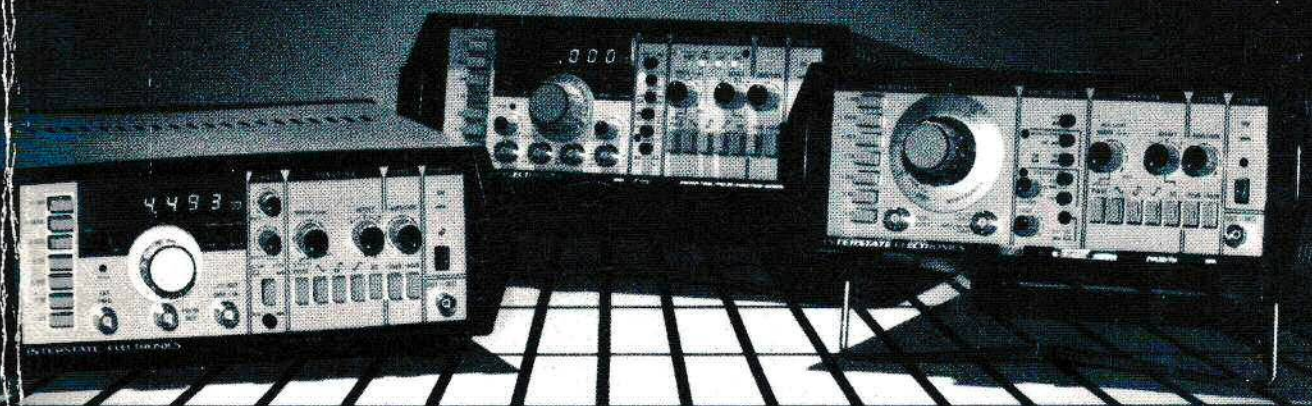
OPERATION AND MAINTENANCE MANUAL



SERIES 60 FUNCTION GENERATOR

Models F62, F63, and F64

INTERSTATE ELECTRONICS CORPORATION
A Figgie International Company

Operation and Maintenance MANUAL

SERIES 60 FUNCTION GENERATORS (Models F62, F63, and F64)

INTERSTATE ELECTRONICS CORPORATION
A Figgie International Company

RADC-TDAL-A
NEWTON, MA

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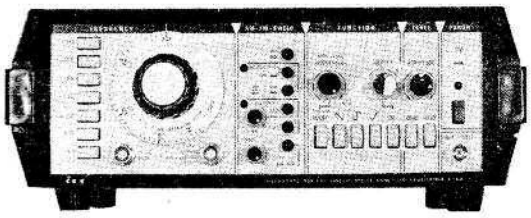
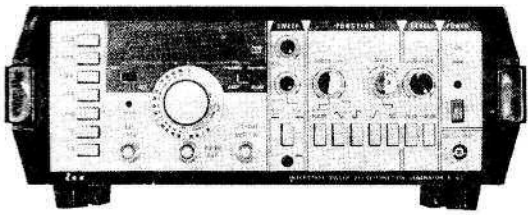


F62

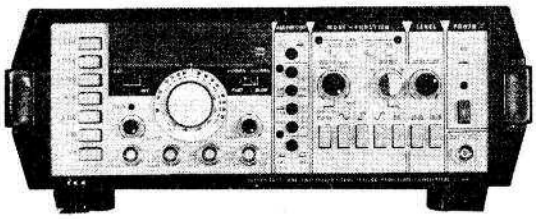
- 0.002 Hz – 2 (5.5) MHz frequency range.
- Coarse/fine tuning mechanism – with linear dial.
- Pulse generator performance.
- 90dB – attenuator, 50 Ω/20 Vpp output.
- DC offset and DC output.
- Symmetry control – provides sawtooth and non-symmetrical sinewave.
- 1:1000 VCG.
- Internal/external AM-FM fully adjustable plus 400Hz auxiliary sinewave.
- 1:1000 sweep with auxiliary sawtooth for X drive of oscilloscopes and recorders.



F63

Includes all features of the F62 plus:

- 1:1000 internal/external sweep.
- Accurate-counter precision-sweep limits adjustments.
- Precise adjustment of super narrow band sweep.
- Response analyzing capabilities.



F64

Includes all features of the F63 plus:

- Trigger gate and burst.
- Internal/external AM-FM fully adjustable in depth and deviation.

Figure 1-1. Series 60 Function Generators

Chapter 1

SPECIFICATIONS

1-1. INTRODUCTION

This manual describes the operation and maintenance of the Interstate Electronics Series 60 Function Generators, illustrated in figure 1-1.

1-2. SPECIFICATIONS

The following paragraphs describe the Series 60 Function Generator specifications.

NOTE

Specifications apply for ambient temperature of 25°C ±5°, frequency dial in range 0.2 to 2.0, symmetrical waveforms, no dc offset and after 20 minutes warmup. All specifications are subject to change without notice.

a. Waveforms

Main Output (selectable):

Symmetrical:	Sine, triangle, square, dc
Asymmetrical:	Pulse, Ramp 10% to 90% duty cycle

Waveforms may be attenuated and/or offset using front panel controls.

Fixed Amplitude Outputs:

Sync/Output Pulse:	Square or rectangular waveform, T^2L compatible, 3V unipolar from 120 ohm source. Typical rise/fall time 25 nsec.
Sweep sawtooth:	T^2L compatible unipolar sawtooth approximately 3V from 1K ohm source.
400 Hz sinewave (F62 and F64 only):	8V p-p from 600 ohms.

b. Frequency

Range:	0.002 Hz - 2 MHz in 7 overlapping decade steps. 2 to 5.5 MHz on 8th step.
Dial Accuracy:	F62: 3% of full scale to 200 kHz 5% of full scale 200 kHz - 5.5 MHz F63 and F64: 3% of full scale to 100 Hz $\pm$1 Hz 100 Hz - 20 kHz (using counter) $\pm$100 Hz 20 kHz - 5.5 MHz (using counter)

c. Amplitude (Main Output)

Output range:	<1 mV to 20V open circuit <1 mV to 10V into 50 ohm load
Note:	Combined signal plus offset must be in a region between $\pm$10V open circuit or $\pm$5V into 50 ohms.

Attenuation:	Three 20 dB steps plus variable 0 - 30 dB vernier provide 90 dB attenuation.

d. Waveform Characteristics

Sine Amplitude Response:	0.2 dB to 2 MHz 3.0 dB 2 MHz - 5.0 MHz
Sine Distortion:	<1% to 200 kHz
Time Symmetry:	±1% to 200 kHz
Squarewave:	Rise/Fall times (10% to 90% amplitude): 100 nsec when terminated in 50 ohm load.
Triangle Linearity:	Better than 99% to 200 kHz
Stability:	Amplitude, frequency and offset (after 20 minute warmup): ±0.25% for 10 minutes ±0.5% for 24 hours

e. FM (VCF) - External AC or DC voltage controls output frequency; 0 to +5V varies frequency upward 1000:1 from minimum dial setting.

Linearity:	0.5%
Slew Rate:	2% of range per microsecond
Input Impedance:	5K ohms

f. Sweep - Main generator frequency sweeps upward linearly between limits set by main dial and sweep-width control. Either limit may be held for measurement.

Repetition rate:	30 msec to 10 sec in one continuous range
Sweep width:	Adjustable from 1:1 to 1000:1 max.

g. Modulation (F62 and F64 only)

AM:	Output waveforms may be amplitude modulated from 0 to 100% modulation depth using internal 400 Hz (nominal) sinewave oscillator or external waveform.
FM:	In addition to external FM input port, the internal 400 Hz sinewave oscillator may be used to frequency modulate the main output frequency between limits set by MOD LEVEL control.

h. Modes (F64 only)

Continuous:	Generator produces continuous wavetrain.
Triggered:	External pulse generates one complete waveform cycle.
Gated:	External signal starts wavetrain which continues until signal is removed. The last cycle of the wavetrain is completed before generator stops.
Burst:	Internal sweep generator is used to gate main output. Sweep rate control determines burst repetition rate, WIDTH control determines number of output cycles per burst.

i. Trig Gate Input - T^2L compatible. Trigger or gate initiates when input level rises above approximately +1.2V and ceases when the level falls below approximately +1V.

Maximum Trigger Rate:	1 MHz
Minimum pulse width:	200 nsec.
Input impedance:	10K ohms

j. Frequency Counter (F63 and F64 only) - Used to measure generator frequency or that of an external signal.

Range:	5 Hz - 90 MHz
Accuracy:	±1 count (Time base in 1 MHz/10 ppm Crystal)
Resolution:	1 Hz (5 Hz to 20 kHz) 100 Hz (above 20 kHz)
Sensitivity:	70 mV RMS to 50 MHz - Sensitivity may be adjusted using screwdriver adjustment control accessible on front panel.

k. General

Power:	115 Vac ±10%, 50/60 Hz, 20W maximum
Operating Temperature:	0° to 50°C.
Dimensions:	11.5" w x 4-1/2" h x 12-1/2" d (295 x 115 x 320 mm)
Weight:	9 lb. (4 Kg)

Chapter 2

OPERATION

2-1. INTRODUCTION

Chapter 2 presents operating instructions for the Series 60 Function Generators.

2-2. FREQUENCY

To adjust the frequency, set the frequency dial to the desired number between 0.2 and 2.0 on the dial and select one of the seven multiplier switches arranged vertically at the left of the panel. If all multiplier switches are out (OFF) a frequency range of 2 to 5.5 MHz is automatically selected, as indicated on the lower calibration marks on the frequency dial.

2-3. AMPLITUDE

Waveform amplitude appearing at the OUT 50Ω connector may be varied between < 1 millivolt and 20V peak-to-peak into an open circuit, or between < 1 millivolt and 10V peak-to-peak using a 50 ohm line termination. The maximum voltage excursion (signal plus offset) must lie in a range between -10V and +10V open circuit or between -5V and +5V using a 50 ohm termination. Full voltage output is obtained with AMPLITUDE control fully clockwise and both attenuator switches (-20 dB and -40 dB) out (OFF).

Proper settings of the attenuator switches for the desired amplitude are:

2 - 20V:	both attenuators out (OFF)
0.2 - 2V:	-20 dB switch in
0.02 - 0.2V:	-40 dB switch in
below 20 mV:	- both attenuator switches in

2-4. OFFSET

DC offset may be introduced into the output by pressing the DC switch and adjusting the OFFSET control. If none of the waveform switches are down, the output will be a dc level.

2-5. WAVEFORMS

For normal symmetrical waveforms press the , or switch. For asymmetrical waveforms (pulse, ramp) also press the PULSE switch. The WIDTH (SYM) control adjusts the wavefore duty cycle from 10 to 90%.

2-6. SWEEP

Frequency sweeps of up to 1000:1 may be obtained on any frequency range. The low starting frequency may be measured in a normal continuous mode. The high sweep limit may be set by pressing the SWEEP STP switch and adjusting the WIDTH control. Releasing the SWEEP STP switch and pressing the SWEEP RUN switch will cause the output frequency to be swept at a rate determined by the RATE control. The sweep sawtooth waveform may be monitored or used for driving the X axis of an XY recorder by connecting to out connector and setting the INT-EXT switch to INT.

2-7. MODULATION

a. AM - For AM modulation with 400 cycle sine wave, set the AM-FM switch to AM, the INT-EXT switch to INT, and the AM-FM-SWP/MODULATION ON switch in. Set the desired depth of modulation using the MOD LEVEL control.

   For external AM modulation set the INT-EXT switch to EXT and apply the external signal to INPUT AM-FM connector.

b. FM - For 400 cycle sine wave FM modulation of wavetrain, set the AM-FM switch to FM, the INT-EXT switch to INT, and the AM-FM-SWP/MODULATION ON switch in. Degree of modulation is controlled by the MOD LEVEL control.

For external FM modulation, set the INT-EXT switch to EXT and apply the external signal to the INPUT AM-FM connector.

c. 400 Hz Sine Wave - A 400 Hz sine wave at $\geq$ 8 volts peak-to-peak appears at the AF /\ OUT connector whenever the generator is in AM or FM mode and the INT-EXT switch is set to INT.

2-8. FREQUENCY COUNTER (MODELS F63, F64)

The frequency counter measures generator frequency when the counter slider switches are set to INT and 5 Hz - 1 MHz. External frequency measurements may be made by setting the counter slide switch to EXT and connecting a signal of $\geq$ 70 mV RMS to the EXT FREQ connector. A screwdriver adjusted SENS control allows meter sensitivity to be reduced as desired.

Chapter 3

PERFORMANCE TEST AND CALIBRATION

3-1. INTRODUCTION

Chapter 3 presents performance test and calibration procedures for the Series 60 Function Generators.

3-2. EQUIPMENT REQUIRED

The following items of test equipment, or their equivalent, are required when checking the performance or calibrating the Series 60 Function Generators.

Equipment	Type/Model
Oscilloscope	Tektronix 475
Frequency Counter	Hewlett-Packard 5326A
Distortion Analyzer	Hewlett-Packard 334A
Function Generator	Interstate Electronics F62
50-ohm Termination	- -

3-3. PERFORMANCE TEST

Table 3-1 presents the Series 60 Function Generator test procedure.

3-4. CALIBRATION

Table 3-2 presents calibration procedures for the PC200P circuit board. Table 3-3 presents calibration procedures for the Model F64 PC200TG circuit board. Table 3-4 presents calibration procedures for the Model F63 PC200S circuit board. Table 3-5 presents calibration procedures for the Model F62 and F64 PC200MST circuit board.

Table 3-1. Performance Test Procedure

Step	Function	Control Settings	Test Equipment	Procedure
1.0	Initial Setup (all models)	All pushbutton switches out. Press X1M, ⊓⊔, CONT (F64 only), AM-FM-SWP/MODULATION ON:OFF (F62,F64) and POWER switches. Set AMPLITUDE control fully CW.	Frequency Counter	1. Connect counter to OUT 50 Ω connector. 2. Observe POWER ON indicator turns on.
2.0	Frequency		Frequency Counter	1. Vary frequency dial between limits to verify that frequencies of < 2 kHz and > 2 MHz can be obtained
		Press X100K switch		2. Repeat for < 200 Hz; > 200 kHz
		Press X10K switch		3. Repeat for < 20 Hz; > 20 kHz
		Press X1K switch		4. Adjust counter for period measurements.
				5. Observe < 500 µs > 500 ms
		Press X100 switch		6. Observe < 5 ms; > 5000 ms

Table 3-1. Performance Test Procedure (Continued)

Step	Function	Control Settings	Test Equipment	Procedure
		Press X10 switch		7. Observe < 50 ms; > 50 sec
		Press X1 switch		8. Observe < 500 ms; > 500 sec
3.0	Dial Accuracy (F62)	Press X10K switch Frequency Dial: 0.2	Frequency Counter	1. Counter indicates 2 kHz ± 600 Hz.
		Frequency Dial: 0.5		2. Counter indicates 5 kHz ±600 Hz.
		Frequency Dial: 1.0		3. Counter indicates 10 kHz ±600 Hz.
		Frequency Dial: 1.5		4. Counter indicates 15 kHz ±600 Hz.
		Frequency Dial: 2.0		5. Counter indicates 20 kHz ±600 Hz.
		Press X1M switch Frequency Dial: 2.0		6. Counter indicates 2 MHz ±100 kHz.
		Frequency Dial: 1.5		7. Counter indicates 1.5 MHz ±100 kHz

Table 3-1. Performance Test Procedure (Continued)

Step	Function	Control Settings	Test Equipment	Procedure
		Frequency Dial: 0.5		9. Counter indicates 500 kHz ±100 kHz.
		Frequency Dial: 0.2		10. Counter indicates 200 kHz ±100 kHz.
4.0	Amplitude	Frequency Dial: 1.0 Press X10K switch	Oscilloscope	1. Connect oscilloscope to OUT 50 Ω connectors.
				2. Verify that AMPLITUDE control produces <.6V p/p; ≥ 20V p/p range.
		AMPLITUDE: CW		3. Verify ∿ and ⩘ waveforms ≥ 20V p/p
				4. Verify -20, -40, and -60 dB attenuator for 2V, 0.2V and 0.02V p/p output

Table 3-1. Performance Test Procedure (Continued)

Step	Function	Control Settings	Test Equipment	Procedure
5.0	Waveform Characteristics			
5.1	Sine wave flatness	ATTENUATOR: 0 dB Press ∿ switch		1. Scan various settings of frequency dial between 0.2 and 2.0 and frequency range switches. Observe output variation of sine wave ≤ 2%. On 2 - 5.5 MHz range, 20% sine flatness, variation to be ≤ 20%.
	Sine Distortion	X100K	Distortion Analyzer	2. Connect distortion analyzer to OUT 50 Ω connector terminated in 50 ohms
		Frequency Dial: 2.0 AMPLITUDE: CW		3. Measure distortion to be ≤ 1%
		Frequency Dial: 0.2		4. Measure distortion to be ≤ 1%
		X1K		5. Measure distortion to be ≤ 1%

Table 3-1. Performance Test Procedure (Continued)

Step	Function	Control Settings	Test Equipment	Procedure
		Frequency Dial: 2.0		6. Measure distortion to be $\leq$ 1%
5.2	Square wave symmetry	Press ⊔⊓ and X100K switches	Frequency Counter	1. Connect counter (period) to OUT 50 Ω connector using 50 ohm terminator
				2. Adjust frequency dial for period of 5.00 µsec
				3. Set counter for time interval measurement (Channel A positive, Channel B negative, common input)
				4. Read 2.50 $\pm$0.05 µsec
		Press X10 switch		5. Adjust frequency dial for period of 50.0 ms
				6. Read time interval (per step 3) of 25.0 $\pm$.5 ms

Table 3-1. Performance Test Procedure (Continued)

Step	Function	Control Settings	Test Equipment	Procedure
5.3	Square wave Rise/Fall Time	Press ⊓ and X1M switches	Oscilloscope	1. Connect oscilloscope to OUT 50 Ω connector terminated in 50 ohms
		Frequency Dial: 1.0		2. Measure rise and fall times (between 10 and 90% amplitude points) to be 100 nsec or less
	DC Offset	Press DC and release ⊓ switches		3. Remove 50 ohm termination
				4. Observe OFFSET control causes DC output to vary from -10V to +10V dc
5.4	Pulse	Press PULSE, X10K and switches and release DC switch		1. Vary WIDTH control and observe waveform duty cycle variation of < 10% to > 90%
				2. Connect oscilloscope to PULSE OUT connector (do not use 50 ohm terminator)

Table 3-1. Performance Test Procedure (Continued)

Step	Function	Control Settings	Test Equipment	Procedure
				3. Observe T^2L level waveform (approximately 0V to +3V levels)
6.0	Sweep	Per Step 1.0 Frequency Dial: CW AM/FM/SWP: ON (F62 and F64)	Frequency Counter	1. Connect counter to OUT 50 Ω connector
		Press SWEEP STOP switch		2. Adjust SWEEP WIDTH control for ≥ 20 kHz counter reading
		Press SWEEP RUN and ∿ switches	Oscilloscope	3. Connect oscilloscope to OUT 50 Ω connector
				4. Observe swept waveform train
			Frequency Counter	5. Connect counter to ⩘ OUT connector
				6. Vary sweep rate control to obtain sawtooth period > 10 sec; < 30 ms

Table 3-1. Performance Test Procedure (Continued)

Step	Function	Control Settings	Test Equipment	Procedure
		SWEEP WIDTH: CW	Oscilloscope	7. Connect oscilloscope to ⩘ OUT connector
				8. Observe sawtooth waveform running between peak levels of 0V and approximately +3.5V
7.0	Modulation (F62,F64)	per Step 1	Oscilloscope	1. Connect oscilloscope to OUT 50 Ω BNC. Synchronize oscilloscope from AF ⩘ BNC connector
		AM/FM/SWP: ON AM/FM: ON AM: ON ∿, X10K, AMPLITUDE: Midrange		2. Observe AM modulation depth varied by MOD LEVEL control from 0% to 100%
		AM/FM: FM		3. Observe FM of waveform train, varied by MOD LEVEL CONTROL

Table 3-1. Performance Test Procedure (Continued)

Step	Function	Control Settings	Test Equipment	Procedure
				4. Connect oscilloscope to AF OUT BNC 5. Observe sine wave of approximately 400 Hz and 8V p/p amplitude
		EXT INT: EXT MOD LEVEL: CW	External Function Generator, Oscilloscope	1. Connect function generator set for 400 Hz. Sine wave at approximately 8V p/p to INPUT SWP AM-FM connector 2. Connect oscilloscope to OUT 50 Ω connector 3. Observe FM of waveform train, varied by amplitude setting of external generator
		AM/FM: AM		4. Observe AM of waveform train, varied by amplitude setting of external generator

Table 3-1. Performance Test Procedure (Continued)

Step	Function	Control Settings	Test Equipment	Procedure
8.0	Internal Counter (F63,F64)	per Step 1 EXT/INT: INT 1-100 MHz/5 Hz - 1 MHz: 1 - 100 MHz SENS (screwdriver control from front panel): CW Note: Instrument is shipped set CW X1K 1 - 100 MHz/5 MHz - 1 MHz: 5 Hz - 1 MHz X100K Frequency Dial: 1.0	 Frequency Counter	1. Observe internal counter readings between 02000.0 kHz and 00003.0 kHz can be obtained by varying frequency dial 2. Observe internal counter readings between 002.000 kHz and 000.003 kHz can be obtained by varying frequency dial 3. Connect counter to OUT 50 Ω connector check displayed count and external count agree within one count on least significant digit

Table 3-1. Performance Test Procedure (Continued)

Step	Function	Control Settings	Test Equipment	Procedure
		All frequency range switches: OUT EXT/INT: EXT 1 - 100 MHz/5 Hz - 1 MHz: 1 - 100 MHz	Oscilloscope	3. Connect OUT 50 Ω connector to oscilloscope and to EXT FREQ connector
				4. Adjust AMPLITUDE control for 200 mV p/p on oscilloscope
		Frequency Dial: 5.5 MHz		5. Observe that counter follows changes in setting of frequency dial to 05500.0 kHz
9.0	Modes (F64)	per Step 1 MODE-FUNCTION: TRIG Frequency Dial: CCW	External Function Generator, Oscilloscope	1. Connect external function generator set for pulse waveform, amplitude 0 to +3V dc, width 200 nsec, repetition rate 1 MHz to TRIG GATE INPUT connector
		∿ pushbutton depressed		2. Connect oscilloscope to OUT 50 Ω connector. Synchronize oscilloscope from external generator

Table 3-1. Performance Test Procedure (Continued)

Step	Function	Control Settings	Test Equipment	Procedure
				3. Observe one sine wave per external generator pulse
		MODE-FUNCTION: GATE		4. Set external generator for 10 kHz square wave (same amplitude levels)
				5. Observe wavetrain generation for approximately half the period of external generator period
				6. Remove external generator
				7. Synchronize oscilloscope from PULSE OUT connector
		FUNCTION: BURST		8. Observe wavetrain with number of cycles adjusted by sweep width control and burst repetition rate adjusted by sweep rate control

Table 3-1. Performance Test Procedure (Continued)

Step	Function	Control Settings	Test Equipment	Procedure
10.0	Lamp Check (F64)			1. Check BURST, TRIG, SWEEP and AM/FM Modulation lamp operation
	(F62)			2. MODULATION and SWEEP lamp operation

Table 3-2. PC200P Circuit Board Calibration Procedure (All Models)

Step	Function	Control Settings	Test Equipment	Procedure
1.0	Initial Settings	o All Pushbutton switches released o POWER: ON o Press X10K RANGE switch o AMPLITUDE: CCW Allow 5 minutes warmup before proceeding		
2.0	Output Amplifier Offset		Oscilloscope	1. Attach oscilloscope using X10 probe between TPa and and ground 2. Adjust P1 for 0.00 ±0.02 Vdc 3. Connect oscilloscope to OUT 50 Ω connector. Do not terminate in 50 ohms. 4. Adjust P2 for 0.00 ±0.02 Vdc. Ignore ac noise.

Table 3-2. PC200P Circuit Board Calibration Procedure (All Models) (Continued)

Step	Function	Control Settings	Test Equipment	Procedure
3.0	Amplitude and Offset	Press ⊓⊔ and PULSE switches • AMPLITUDE: CW • Set frequency dial for 20 kHz • Set WIDTH and OFFSET controls to midrange	Oscilloscope	1. Adjust WIDTH control for 50% waveform duty cycle 2. Adjust OFFSET control so that waveform position is not changed when dc switch is operated and released. (Observe OFFSET and WIDTH controls to be approximately midrange) 3. Release DC switch. 4. Adjust P12 for 20V p/p. 5. Adjust P14 for minimum dc offset. 6. Adjust CT1 for best waveshape.
4.0	Triangle Symmetry	Press ⩘ switch	Oscilloscope	1. Adjust P13 for triangle vertical symmetry around zero. Observe 20V p/p.

Table 3-2. PC200P Circuit Board Calibration Procedure (All Models) (Continued)

Step	Function	Control Settings	Test Equipment	Procedure
		Release PULSE switch		2. Adjust P3 and P4 for 50% duty cycle and to adjust for same frequency between PULSE and ⎍ operation.
5.0	Frequency	Press ⎍ switch Frequency Dial: CW	Frequency Counter	1. Connect counter to OUT 50 Ω connector. NOTE Internal counter can be used in Models F63 and F64. 2. Adjust P6 for 15-20 Hz 3. Adjust P7 for 50% duty cycle NOTE P6 and P7 are interactive. 4. Rotate frequency dial CCW until counter reads 5 kHz ±100 Hz.

Table 3-2. PC200P Circuit Board Calibration Procedure (All Models) (Continued)

Step	Function	Control Settings	Test Equipment	Procedure
				5. Check that the dial is at .5 calibration mark (±100 Hz). If dial is in error, loosen the dial coupler set screws and adjust the dial for a reading of .5 (or loosen pot and rotate while holding dial face) 6. Rotate dial to 2.0. 7. Adjust P5 for 20 kHz ±100 Hz 8. Recheck at dial setting of .5. Repeat steps 5 through 7 if necessary. 9. F62 instruments should be checked at dial readings of .2, .5, 1.0, and 1.5 for deviation not to exceed 400 Hz.

Table 3-2. PC200P Circuit Board Calibration Procedure (All Models) (Continued)

Step	Function	Control Settings	Test Equipment	Procedure
		Frequency Dial: 2.0		10. Press ⊓ switch and check frequencies on each frequency multiplier range except X1M. Observe < 2% error. If > 2% it will be necessary to select trim capacitors on timing board 200T.
		Press X1M switch Frequency Dial: 2.0		11. Adjust trimmers Ct 1 and Ct 2 (on 200T Board) for 2 MHz ±5%
		Frequency Dial: 1.0		12. Check for frequency of 1 MHz ±10%. If necessary repeat steps 11 and 12 for best compromise.
		Frequency Dial: 1.0		13. Readjust Ct 1 (on main board) for best square wave

Table 3-2. PC200P Circuit Board Calibration Procedure (All Models) (Continued)

Step	Function	Control Settings	Test Equipment	Procedure
6.0	Sine wave	Press X10K switch	Oscilloscope	1. Attach oscilloscope to OUT 50 Ω connector
		Press ⩘ switch		2. Recheck triangle vertical symmetry around zero. Trim P13 if necessary
		Press ∿ switch		3. Adjust P11 for 20V p/p
				4. Adjust P10 for vertical symmetry around zero
				5. Adjust P8 and P9 for minimum distortion

Table 3-3. PC200TG Circuit Board Calibration Procedure (Model F64)

Step	Function	Control Settings	Test Equipment	Procedure
		Press X10K, TRIG, and ∿ switches Frequency Dial: 1.0	External Function Generator, Oscilloscope	1. Set external generator to 1 kHz at 5V p/p and connect to TRIG/GATE INPUT connector 2. Connect oscilloscope to OUT 50 Ω connector 3. Observe triggered sine wave display 4. Adjust P1 for 0^{o} phase baseline (midpoint of sine wave amplitude)

Table 3-4. PC200S Circuit Board Calibration Procedure (Model F63)

Step	Function	Control Settings	Test Equipment	Procedure
		Press X10K switch SWEEP WIDTH and SWEEP RATE: CW	Oscilloscope	1. Connect oscilloscope to /\ OUT connector. Set vertical sensitivity for 1V/div.
		Press SWEEP STOP switch		2. Adjust P3 for 3.5V dc
		Press SWEEP RUN switch		3. Adjust P1 for a zero baseline
				4. Adjust P2 for an amplitude of 3.5V peak
				5. Connect oscilloscope to OUT 50 Ω connector and observe sweep rate to be varied by SWEEP RATE control, lower frequency adjusted by frequency dial and upper frequency by SWEEP WIDTH control

Table 3-5. PC200MST Circuit Board Calibration Procedure (Models F62 and F64)

Step	Function	Control Settings	Test Equipment	Procedure
1.0	Initial Setup	AMPLITUDE: CW Attenuator: 0 dB (both switches out) Frequency Dial: 2.0 press X100K, ∿ , and CONT switches MOD LEVEL: CCW MODULATION: ON AM/FM: AM INT/EXT: INT	Oscilloscope	1. Connect oscilloscope to OUT 50 Ω connector 2. Adjust P4 for 20V p/p output 3. Set AMPLITUDE control for 10V p/p output
2.0	Modulation	MOD LEVEL: CW	Oscilloscope	1. Adjust P6 until 400 cycle AM just apparent, then slightly overtravel this setting (for oscillator stability) 2. Adjust P5 for a modulation depth of 100%

Table 3-5. PC200MST Circuit Board Calibration Procedure (Models F62 and F64) (Continued)

Step	Function	Control Settings	Test Equipment	Procedure
				3. Adjust P7 for minimum modulation distortion
3.0	Sweep	SWEEP RATE and SWEEP WIDTH controls: CW	Oscilloscope	1. Connect oscilloscope to /\ OUT connector
		SWEEP: RUN		2. Adjust P1 to bring sawtooth starting point to 0 dc level
				3. Adjust P2 for +3.5V sawtooth peak
		Press SWEEP STP		4. Adjust P3 for +3.5 Vdc

Chapter 4

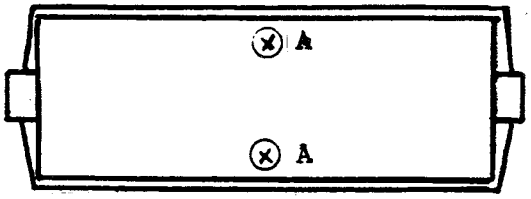
MAINTENANCE

4-1. INTRODUCTION

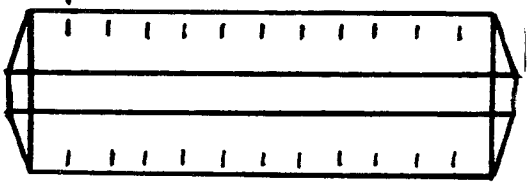
Chapter 4 contains schematic diagrams and parts lists for all circuit boards in the Series 60 Function Generators. Figure 4-1 is a block diagram of the generator. Table 4-1 lists the circuit board types used, their functions, usage, and references the appropriate figure and table numbers for the board schematic diagram and parts list.

4-2. BOX DISASSEMBLY

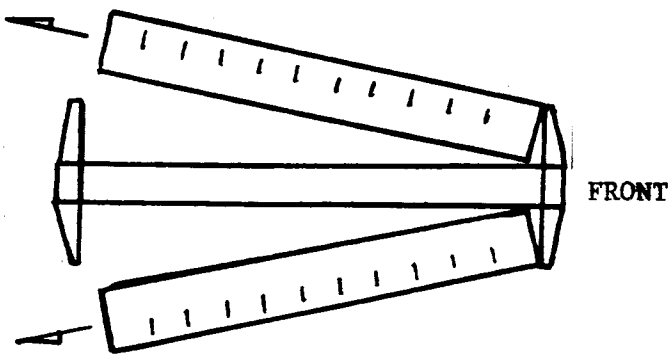
Step 1. Remove two screws (A) on rear panel.



Step 2. Lift the rear part of the top and bottom covers.



Step 3. Pull covers rearwards.



NOTE: When assembling - both covers should be properly placed into their grooves on the front plastic frame.

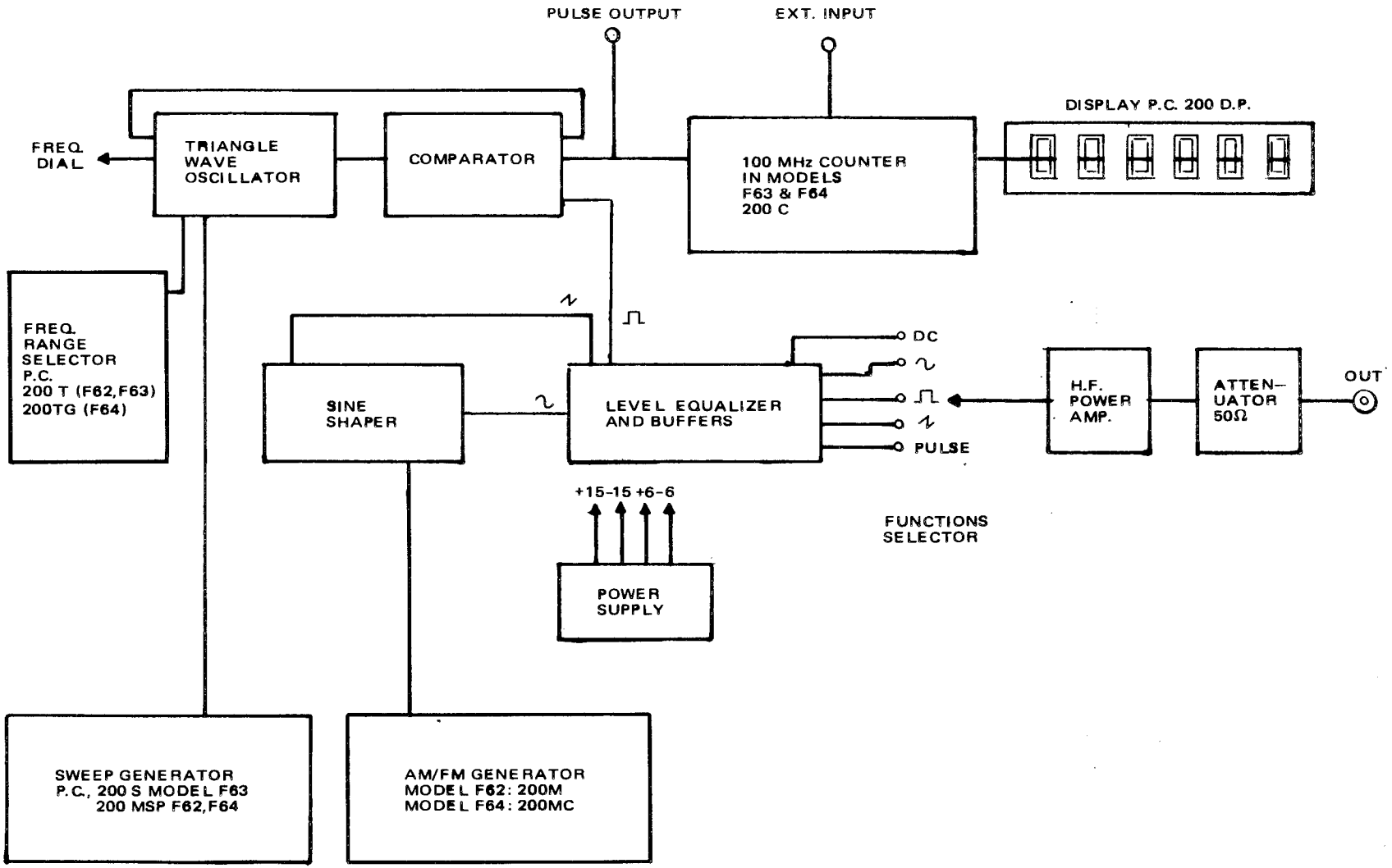
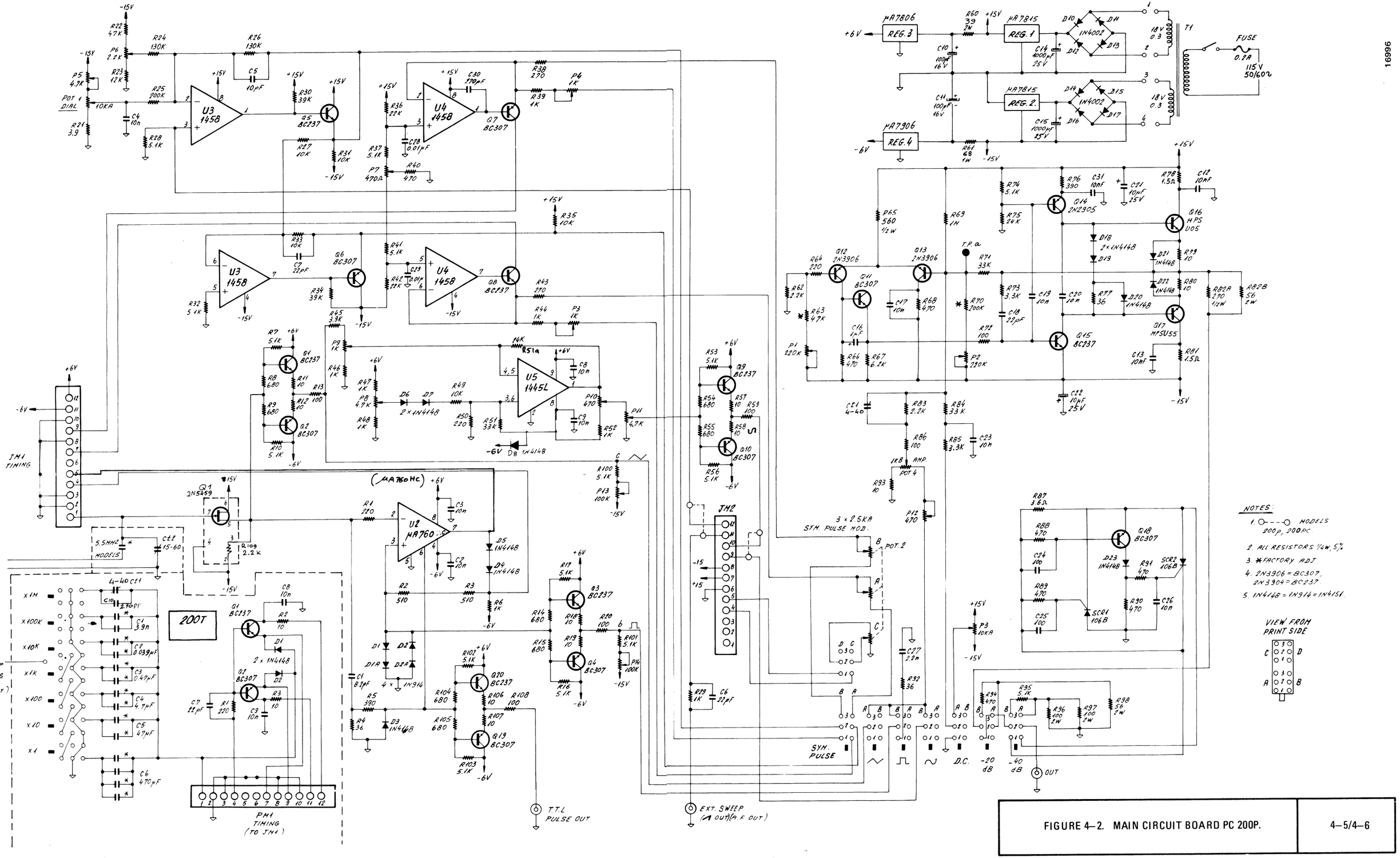


Figure 4-1. Series 60 Function Generator, Block Diagram

Table 4-1. Series 60 Function Generator Circuit Boards

Board Type	Function	Usage			Schematic Figure	Parts List Table
		F62	F63	F64		
PC200P	Frequency Generator, Waveforms, Output Amplifier, Power	X	X	X	4-2	4-2
PC200T	Frequency Range, Current Switch	X	X		4-2	4-2
PC200TG	Frequency Range, Current Switch, Start/Stop Control			X	4-3	4-3
PC200C	Frequency Counter		X	X	4-4	4-4
PC200DP	Frequency Counter Display		X	X	4-5	4-5
PC200S	Sweep		X		4-6	4-6
PC200MSP	Sweep AM/FM Modulation	X		X	4-7	4-7
PC200M	Modulation	X			4-8	4-8
PC200N	Modulation			X	4-9	4-9



NOTES:

1. ○---○ MODELS 200p, 200PC.
2. ALL RESISTORS 1/4W, 5%
3. * FACTORY ADJ.
4. 2N3906 = BC307, 2N3904 = BC237.
5. 1N4148 = 1N914 = 1N4151.

FIGURE 4–2. MAIN CIRCUIT BOARD PC 200P.

4–5/4–6

Table 4-2. Main Circuit Board PC200P, Parts List

Reference Designation	Description	IEC P/N
R1	220, 1/4W, 5%	P00347620-221
R2, R3	510, 1/4W, 5%	P00347620-511
R4	36, 1/4W, 5%	P00347620-360
R5	390, 1/4W, 5%	P00347620-390
R6	1K, 1/4W, 5%	P00347620-102
R7	5.1K, 1/4W, 5%	P00347620-512
R8, R9	680, 1/4W, 5%	P00347620-681
R10	5.1K, 1/4W, 5%	P00347620-512
R11, R12	10, 1/4W, 5%	P00347620-100
R13	100, 1/4W, 5%	P00347620-101
R14, R15	680, 1/4W, 5%	P00347620-681
R16, R17	5.1K, 1/4W, 5%	P00347620-512
R18, R19	10, 1/4W, 5%	P00347620-100
R20	100, 1/4W, 5%	P00347620-101
R21	3.9, 1/4W, 5%	P00347620-3R9
R22	47K, 1/4W, 5%	P00347620-473
R23	12K, 1/4W, 5%	P00347620-123
R24, R26	130K, 1/4W, 5%	P00347620-134
R25	200K, 1/4W, 5%	P00347620-204
R27	10K, 1/4W, 5%	P00347620-103
R28	5.1K, 1/4W, 5%	P00347620-512
R29	1K, 1/4W, 5%	P00347620-102
R30	39K, 1/4W, 5%	P00347620-393
R31	10K, 1/4W, 5%	P00347620-103
R32	5.1K, 1/4W, 5%	P00347620-512
R33	10K, 1/4W, 5%	P00347620-103
R34	39K, 1/4W, 5%	P00347620-393
R35	10K, 1/4W, 5%	P00347620-103
R36	22K, 1/4W, 5%	P00347620-223
R37	5.1K, 1/4W, 5%	P00347620-512
R38	270, 1/4W, 5%	P00347620-271

Table 4-2. Main Circuit Board PC200P, Parts List (Continued)

Reference Designation	Description	IEC P/N
R39	1K, 1/4W, 5%	P00347620-102
R40	470, 1/4W, 5%	P00347620-471
R41	5.1K, 1/4W, 5%	P00347620-512
R42	22K, 1/4W, 5%	P00347620-223
R43	270, 1/4W, 5%	P00347620-271
R44	1K, 1/4W, 5%	P00347620-102
R45	3.9K, 1/4W, 5%	P00347620-392
R46	1.2K, 1/4W, 5%	P00347620-122
R47, R48	1K, 1/4W, 5%	P00347620-102
R49	10K, 1/4W, 5%	P00347620-103
R50	220, 1/4W, 5%	P00347620-221
R51	33K, 1/4W, 5%	P00347620-333
R51a	24K, 1/4W, 5%	P00347620-243
R52	1K, 1/4W, 5%	P00347620-102
R53	5.1K, 1/4W, 5%	P00347620-512
R54, R55, R104, R105, R109	680, 1/4W, 5%	P00347620-681
R56	5.1K, 1/4W, 5%	P00347620-512
R57, R58	10, 1/4W, 5%	P00347620-100
R59	100, 1/4W, 5%	P00347620-101
R60	68, 2W, 5%	302000846
R61	82, 2W, 5%	302000847
R62	2.2K, 1/4W, 5%	P00347620-222
R63	47K, 1/4W, 5%	P00347620-473
R64	220, 1/4W, 5%	P00347620-221
R65	560, 1/2W, 5%	P00347621-561
R66	470, 1/4W, 5%	P00347620-471
R67	6.2K, 1/4W, 5%	P00347620-622
R68	470, 1/4W, 5%	P00347620-471
R69	1, M 1/4W, 5%	P00347620-105
R70	200K, 1/4W, 5%	P00347620-204

Table 4-2. Main Circuit Board PC200P, Parts List (Continued)

Reference Designation	Description	IEC P/N
R71	33K, 1/4W, 5%	P00347620-333
R72	100, 1/4W, 5%	P00347620-101
R73	3.3K, 1/4W, 5%	P00347620-332
R74	5.1K, 1/4W, 5%	P00347620-512
R75	24K, 1/4W, 5%	P00347620-243
R76	390, 1/4W, 5%	P00347620-391
R77	36, 1/4W, 5%	P00347620-366
R78, R81	1.5, 1/4W, 5%	P00347620-1R5
R79, R80	10, 1/4W, 5%	P00347620-100
R82A	270, 1/2W, 5%	P00347621-271
R82B	56, 2W, 5%	302000825
R83	2.2K, 1/4W, 5%	P00347620-222
R84	33K, 1/4W, 5%	P00347620-333
R85	3.3K, 1/4W, 5%	P00347620-332
R86	100, 1/4W, 5%	P00347620-101
R87	3.6, 1/4W, 5%	P00347620-3R6
R88...R91	470, 1/4W, 5%	P00347620-471
R92	36, 1/4W, 5%	P00347620-360
R93, R106, R107	10, 1/4W, 5%	P00347620-100
R94	470, 1/4W, 5%	P00347620-471
R95, R100, R101, R102, R103	5.1K, 1/4W, 5%	P00347620-512
R96	100, 1/4W, 5%	P00347620-101
R97, R108	100, 2W, 5%	302000764
R98	56, 2W, 5%	302000825
R99	24K, 1/4W, 5%	P00347620-243
C1	8.2pF, DISC	200-06082
C5	10 pF, DISC	200-06102
C2, C3, C4	0.01 µF, POLYESTER, 100V	200-06104
C6, C7	22 pF, DISC	200-06103
C8, C9	0.01 µF, POLYESTER, 110V	200-06104

Table 4-2. Main Circuit Board PC200P, Parts List (Continued)

Reference Designation	Description	IEC P/N
C10, C11	100 µF, ELECT., 16V	200-05106
C12, C13	10 nF, ELECT., 25V	200-06104
C14, C15	1000 µF, ELECT., 25V	200-05104
C16	1 µF, ELECT., 25V	200-05107
C17	0.01 µF, POLYESTER, 100V	200-06104
C18	22 pF, DISC	200-06103
C19, C20	0.01 µF, POLYESTER, 100V	200-06104
C21, C22	10 µF, ELECT., 25V	200-05105
C23	0.01 µF, POLYESTER, 100V	200-06104
C24, C25	100 pF, DISC	200-06109
C26	0.01 µF, POLYESTER, 100V	200-06104
C27	2200 pF, POLYESTER, 100V	200-06110
C28, C29, C31	0.01 µF, POLYESTER, 100V	200-06104
C30	270 pF, DISC	200-06271
D1-D7	Diode, Silicon	304000007
D10-D17	Diode, Silicon	304000005
D18-D23	Diode, Silicon	304000007
Q1, Q3, Q5, Q8, Q9, Q15, Q20	Transistor, NPN 2N3904	P00347001
Q2, Q4, Q6, Q7, Q10, Q11, Q12, Q13, Q18, Q19	Transistor, PNP 2N3906	P00347102
Q14	Transistor, 2N2905	303000015
Q16	Transistor, MPSU05/06	303000039
Q17	Transistor, MPSU55	303000064
U1	IC, DUALFET U411	200-35201
U2	IC, NA760 HC	200-35202
U3, U4	IC, MC1458	P00347426
U5	IC, MC1445L	200-35204
P1, P2	200K Trimpot	200-13204
P3, P4, P9	1K	200-13102

Table 4-2. Main Circuit Board PC200P, Parts List (Continued)

Reference Designation	Description	IEC P/N
P5, P8, P11	4.7K	200-13472
P6	2.2K	200-13222
P7, P10, P12	470	200-13471
P13, P14	100K	200-13104
POT.1	10K POT:DIAL, TYPE A	200-85101
POT.2	3x2.5K POT:SYM.MODULATION,TYPE A	200-85102
POT.3	10K POT:DC OFFSET, TYPE A	200-85103A
POT.4	1K POT:AMPLITUDE, TYPE B	200-85103B
SYM,PULSE	4C/O Pushbutton Switch	200-82104
TRIANGLE	2C/O Pushbutton Switch	200-82102
SQUARE	2C/O Pushbutton Switch	200-82102
SINE	2C/O Pushbutton Switch	200-82102
DC	2C/O Pushbutton Switch	200-82102
-20 µdB	2C/O Pushbutton Switch	200-82102
-40 dB	2C/O Pushbutton Switch	200-82102
JM1	12PIN MOLEX CONNECTOR	
JM2	12PIN MOLEX CONNECTOR	
SCR1	SCR, 1068	
SCR1	SCR, 1068	
REG1	REGULATOR, NA7815	
REG2	REGULATOR, NA7815	
REG3	REGULATOR, NA7806	
REG4	REGULATOR, NA7906	
LED1	LED, DL-11AL	209-4106
F1	Fuse, 0.4 Amp	
T1	Transformer	
POWER	Pushbutton Switch Power Cable	311000104
	PC200T Circuit	
R1	220, 1/4W, 5%	P00347620-221
R2, R3	10, 1/4W, 5%	P00347620-100
C1	3.9 nF, POLYESTER, 100V	201-06101

Table 4-2. Main Circuit Board PC200P, Parts List (Continued)

Reference Designation	Description	IEC P/N
C2	47 nF, POLYESTER, 100V	201-06102
C3	0.47 µF, POLYESTER, 100V	201-06103
C4	4.7 µF, TANTALUM, 10V	201-09105
C5	47 µF, TANTALUM, 10V	201-09104
C6	470 µF, TANTALUM, 3V	201-09103
C7	22 pF, DISC	06103
C8, C9	0.01 µF, POLYESTER, 100V	06104
Ct1	15-60pF	
D1, D2	Diode Silicon	304000007
Q1	Transistor, NPN	P00347001
Q2	Transistor, BC306	201-25394
PB	2C/O Pushbutton Switch	201-82102
PM1	CONNECTOR:12 PIN-MOLEX	

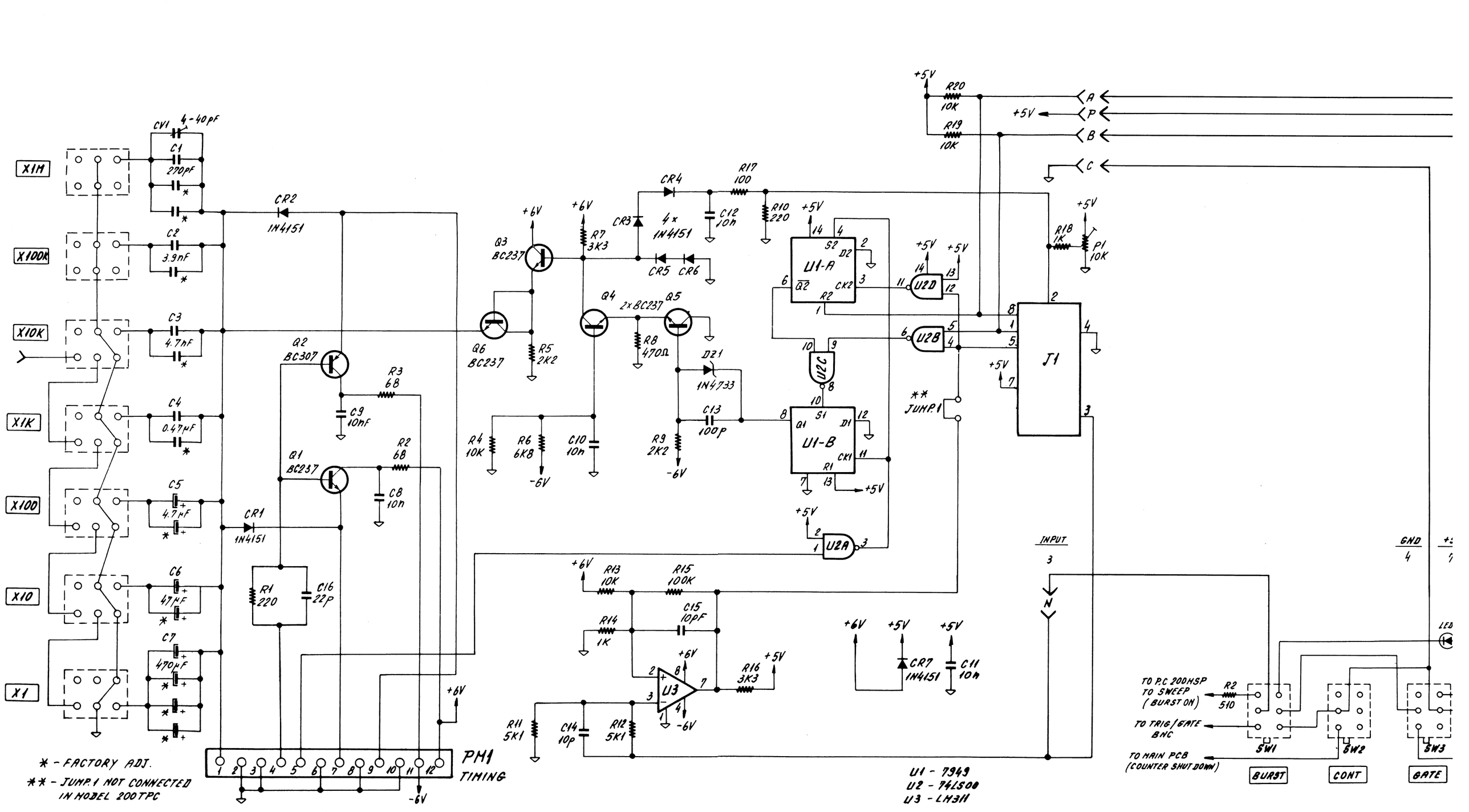


FIGURE 4–3. FREQUENCY RANGE SELECTOR

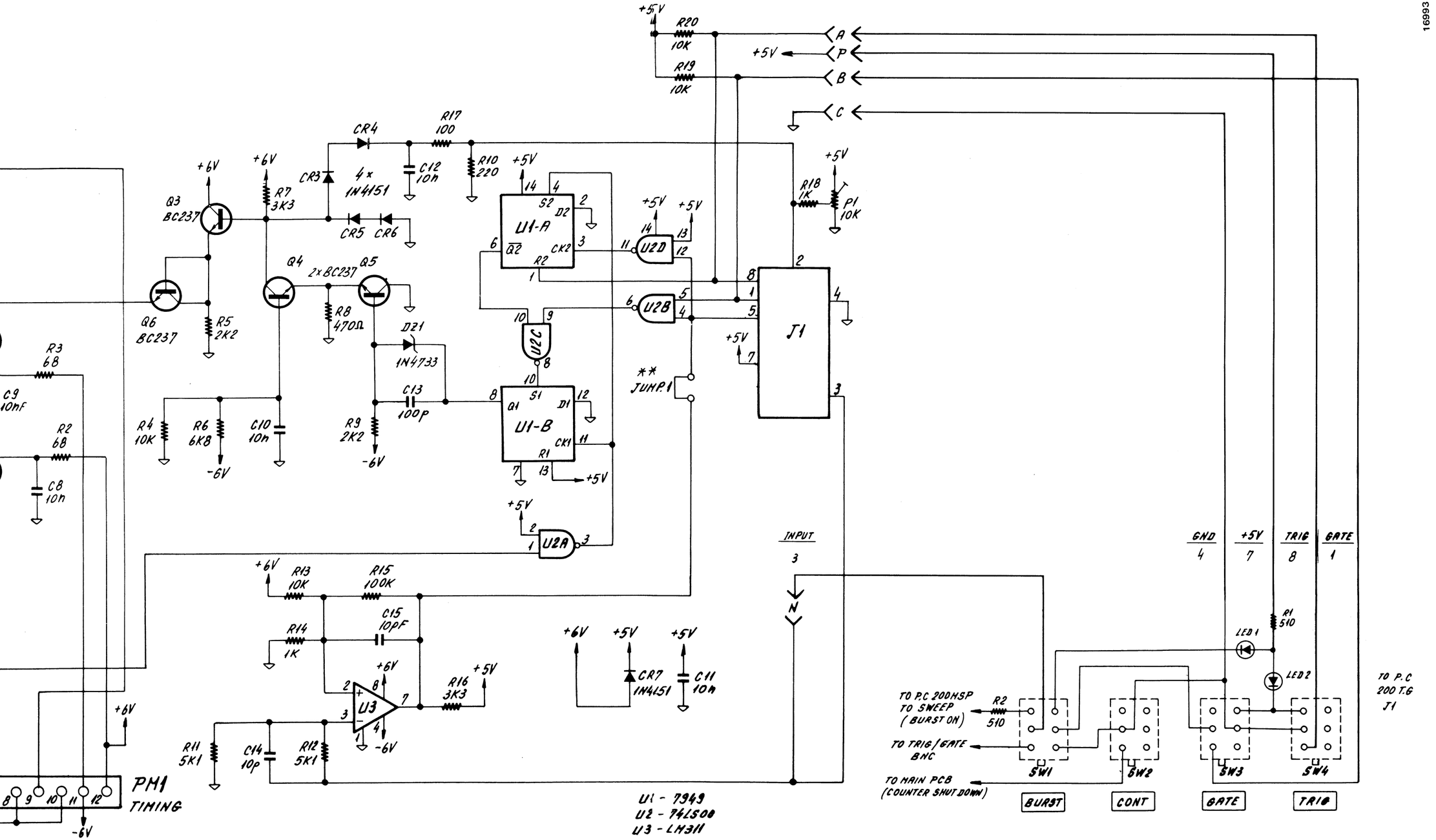


FIGURE 4–3. FREQUENCY RANGE SELECTOR PC 200TG.

Table 4-3. Frequency Range Selector PC200TG, Parts List

Reference Designation	Description	IEC P/N
R3, R2	68, 5%, 1/4W	P00347620-680
R17	100, 5%, 1/4W	P00347620-101
R10, R1	220, 5%, 1/4W	P00347620-221
R8	470, 5%, 1/4W	P00347620-471
R18, R14	1K, 5%, 1/4W	P00347620-102
R9, R5	2.2K, 5%, 1/4W	P00347620-222
R11, R7	3.3K, 5%, 1/4W	P00347620-332
R6	6.8K, 5%, 1/4W	P00347620-682
R13, R19, R20, R4	10K, 5%, 1/4W	P00347620-103
R15	100K, 5%, 1/4W	P00347620-104
C1	300 pF, CERAMIC 100V	207-06106
C2	3900 pF, POLYESTER 100V	201-06101
C3	47000 pF, POLYESTER 100V	201-06102
C4	0.47 µF, POLYESTER 100V	201-06103
C5	4.7 µF, TANTALUM 10V	201-09105
C6	47 µF, TANTALUM 10V	201-09104
C7	470 µF, TANTALUM 3V	201-09103
C14, C15	10 pF, DISC	207-06102
C16	22 pF, DISC	207-06103
C13	100 pF, DISC	207-06109
C8	0.01 µF, DISC	207-06104
P1	10K, Trimpot	207-13103
D1, D2	Diode, IN4735	209-16151
D3, D4, D6	Diode, Silicon	304000007
D5	Diode, IN4738	304000060
LED1, LED2	LED, DL-11AR	209-46102
PM1	CONNECTOR, 12 - PIN MOLEX	209-51112
PB1	2C/O OFF PUSHBUTTON Switch	209-82102
PB2	6C/O MOD. ON PUSHBUTTON	209-82106
PB3	4C/O AM/FM PUSHBUTTON	209-82104
PB4	4C/O STOP PUSHBUTTON	209-82104

Table 4-3. Frequency Range Selector PC200TG, Parts List (Continued)

Reference Designation	Description	IEC P/N
PB5	2C/O RUN PUSHBUTTON	209-82102
PB6	2C/O INT/EXT PUSHBUTTON	209-82102
PB7	4C/O HF PUSHBUTTON	209-82104

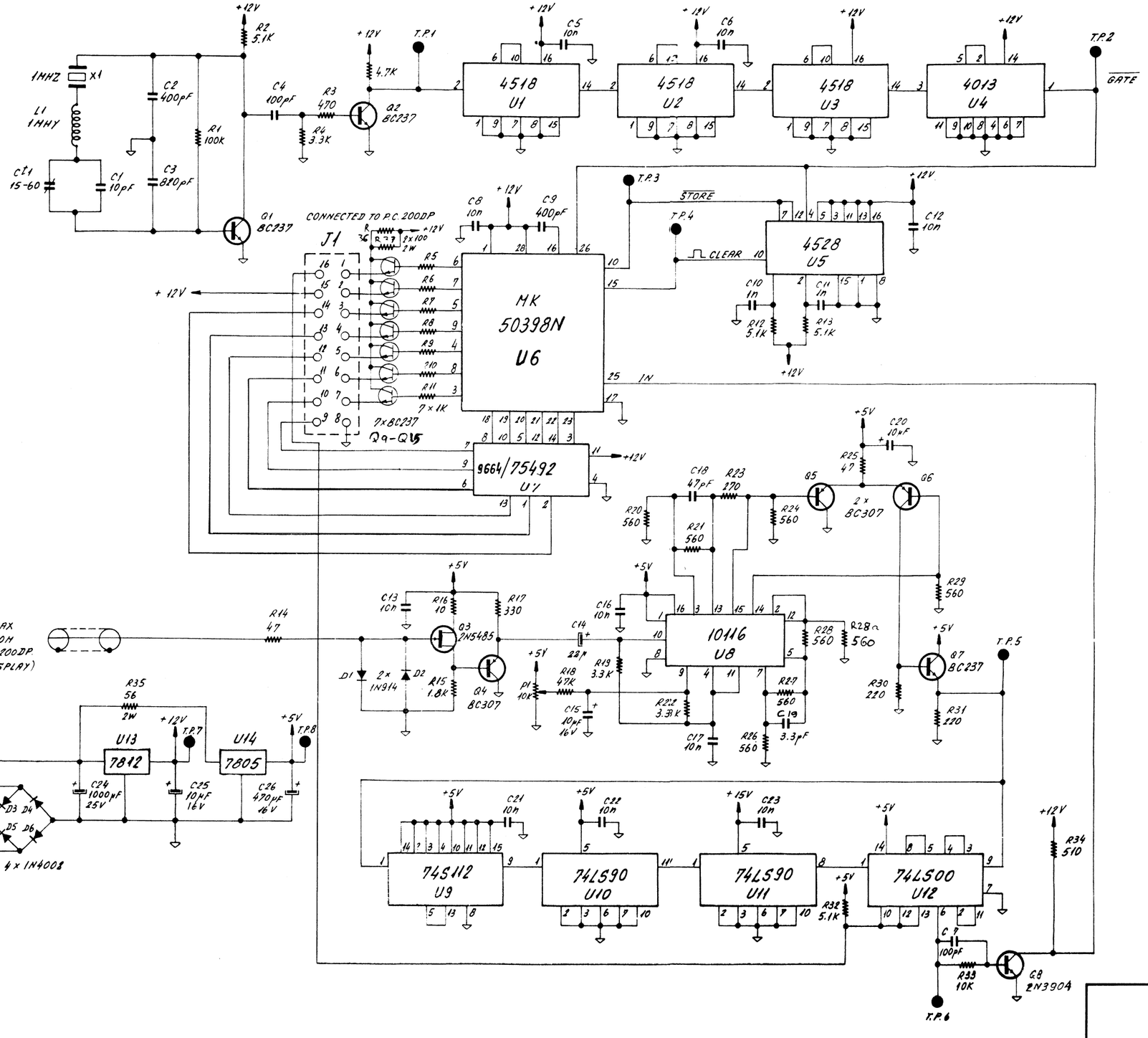


FIGURE 4–4. COUNTER PC 200C.

Table 4-4. Counter PC200C, Parts List

Reference Designation	Description	IEC P/N
R1	100K, 1/4W, 5%	P00347620-104
R2	5.1K, 1/4W, 5%	P00347620-512
R3	470, 1/4W, 5%	P00347620-471
R4	3.3K, 1/4W, 5%	P00347620-332
R5-R11	510, 1/4W, 5%	P00347620-510
R12, R13, R32	5.1K, 1/4W, 5%	P00347620-512
R14	47K, 1/4W, 5%	P00347620-473
R15	1.8K, 1/4W, 5%	P00347620-182
R16	10, 1/4W, 5%	P00347620-100
R17	330, 1/4W, 5%	P00347620-331
R18	47K, 1/4W, 5%	P00347620-473
R19, R22	3.3K, 1/4W, 5%	P00347620-332
R20, R21, R24, R26, R27, R29	560, 1/4W, 5%	P00347620-561
R23	270, 1/4W, 5%	P00347620-271
R25	47, 1/4W, 5%	P00347620-470
R28, R28A	680, 1/4W, 5%	P00347620-681
R30, R31	220, 1/4W, 5%	P00347620-221
R33	10, 1/4W, 5%	P00347620-100
R34	510, 1/4W, 5%	P00347620-511
R35	56, 2W, 5%	302000845
R36, R37	100, 2W, 5%	302000764
C1	10 pF, DISC	202-06102
C2	400 pF, DISC	202-06103
C3	820 pF, DISC	202-06105
C4	220 pF, DISC	202-06106
C5, C6, C8	0.01 µF, POLYESTER OR DISC, 100V	202-06104
C7	100 pF, DISK	202-06109
C9	400 pF, POLYESTER OR DISC, 100V	202-06103
C10, C11	1 nF, POLYESTER OR DISC, 100V	202-06107
C12, C13	0.01 µF	202-06104

Table 4-4. Counter PC200C, Parts List (Continued)

Reference Designation	Description	IEC P/N
C14	22 µF, ELECT, 16V	202-05108
C15	10 µF, ELECT, 16V	202-05109
C16, C17	0.01 µF, POLYESTER OR DISC, 100V	202-06104
C18	47 pF, DISC	202-06110
C19	3.3 pF, DISC	202-06111
C20	10 µF, ELECT, 16V	202-05109
C21, C22, C23	0.01 µF, POLYESTER OR DISC, 100V	202-06104
C24	1000 µF, ELECT, 25V	202-05104
C25	10 µF, ELECT, 16V	202-05112
C26	470 µF, ELECT, 16V	202-05113
D1, D2	Diode, IN914	P00347300
D3...D6	Diode, IN4002	304000005
Q1, Q2, Q7, Q8	Transistor, NPN	P00347001
Q4, Q5, Q6	Transistor, PNP	P00347102
Q3	Transistor, FET 2N5485	303000029
Q9-Q15	Transistor, BC237	202-25393
U1, U2, U3	IC, 4518	202-35101
U4	IC, 4013	202-35102
U5	IC, 4528	202-35103
U6	IC, MK50398N (MOSTEK)	202-35104
U7	IC, 75492/9664	202-35105
U8	IC, 10116	202-35106
U9	IC, 74S112	305000156
U10, U11	IC, 74LS90	202-35108
U12	IC, 74LS00	305000130
U13	IC, 7812	202-35110
U14	IC, 7805	202-35111
J1	CONNECTOR, MOLEX, 16 PIN	202-51116
L1	INDUCTANCE, 1 mH	202-40100
X1	CRYSTAL, 1 MHz/10 PPM	202-81100
P1	10K TRIMPOT	202-13103
Ct 1	15-60 pF CAPACITANCE TRIMMER	202-14060

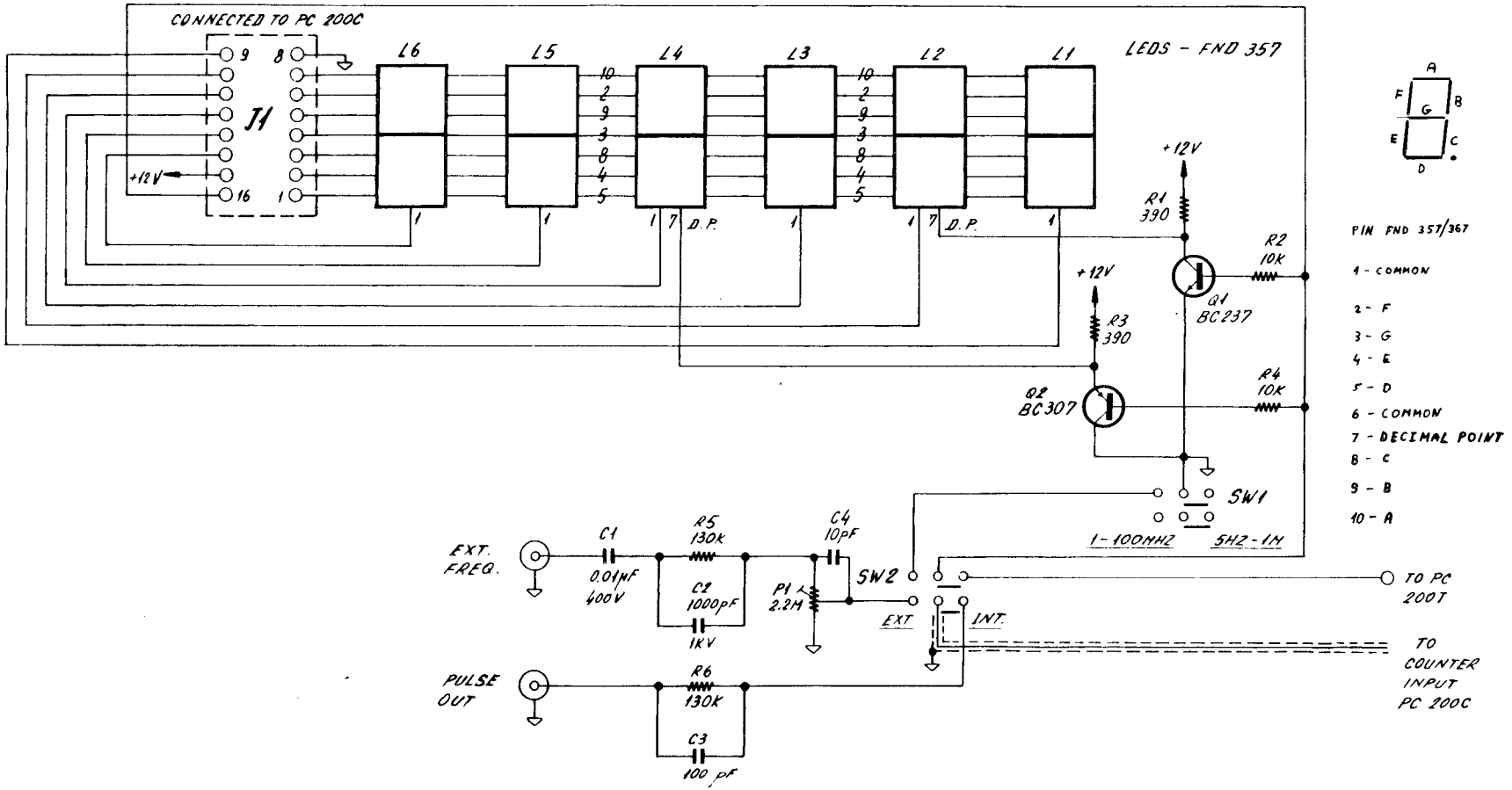


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Figure 4-5. Display PC200DP, Schematic Diagram

Table 4-5. Display PC200DP, Parts List

Reference Designation	Description	IEC P/N
R1, R3	390, 1/4W, 5%	P00347620-391
R2, R4	10K, 1/4W, 5%	P00347620-103
R5, R6	130K, 1/4W, 5%	P00347620-134
C1	0.01 µF, POLYESTER, 400V	203-06101
C2	1 nF, CERAMIC, 1000V	203-08102
C3	100 pF, CERAMIC, 100V	203-08101
C4	10 pF, CERAMIC, 100V	203-08100
P1	2.2M TRIMPOT	203-13225
Q1	Transistor, NPN	P00347001
Q2	Transistor, PNP	P00347102
L1-L6	LED, 7-SEGMENT, FND 357	203-45103
SW1, SW2	2C/O SLIDE SWITCH	203-82201

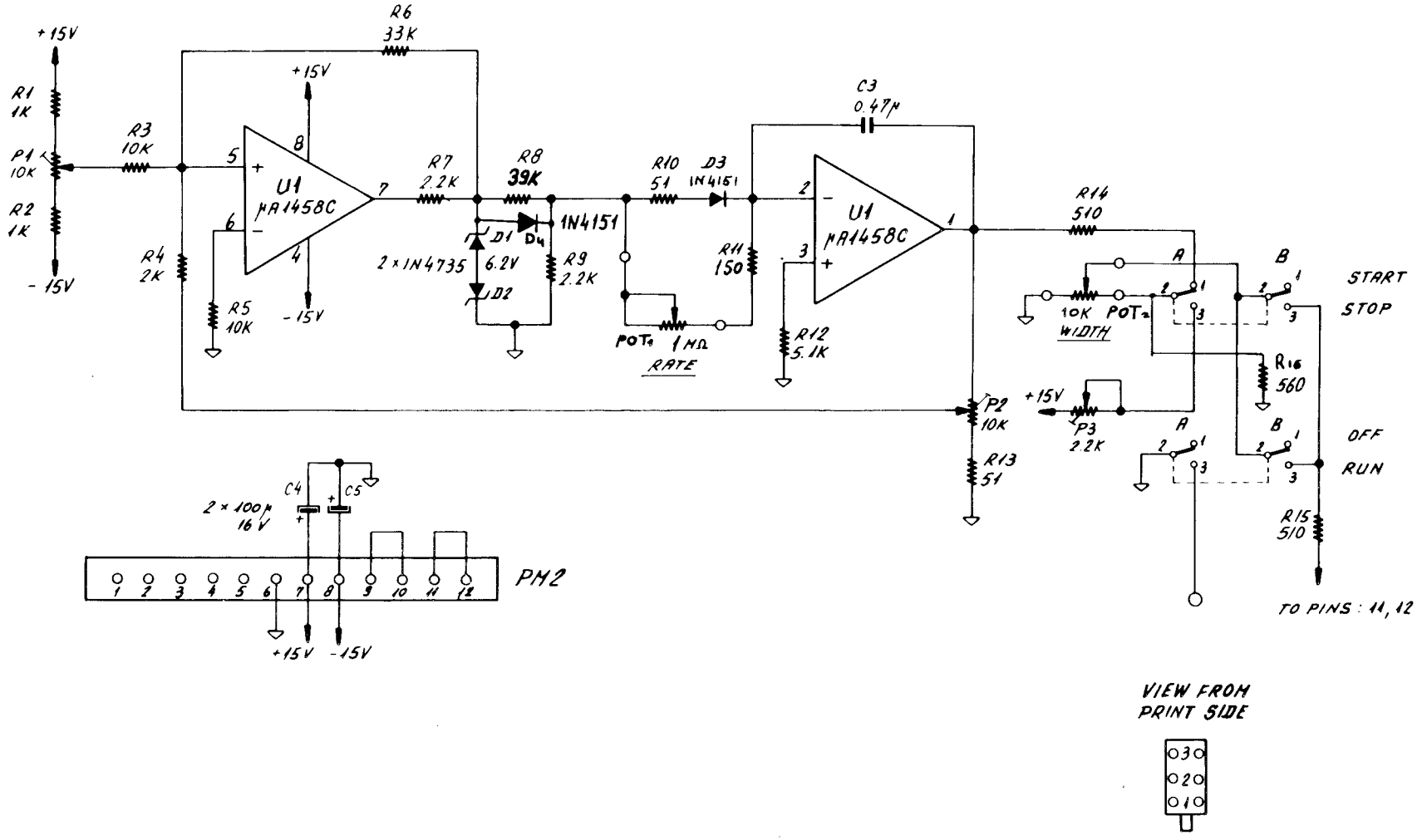

Figure 4-6. Sweep Generator PC200S, Schematic Diagram

Table 4-6. Sweep Generator PC200S, Parts List

Reference Designation	Description	IEC P/N
R1, R2	1K, 1/4W, 5%	P00347620-102
R3	10K, 1/4W, 5%	P00347620-103
R4	2K, 1/4W, 5%	P00347620-202
R5	10K, 1/4W, 5%	P00347620-103
R6	33K, 1/4W, 5%	P00347620-333
R7, R9	2.2K, 1/4W, 5%	P00347620-222
R8	39K, 1/4W, 5%	P00347620-393
R10, R13	51, 1/4W, 5%	P00347620-510
R11	150, 1/4W, 5%	P00347620-151
R12	5.1K, 1/4W, 5%	P00347620-512
R14, R15, R16	560, 1/4W, 5%	P00347620-561
U1	IC, MC1458	P00347426
PB	2C/O START/STOP PUSHBUTTON Switch	204-82202
PB	2C/O RUN PUSHBUTTON Switch	204-82102
PM2	CONNECTOR, MOLEX 12 PIN	204-51112
POT.1	1M POTENTIOMETER, RV6	204-85105
POT.2	5K POTENTIOMETER, RV6	204-85502

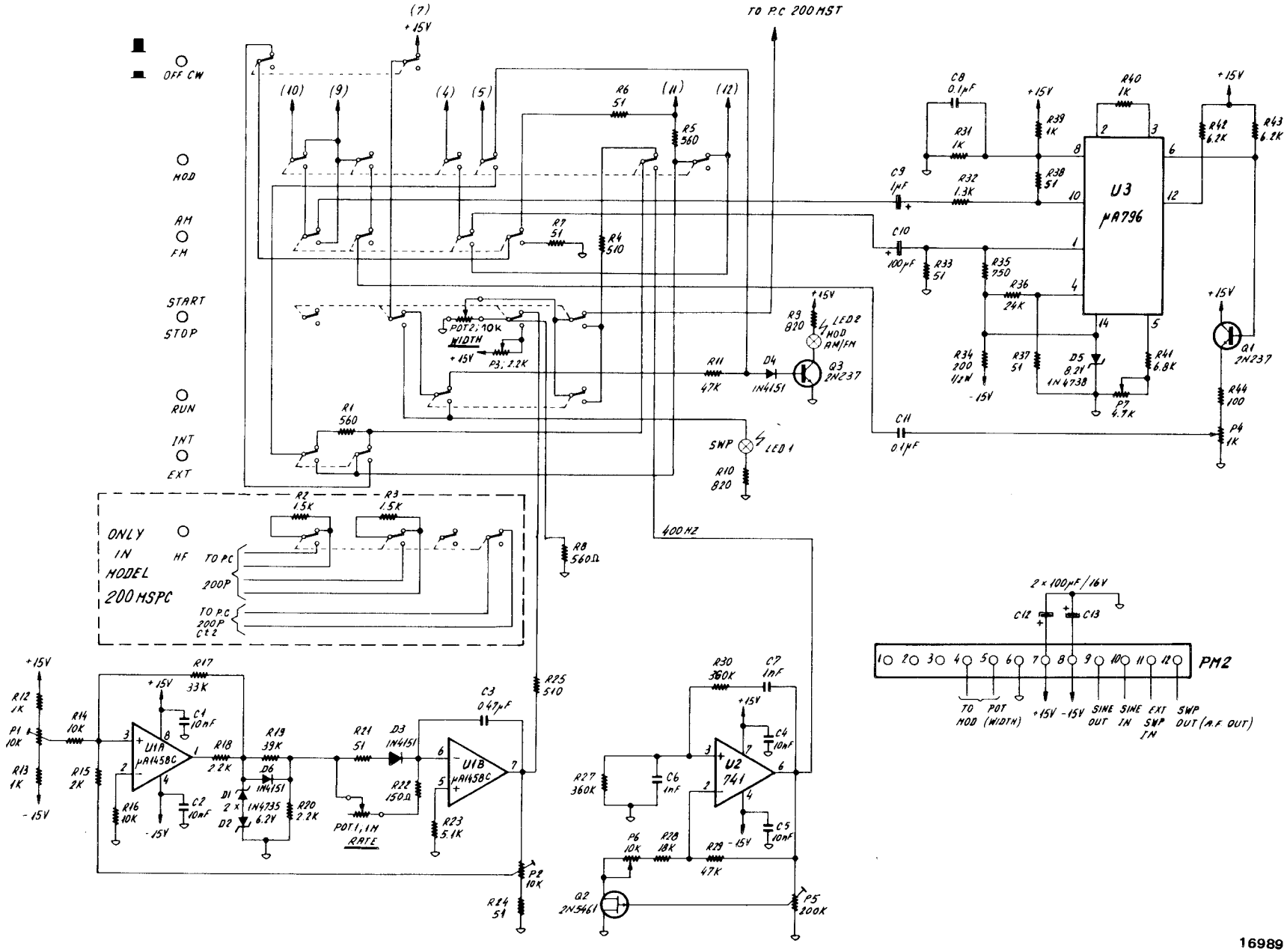

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Figure 4-7. Sweep Generator PC200MSP, Schematic Diagram

Table 4-7. Sweep Generator PC200MSP, Parts List

Reference Designation	Description	IEC P/N
R21, R24, R6, R7, R33, R38, R37	51, 5%, 1/4W	P00347620-510
R44	100, 5%, 1/4W	P00347620-101
R22	150, 5%, 1/4W	P00347620-161
R25, R4	510, 5%, 1/4W	P00347620-510
R8, R5, R1	560, 5%, 1/4W	P00347620-561
R35	750, 5%, 1/4W	P00347620-751
R9, R10	820, 5%, 1/4W	P00347620-821
R40, R31, R39, R12, R13	1K, 5%, 1/2W	P00347621-102
R32	1.3K, 5%, 1/4W	P00347620-132
R2, R3	1.5K, 5%, 1/4W	P00347620-152
R15	2K, 5%, 1/4W	P00347620-202
R18, R20	2.2K, 5%, 1/4W	P00347620-222
R23	5.1K, 5%, 1/4W	P00347620-512
R42, R43	6.2K, 5%, 1/4W	P00347620-622
R41	6.8K, 5%, 1/4W	P00347620-682
R14, R16	10K, 5%, 1/4W	P00347620-103
R28	18K, 5%, 1/4W	P00347620-183
R36	24K, 5%, 1/4W	P00347620-243
R17	33K, 5%, 1/4W	P00347620-333
R19	39K, 5%, 1/4W	P00347620-393
R11, R29	47K, 5%, 1/4W	P00347620-473
R27, R30	360K, 5%, 1/4W	P00347620-364
R34	200, 5%, 1/2W	P00347621-201
C6, C7	1 nF, POLYESTER	209-07106
C1, C2, C5, C4	10 nF, POLYESTER	209-06104
C8, C11	100 nF, POLYESTER	209-06102
C3	470 nF, POLYESTER	209-06103
C9	1 µF, ELECTROLIT	209-05107
C10, C12, C13	100 µF, ELECTROLIT	209-05106

Table 4-7. Sweep Generator PC200MSP, Parts List (Continued)

Reference Designation	Description	IEC P/N
CR1, CR2, CR7, CR3, CR6, CR4, CR5	Diode, Silicon	304000007
D7	Diode, Zener, 5.1V, IN4733	207-16158
Q1, Q3	Transistor, 2N237	209-35393
Q2	Transistor, 2N5461	303000072
U1	IC, MC1458C	P00347426
U2	IC, NA741	305000312
U3	IC, NA796	209-35101
P4	1K TRIMPOT	209-13102
P3	2.2K TRIMPOT	209-13222
P7	4.7K TRIMPOT	209-13472
P1, P2, P6	10K TRIMPOT	209-13103
P5	220K TRIMPOT	209-13224
POT.1	1M POTENTIOMETER	209-85105
POT.2	5K POTENTIOMETER	209-8502
PM1	CONNECTOR, 12-PIN MOLEX	207-51112
PB	2C/O X1-X1M PUSHBUTTON Switch	207-82102

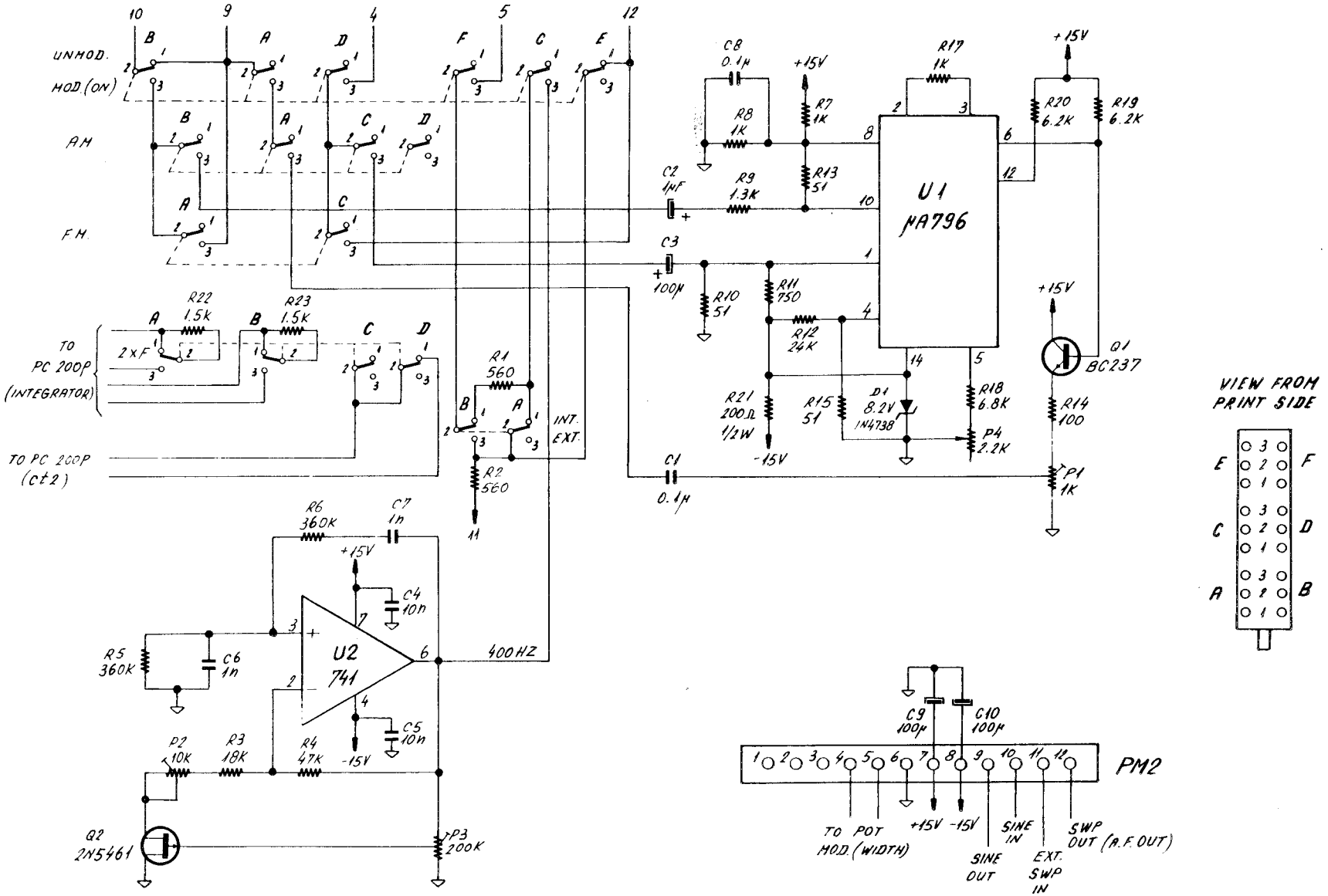

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Figure 4-8. AM/FM Generator PC200M, Schematic Diagram

Table 4-8. AM/FM Generator PC200M, Parts List

Reference Designation	Description	IEC P/N
R1, R2	560, 1/4W, 5%	P00347620-561
R3	18K, 1/4W, 5%	P00347620-183
R4	47K, 1/4W, 5%	P00347620-473
R5, R6	360K, 1/4W, 5%	P00347620-363
R7, R8, R17	1K, 1/4W, 5%	P00347620-102
R9	1.3K, 1/4W, 5%	P00347620-132
R10, R13, R15	51, 1/4W, 5%	P00347620-510
R11	750, 1/4W, 5%	P00347620-751
R12	24K, 1/4W, 5%	P00347620-243
R14	100, 1/4W, 5%	P00347620-101
R18	68K, 1/4W, 5%	P00347620-683
R19, R20	6.2K, 1/4W, 5%	P00347620-522
R21	220, 1/2W, 5%	P00347621-221
C1, C8	0.1 µF, POLYESTER, 100V	205-06102
C2	1 µF, ELECT., 25V	205-05107
C3	100 µF, ELECT., 16V	205-05106
C4, C5	0.01 µF, POLYESTER, 100V	205-06104
C6, C7	1 nF, POLYESTER, 100V	205-06103
D1	Diode, Zener, 8.2V, IN4738	334000060
Q1	Transistor, NPN	P00347001
Q2	Transistor, FET2N5461	303000072
U1	IC, NA796	205-35101
U2	IC, NA741	305000312
P1	1K TRIMPOT	205-13102
P2	10K TRIMPOT	205-13103
P3	200K TRIMPOT	205-13204
P4	2.2K TRIMPOT	205-13222
PB	6C/O MODULATION PUSHBUTTON Switch	205-82106
PB	4C/O AM/FM PUSHBUTTON Switch	205-82104
PB	2C/O INT/EXT PUSHBUTTON Switch	205-82102
PM2	12 PIN MOLEX CONNECTOR	205-51112

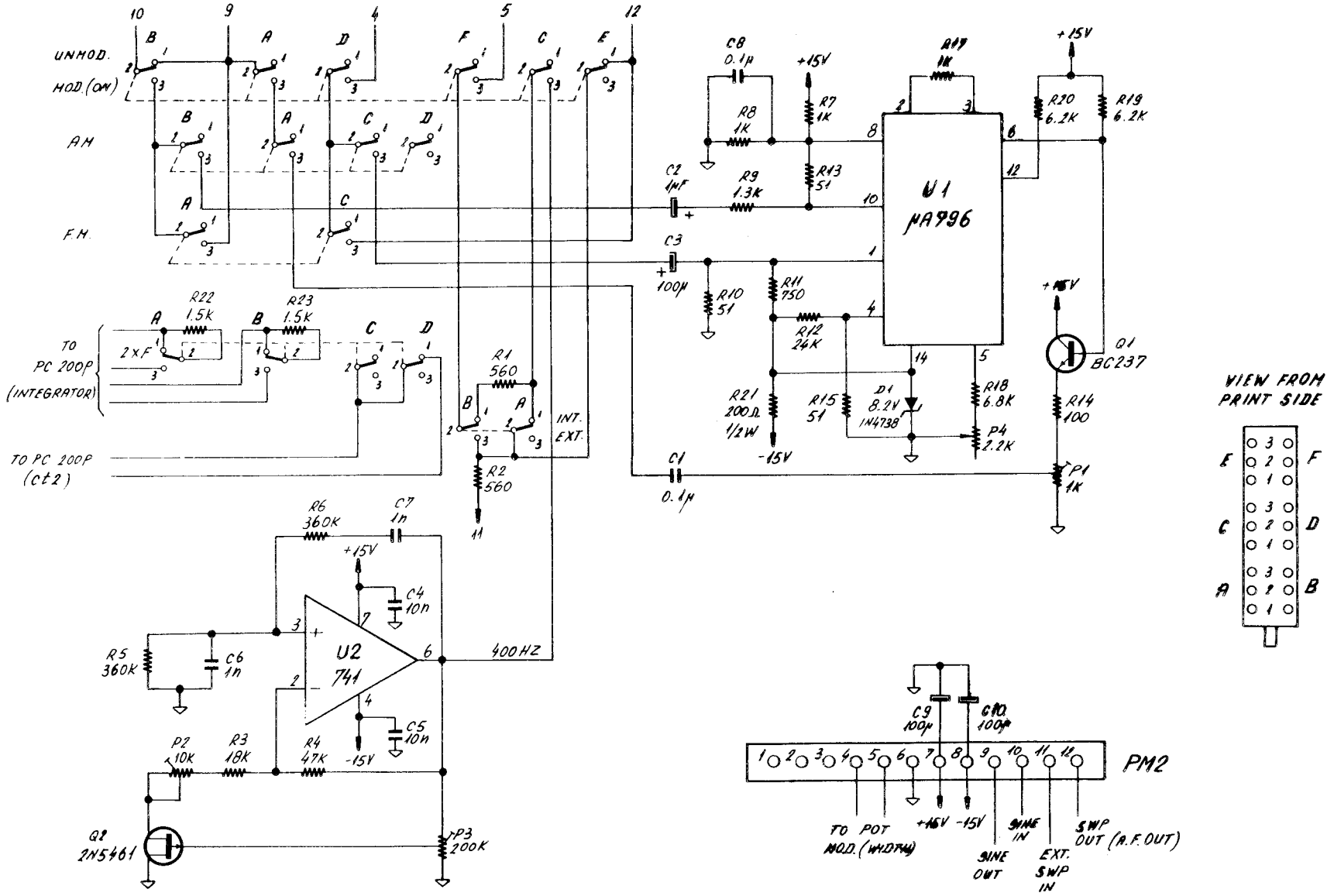


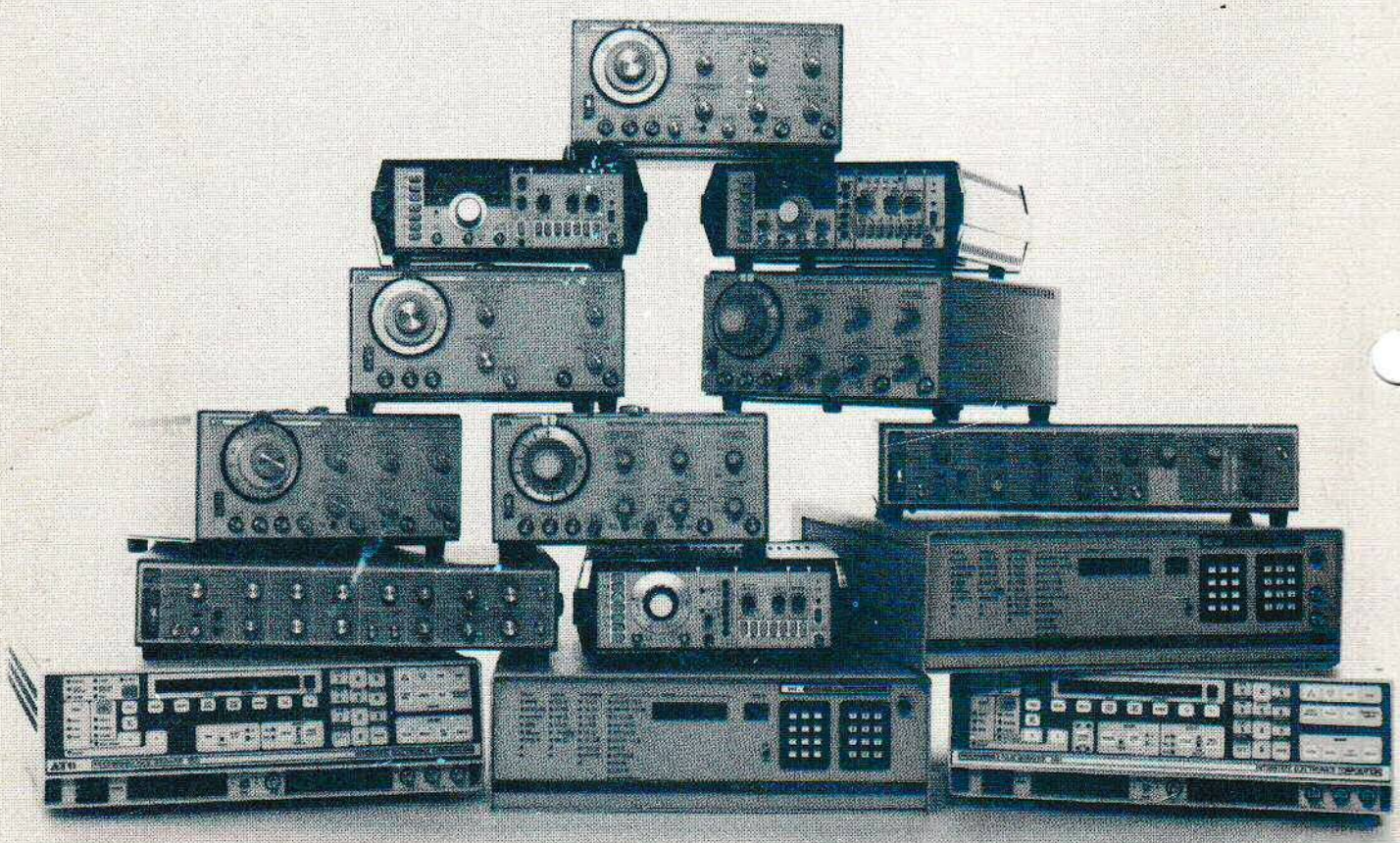
Figure 4-9. AM/FM Generator PC200MC, Schematic Diagram

Table 4-9. AM/FM Generator PC200MC, Parts List

Reference Designation	Description	IEC P/N
R1, R2	560, 1/4W, 5%	P00347620-561
R3	18K, 1/4W, 5%	P00347620-183
R4	47K, 1/4W, 5%	P00347620-473
R5, R6	360K, 1/4W, 5%	P00347620-364
R7, R8, R17	1K, 1/4W, 5%	P00347620-102
R9	1.3K, 1/4W, 5%	P00347620-132
R10, R13, R15	51, 1/4W, 5%	P00347620-510
R11	750, 1/4W, 5%	P00347620-751
R12	24K, 1/4W, 5%	P00347620-243
R14	100, 1/4W, 5%	P00347620-101
R18	6.8K, 1/4W, 5%	P00347620-682
R19, R20	6.2K, 1/4W, 5%	P00347620-622
R21	220, 1/4W, 5%	P00347620-221
R22, R23	1.5K, 1/4W, 5%	P00347620-152
C1, C8	0.1 µF, POLYESTER, 100V	206-06102
C2	1 µF, ELECT., 25V	206-05107
C3, C9, C10	100 µF, ELECT., 16V	206-05106
C4, C5	0.01 µF, POLYESTER, 100V	206-06104
C6, C7	1 µF, POLYESTER, 100V	206-06107
D1	Diode, Zener, 8.2V, IN4738	304000060
Q1	Transistor, NPN	P00347001
Q2	Transistor, FET 2N5461	303000072
U1	IC, NA796	206-35101
U2	IC, NA741	305000312
P1	1K TRIMPOT	206-13102
P2	10K TRIMPOT	206-13103
P3	200K TRIMPOT	206-13204
P4	2.2K TRIMPOT	206-13222
PB1	6C/O MODULATION "ON" PUSHBUTTON Switch	206-82106
PB2	4C/O AM PUSHBUTTON Switch	206-82104

Table 4-9. AM/FM Generator PC200MC, Parts List (Continued)

Reference Designation	Description	IEC P/N
PB3	4C/O FM PUSHBUTTON Switch	206-82104
PB4	4C/O 2xF PUSHBUTTON Switch	206-82104
PB5	2C/O INT/EXT PUSHBUTTON Switch	206-82102
PM2	12 PIN MOLEX CONNECTOR	206-51112



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