

Instruction Manual
Partial Discharge System
Master Calibrator
Catalog No. 6617250 Series

JAMES G. BIDDLE CO.
Plymouth Meeting, Pa. U.S.A. 19462
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SECTION A

INTRODUCTION

The Master Calibrator is intended for use as an accurate, portable source of Partial Discharge Calibration Signals for periodic inspection, maintenance or calibration testing of Partial Discharge (Corona) Detection systems. It is also a reliable means for comparing the sensitivity and minimum detection threshold capability of several detection systems located in the same or different test areas.

SECTION B
SAFETY PRECAUTIONS

USE EXTREME CAUTION WHEN WORKING NEAR HIGH VOLTAGE!

Never connect the Calibration Signal Coupler across the sample when test voltage is applied to sample.

Never apply test voltage to the sample when the Calibration Signal Coupler is connected across the sample.

The Master Calibrator is intended for use only when the Test Set high voltage is off.

Use equipment only in accordance with instruction manual.

Remove the Calibration Signal Coupler from the high voltage terminal before energizing high voltage power supply.

SECTION C

RECEIVING INSTRUCTIONS

Your Master Calibrator has been thoroughly tested and inspected to rigid inspection specifications before being shipped and is ready for use after it is set up as indicated in the Operation Section. Check the equipment received against the packing list. Notify James G. Biddle Co., Plymouth Meeting, Pa. of any shortage of materials. The Master Calibrator should be examined for damage received in transit. If any damage is found, file a claim with the carrier at once and notify James G. Biddle Co. or its nearest representative giving a detailed description of the damages observed.

SECTION D
SPECIFICATIONS

Electrical

Output Level: Continuously variable from 0.1 pC to 1000 pC.

Level Adjustment: Direct-reading, digital control and 3-range multiplier
(X 0.01, X 0.1, X 1.0).

Output Accuracy: $\pm 2\%$ of full scale for 0.1 pC to 10 pC (0.01 range)
 $\pm 1\%$ of full scale for 10 pC to 100 pC (0.1 range)
 $\pm 2\%$ of full scale for 100 pC to 1000 pC (1 range)

Calibration Capacitor: 150 pF (nominal), 150 VAC (maximum).

Pulse Positioning: Synchronized to power line frequency; variable
position control permits convenient placement on the
display of any Partial Discharge Detection System.

Pulse Rise Time: Less than 0.1 microsecond (10% to 90% points).

Pulse Width: For 60 Hz, 8.3 milliseconds.
For 50 Hz, 10 milliseconds.

Primary Power: 120 VAC or 240 VAC + 10%-17%; 47 Hz to 63 Hz; 5 VA (maximum).

Fuse: For 120 VAC: Use 1/16A Slow-Blow type.
For 240 VAC: Use 1/32A Slow-Blow type.

Note: Make certain that the fuse compartment printed circuit
card is inserted so that the number visible on the card
is the same as the operating primary voltage (See Section G).

Mechanical

Dimensions: 8 in. (20.3 cm) H X 8-3/4 in. (22.2 cm) W x 7-7/8 in. (20 cm) D
including projections.

Weight: 5.5 lbs. (2.5 kg).

Case Material: High-impact plastic carrying case with handle.

Fuse: Accessible from front panel.

Environmental (Operating)

Temperature: 32° F to 122° F (0° C to 50° C).

Humidity: 5% to 95% (non-condensing)

Altitude: Sea level to 10,000 feet.

SECTION E

DESCRIPTION

The Biddle Master Calibrator consists of a precision Calibration Signal Generator, special low voltage Calibration Signal Coupler (150 pF, 150 VAC) with attached 10 ft. interconnecting coaxial cable and a 7 ft. primary power cable. The coupler and cables are stored within the lid of the portable carrying case. The user connects the coupler to the test sample and ground by means of clip leads furnished as a part of the coupler.

The calibration signal generator is composed of three basic circuits: The first synchronizes and positions the calibrator signal. The second is a dc circuit which establishes the dc level for the selected charge. The third is a switching circuit which ultimately feeds into the Calibration Signal Coupler. A regulated power supply circuit is included to provide the necessary operating voltages.

The output is produced in a properly terminated coaxial connection of a nominal 75 ohms resistor when the Calibration Signal Coupler is connected. The CHARGE MULTIPLIER switch has 3 settings: Times 1 (where the digital potentiometer reads directly), Times .1 and Times .01.

The entire circuitry is supplied by means of a voltage regulator which is set at ± 16 VDC to allow the necessary 13.33 VDC maximum for a 1000 pC setting on the digital potentiometer. The input from the synchronizing transformer is protected by diodes against surge voltage. The remaining components on the printed wiring card are the power supply transformer, rectifiers, filters, power switches, and various protective networks. Primary power can be obtained from either a 120 VAC or 240 VAC, 50 or 60 Hertz source provided that fuse selection and primary power circuit card placement is as described in Section G.

SECTION F

CONTROL & CONNECTOR IDENTIFICATION

ON/OFF: This switch energizes the power supply and its pilot lamp.

CHARGE pC: This variable resistor is used to digitally select the calibration signal amplitude. The maximum output using the highest range multiplier is 1000 picocoulombs.

CHARGE MULTIPLIER: This selector switch is used to change the picocoulomb multiplier as required. To determine the calibrator output level, multiply the digital calibrator charge reading by the CHARGE MULTIPLIER setting.

CAL POSITION: This control is used to position the calibration signal on the oscilloscope trace.

CAL OUT: This coaxial output interconnects the internal circuit signal to the Calibration Signal Coupler by means of the coaxial cable furnished as a part of the Coupler.

POWER: This receptacle is used to connect the Master Calibrator to a power source. It also contains a plug-in circuit card which provides for selection of desired input voltage. The fuse which is used for overload protection is also contained within this unit. See Section G of this manual for voltage selection information.

SECTION G
INSTALLATION

Calibrator Operating Voltage:

The Master Calibrator is supplied with line voltage set to individual order. When it is necessary to set up the POWER receptacle for an alternate input voltage:

- a. View the factory set operating voltage through the cover door window of the receptacle. If proper, no other steps are necessary. If improper, procede to step b.
- b. Selection of Operating Voltage:
 1. Open cover door and rotate fuse-pull to left.
 2. Remove PC board using bent paper clips or similar tool. Select operating voltage by orienting PC board to position desired voltage on top-left side.
 3. Rotate fuse-pull back into normal position and re-insert fuse in holders, using caution to select correct fuse value. This value is indicated on panel.
 4. Select the fuse rating according to the primary voltage in use. See Electrical Specifications, Section D.

No other installation set up is required.

SECTION H

OPERATION

Accurate calibration of any detection system is made when a known pC level from the calibrator is introduced across the test sample terminals (HV OFF) and the resultant signal amplitude is observed on the detection system oscilloscope. The partial discharge detector amplifier gain is adjusted for any desired signal amplitude in terms of centimeters of oscilloscope deflection.

After removal of the coupler and application of high voltage to the test sample, the unknown pC level originating in the test sample is established by comparing the observed peak pulse amplitude to the number of centimeters of deflection.

CALIBRATION - DIRECT METHOD (Per ASTM D1868, Method 3.)

To calibrate any Partial Discharge Detection System and to compare the calibration level obtained from another system calibrator, observe the following procedure:

1. Connect the Calibration Signal Coupler (CSC) to the CAL OUT connector by means of the coaxial cable furnished as a part of the Coupler Assembly.
2. Set the Master Calibrator front panel ON/OFF switch in the ON position.
3. Connect the output terminal (short red lead) of the Calibration Signal Coupler to the high-voltage terminal of the test sample.
4. Connect the ground terminal (long black lead) of the Calibration Signal Coupler to the ground terminal of the test sample. Do not permit this lead to touch the high voltage terminal.
5. Set the desired charge level using the CHARGE pC dial and the CHARGE MULTIPLIER. If there is a difference in the height of the two pulses, use the largest pulse to obtain the correct calibration. Use a straight-line oscilloscope display.
6. Note the pulse amplitude as observed on the oscilloscope. If desired, adjust the amplitude using the Detector Amplifier gain controls to a convenient number of units of oscilloscope

SECTION H (cont'd)

OPERATION

deflection (i.e., 10 pC/cm). The height of the largest pulse observed always represents the set picocoulomb level output from the Master Calibrator.

7. Disconnect the Master Calibrator CSC from the Test Sample.
8. Without disturbing the gain settings, connect the system CSC and compare the deflection obtained for the same pC level. The error, if any, of the latter calibrator will become apparent by observation of any difference in deflection. (See notes 1 and 2).
9. By these means, the output level accuracy of any calibration signal source and calibration of the associated detection system can easily be established.
10. When securing the Master Calibrator for storage, make certain that the CAL OUT coaxial cable connector is disconnected before the Calibration Signal Coupler Assembly, with its cables, is placed in the equipment lid.

NOTES:

1. Never connect more than one Calibration Signal Coupler at one time.
2. The phase of the input power for the Master Calibrator and PD Detector Calibrator must be the same when making a comparison of pulse height.

SECTION K

SERVICE AND MAINTENANCE

The James G. Biddle Co. maintains a complete instrument repair service. Should this instrument ever require repairs, we recommend it be returned to the factory for repair by our instrument specialists. The equipment should be carefully packed and shipped Prepaid and Insured. The package should be marked for the attention of the Repair Department.

Because the Master Calibrator is composed entirely of passive components, semiconductors, integrated circuits and other high quality parts, there is no need for any periodic maintenance.

SECTION M
CALIBRATION

The Master Calibrator is considered to be a secondary standard. It is suggested that it be returned to the factory for re-calibration in the event that the equipment is damaged by inadvertent application of high voltage to the Low Voltage Calibration Signal Coupler or is otherwise determined to be inoperative.

SECTION N

PARTS LIST

<u>ITEM</u>	<u>BIDDLE PART NUMBER</u>
Master Calibrator	17250 series
Calibration Signal Coupler Assembly*	17265
Switch, DPDT, 120/240 VAC	14870-1
Switch, Rotary	17149
Indicator Lamp (LED)	17142
Line Cord	17032 (120 VAC): 17032-2 (240 VAC)
Power Input Receptacle	17025-1
Fuse 120V-1/16A SB	2567-29
240V-1/32A SB	2567-22

*If this item is replaced, factory recalibration of the Master Calibrator is required

IDENTIFICATION

<u>Catalog No.</u>	<u>Primary Voltage</u>
6617250	120 VAC, 50/60 Hz
6617250-1	240 VAC, 50/60 Hz
6617250-2	100 VAC, 50/60 Hz

NOTE: A Master Calibrator designed to operate from a 400 Hz primary voltage source for use with 400 Hz Partial Discharge Detection Systems is available. Another having a special 0.2 to 2000 pC output range for operation at 50 Hz and 60 Hz is also available.

SECTION P

WARRANTY

All products supplied by the James G. Biddle Co. are warranted against all defects in material and workmanship for a period of one year following shipment. Our liability is specifically limited to replacing or repairing, at our option, defective equipment. Equipment returned to the factory for repair must be shipped Prepaid and Insured. The warranty does not include batteries, lamps or tubes, where the original manufacturer's warranty shall apply. WE MAKE NO OTHER WARRANTY.

It is recommended that the Factory be notified prior to the return of any equipment for warranty repair or otherwise.

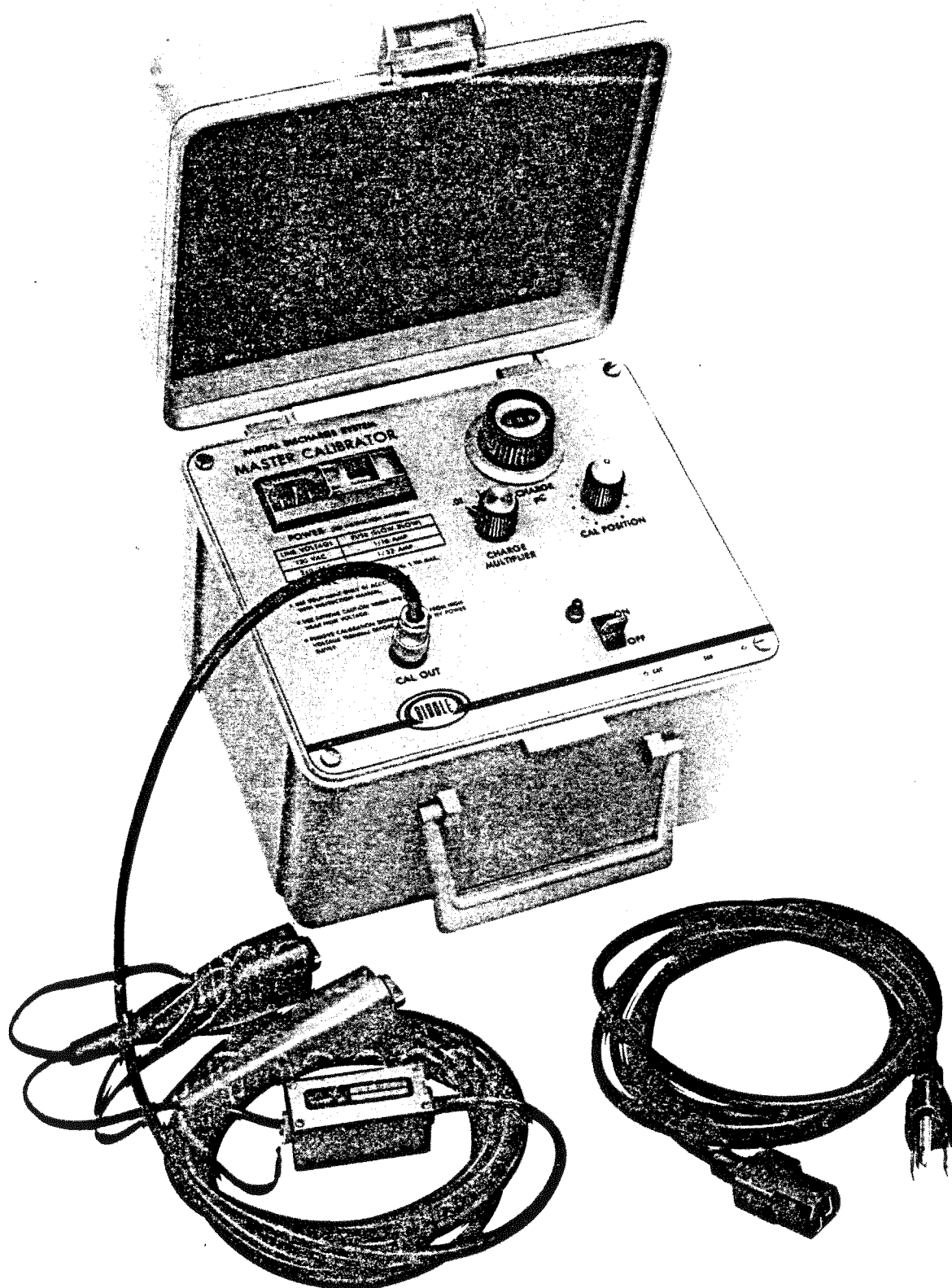


FIGURE 1: Partial Discharge System Master Calibrator.

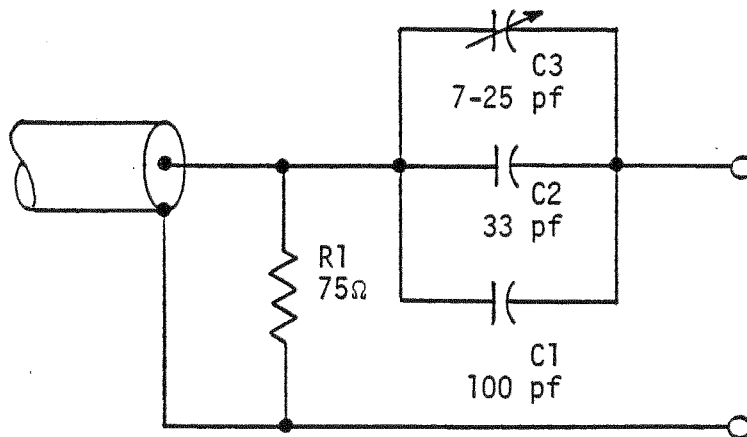
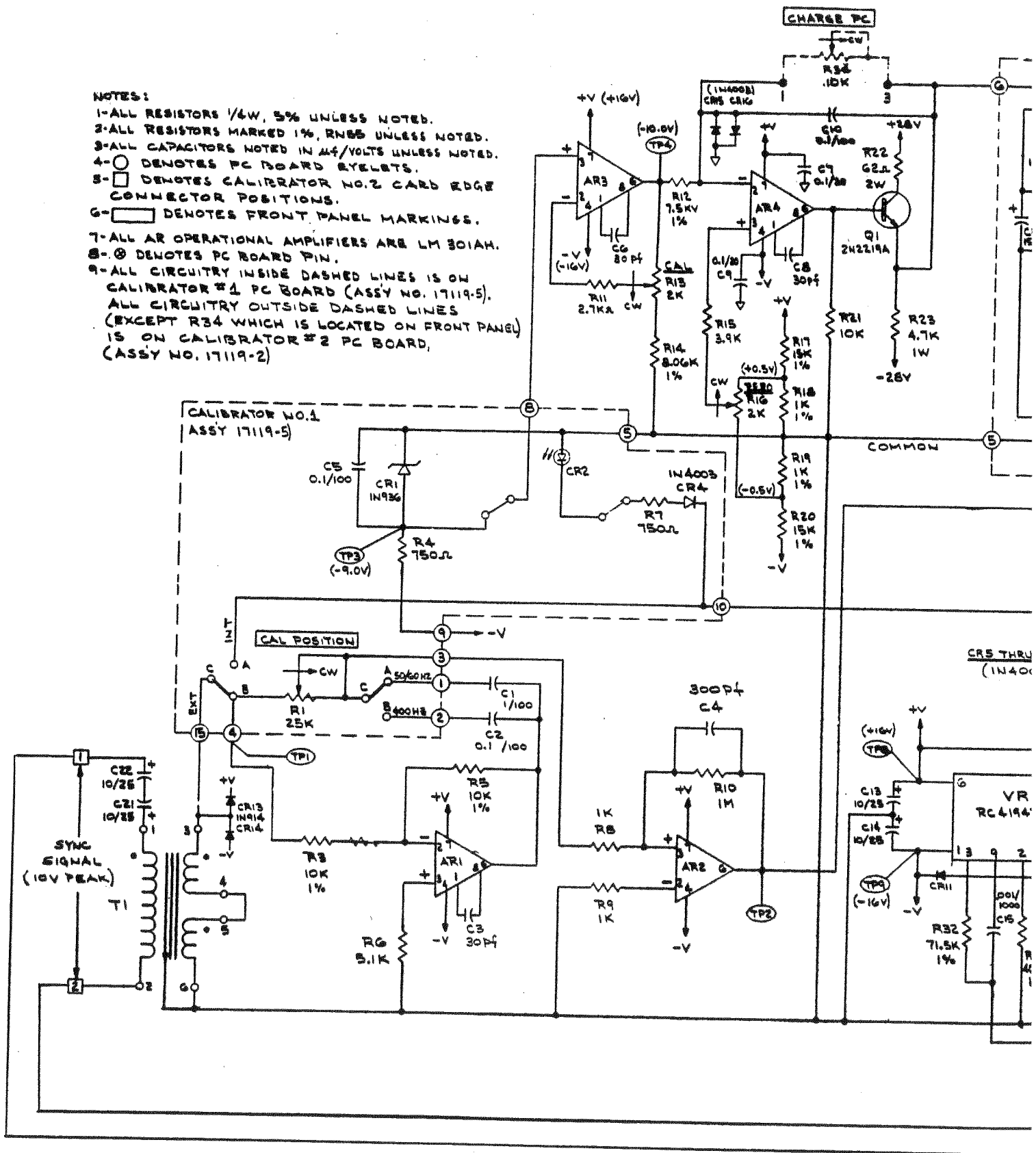


FIGURE 2: Circuit Diagram 17265 - Calibration Signal Coupler Assembly for Master Calibrator.

NOTES:

- 1-ALL RESISTORS 1/4W, 5% UNLESS NOTED.
- 2-ALL RESISTORS MARKED 1%, RNEB UNLESS NOTED.
- 3-ALL CAPACITORS NOTED IN μF /VOLTS UNLESS NOTED.
- 4- \bigcirc DENOTES PC BOARD EYELETS.
- 5- \square DENOTES CALIBRATOR NO.2 CARD EDGE CONNECTOR POSITIONS.
- 6- \square DENOTES FRONT PANEL MARKINGS.
- 7-ALL AR OPERATIONAL AMPLIFIERS ARE LM 301AH.
- 8- \bigcirc DENOTES PC BOARD PIN.
- 9-ALL CIRCUITRY INSIDE DASHED LINES IS ON CALIBRATOR #1 PC BOARD (ASSY NO. 17119-5).
- ALL CIRCUITRY OUTSIDE DASHED LINES (EXCEPT R34 WHICH IS LOCATED ON FRONT PANEL) IS ON CALIBRATOR #2 PC BOARD, (ASSY NO. 17119-2)



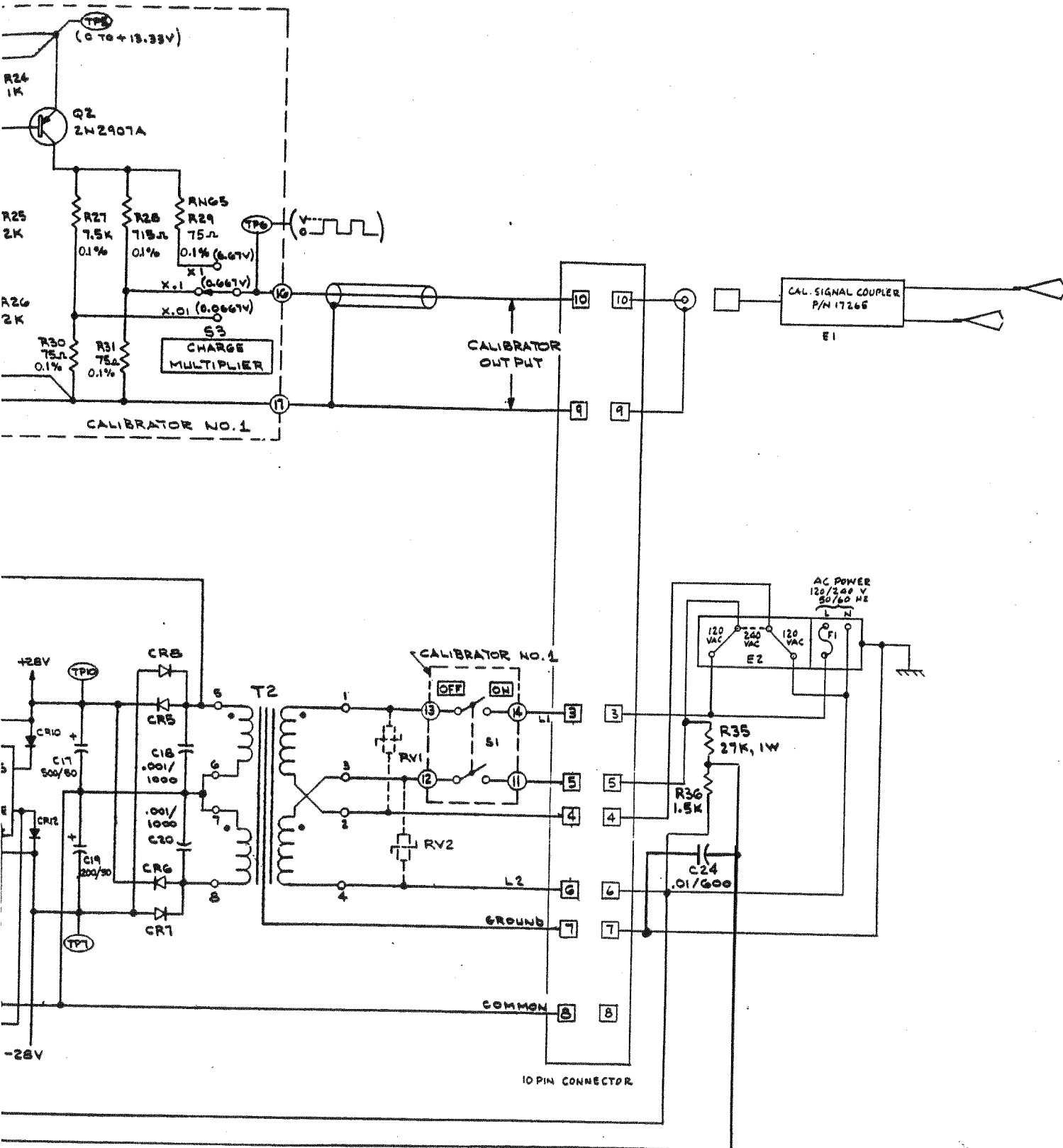


FIGURE 3: Schematic of Master Calibrator