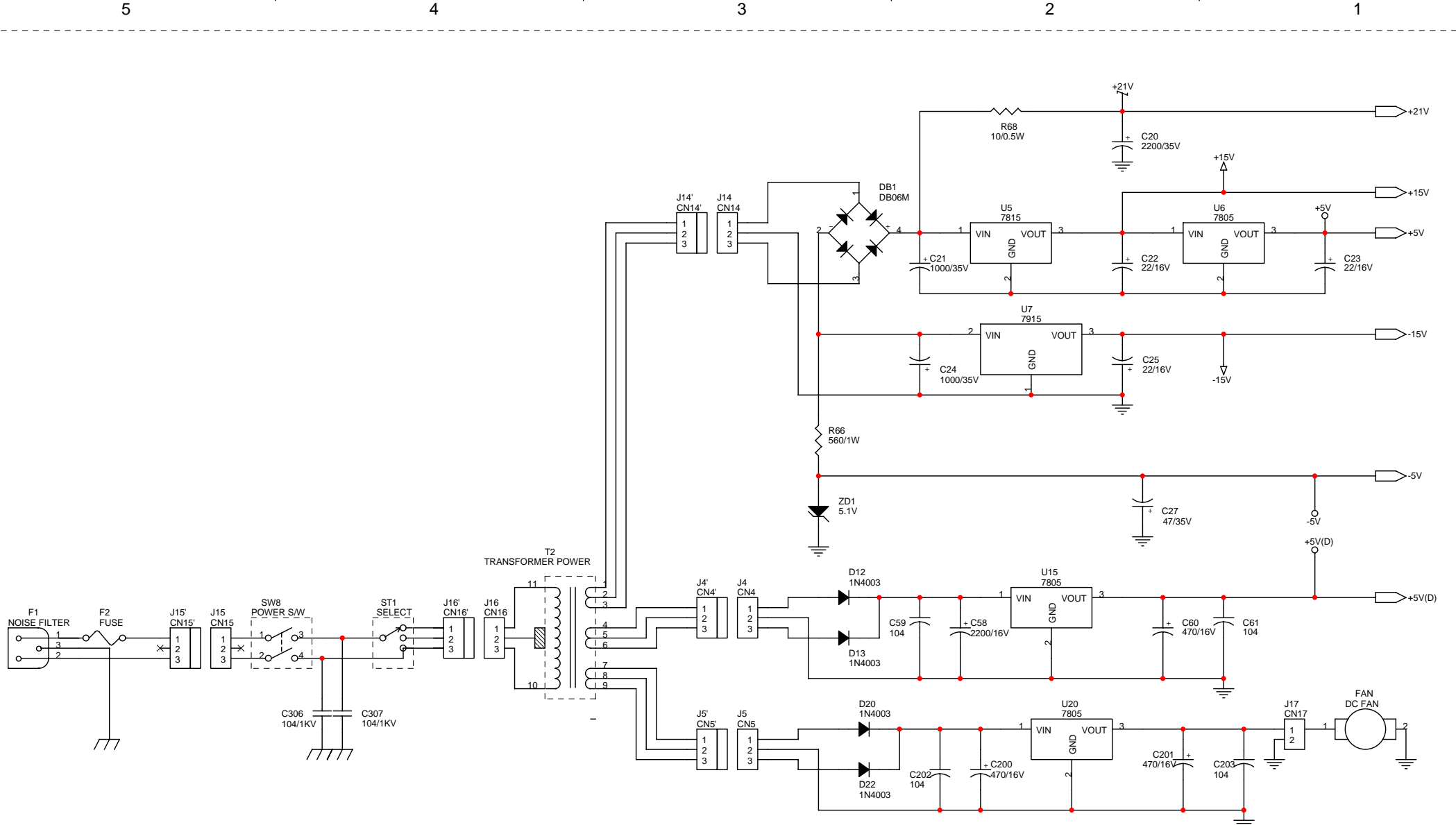
Frequency



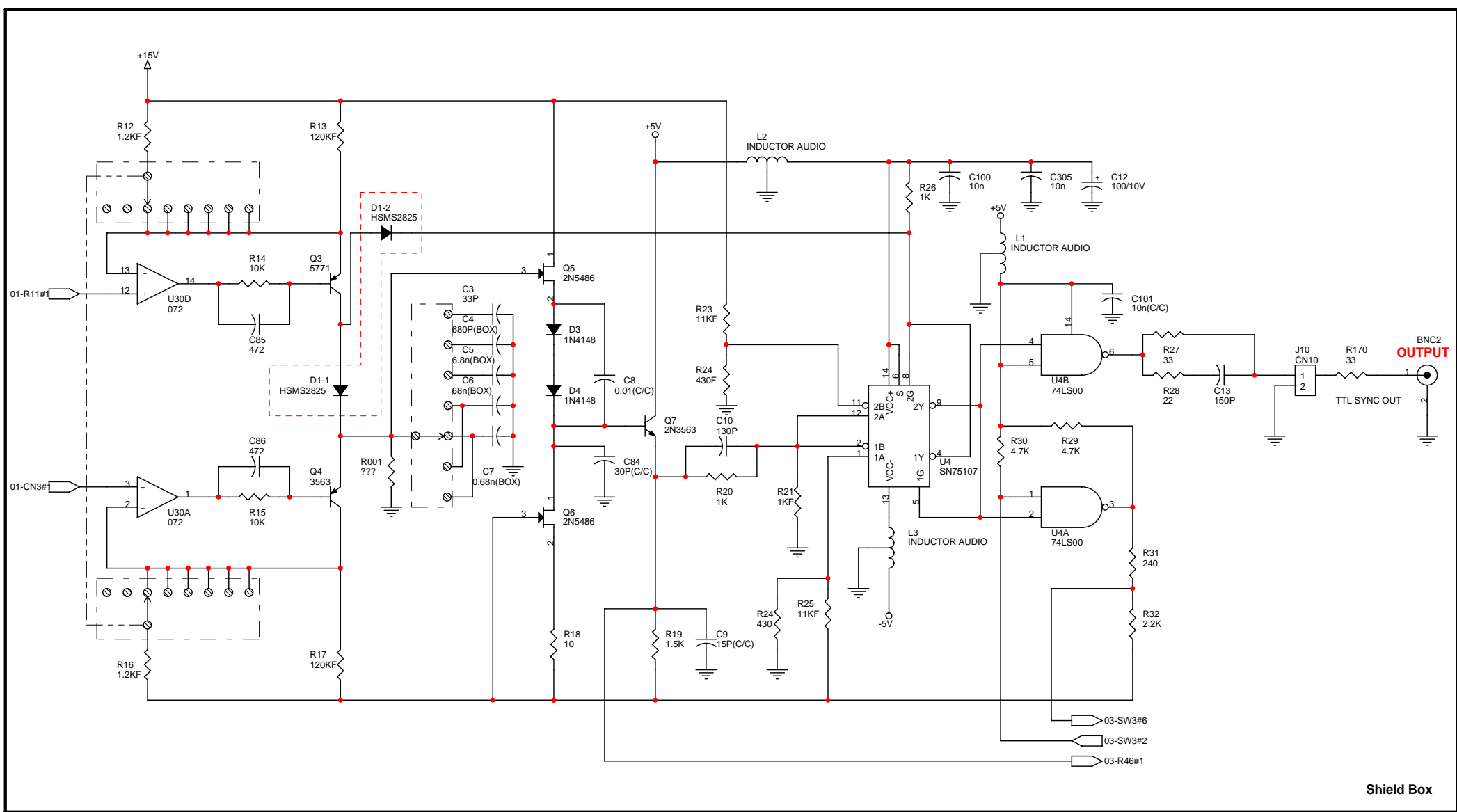
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Model FREQ/VCF IN CIRCUIT		
Size A3	Rev 02	
Sheet 1 of 6	Scale 2:1	
Date 2002/3/30		



Title	8210 - 03	Drawing	Design	Checked	Approved
Model	AMPLIFIER CIRCUIT				
Size	A3	Rev	02		



Title		8210 - 04	Drawing	Design	Checked	Approved
Model		POWER SUPPLY CIRCUIT				
Size	A3	Rev	02			
Sheet	4 of 6	Scale	2:1			



Shield Box

Title	8210 - 02	Drawing	Design	Checked	Approved
Model	OSCILLATOR/TTL CIRCUIT				
Size	A3	Rev	02		