

VELONEX

INSTRUCTION MANUAL

MODEL 587

S/N 14788

*w/o isolation unit, some units require J202-D+E jumper
as well as J201-A+B*

VELONEX

OPERATING AND SERVICING MANUAL

VELONEX MODEL 587
VOLTAGE AND CURRENT SURGE GENERATOR

INCLUDING OPTIONS

IM-163

SERIAL NO. 14788

A

CLAIM FOR DAMAGE IN SHIPMENT

This instrument should be tested as soon as possible after receipt. If it fails to operate properly, or is damaged in any way, a claim should be filed with the carrier. A full report of the damage should be obtained by the claim agent and this report should be forwarded to us. We will then advise you of the disposition to be made of the equipment and arrange for repair or replacement. Include model number and serial number when referring to this instrument for any reason.

B

WARRANTY

Velonex warrants each instrument manufactured by us to be free from defects in material and workmanship. Our liability under this warranty is limited to servicing or adjusting any instrument returned to the factory for that purpose and to replace any defective parts thereof. This warranty is effective for one year after delivery to the original purchaser when the instrument is returned, transportation charges prepaid by the original purchaser, and when upon our examination, it is disclosed to our satisfaction to be defective. If the fault has been caused by misuse or abnormal conditions of operation, repairs will be billed at cost. In this case, an estimate will be submitted before the work is started.

If any fault develops, the following steps should be taken:

1. Notify us, giving full details of the difficulty and include the model number and serial number. On receipt of this information, we will give you service data or shipping instructions.
2. On receipt of shipping instructions, forward the instrument prepaid to the factory. If requested, an estimate of the charges will be made before the work begins provided the instrument is not covered by the warranty.

C

SHIPPING

All shipments of Velonex instruments should be made via Air or Truck if shipping distance is under 300 miles. The instrument(s) should be either repacked in the original shipping container or packed in a strong exterior container and surrounded by at least three inches of excelsior or similar shock-absorbing material.

D

PROPRIETARY NOTICE

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MODEL 587 SPECIFICATIONS

The Model 587 Generator without option "T" has three front-panel selectable surge outputs, namely:

- Pos: 1 (ccw.) Open Circuit Exponential Waveform 6kV, 1.2 x 50 μ S,
- Pos: 2 (mid.) Short Circuit Exponential Waveform 3kA, 8 x 20 μ S,
- Pos: 3 (cw.) Oscillatory Waveform (Ring Wave) 6kV, 100kHz.

The Model 587 Generator with option "T" has three front-panel selectable surge outputs, namely:

- Pos: 1 (ccw.) Open Circuit Exponential Waveform 6kV, 1.2 x 50 μ S,
- Pos: 2 (mid.) A waveform which under open circuit conditions provides a 6kV, 1.2 x 50 μ S exponential signal and under short circuit conditions provides a 3kA, 8 x 20 μ S exponential signal.
- Pos: 3 (cw.) Oscillatory Waveform (Ring Wave) 6kV, 100kHz.

Those features which differ depending upon the position of the Surge Selector are described separately below.

OPEN CIRCUIT EXPONENTIAL WAVEFORM

6kV, 1.2 x 50 μ S (CCW position with or without option T)

Output Voltage: (Open Circuit)	Variable by front-panel control up to 6kV maximum (peak value)
Rise Time to Peak Value: (30-90% x 1.67)	Approximately 1.2 μ S
Decay:	50 μ S to one-half peak voltage value
Repetition Rate:	Approximately 1Hz
Signal Initiation:	One Shot; Up to 1Hz maximum Non-synced; Approximately 1Hz Line synced; One exponential waveform for each 60 cycles. (50 cycles for Option F, K, Q or W) Ext. Trigger; Up to 1Hz maximum

SHORT CIRCUIT EXPONENTIAL WAVEFORM

3kA, 8 x 20 μ S (MID position without option T)

Output Current: (Short Circuit)	Variable by front-panel control up to 3kA maximum
Rise Time to Peak Value: (10-90% x 1.25)	Approximately 8 μ S
Decay:	20 μ S from pulse start to one-half peak current value

MODEL 587 SPECIFICATIONS (Cont'd)

Short Circuit Exponential Waveform (Cont'd)

Repetition Rate: Approximately 0.04Hz or one exponential waveform for every 25 seconds.

Signal Initiation: One shot; Up to 0.04Hz maximum

Non-synced; Approximately 0.04Hz

Line synced; One exponential waveform for each 1500 cycles, (1250 cycles for Option F, K, Q or W). Available with Option B only.

Ext. Trigger; Up to 0.04Hz maximum.

CONTINUOUS DUAL WAVE (MID position with option T only)

With the selector switch in the MID position, with option T, when operating into an open-circuit or a short-circuit, the waveforms will provide the respective outputs shown above. When operating into any other impedance, the waveform is undefined but will generally lie between the two sets of values given above. When returning to open or short circuit conditions the waveforms will return to the values shown. (i.e. the output signal is two directional from Hi Z to Lo Z or vice versa). The repetition rate for the Continuous Dual Mode operations is approximately 0.04 Hz or one exponential waveform for every 25 seconds. Signal initiation is the same as shown for the MID position without option T.

CONTINUOUS DUAL WAVE (with option T only)

	<u>Open Circuit</u>	<u>Short Circuit</u>
Output Voltage:	Variable by front-panel control up to 6kV maximum (peak value)	-
Output Current:	-	Variable by front-panel control up to 3kA maximum
Rise Time to Peak Value: (30-90% x 1.67)	Approximately 1.2 microseconds	-
Rise Time to Peak Value: (10-90% x 1.25)	-	Approximately 8 microseconds
Decay:	50 microseconds to one-half peak voltage value	20 microseconds from pulse start to one-half peak current value
Repetition Rate:	Approximately 0.04Hz or one exponential waveform for every 25 seconds.	
Signal Initiation:	One Shot; Up to 0.04Hz maximum	

MODEL 587 SPECIFICATIONS (Cont'd)

Continuous Dual Wave (with option T only) Cont'd

Non-synced; Approximately 0.04Hz

Line Synced; One exponential waveform for each 1500 cycles, (1250 cycles for Option F, K, Q or W). Available with Option B only.

Ext. Trigger; Up to 0.04Hz maximum.

OSCILLATORY WAVEFORM (RING WAVE)

6kV, 100 kHz (CW position with or without option T)

Output Voltage: (Open Circuit)	Variable by front-panel control up to 6kV maximum (crest value of the first half cycle peak)
Oscillatory Frequency:	100kHz nominal
Rise Time to Crest Voltage: (10-90%)	Approximately 0.5 μ S
Decay:	Each peak 60% of preceding peak
Repetition Rate:	Approximately 1Hz
Signal Initiation:	One shot; Up to 1Hz maximum Non-synced; Approximately 1Hz Line synced; One oscillatory waveform for each 60 cycles. (50 cycles for Option F, K, Q or W) External Trigger; Up to 1Hz maximum

THE FOLLOWING SPECIFICATIONS ARE COMMON TO ALL SETTINGS OF THE
SURGE SELECTOR

Ext. Trigger Input: 2.5 volts to 10 volts peak, 0.05 μ S width minimum, positive polarity. Repetition rate up to 1Hz or 0.04Hz maximum depending on Surge Selector position. Automatic frequency limit is provided.

Output Isolation: Output circuitry is isolated from ground. One side of output should always be strapped to chassis ground, except when connected to AC power line. When floating, and when connected to an isolation network V-2734 or equivalent, output may be directly applied to any DC or 47 to 63Hz power line voltage up to 277V RMS AC (480V RMS with Option P) or \pm 50V DC**. Observe caution notes on pages 16 and 17. An isolation network V-2734, or equivalent should always be used when connecting to active power lines.

Shielding: Surge signals are shielded to prevent unwanted radiation or conduction of signal.

Voltage Monitor Output: A low-level ground referenced 1000:1 attenuated output is provided for scope monitoring (when output return is grounded).

Current Monitor Output: 10 A/volt (For use with an external oscilloscope.)
Available only with Option D.

Phase Adjust: Front panel adjustment allows $>180^\circ$ phase variation between 50 or 60 Hz power line and surge signal in 6kV, 1.2x50 μ S and 6kV, 100kHz positions. For 3kA, 8x20 μ S and Continuous Dual Wave, Option "T" position, available with Option B only.

Note: When synchronized with the power line, one oscillatory waveform will occur for each 60 cycles (50 cycles for the F, K, Q or W options) of the power line frequency. The maximum repetition rate of exponential voltage and current waveform are approximately 1Hz and 0.04Hz, respectively. With Option "B" these signals may be internally synchronized with the power line. When using Option "B" and when synchronized, one exponential voltage waveform will occur as described above for the oscillatory waveform, and one exponential current waveform will occur for each 1500 cycles of the 60Hz power line frequency (or when operating with Options F, K, Q or W, one exponential current waveform will occur for each 1250 cycles of the 50Hz power frequency).

*480V RMS with Option "P" only.

**For DC Option D is required on V-2734 Isolation Unit.

MODEL 587 SPECIFICATIONS (Cont'd)

Polarity: Plus or minus depending on which end of floating output is connected to chassis ground.

Scope Output: A ground isolated front panel scope trigger output signal is provided.

Metering: A front panel digital voltmeter indicates approximately peak output voltage.

Ready to Test Indicator: A front panel green indicator light advises the operator when the unit is ready for test. This light flashes automatically when the signal is initiated by internal or external electrical trigger; and in the "one shot" mode, indicates when the trigger button may be pushed

High Voltage Protection: Two push-buttons (located on opposite sides of the instrument) must be simultaneously pressed in order to obtain high voltage output.

Input: 115V \pm 10%, 60Hz, 150 watts, Output is regulated to minimize effects of input line variations.
For 230V \pm 10%, 50Hz, (Model 587-F)
For 115/230V 10%, 60Hz, (Model 587-G)
For 100V \pm 10%, 60Hz, (Model 587-J)
For 115V \pm 10%, 50Hz, (Model 587-K)
For 230V \pm 10%, 60Hz, (Model 587-N)
For 100V \pm 10%, 50Hz, (Model 587-Q)
For 200V \pm 10%, 50Hz, (Model 587-W)

Mechanical: Housed in a cabinet 19-3/4"W x 13"H x 21-1/2"D. Standard 19" rack mounting is also available--specify Model 587-R.

Weight: Approximately 100 lbs (cabinet model)

Accessory Available: Isolation Network V-2734, 20A RMS max line current. (See V-2734 specification). When using V-2734 with Option E (to provide adequate isolation in the 6kV 1.2x50 μ S high impedance mode), Option E should also be employed in the Model 587 to automatically switch the isolation unit when the generator is in the high impedance mode. When ordering Model 587 with Option T, Option E is not needed.

Surge Selector Switch Position	E_P Open Circuit	I_P Short Circuit	T_R	T_{Delay} to 1/2 Peak Nominal
CCW	$\geq 6kV$	—	1.2 μS Open Circuit	50 μS Open Circuit
MIDDLE (without Option "T")	$\geq 6kV$	$\geq 3kA$	8 μS Short Circuit	20 μS Short Circuit
CW	$\geq 6kV$ Osc.	*500A	0.5 μS Open Circuit	Each Peak 60% of Preceding Peak Open Circuit
MIDDLE (with Option "T")	$\geq 6kV$	$\geq 3kA$	1.2 μS Open Circuit 8 μS short Circuit	50 μS Open Circuit 20 μS Short Circuit

**with Option C, this current may be limited to approximately 200A peak or 500A peak (by front panel selector).

OUTPUT E_P OR I_P AND T_R AND T_D FOR SURGE SELECTOR POSITIONS

Table 1

WARNING

The Model 587 Voltage and Current Surge Generator contains voltages which could be dangerous if contacted. All reasonable safety precautions have been taken in the design and manufacture of this instrument. DO NOT attempt to defeat the protection provided.

Power should be removed and high voltage capacitors should be discharged prior to any maintenance work.

Only recommended replacement parts should be used.

The Model 587 should be operated and maintained only by personnel qualified to work with high voltage equipment.

SECTION I

GENERAL DESCRIPTION

1.1 Introduction

The Model 587 Voltage and Current Surge Generator provides the waveshapes and characteristics to meet and exceed those required by the IEEE Standard 587-1980, IEEE Guide for Surge Voltages in Low-Voltage AC Power Circuits.

1.2 Damage in Transit

After unpacking this instrument, if any shipping damage is discovered, follow the procedure outlined in the "Claim for Damage in Shipment" in Section A of this Manual.

1.3 Power Cable

The three-conductor power cable of this instrument is terminated in a polarized three-prong male connector. The third contact grounds the instrument chassis when used with the appropriate receptacle.

To use this connector in a two-contact receptacle, a three-prong to two-prong adaptor should be used. The ground connection emerges from the adaptor as a short lead which must be connected to a suitable ground for the protection of operating personnel.

SECTION II

OPERATING INSTRUCTIONS

2.1 Controls and Terminals

1. Meter

The digital panel meter (DPM) indicates the approximate open-circuit peak voltage output provided the "ready to test" light is illuminated. This is intended primarily for reference purposes and is not to be used for accurate adjustments.

2. Power Push-Button

The power push-button is the main power switch which controls all voltages to the unit.

3. HV Push-Buttons

For safety, two push-buttons (located on opposite sides of the instrument) must be simultaneously depressed in order to obtain high voltage output. The high voltage may be turned off by depressing either (one-only) of the HV push-buttons.

4. Pulse Selector Switch

The surge selector switch allows selection of three defined waveforms as shown in Table 1, page 7.

CAUTION: Never operate the surge selector switch with the HV on, or until the HV has been off for at least 10 seconds.

5. One Shot Push-Button

The push-button will produce a single voltage or current surge.

CAUTION: Do not depress the "one shot" button until the "Ready to Test" light is illuminated.

SECTION 11 - OPERATING INSTRUCTIONS (Cont'd)

2.1 Controls and Terminals (Cont'd)

6. External Trigger Input

A front panel BNC connector for external input is employed to apply an external trigger to the internal generator. The input impedance at the external input terminal is approximately 600Ω . Maximum surge repetition frequency is one shot every 25 seconds in the 3kA, 8/20 μ S mode or in the Continuous Dual Mode (with Option "T") and 1Hz in the 6kV, 1.2/50 μ S and 6kV, 100kHz mode. Input trigger requirement is 2.5 volts to 10 volts peak, 0.5 μ S width minimum, positive polarity. When the maximum frequency of 1Hz is exceeded, the output of the generator will turn off. When the maximum frequency of 0.04Hz is exceeded, the output current may be greatly reduced and the "Ready to Test" indicator may not be meaningful.

CAUTION: It is not recommended to operate the generator at frequencies above 0.04Hz when in the 3kA, 8/20 μ S mode, or Continuous Dual Mode (with Option "T").

7. Scope Trigger Output Terminal

A scope trigger is obtained by connecting to a front panel BNC connector which provides the trigger pulse for scope synchronizing purposes. This trigger is of positive polarity and approximately 5 volts. A scope trigger is present whenever the power switch is on and an external trigger is fed to the generator, or the one shot button is actuated, or the mode switch is in the non-synced or line-synced mode. The scope output BNC is isolated from chassis ground.

CAUTION: Maximum voltage between BNC ground and chassis ground must not exceed 25V.

8. Voltage Monitor Output Terminal

A front panel BNC connector provides an output voltage attenuated by 1,000 with an accuracy of $\pm 3\%$ (with an open-circuit output) when connected to an impedance greater than 2,000 ohms. This signal is referenced to chassis ground provided the output is not floating. When connecting the attenuator to a low impedance (such as a terminated cable) a correction factor should be made for the attenuation ratio.

SECTION II - OPERATING INSTRUCTIONS (Cont'd)

2.1 Controls and Terminals (Cont'd)

9. Current Monitor Output Terminal (With Option D Only)

A floating front panel BNC connector provides an output voltage of 1V/10A of output pulse when connected to an impedance greater than 2,000 ohms. This signal is not referenced to chassis ground. When connecting the output to a 50 Ω impedance (such as a terminated cable) a correction factor of approximately 2X should be made.

10. Phase Adjust

A front panel control allows $>180^\circ$ phase variation between 50 or 60 Hz power line and surge signal in 6kV, 1.2x50 μ S and 6kV, 100kHz positions. For 3kA, 8x20 μ S position, or Continuous Dual Mode with Option "T", this feature is available with Option "B" only.

Note: When synchronized with the power line, one oscillatory waveform will occur for each 60 cycles (50 cycles for the F, K, Q or W options) of the power line frequency. The maximum repetition rate of exponential voltage and current waveform are approximately 1Hz and 0.04Hz, respectively. With Option "B" these signals may be internally synchronized with the power line. When using Option "B" and when synchronized, one exponential voltage waveform will occur as described above for the oscillatory waveform, and one exponential current waveform will occur for each 1500 cycles of the 60Hz power line frequency (or when operating with Options F, K, Q or W one exponential current waveform will occur for each 1250 cycles of the 50Hz power frequency).

SECTION 11 - OPERATING INSTRUCTIONS (Cont'd)

2.1 Controls and Terminals (Cont'd)

11. Output Connector

Two binding-post-type connectors are employed and mounted in a recessed cavity. An HV interlocked and hinged plastic cover is supplied for safety. The output is color coded. Red is output "high" and white is output "low". Between output "high" and output "low" is a chassis-ground binding post. One side of the output circuit should always be tied to chassis ground depending on output polarity desired, unless the signal is being floated on the power line. For positive output, ground "low" (white) connector for negative output, ground "high" (red) connector.

CAUTION: Extremely high voltage appears on these terminals.

12. Output HV Interlock

As a safety feature, the Model 587 incorporates active output interlock circuitry. To allow the HV to be turned on, pins "A" and "B" of output connector J 201, located on the rear of the Model 587, must be shorted. If pins "A" and "B" are disconnected, the HV will shut down. This connector may be used to interconnect the generator with an isolation unit and/or other user circuitry.

CAUTION: Activating the output interlock circuitry with the HV on may trigger a single output voltage surge.

When employing a Model V-2734 Isolation Unit, Pins A in each unit should be connected together as should Pins B. The V-2734 will automatically provide the "short" when the V-2734 is turned on. Obviously Pins A and B on the connector should not be shorted when operating in this mode. When employing Option E, it is also necessary to connect Pin C to Pin C and Pin D to Pin D between the J 201 connectors of the Model 587 and the Model V-2734.

SECTION II - OPERATING INSTRUCTIONS (Cont'd)

13. Output Ground Strap

Normally, the output "high" or the output "low" is grounded through a metal grounding strap between either output "high" or output "low" and chassis ground. *The voltage and current surge generator may be used to feed the output signal referenced to a system ground with the strap in place. For normal (transverse) mode tests, the ground-strap must be disconnected. When floating and when connected to an Isolation Network V-2734, or equivalent, output may be directly applied to any DC or 47 to 63 Hz power line voltage up to 277V RMS AC (480V RMS with Option P) or $\pm 50V$ DC.**

For safety, the metal grounding strap should always be connected, except when the instrument is being used in the output floating mode. In the output floating mode, a suitable impedance from output "low" or output "high," depending on polarity, to chassis ground should be connected.

14. Fuses

Two fuses are employed for instrument protection. They are easily accessible on the back of the instrument. A 2 1/2 amp *** Slo-Blo fuse F201 protects the entire unit, and a 2 amp Slo-Blo fuse F202 protects the HV DC power supply. Should either of these fuses blow, after removing the cause of the failure, replace the same type fuse as in the original equipment.

15. A rear panel mounted recessed screw driver operated switch allows the selection of 115V or 230V line operation. Disconnect power from model 587 before operating switch.

CAUTION: Damage to the Model 587 Voltage and Current Generator may result if connected to active power lines without employing a suitable Line Isolation Unit (such as the Velonex Model V-2734 or equivalent).

**For DC Option D is required on V-2734 Isolation Unit.

***1 1/4 amp Slo-Blo for Model 587-F

SECTION II - OPERATING INSTRUCTIONS (Cont'd)

16. Ready to Test Indicator and Output:

The Ready to Test Indicator is located on the front panel. It will illuminate at a predetermined time after each trigger. In the 1.2 x 50 μ S or the 6 kV 100 kHz mode it will illuminate in 1 second. In the 80 x 20 μ S mode it will illuminate approximately 25 seconds after each trigger.

The Ready to Test Output on plus A and B of J202 on the rear panel is coincident with the Ready to Test Indicator. The output signal is TTL compatible with Pin A the signal and Pin B ground.

2.2 Initial Turn On

1. Plug the AC power cord into a *115V $\pm 10\%$, 60Hz only source.
2. Connect scope trigger to the external trigger of an oscilloscope.
3. Connect the output voltage or current monitor to an oscilloscope input. (Output current monitor with option D only).
4. Depress power push button.
5. Set mode switch to desired trigger mode.
6. Set the surge selector switch to desired waveform.
7. Select surge polarity for positive or negative output by connecting either the output "high" or the output "low" to chassis ground.
8. Set output amplitude control to desired output.
9. Close output cavity plastic cover to activate HV interlock.
10. Connect pins "A" and "B" of rear panel MS type connector J 201, only when the Model 587 is not connected to Isolation Unit V-2734, to activate HV interlock.
11. With no load connected to the output, except when surge selector switch is in the 3kA, 8 x 20 μ S position, simultaneously depress both HV-ON buttons.

CAUTION: DO NOT CONTACT THE CONDUCTOR OF EITHER OUTPUT TERMINAL.

12. The output DPM and scope presentations should appear.
13. Push One Shot button to initiate an output voltage surge or trigger external, unless mode switch is in the non-synced or line synced position.
14. To turn the instrument to standby, depress either (not both) HV-ON buttons.
15. To turn all power off, depress the Power button.

CAUTION: Always turn off high voltage when changing the surge selector or polarity. After turning off the HV, wait at least 10 seconds before operating the surge selector switch. When operating the mode switch with the HV on, an undesired surge may be triggered.

*230V $\pm 10\%$, 50 Hz only for Model 587-F
100V $\pm 10\%$, 60 Hz only for Model 587-J
115V $\pm 10\%$, 50 Hz only for Model 587-K
230V $\pm 10\%$, 60 Hz only for Model 587-N
100V $\pm 10\%$, 50 Hz only for Model 587-Q
200V $\pm 10\%$, 50 Hz only for Model 587-W
115V/230V $\pm 10\%$, 60 Hz only for Model 587-G

SECTION II - OPERATING INSTRUCTIONS (Cont'd)

2.2 Initial Turn on (Cont'd)

16. When using a Model V-2734 and a Model 587, connect rear interlock (Connector J 201), Pins A to A and Pins B to B between the V-2734 Isolation Unit and the Velonex Model 587 Surge Generator. If not using a Model V-2734, contacts A and B on J 201 must be connected together to obtain output. This is to provide a means to turn off the high voltage remotely if required.

17. When using Option E, on the Models 587 and V-2734, Pins C to C and Pins D to D must also be connected between the V-2734 and Model 587.

SECTION II - OPERATING INSTRUCTIONS (Cont'd)

2.3 Set-Up Procedure

Various interfacing equipment may be required during surge testing. Make certain that required isolation or other interfacing equipment is installed.** Never connect Model 587 Surge Generator to active power lines without employing a suitable Line Isolation Unit (such as the Velonex Model V-2734 or equivalent).

1. The output "low" or the output "high" terminal should be either tied to Model 587 chassis ground or to a point with less than *277V AC or $\pm 50V$ DC maximum off ground. The "low" (white) terminal end should be connected to the power line when floating equipment.
2. Connect the output terminals (through appropriate interfacing equipment, if required) to the unit under test.
3. Set the mode and surge selectors to desired positions.
4. Connect an oscilloscope to scope trigger and voltage or current monitor output terminals. Current monitor output is available only with Option D.
5. Turn power switch on, then high voltage on by simultaneously pressing the two HV-ON buttons.
6. Turn signal (HV) off by depressing either (not both) HV-ON power buttons.

CAUTION: Always turn HV off first before depressing the power off button. If the power off button is depressed with the HV-ON, a voltage or current surge may be triggered.

2.4 Additional CAUTION Notices

1. In order to prolong the life of the components within the Model 587 Voltage and Current Surge Generator, it is recommended that the high voltage be turned off when the instrument is not in use. It is also recommended that the instrument not be left operating with a continuous trigger of the output surges when the surges are not required.

* ≤ 480 V AC with Option "P".

** See Page 13 for CAUTION NOTE.

SECTION II - OPERATING INSTRUCTIONS (Cont'd)

2.4 Additional CAUTION Notices (Cont'd)

2. In most cases, the maximum short circuit current and the maximum open circuit voltage which can be obtained from the Model 587 exceeds those required to meet specifications. This is provided to compensate for possible losses in interfacing other equipment. Therefore, the user is cautioned to adjust the output voltage control so as to not exceed the desired values.
3. When the Model 587 is supplied as a cabinet-mounted instrument, safety interlocks are employed. If the instrument should be removed from the cabinet for intended use in an instrument rack, it is necessary to provide a protective lower cover with proper openings for air flow and also to interlock this cover (also the interlock on the rear of the instrument may then be removed if desired). If the instrument is to be operated outside of the cabinet, the Velonex factory should be contacted for a modification kit or information.
4. To maximize instrument life, operation in the "3kA, 8 X 20 μ S" mode should not be made into an open circuit or high impedance, except with Option "T".
5. This instrument relies upon air-convection to provide proper internal cooling. The air flow should never be restricted in any way.
6. When operating in the "Short Circuit Exponential Waveform, 3kA 8x20 μ S" mode, or with the Continuous Dual Mode with Option "T", special care must be taken to make certain that the red and white output terminals are very tightly screwed down on any inter-connecting wires. Since there can be extremely high peak currents flowing through these connections, any looseness in the connections can cause arcing and burn the connectors.
7. Maximum voltage between BNC ground and chassis ground must not exceed 25V.

SECTION II - OPERATING INSTRUCTIONS (Cont'd)

2.4 Additional CAUTION Notices (Cont'd)

7. Never connect Model 587 Surge Generator to active power lines without employing a suitable Line Isolation Unit (such as the Velonex Model V-2734).

CIRCUIT DESCRIPTION3.1 General

The Model 587 employs circuits to determine surge width, rise and decay times and amplitude for three precisely defined output waveshapes per the applicable IEEE specifications. These waveshapes can be selected by front panel control. Positive or negative polarity can be chosen by grounding either the "high" or "low" output terminal. The Model 587 is of all solid state design. Figures 6-1, 6-2, and 6-3 are block diagrams, and Figures 6-4, 6-5, 6-6, and 6-7 are schematic diagrams of the Model 587 Generator. The pulse switching and pulse forming portions (for both the exponential and ring-wave signals) of this generator are not intended to be serviced in the field. Therefore, schematic diagrams of these portions of the circuitry are not included. If any problem arises in these parts of the unit, please contact the Velonex factory.

3.2 Control Circuits

The following power control circuitry is employed in the Model 587:

- a) Power-on circuit. When power switch S 101 closes, transformers T 501 and T 502 are energized. The secondary windings of transformer T 502 supply power to the "Power" lights I 101 and I 102 and the 24V DC power supply CR 902, R 901 and C 902 to operate relays K 301, 302 and 303. The secondary windings of transformer T 501 provide power to the low-level logic circuitry through rectifier bridge CR 308. Primary power is also supplied to capacitor C 501, through diode CR 501 and resistor R 501, and to power supply module P-26* to operate the digital panel meter M 101.
- b) High-voltage-on circuitry. When "HV-ON" momentary switches S 102 and S 103 are both simultaneously actuated, terminal 13 of K 501 and terminal 4 of K 502 connect through S 102, S 103, and contacts 2 and 10 of K 501 to obtain DC voltage from C 501. Both relays latch through contacts 7 and 11 of K 501 and contacts 9 and 10 of K 502. When the high voltage is on and switch S 102 or S 103 is actuated, capacitor C 504 is connected across relay coil of K 502 momentarily causing a greater than normal voltage drop across resistor R 503. This action unlatches

*P-27 on Model 587-P

SECTION III - CIRCUIT DESCRIPTION (Cont'd)

3.2 Control Circuits (Cont'd)

K 501 and K 502, thereby turning the high voltage off. Resistor R 504 and switch S 103 keep C 504 discharged for fast HV turn-off response. Contacts 5 and 9 of K 501 disconnect C 504 during HV turn-on for faster latching response of K 502. With the control circuit in the HV-ON mode, main power for the HV power supply is provided through contacts 7, 11 and 8, 12 of K 501. Contacts 6 and 7 of K 502 close the circuit path to light the "HV-ON" indicators I 103 and I 104.

3.3 Output HV Interlock Circuit

The output HV interlock circuit consists of a 24V DC power supply and relay K 601. Transformer T 601, bridge rectifier CR 601, capacitor C 601 and resistors R 601 and R 602 are parts used in the power supply assembly. The output HV interlock switch S 105 is mounted on the output cavity and actuated when the hinged plastic cover is opened. A connector J 201 on the rear of the unit provides for remote output HV interlock control. Contacts A and B must be shorted directly or through auxiliary equipment to obtain HV and output. An open between contacts A and B will prevent the HV and output from being present.

3.4 Power Supplies

The Model 587 uses eight (nine with Option "C") different DC power supplies, as follows:

- a) 120V power supply for power-control-relay circuitry. This power supply is an unregulated, positive 120V DC source utilizing CR 501, R 501, C 501, and R 502.
- b) 12V power supply for low level drive circuits. This power supply is a regulated positive twelve volt DC source containing IC regulator Z 308 and associated components CR 308, R 320, C 313, and capacitor C 310.

SECTION III - CIRCUIT DESCRIPTION (Cont'd)

3.4 Power Supplies (Cont'd)

- c) 5V power supply for PRF and pulse width generator and low level drive circuits. This power supply is a regulated positive five volt DC source using IC regulator Z 307 and C 309.
- d) A 28V DC power supply for ready to test indicator timing circuit. This power supply consists of T 801, CR 804, R 801 and C 805.
- e) A 24V DC power supply for relays K 301, K 302, K 303 and K 1001. This power supply consists of CR 902, R 901 and C 902.
- f) A 5V DC power supply module P-26* to power DPM M101. This power supply is actively regulated and supplies 5V DC.
- g) A 24V DC power supply for output HV interlock circuit. This power supply consists of T 601, CR 601, K 601, C 601 and R 602. This power supply actuates K 601.
- h) A 26.5V DC power supply to actuate HV capacitance discharge relay K 1101. This power supply consists of CR 1101, R 1101 and C 1101.
- i) A 26.5V DC power supply to actuate surge output relay K 201 with Option "C" only. This power supply consists of T 1201, CR 1201, R 1201 and C 1201.

3.5 Frequency Oscillator, Pulse Width and Drive Circuits

The dual-frequency oscillator consists of integrated circuit Z 301, operating as a free-running oscillator. The frequency of oscillation is determined by R 301, R 302, R 303 and C 301. K 301 selects the frequency in accordance with the surge selector setting. In the "ONE SHOT", "LINE SYNC" and EXTERNAL TRIGGER positions, oscillator Z 301 is not used. An input from the dual frequency oscillator, the one-shot, line sync or the external trigger circuitry is fed to fixed-pulse-width one-shot multivibrators Z 302 and Z 304. The approximately 10 μ s pulse width of Z 302 is determined by resistor R 309 and capacitor C 304. Z 302

*P-27 on Model 587-F

SECTION III - CIRCUIT DESCRIPTION (Cont'd)

3.5 Frequency Oscillator, Pulse Width and Drive Circuits (Cont'd)

and Z 304 both differentiate the input and trigger on the negative-going slope. The positive-going output of Z 302 is connected to the input of gate Z 303. The output of Z 303 is connected to a pulse amplifier consisting of Q 301, Q 302 and Q 303. Emitter follower Q 301 provides the proper signal to drive the SCR switch.

3.6 Scope Trigger Output

The scope trigger output is derived from blocking oscillator Q 304 which is derived from the output signal of Z 304.

The integrated circuitry is supplied with power from a 5V integrated circuit regulated power source.

The amplifier Q 301, Q 302, Q 303, and the blocking oscillator Q 304 derive their collector potential of 12 volts DC from a 12V integrated circuit regulated power source.

3.7 Frequency Limiter, External Trigger Circuits

The frequency limiter and the external trigger circuits consist of buffer, inverter, transistor Q 305, one-shot integrated circuit Z 309 and buffer, inverter Z 303. The frequency limiter is fixed and designed to turn the output of the Model 587 off when the external trigger frequency exceeds 1Hz. The timing elements are R 344 and C 328. When the surge selector switch S 401E is in the 3kA, 8x20 μ S position and the external trigger frequency exceeds 0.04Hz, no damage to the generator will occur. However, greatly reduced output may occur and the "Ready to Test" indicator may not be meaningful.

CAUTION: It is not recommended to operate the generator at frequencies above 0.04Hz when in the 3kA, 8x20 μ S mode.

3.8 Line Sync Trigger Circuits

An AC signal is derived from the 50 or 60Hz power line and rectified. Depending on the surge selector setting, the 50 or 60Hz line frequency is divided down by a ratio of 50:1 or 60:1 respectively to obtain a 1Hz synced to line trigger signal. The divide by 50/60 integrated circuit Z 306 is connected through pin 7 to either +12V DC or ground for proper line frequency. On standard units, relay K 303 interrupts line sync operation in

SECTION III - CIRCUIT DESCRIPTION (Cont'd)

3.8 Line Sync Trigger Circuits (cont'd)

the "3kA 8 x 20 μ S" surge selector setting. With Option "B" line sync operation is available in all settings of the surge selector. With surge selector in the "3kA, 8 x20 μ S" position, K 303 is deenergized and the output of integrated circuit Z 306 is redirected to Z 310, Z 311 and Z 305. The total count-down is 1500:1 for 60Hz power line frequency or 1250:1 for 50Hz power line frequency. Z 305, in connection with timing components capacitor C 314 and variable resistance R 333, provides the desired phase relationship of the output surge with reference to the power line when the mode switch is in the line sync position.

3.9 Ready to Test Indicator Timing Circuit

When the high voltage is turned on, T 801 is energized. A positive unfiltered signal from CR 804 is fed through diode CR 801 to input gate of integrated circuit Z 801. The negative output of Z 801 is fed to the input gate of Z 802 Pin 2. This negative input to Pin 2 starts the timing cycle. For a predetermined time period, IC Z 802 produces a positive pulse on Pin 3. This pulse is fed to transistor Q 802 to turn the device on. This removes base drive supplied through resistor R 803 and turns Q 801 off. With Q 801 off, indicator lights I 105 and I 106 are also turned off. The "on time" of Z 802 is set by C 807 and adjustable potentiometer R 804 for 1Hz (in the "6kV, 1.2x50 μ S" and "6kV, 100kHz" positions) and by adjustable potentiometer R 806 for 0.04Hz (in the "3kA, 8x20 μ S" position). The surge selector switch actuates relay K 801 to select the proper timing. When an output surge is initiated, regardless of the trigger mode setting, the corresponding low-level output from the internal pulse generator is fed to the input gates Pins 1, 2, 4 and 5 of Z 801. A negative output of Pin 6 is also fed to Pin 2 of Z 802. The timing function of Z 802 and pulse propagation through Q 802 and Q 801, actuating the ready to test indicator lights I 105 and I 106 is the same as described above and identical

SECTION III - CIRCUIT DESCRIPTION (Cont'd)

3.9 Ready to Test Indicator Timing Circuit (Cont'd)

regardless of which input gate structure of Z 801 is addressed. The only purpose of the input signal at pins 9, 10, 12 and 13 is to synchronize the indicator lights with the output of the internal pulse generator during initial HV turn-on, and to prevent the indicator lights from turning on before the discharge caps are fully charged.

3.10 Switch and Shaping Circuits

These are not shown. Please see explanation in section 3.1.

SECTION IV

MAINTENANCE

4.1 General

Before attempting to troubleshoot or service this instrument, completely study and understand the circuit description of Section III.

4.2 Cooling

The Model 587 utilizes convection cooling; therefore, all vents in the rear of the cabinet must be clear of obstructions. In rack-mounted units it is also necessary to avoid blockage of the required airflow.

4.3 Cabinet Removal (Not Applicable for Rack-Mounted Units)

To remove the instrument from its cabinet, remove the eight screws from the front panel (four on each side), and the four screws (two on each side) holding the rear mounting brackets to the chassis, and slide the instrument forward clear of the cabinet.

4.4 Top Cover Removal

To remove top cover, remove the eighteen flat head screws. Removal of the top cover opens interlock switch S 202.

4.5 Bottom Cover Removal

To remove bottom cover, remove the eighteen flat head screws. Removal of the bottom cover opens interlock switch S 201.

4.6 Cleaning

Periodically inspect the instrument for dust accumulation. If necessary, clean by use of a vacuum cleaner or by blowing out dust using air under moderate pressure.

4.7 Pilot Lights

Incandescent panel lights are used to indicate POWER, and HV-ON. Panel lamps for these indicators are replaceable from the front panel by snapping out the translucent cover from each switch. Twenty-eight

SECTION IV - MAINTENANCE (Cont'd)

4.7 Pilot Lights (Cont'd)

volt, number 327, lamp bulbs are used. In order to provide an additional safety measure, two lamps are connected in parallel in each indicator. Therefore, if any indicator light becomes dim (due to lamp burn-out) the burned out lamp should be replaced. This should prevent the possibility of having the high voltage on in the absence of the red indicator lights. Panel lamp replacement may be facilitated by the use of a lamp replacing tool (such as a Microswitch, type 15PA19 tool).

4.8 Fuses

Two fuses are employed for instrument protection. They are easily accessible on the back of the instrument. A 2.5 amp* Slo-Blo fuse protects the entire unit, and a 2 amp* Slo-Blo fuse protects the HV DC power supply. Should either of these fuses blow, after removing the cause of the failure, replace with the same type fuse as in the original equipment.

4.9 Digital Panel Meter Adjust

3kA, 8x20 μ S Surge Selector Setting (or Continuous Dual Mode with Option T

Connect "low" output terminal to chassis ground; with no load connected to output terminals, measure output surge amplitude using an HV probe and oscilloscope or built-in output attenuator. Using the amplitude control, set output to 6kV using a non-metallic screw driver. Adjust internal "trim-potentiometer" R 1004 to 6.00kV on the DPM. It is not recommended to operate the Model 587 in this mode into an open circuit except for the short time required to set R 1004.

6kV, 1.2x50 μ S Surge Selector Setting;

Connect "low" output terminal to chassis ground and with no load connected to output terminals, measure output surge amplitude using an HV probe and oscilloscope or built-in output attenuator. Using the amplitude control, set output to 6kV. Adjust internal trim-potentiometer R 1005 with a non-metallic screw driver to 6.00kV.

* 1 1/4 amp Slo-Blow and 1 amp Slo-Blo for Model 587-F, 587-N and 587-W.

SECTION IV - MAINTENANCE (Cont'd)

4.10 Ready to Test Light Timing Adjust

Operate the Model 587 in the one-shot mode. Check and adjust the time it takes for the "Ready to Test" indicator light to come on after firing.

If adjustment is necessary, proceed as follows:

Set surge selector switch to 6kV, 1.2/50 μ S position with no output load.

Adjust trim potentiometer R 807 until the timing to turn on indicator light is 0.8 seconds.

Set surge selector switch to 3kA, 8/20 μ S position output short circuited. Adjust trim potentiometer R 809 for 20 second timing to turn on indicator light.

4.11 Interlocks

Three interlocks are provided for safety, one on each of the chassis top and bottom covers, and one on the plastic door covering the output terminal cavity.

4.12 Instrument Failure

By carefully observing the symptoms and by referring to the schematic diagrams, most troubles can be pinpointed quickly to a particular circuit. Significant voltages and waveforms are shown on the diagrams. Voltage readings are given for the conditions described on the diagram.

SECTION V

VELONEX REPLACEMENT PARTS LIST

Table 2 lists the replaceable parts used in the Model 587. Circuit reference designations, where applicable, refer to the schematic diagrams in Section VI. Replacement parts should be ordered by specifying the entire VELONEX part number.

TABLE 2

RESISTORS

(RESISTORS ARE FIXED, COMPOSITION, 1/4 WATT,
±5%, IN OHMS, EXCEPT WHERE OTHERWISE NOTED)

<u>Circuit Reference Designation</u>	<u>Description</u>	<u>Velonex Part No.</u>
R 101	49.9, ±1%	093-0002.001
R 102	MOV. 25V	094-0083
R 301	1.21k, ±1%, Film	093-0002.134
R 302	11.5k, ±1%, Film	093-0002.228
R 303	332k, %1%, Film	093-0002.368
R 304	10k	091-0008.087
R 305	100k	091-0008.111
R 306	220	091-0008.047
R 307	220	091-0008.047
R 308	8.2k	091-0008.085
R 309	15k, ±1%, Film	093-0002.239
R 310	330	091-0008.051
R 311	47k	091-0008.103
R 312	330	091-0008.051
R 313	470	091-0008.055
R 314	1k	091-0008.063
R 315	3.9k	091-0008.077
R 316	10k	091-0008.087
R 317	33k	091-0008.099
R 318	12k	091-0008.089
R 319	620	091-0008.058
R 320	2.7, 1W	091-0016.001
R 321	2.2k	091-0008.071
R 322	1k	091-0008.063
R 323	470	091-0008.055
R 324	330	091-0008.051
R 325	220	091-0008.047
R 326	470k	091-0008.111
R 327	1k	091-0008.063
R 328	1k	091-0008.063
R 329	75	091-0008.036
R 330	51	091-0008.032
R 331	1k	091-0008.063
R 332	22, 1W	091-0016.023
R 333	Var., 15k, ±10%, 2W	V-16532

RESISTORS

<u>Circuit Reference Designation</u>	<u>Description</u>	<u>Velonex Part No.</u>
R 334	820	091-0009.061
R 335	27k	091-0008.097
R 336	10	091-0008.015
R 337	1k	091-0008.063
R 338	Not used	
R 339	Not Used	
R 340	150	091-0008.043
R 341	470	091-0008.055
R 342	470	091-0008.055
R 343	2.2k	091-0008.071
R 344	40.2, $\pm 1\%$, Film	093-0002.280
R 345	470	091-0008.055
R 347	100k	091-0008.111
R 501	220, 1/2W	091-0012.047
R 502	22k, 2W	091-0020.095
R 503	27k, 1W	091-0016.097
R 504	1k, 1/2W	091-0012.063
R 505	*MOV, V130 LA 10A	094-0036
R 506 - R 507	47, 1/2W	091-0012.031
R 701 - R 712	1M Ω , 2W	091-0020.135
R 713	10, 1/2W	091-0012.015
R 801	68, 1/2W	091-0012.035
R 802	VAR, 50k, 1/2W, $\pm 10\%$	094-0093
R 803	1M, 1/2W, $\pm 10\%$	094-0094
R 804	10k, $\pm 1\%$	093-0002.222
R 805	200k, $\pm 1\%$	093-0002.347
R 806	6.8k	091-0008.083
R 807	4.3k	091-0008.078
R 808	4.7k	091-0008.079
R 809	22, 1/2W	091-0012.023
R 810	22k	091-0008.095
R 811	22, 2W	091-0020.023
R 812	VAR., 250k, $\pm 10\%$	094-0092
R 813	VAR., 50k, $\pm 10\%$	094-0093
R 814	53.6k, $\pm 1\%$	093-0002.292
R 815	100k, $\pm 1\%$	093-0001.318
R 816	10, 1/2W	091-0012.015
R 817	10k	091-0008.087
R 818	10K	091-0008.087
R 819	4.7k	091-0008.079
R 820	4.7k	091.0008.079

*MOV V250 LA 40B, P/N 094-0037, For Model 587-F

RESISTORS

<u>Circuit Reference Designation</u>	<u>Description</u>	<u>Velonex Part No.</u>
R 1201 - R 1210	10k, 1W, ±1%	093-0003.337
R 1601	68, 1/2W	091-0012.035
R 1602	320, 1W <u>CAPACITORS</u>	091-0016.061

(ALL VALUES IN μ F, ±20%, EXCEPT WHERE OTHERWISE NOTED)

C 201	5, 370V AC	*
C 301	100, 20V, ±10%	104-0005.053
C 302	0.02, 50V, ±5%	101-0007
C 303	1200pF, 100V, ±5%	103-0001.053
C 304	0.01, 200V, ±10%	102-0051
C 305	0.0047, 200V, ±10%	102-0049
C 306	100pF, 500V, ±5%	103-0001.027
C 307	0.1, 10V	101-0015
C 308	47, 6V	104-0016
C 309	400, 6V	105-0048
C 310	100 μ F, 50V	105-0017
C 311	220pF, 500V, ±5%	103-0001.035
C 312	39pF, 500V, ±5%	103-0001.016
C 313	500 μ F, 25V	105-0085
C 314	1.0, 100V ±5%	102-0029
C 315	0.1, 16V	101-0067
C 316	0.1, 50V	102-0067
C 317	220pF, 500V, ±5%	103-0001.035
C 318	0.1, 50V	102-0067
C 319	0.1, 16V	101-0067
C 320	Not Used	
C 321	Not Used	
C 322	0.1, 10V	101-0015
C 323	Not Used	
C 324	0.05, 500V	101-0002.029
C 325	0.05, 500V	101-0002.029
C 326	220pF, 500V, ±5%	103-0001.035
C 327	0.01, 200V	102-0002.08
C 328	56, 20V, ±10%	102-0005.050
C 501	20, 250V	105-0054
C 502	4, 200V	102-0072
C 503	5, 200V	102-0083
C 504	100, 25V	105-0040
C 701	0.5, 5kV	106-0030
C 702	Not Used	
C 703	0.5, 10KV	106-0048

*Supplied as Part of T201

CAPACITORS

<u>Circuit Reference Designation</u>	<u>Description</u>	<u>Velonex Part Number</u>
C 801 - C 802	100, 50V	105-0017
C 803	0.1, 16V	101-0067
C 804	1.5, 100V	102-0010.013
C 805	0.01, 200V	102-0002.08
C 806	33, 20V, ±10%	104-0001.016
C 807	50, 50V	105-0084
C 808	0.15, 200V, ±10%	102-0020.001
C 1601	25uf, 50V	105-0020.001

DIODES

CR 301	1A, 200V	111-0062
CR 302	Not Used	
CR 303	Not Used	
CR 304 - CR 307	Signal	111-0003
CR 308	1A, 600V	111-0069
CR 309 - CR 310	Signal	111-0003
CR 311	1A, 200V	111-0062
CR 501 - CR 503	1A, 600V	111-0061
CR 701 - CR 702	25MA, 22.5kV	111-0187
CR 801 - CR 802	BRIDGE 1A, 600V	111-0069
CR 803 - CR 805	Signal	111-0003
CR 806	Bridge	111-0154
CR 807	BRIDGE 1A, 600V	111-0069
CR 1601	BRIDGE 1A, 600V	111-0069

TRANSISTORS

Q 301	NPN 2N6584	112-0108
Q 302 - Q 303	NPN 2N3646	112-0052
Q 304 - Q 305	NPN MPS 6531	112-0001
Q 801 - Q 802	NPN MPS 6531	112-0001

*Used on Option "E" Only.

SWITCHES

<u>Circuit Reference Designation</u>	<u>Description</u>	<u>Velonex Part Number</u>
S 101	Power	131-0001
S 102	HV-On	131-0003
S 103	HV-On	131-0085
S 104	One Shot	131-0002
S 105	Microswitch	131-0010
S 201 - S 202	Interlock	131-0006
*S 203	XFMR Switch	900-19346
S 301	Mode	900-16579-5
S 401	Surge Selector	900-19075

TRANSFORMERS

T 101	Variac	142-0112
T 201	Constant Voltage	142-0089
T 202	High Voltage	142-0109
**T 203	Constant Voltage	142-0039
T 301	400 μ H	900-2442
T 501	Low Voltage	142-0052
T 502	Low Voltage	142-0053
T 801	Low Voltage	142-0014
T 1601	Low Voltage	142-0014

PILOT LAMPS

I 101 - I 108	28V, 0.04A	280-0009
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INTEGRATED CIRCUITS

Z 301	Timer	113-0022
Z 302	One Shot	113-0002
Z 303	Dual Buffer	113-0003
Z 304	One Shot	113-0002
Z 305	Dual Timer	113-0031
Z 306	Divide by 60	113-0088
Z 307	Voltage Regulator	113-0017

*Used on option "G" only.

**Part No 142-0065 for Model 587-F

INTEGRATED CIRCUITS

<u>Circuit Reference Designation</u>	<u>Description</u>	<u>Velonex Part Number</u>
Z 308	Voltage Regulator	113-0016
Z 309	One Shot	113-0042
*Z 310 - Z 311	Divide by 5/6	113-0086
Z 801	Dual Gate	113-0010
Z 802	Timer	113-0022

RELAYS

K 301	24V DC, SP DT	132-0020
K 303	24V DC, SP DT	132-0020
**K 304	24V DC, SP DT	132-0020
K 501	110V DC, 4P DT	132-0012
K 502	5.8MA, 2P DT	132-0023
K 801 - K 804	24V DC, SP DT	132-0020
K 1601	Socket, Relay	150-0052

FUSES

+ F 201 - F 202	2A, Slo-Blo	270-0001.24
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MISCELLANEOUS

M 101	DPM	920-37K-4
J 101	Connector, BNC	150-0098
J 102	Connector, BNC	150-0001
J 103	Connector, BNC	150-0001
J 104	Binding Post (Red)	150-0011
J 105	Binding Post (White)	150-0057
J 106	Ground Post	150-0209
***J 107	Ground Post	150-0034-001
****J 108	Connector BNC	150-0098
J 201	Connector	150-0175
J 202	Connector	150-0215
FL 201	Filter Line	143-0001

*Used on Option "B" Only

**Used on Option "E" Only

***Not used with Option "D"

****Used on Option "I" Only

+F201 = 1.25 A, Slo-Blo Part No 270-001-24 For Model 587-F only

MISCELLANEOUS

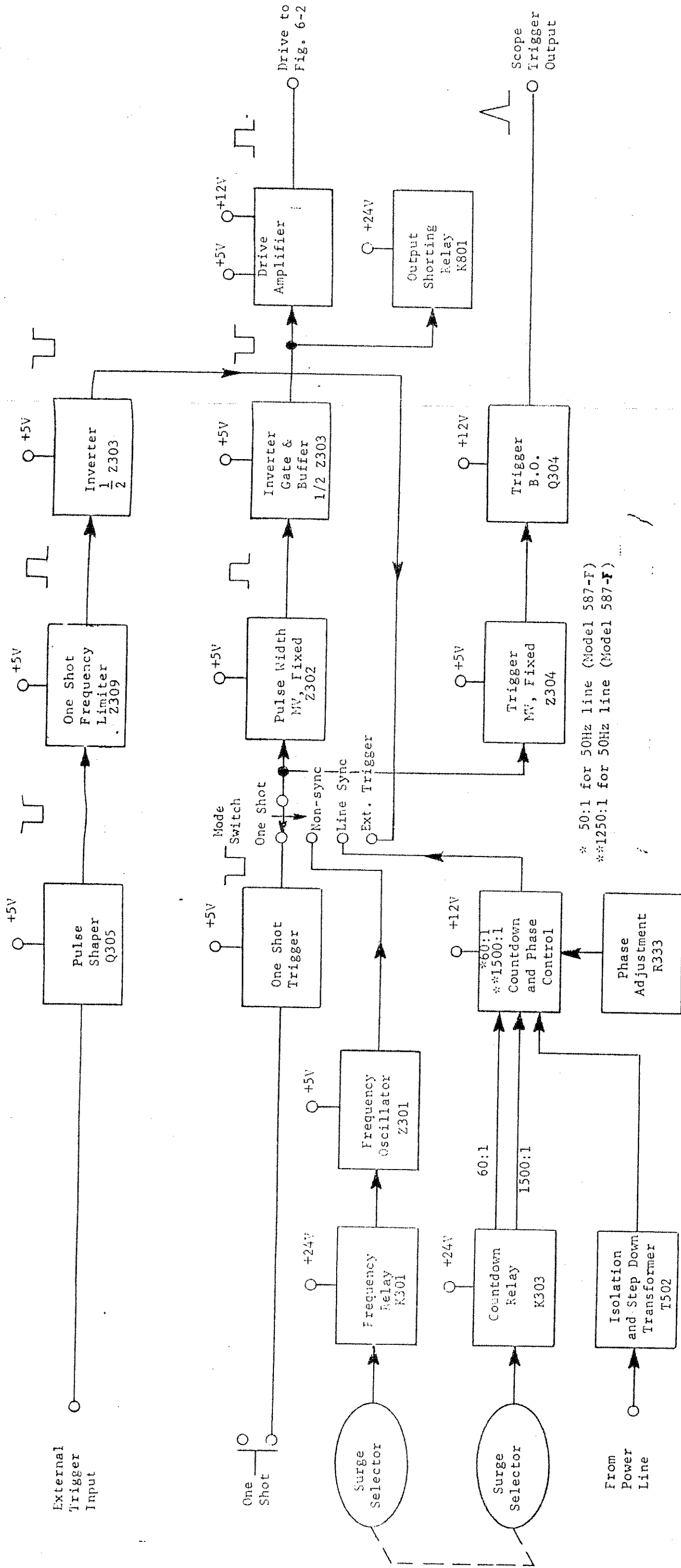
<u>Circuit Reference Designation</u>	<u>Description</u>	<u>Velonex Part Number</u>
PS 101	Power Converter	910-P-26
P 201	Connector (Mates with J 201)	150-0176
	Power Cord	053-0001
	*Cabinet Assembly	900-16787
	Front Panel Handle	170-0005
	Knob, Skirted	170-0002
	Knob, Bar	170-0008.01
	Display Module, Power	900-15879-1
	Display Module, HV-On	900-15879-4
	Display Module, Ready for Test	900-15879-5
	**Knurled Nut Used w/J107	150-0034-002
B 201	***FAN	300-0004****
P 202	Connector (Mates w/J202)	150-0216

*Not used on Rack-Mount Units (Option "R")

**Not used with Option D.

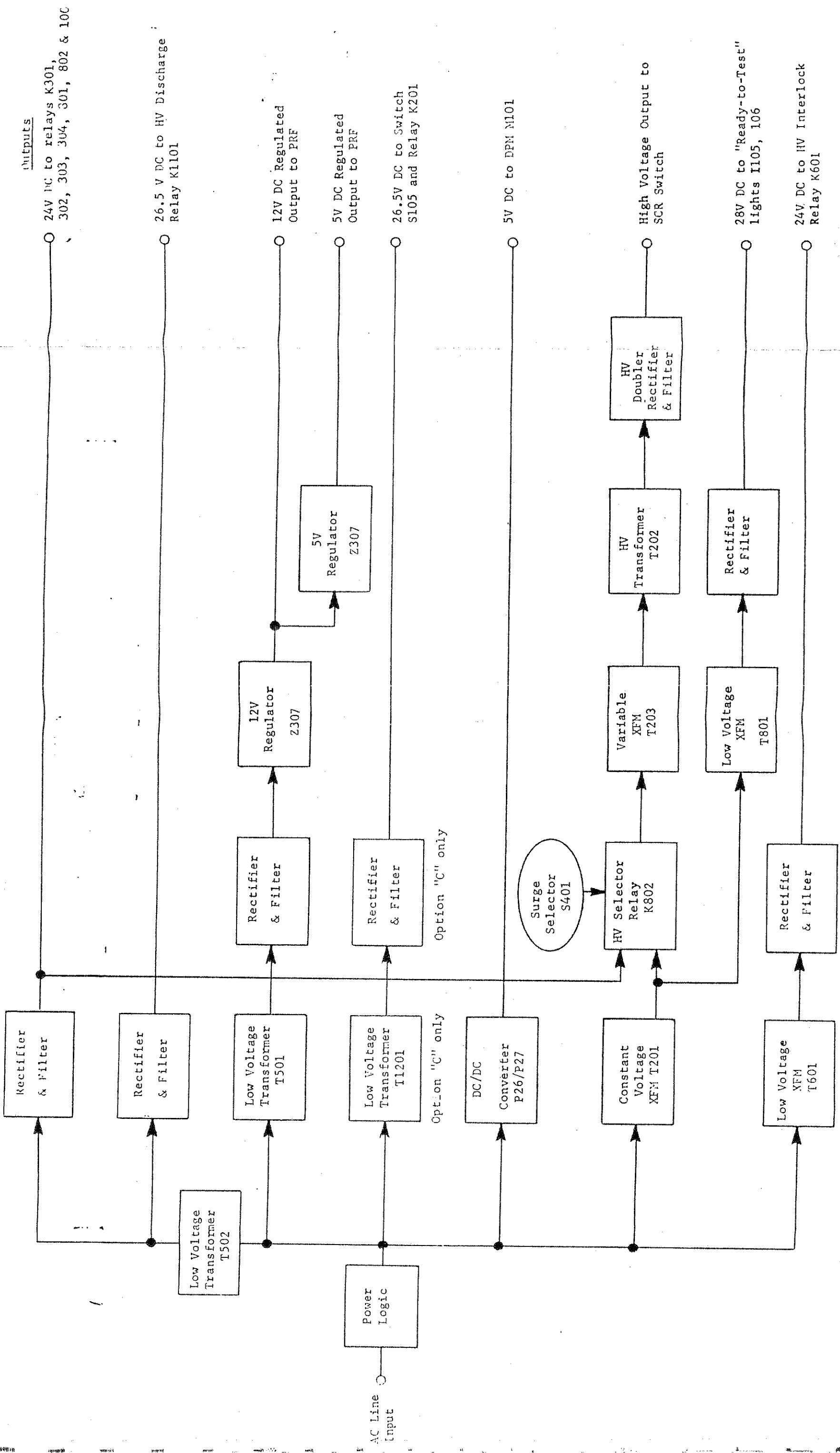
***Used on Option "P" only.

****On "F" Models, B201 uses Velonex
P/N 300-0007



BLOCK DIAGRAM OF PULSE WIDTH GENERATOR AND LOW LEVEL DRIVE CIRCUITS
MODEL 587

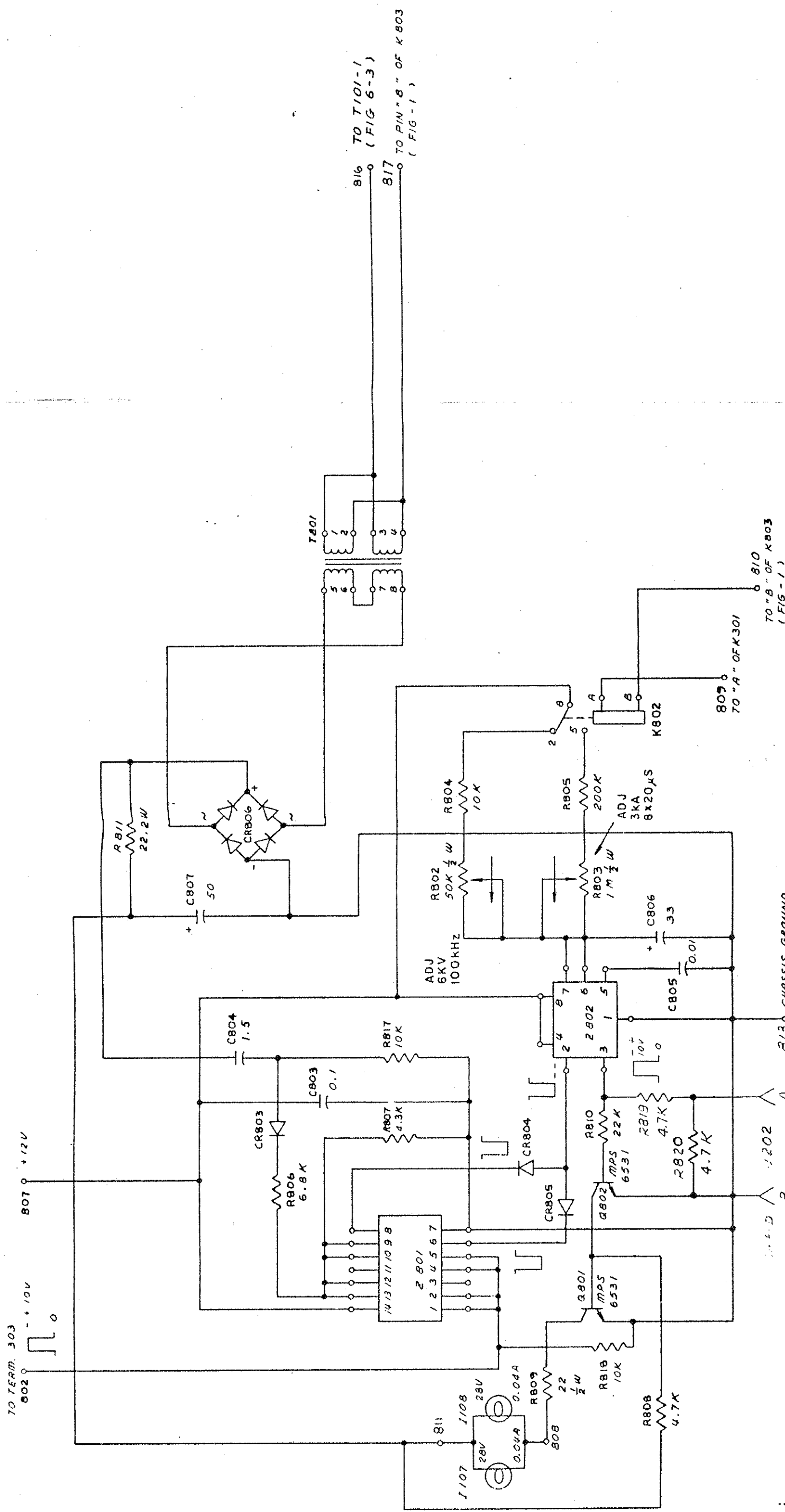
Figure 6-1



BLOCK DIAGRAM OF POWER SUPPLIES

Model 587

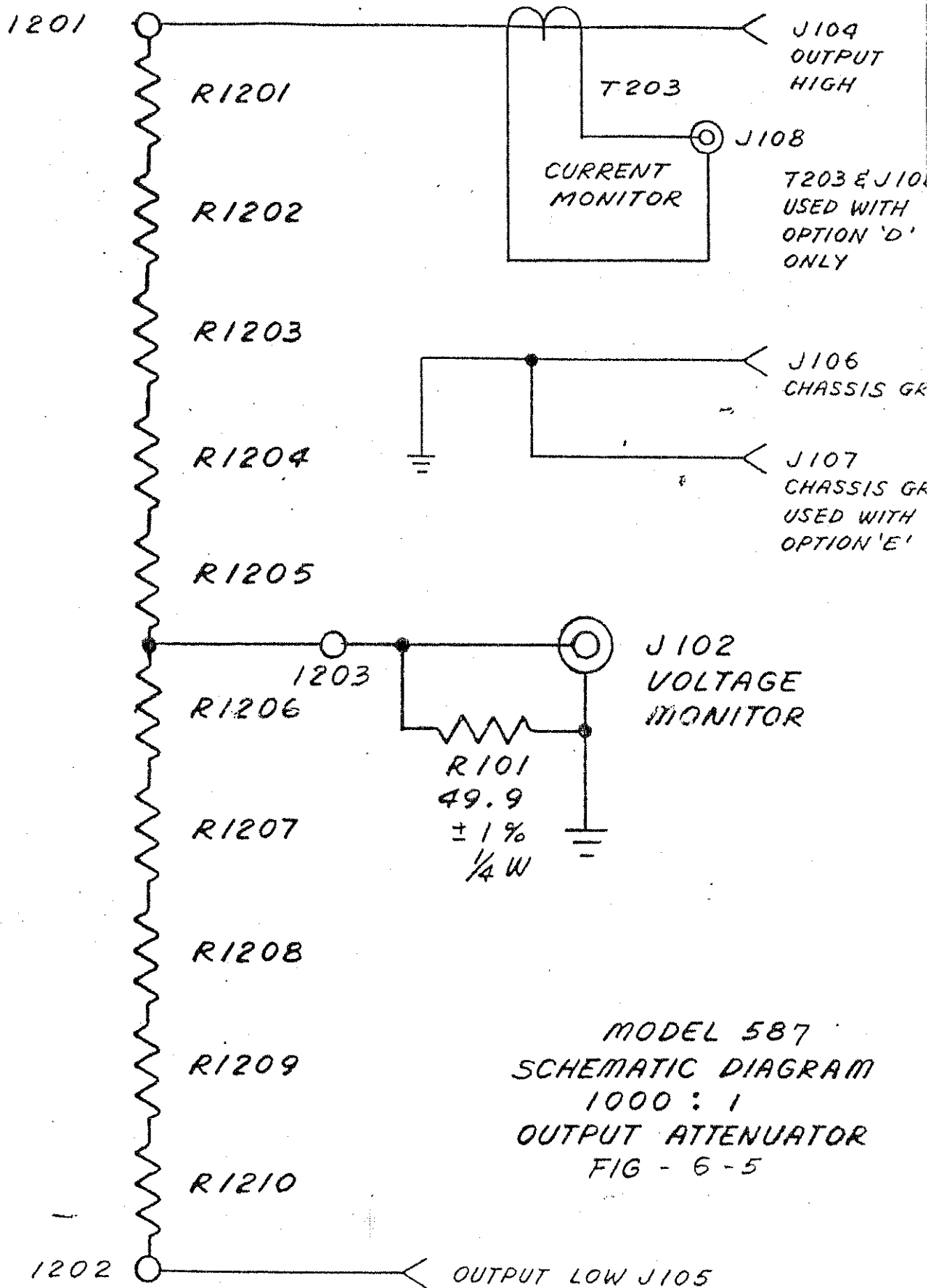
Figure 6-2



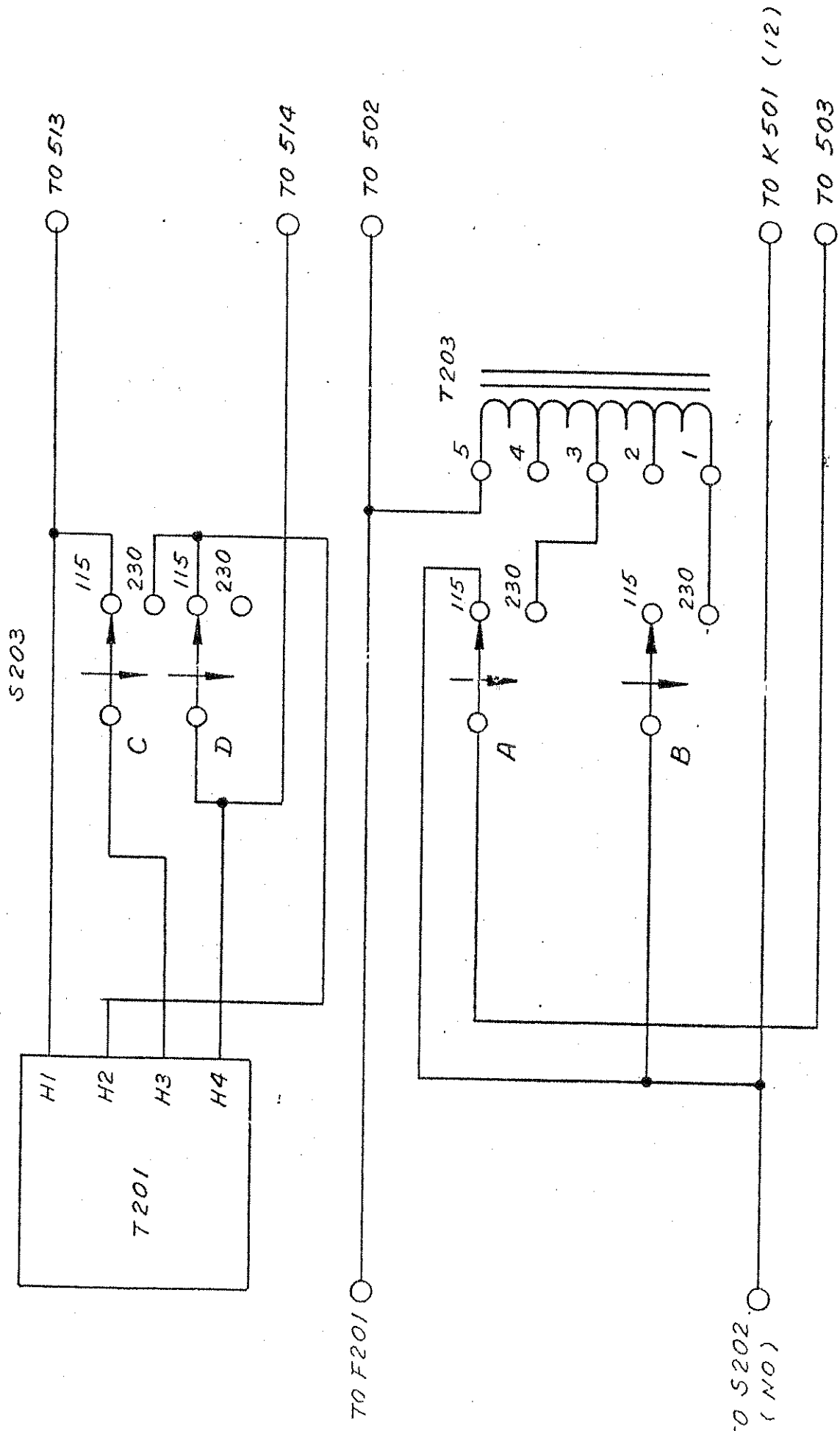
NOTES :

- 1) UNLESS OTHERWISE SPECIFIED ALL RESISTORS ARE $\frac{1}{4}$ W $\pm 5\%$ AND IN OHMS.
- 2) UNLESS OTHERWISE SPECIFIED ALL CAPACITORS ARE IN MICRO FARADS.

VELONEX
 SCHEMATIC DIAGRAM
 READY TO TEST INDICATOR LIGHT
 TIMING CIRCUIT
 MODEL-587
 FIGURE 6-4



NOTE :
RESISTORS R1201 THRU R1210
ARE 10K, ± 1% , 1W .



MODEL 587-G
SCHEMATIC DIAGRAM
FIGURE 6-6

S 203 AND T 203 ARE ADDED FOR OPTION "G" ONLY