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5200A AC Calibrator

Instruction Manual

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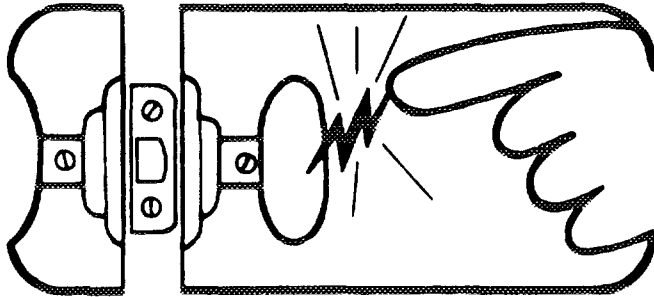
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static awareness



A Message From
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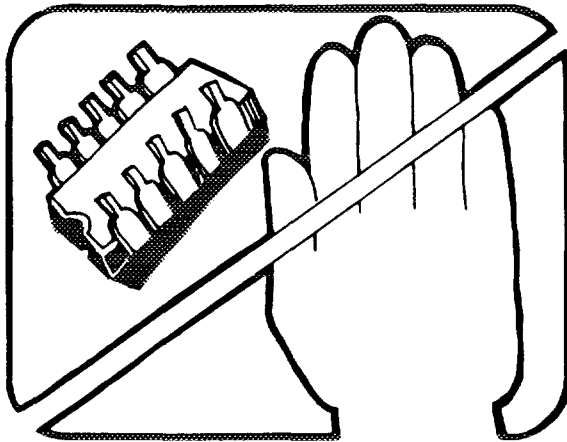
Some semiconductors and custom IC's can be damaged by electrostatic discharge during handling. This notice explains how you can minimize the chances of destroying such devices by:

1. Knowing that there is a problem.
2. Learning the guidelines for handling them.
3. Using the procedures, and packaging and bench techniques that are recommended.

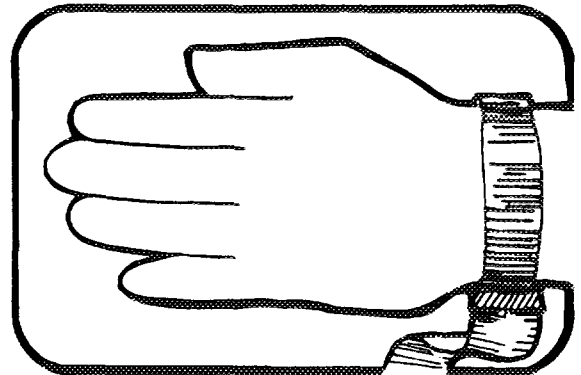
The Static Sensitive (S.S.) devices are identified in the Fluke technical manual parts list with the symbol



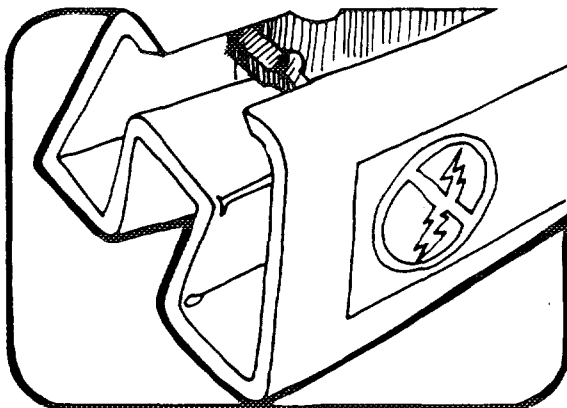
The following practices should be followed to minimize damage to S.S. devices.



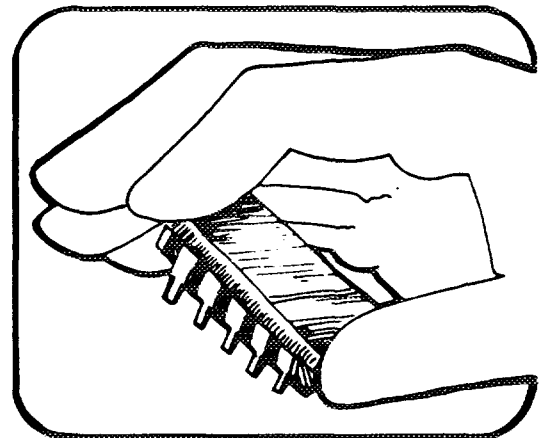
1. MINIMIZE HANDLING



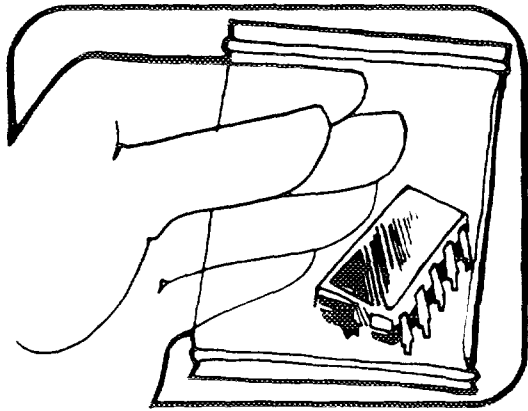
3. DISCHARGE PERSONAL STATIC BEFORE HANDLING DEVICES. USE A HIGH RESISTANCE GROUNDING WRIST STRAP.



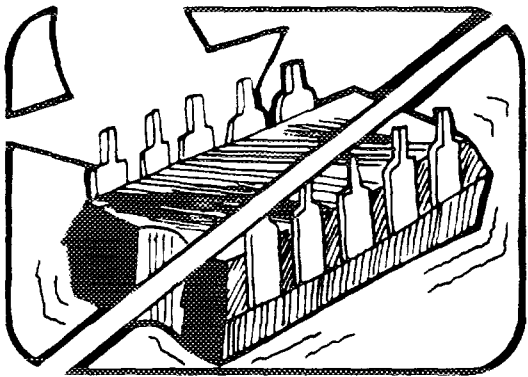
2. KEEP PARTS IN ORIGINAL CONTAINERS UNTIL READY FOR USE.



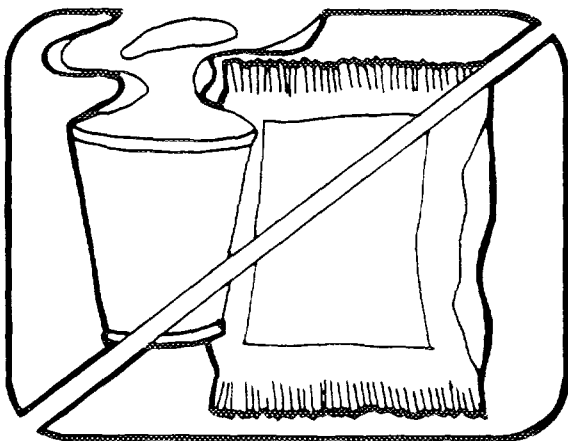
4. HANDLE S.S. DEVICES BY THE BODY



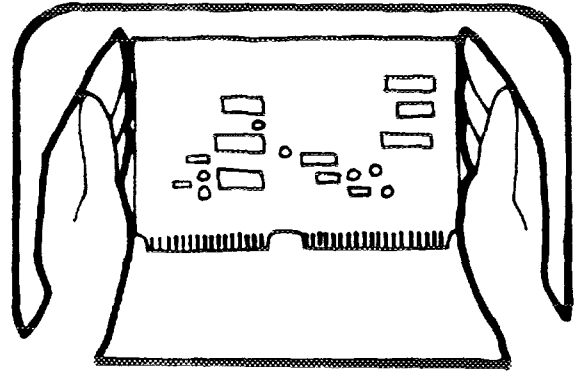
5. USE STATIC SHIELDING CONTAINERS FOR HANDLING AND TRANSPORT



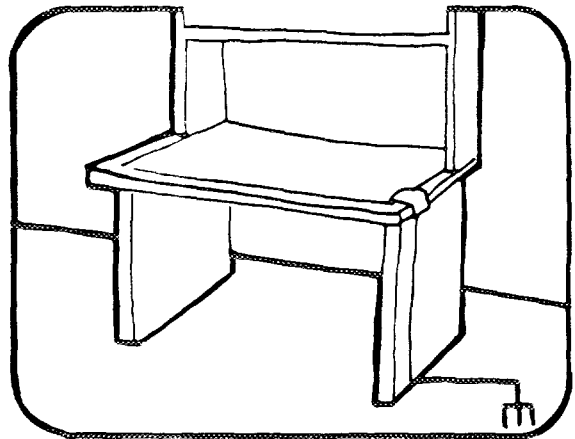
6. DO NOT SLIDE S.S. DEVICES OVER ANY SURFACE



7. AVOID PLASTIC, VINYL AND STYROFOAM® IN WORK AREA



8. WHEN REMOVING PLUG-IN ASSEMBLIES, HANDLE ONLY BY NON-CONDUCTIVE EDGES AND NEVER TOUCH OPEN EDGE CONNECTOR EXCEPT AT STATIC-FREE WORK STATION. PLACING SHORTING STRIPS ON EDGE CONNECTOR HELPS TO PROTECT INSTALLED SS DEVICES.



9. HANDLE S.S. DEVICES ONLY AT A STATIC-FREE WORK STATION
10. ONLY ANTI-STATIC TYPE SOLDER-SUCKERS SHOULD BE USED.
11. ONLY GROUNDED TIP SOLDERING IRONS SHOULD BE USED.

A complete line of static shielding bags and accessories is available from Fluke Parts Department, Telephone 800-526-4731 or write to:

JOHN FLUKE MFG. CO., INC.
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Section 1

Introduction & Specifications

1-1. INTRODUCTION

1-2. The Model 5200A is a guarded, precision AC Calibrator designed for use in calibration laboratories and in manufacturing environments. The Calibrator provides accurate ac voltages from $100\ \mu\text{V}$ to 120V rms, at currents up to $50\ \text{mA}$, and at frequencies from $10\ \text{Hz}$ to $1.2\ \text{MHz}$.

1-3. The amplitude of the output voltage is controlled by a range selector switch and six decade switches. Any of seven amplitude ranges (1mV , $10\ \text{mV}$, $100\ \text{mV}$, 1V , 10V , 100V , and 1000V) may be selected. (The 1000V range is used only in conjunction with a companion unit, the Model 5205A Precision Power Amplifier). The decade switches can then be set for any value from 10 to 120 percent of the selected range (each range has a 20 percent overrange capability). Six-digit resolution within the selected range provides steps as small as $1\ \text{nV}$ in the $1\ \text{mV}$ range through $100\ \mu\text{V}$ in the 100V range (and $1\ \text{mV}$ steps in the 1000V range). The amplitude can be offset up to either ± 0.3 percent or ± 3 percent (selectable) by means of a voltage error measurement feature. This feature provides direct indications of percentage error during calibration of voltmeters.

1-4. The frequency of the output voltage is similarly controlled by a range selector switch and four decade switches. Any of five frequency ranges ($100\ \text{Hz}$, $1\ \text{kHz}$, $10\ \text{kHz}$, $100\ \text{kHz}$, and $1\ \text{MHz}$) may be selected. The decade switches can then be set for any value from 10 to 120 percent of the selected range. Four-digit resolution within the selected range provides steps as small as $0.01\ \text{Hz}$ in the $100\ \text{Hz}$ range through $100\ \text{Hz}$ in the $1\ \text{MHz}$ range. If desired, the frequency can be phase-locked to an external reference source connected by coaxial cable to a BNC connector on the rear panel. The accuracy of the phase-lock feature is ± 1 degree (nominal).

1-5. The selected output of the 5200A is available at output connectors located on both the front and the rear panels. The front panel connectors are banana-type jacks and are provided for high and low output lines, high and low sense input lines, guard, and ground. The rear panel connectors are a pair of pcb card-edge connectors accessed through openings in the panel. One of the connectors provides interconnection to the Model 5205A Precision Power Amplifier (when used), and the other provides the selected calibrator output (except ground) to any other external equipment requiring it.

1-6. In addition to the regular calibrator outputs, a quadrature output and a counter output are available at BNC connectors on the rear panel. The quadrature output leads the regular output in phase by 90 degrees. The amplitude of the quadrature output is proportional to the setting of the amplitude control decade switches. Regardless of the range selected, the rms amplitude of this output will be anywhere from 1V , at minimum setting, to 12V , at maximum setting. At full-range (100 percent) setting, the amplitude will be 10V rms. The counter output is the same frequency as the other outputs, but in pulse form. The pulses are fixed in amplitude at $+3\text{V}$ peak, and vary in width according to the selected frequency range.

1-7. Output overload protection is provided to limit output current. When an output overload occurs, the calibrator automatically enters the limit mode. When the normal load is restored, the calibrator automatically reverts to the operate mode.

1-8. All operating functions, except primary power switching and voltage error measurement, can be remotely programmed upon installation of the Remote Control Unit pcb assembly (-02 option). Programming requirements are

TTL compatible, or contact closures to ground. Connection of the programming control lines to the Remote Control Unit is by means of a card-edge connector accessed through an opening in the rear panel of the 5200A.

1-9. The 5200A may be bench or 19 inch rack mount-

ed. (The overall dimensions of the unit are shown in Figure 1-1.) Input power requirements are 100, 115, 200, or 230V ac ± 10 percent, 50 to 60 Hz, 150VA. A 50-to-400 Hz Input Power Modification (+02 option) is available to permit the unit to operate from 400 Hz, as well as 50- and 60-Hz. power lines.

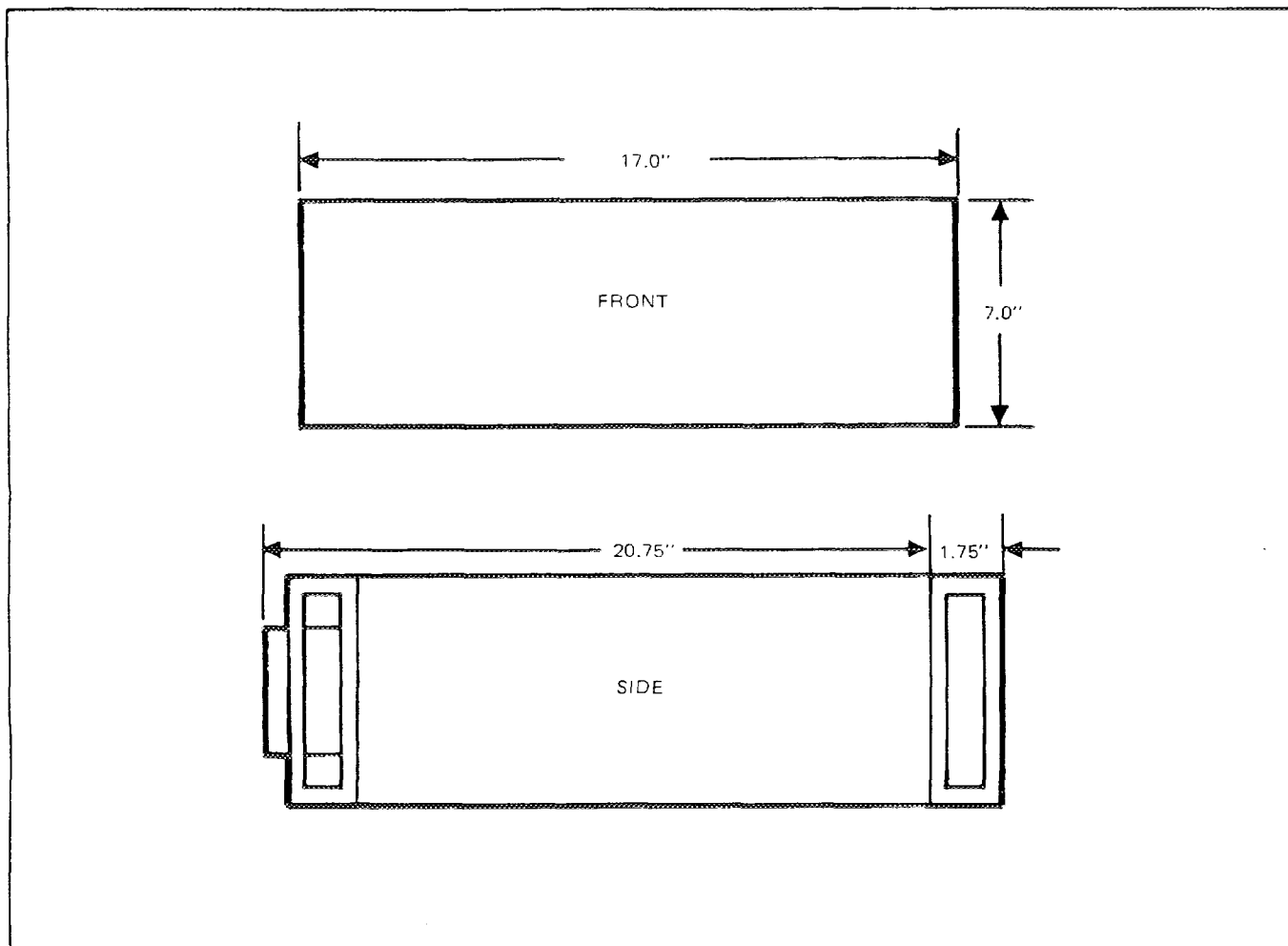


Figure 1-1. EQUIPMENT DIMENSIONS

1-10. SPECIFICATIONS

VOLTAGE RANGES

1 mV, 10 mV, 100 mV, 1V, 10V, 100V
(1000V with 5205A Power Amplifier)

Overrange

20% on all ranges (120V maximum)
(1100V with 5205A Power Amplifier)

Range Limits

10% to 120% (100 μ V and above)

Resolution

0.0001% of Range (1 nV on 1-mV range)

FREQUENCY RANGES

100 Hz, 1 kHz, 10 kHz, 100 kHz, 1 MHz

Overrange

20% on all ranges (1.2 MHz maximum)

Range Limits

10% to 120% (10 Hz and above)

Resolution

0.01% of Range (0.01 Hz on 100-Hz Range)
 $\pm 0.1\%$ of Range (100 kHz Range)
 $\pm 1.0\%$ of Range (1MHz Range)

ACCURACY

(for 90 days, 23 ± 5° C, after 1-hour warmup.)

Amplitude

10 Hz to 30 Hz

± (0.1% of setting + 0.005% of range)
1, 10, 100 volt ranges.

± (0.1% of setting + 10 μV)
1, 10, 100 millivolt ranges.

30 Hz to 20 kHz

± (0.02% of setting + 0.002% of range)
1, 10, 100 volt ranges.

± (0.02% of setting + 10 μV)
1, 10, 100 millivolt ranges.

20 kHz to 100 kHz

± (0.05% of setting + 0.005% of range)
1, 10, 100 volt ranges

± (0.05% of setting + 20 μV)
1, 10, 100 millivolt ranges.

0.1 MHz to 1 MHz¹

± (0.33% of setting + 0.03% of range)
1, 10, 100 volt ranges.

± (0.33% of setting + 30 μV)
1, 10, 100 millivolt ranges.

Frequency

100-Hz to 100-kHz Ranges ±(1% of setting + 0.1% of range)

1-MHz Range ±(3% of setting + 0.3% of range)

SHORT TERM AMPLITUDE STABILITY

1-mV to 100V Ranges:

The change in rms value will be less than (0.007% of setting + 0.0003% of range) p-p for the 1 kHz thru 1 MHz ranges and (0.007% of setting + 0.004% of range) p-p for the 100 Hz range over a ten minute interval.

LONG TERM AMPLITUDE STABILITY (At Constant Line, Load and Temperature)

±0.005% of setting for 24 hours

±0.01% of setting for 6 months

FREQUENCY STABILITY

±0.05% for 24 hours

±0.1% for 6 months

¹ NOTE: on 1mV range, at output frequencies above 100 kHz, specifications apply for measuring instruments with bandwidths less than 2 MHz.

AMPLITUDE LIMITS WITH TEMPERATURE

(0° to 18° C and 28° C to 50° C)

Add ±(0.025 x accuracy) per °C to stated accuracy limits

FREQUENCY LIMITS WITH TEMPERATURE

(0° to 18° C and 28° C to 50° C)

Add ±(0.025 of setting) per °C to stated accuracy limits

MAXIMUM OUTPUT CURRENT (For Rated Accuracy)

50 mA rms from 10% to 120% of range

NOTE: Min. Load impedance for specified accuracy:

1-, 10-, 100-mV Ranges	6kΩ
1V Range	50Ω above .1 MHz

CURRENT LIMIT

The output is protected against overloads and short circuits by a current limiter.* Upon removal of the overload, the output will recover automatically.

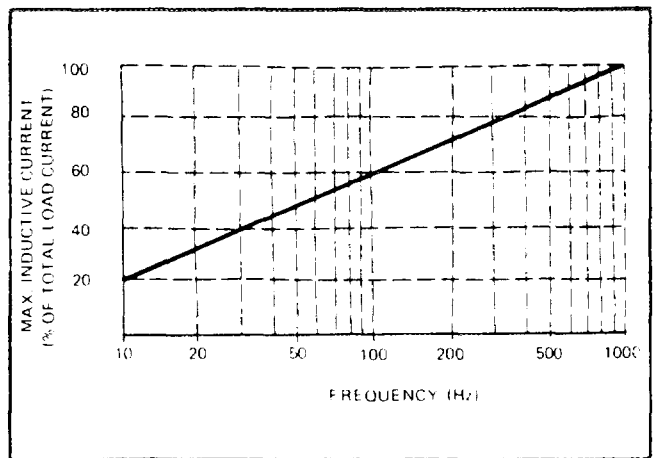
*NOTE: See MAX. INDUCTIVE LOAD.

MAXIMUM CAPACITIVE LOAD

1000 pF

MAXIMUM INDUCTIVE LOAD

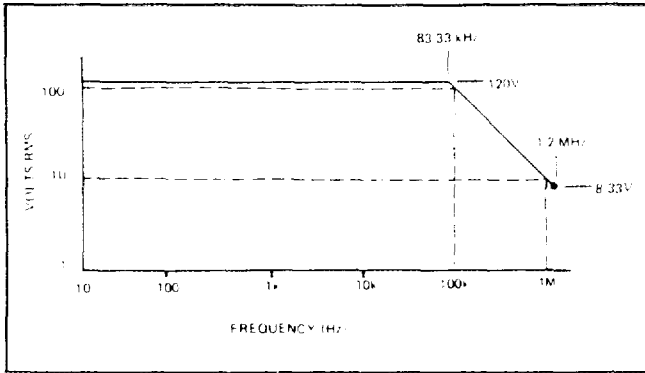
Maximum inductive current allowed is shown below.



The above limit does not restrict the use of precision inductive dividers that have a maximum voltage limit of (0.35 x frequency) or higher.

MAXIMUM OUTPUT VOLTAGE

120V rms, up to 83.33 kHz. Beyond that, maximum output voltage decreases as frequency increases. At highest frequency (1.2 MHz), maximum output voltage is 8.33V rms. Maximum volt-hertz product is 1.0×10^7 or $1.0 \times 10^7 \times (\text{Voltage Range}/10)$, whichever is less (See graph below).



RESPONSE TIME

For any programmed amplitude, the output voltage and frequency will settle to within 0.01% of change as follows:

10 Hz - 30 Hz	4 to 15 seconds
30 Hz - 100 Hz	4 seconds
100 Hz - 400 Hz	2 seconds
400 Hz - 1 MHz	1 second*

The output will recover from short circuits and overload conditions within the specified settling time.

*Typically below 0.5 seconds from 400 Hz to 1.2 MHz except for frequency range changes.

TOTAL HARMONIC DISTORTION AND LINE RELATED NOISE

(Bandwidth 10 Hz to 10 MHz) Effects of broadband noise included in accuracy specification for both RMS and average responding instruments.

10 Hz to 100 kHz	0.04% of setting +10 μ V rms *†
100 kHz to 500 kHz	0.3% of setting +30 μ V rms
500 kHz to 1 MHz	1% of setting +30 μ V rms

*For output currents exceeding 15 mA, see below:

†The specification on the 1-Volt range between 10 Hz and 15 Hz is 0.08% of setting + 10uV rms.

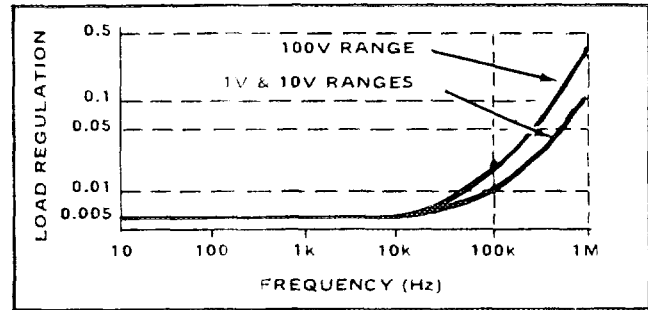
20 kHz to 100 kHz

$$\left[0.04 + \left(\frac{0.3}{V} \right) \left(\frac{F}{100} \right) \left(\frac{I}{50} \right)^2 \right] \%$$

V = volts, F = kHz, I = mA

LOAD REGULATION (EXT. SENSE MODE)

0.005% of selected range, no load to full load, up to 10 kHz. Beyond that, regulation is a function of both range and frequency selected (See following graph).



NOTE: Output impedance on the 1-mV through 100-mV ranges is less than 1.5 Ω in series with 1.5 μ H.

LINE REGULATION

$\pm 0.001\%$ of setting for a 10% change in line voltage.

EXTERNAL FREQUENCY PHASE LOCK INPUT

The oscillator of the 5200A has the capability of being phased locked to an external signal. Phase lock accuracy is $\pm 3^\circ$ below 30 Hz, and $\pm (1^\circ + 0.05^\circ \text{ per kHz})$ over a $\pm 2\%$ band around the center frequency, (BNC connector on rear panel). Input is 1 volt to 10 volts rms (useable down to 100mV rms).

QUADRATURE OUTPUT

(Minimum Load $Z = 3 \text{ k}\Omega$)

Amplitude

10V rms $\pm 10\%$ when 100% of range is selected. Quadrature amplitude is proportional to the dialed output voltage from 10% to 100% of Range. (BNC connector on rear panel.)

Phase

$90^\circ \pm (1^\circ + 0.03^\circ \text{ per kHz})$, 40 Hz to 1.2 MHz.
 $90^\circ \pm 3^\circ$, 10 Hz to 40 Hz

COUNTER OUTPUT

Auxiliary frequency counter output (BNC Connector) on rear panel; 3V pulse, short circuit protected.

EXTERNAL SENSE

A two position switch is provided to control Internal or External Sensing on the 1V, 10V, and 100V ranges. When in Remote Sense (1, 10 and 100V ranges) and the sense leads are accidentally disconnected, the output voltage will not exceed the programmed setting by more than 2.0 volts.

VOLTAGE ERROR MEASUREMENT

0 to $\pm 0.3\%$ with 0.001% resolution

0 to $\pm 3\%$ with 0.01% resolution

An "OFF" error switch position is provided to easily lock out the error measurement function which is automatically disabled in program mode.

OUTPUT TERMINALS

High, Low, High Sense, Low Sense, Guard, and Ground terminals on front and rear panels. Front panel terminals are five-way binding post. Rear panel terminals are pins of a pcb card-edge connector, with mating connector supplied (P/N 337675).

LOCAL/REMOTE OPERATION

Two-position CONTROL switch, interlocked with the optional remote programming function. In the LOCAL position, all control is implemented from the front panel switches. In the REM position, control is obtained via the programming lines through a rear panel connector. When the REMOTE function is called on the programming line, the 5200A will be locked in the Remote condition (regardless of the position of the CONTROL switch), disabling the error measurement control and all other front panel controls except the POWER switch. When the LOCAL function is called on the programming line, the 5200A may be operated in either the Local or the Remote condition, at the operator's discretion.

SAFETY FEATURES

When the ac power is turned on, the instrument is automatically set to the Standby condition. When in Remote Sense and the sense leads are accidentally disconnected, the output voltage will not exceed 2.0 volts above the programmed setting on the 1V thru 100V ranges. The 1 mV thru 100 mV ranges are not affected.

CALIBRATION REQUIREMENTS

The 5200A is calibrated at the factory by instrumentation traceable to the National Bureau of Standards. Periodic calibration of the 1V, 10V, and 100V ranges may be accom-

plished through the use of a thermal transfer standard and a precision dc source, such as the Fluke Models 540B and 332D. The accuracy on the 1-, 10-, and 100 mV ranges depends on precision inductive dividers which are tested at the factory with special verification equipment, and do not require periodic adjustment. All other adjustments can be made with general purpose laboratory equipment.

GENERAL

Input Power

100, 115, 200, 230V ac $\pm 10\%$ (switch selectable), 50 to 60 Hz (50-to-400-Hz Option available, 150 VA).

Maximum Isolation Voltages

500V dc or peak ac, "Guard" to "Chassis"

100V dc or peak ac, "Lo" to "Guard"

Dimensions

7" (178 mm) x 17" (432 mm) x 21.75" (533 mm)

Weight

53 pounds (24 kg)

ENVIRONMENTAL

Cooling

Forced air cooled. Air intake through re-useable filter on rear panel. Air exit along both sides.

Temperature

0°C to 50°C, operating
-40°C to +75°C, storage

Relative Humidity

0 to 80 percent (0°C to +40°C)
0 to 70 percent (+40°C to +50°C)

Shock

15G, 11-ms half-sine wave

Vibration

3.1G, 10 Hz to 55 Hz

Altitude

0 to 10,000 feet, operating
50,000 feet, non-operating

Protection Class 1 (relates solely to insulation and grounding properties further defined in IEC 348.)

Section 2

Operating Instructions

2-1. INTRODUCTION

2-2. This section contains information regarding installation and operation of the Model 5200A AC Calibrator. It is recommended that the contents of this section be read and understood before any attempt is made to operate the calibrator. Should any difficulties arise during operation, please contact your nearest John Fluke Sales Representative or the John Fluke Mfg. Co., Inc., P.O. Box 43210, Mountlake Terrace, WA 98043; telephone (206) 774-2211. A list of Sales Representatives is located in Section 7 of this manual.

2-3. SHIPPING INFORMATION

2-4. The Model 5200A is packaged and shipped in a foam-packed container. Upon receipt of the equipment, a thorough inspection should be made to reveal any possible shipping damage. Special instructions for inspection and claims are included in the shipping carton.

2-5. If reshipment of the equipment is necessary, the original container should be used. If the original container is not available, a new container can be obtained from the John Fluke Mfg. Co., Inc. Please reference the equipment model number when requesting a new shipping container.

2-6. INPUT POWER

2-7. The 5200A can be operated from a 100, a 115, a 200 or a 230V ac, 50 to 60 Hz, power line. (Installation of the -02 option permits operation from a 400 Hz power

line.) Before connecting the equipment to primary power, check and, if necessary, set the input power selection switches as follows:

- a. Remove the top dust cover.
- b. Remove the inner cover located in the right section (as viewed from the top front).
- c. Locate the input power selection switches shown in Figure 2-1.
- d. Set the two slide switches to accommodate the local line voltage. The different switch position combinations are printed on the printed circuit board.
- e. Replace the inner and top dust covers.
- f. Install the proper fuse (i.e. 1½A slo-blo for 100 and 115 vac, and ¾A slo-blo for 200 Vac line voltage) in the rear panel fuse holder.

2-8. RACK INSTALLATION

2-9. The 5200A is designed for bench-top use or for installation in a standard 19 inch equipment rack using the optional Accessory Rack Mounting Kit (part number M07-205-600). Accessory chassis slides (part number M00-208-610) can also be installed to better facilitate access to the rack-installed equipment. Information regarding installation of the mounting accessories is given in Section 6, Rack Installation subsection.

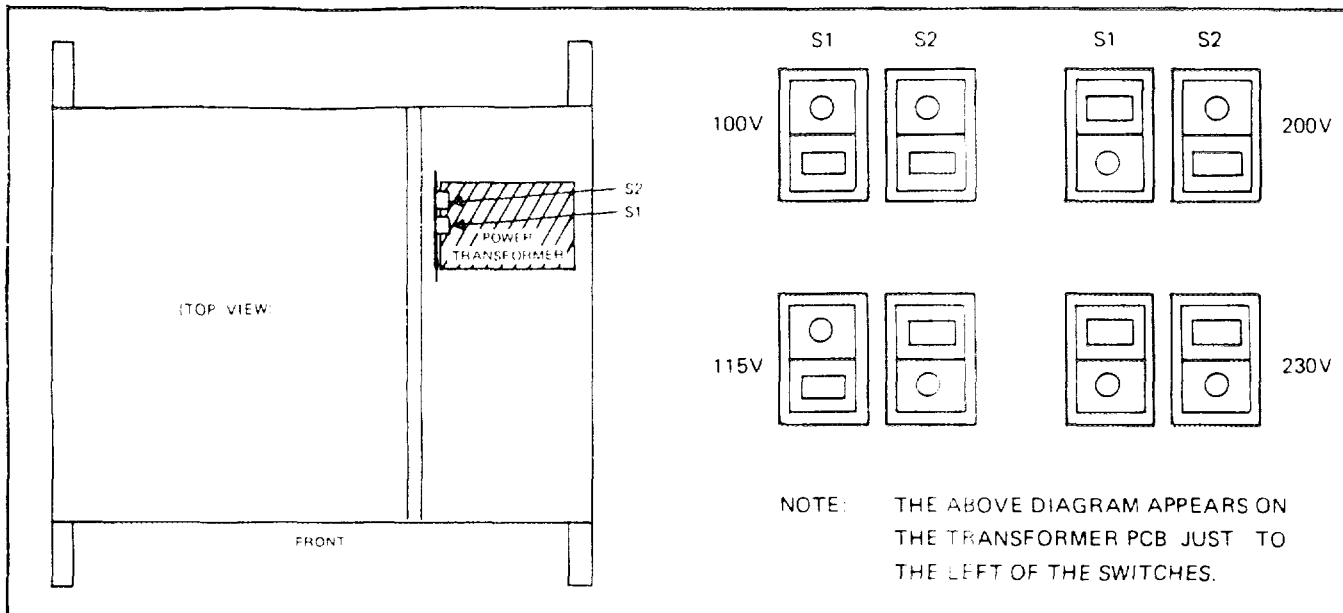


Figure 2-1. INPUT POWER SELECTION SWITCHES, LOCATION AND POSITIONS.

2-10. OPERATING FEATURES

2-11. The front panel controls, indicators and terminals

are shown in Figure 2-2. The items shown are listed in numerical order in Table 2-1, together with the name and function of each.

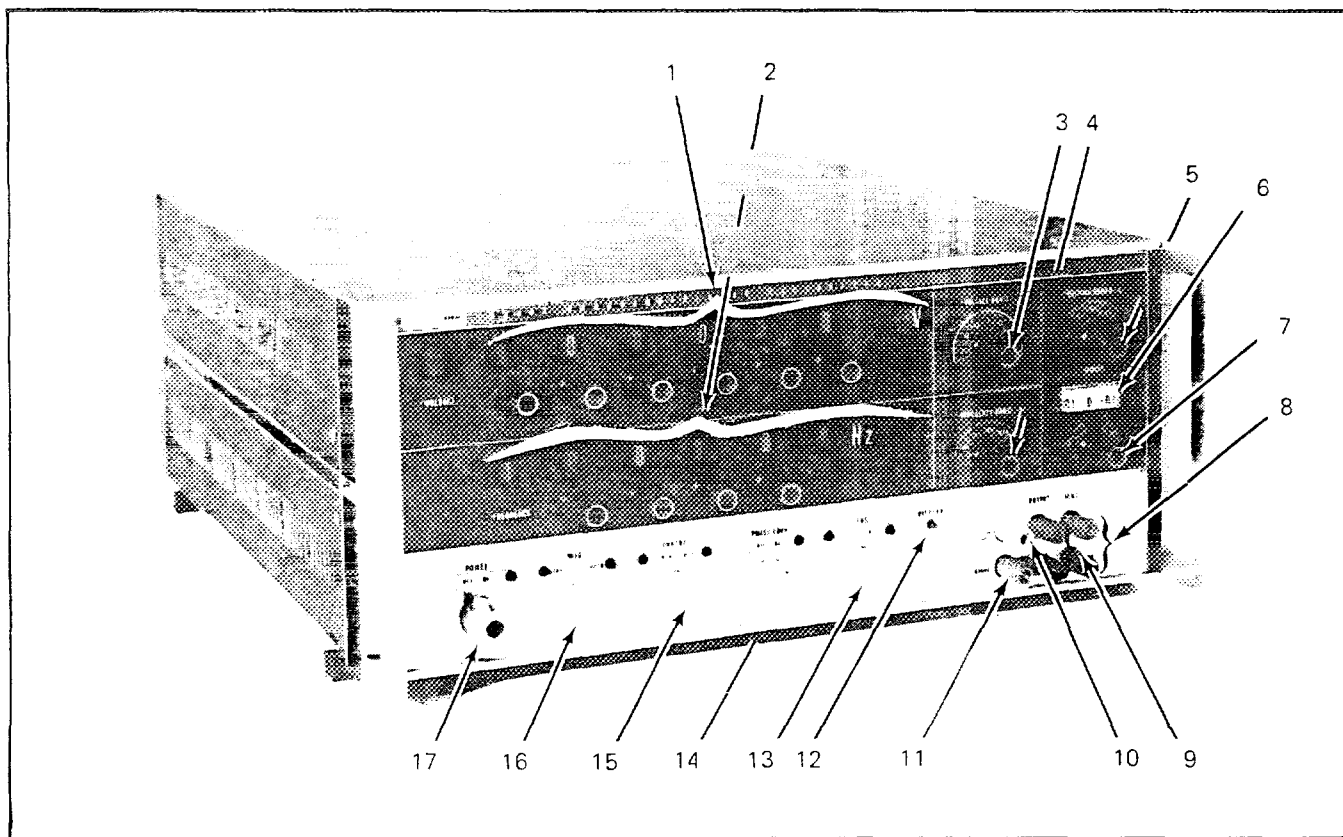


Figure 2-2. FRONT PANEL CONTROLS, INDICATORS AND TERMINALS

Table 2 1. FRONT PANEL CONTROLS, INDICATORS AND TERMINALS.


FIG. & INDEX NO.	NAME	FUNCTION
2-2, 1	VOLTAGE Selection Switches	Select desired calibrator output voltage (within range selected by VOLTAGE RANGE switch). Position of each switch is displayed in window above switch; windows form a readout that displays selected voltage. Leftmost switch has 11 positions (.1 thru 1.1 range) to provide 20% overrange; rest of switches have 10 positions (0 thru 9).
2	FREQUENCY Selection Switches	Select desired calibrator output frequency (within range selected by FREQUENCY RANGE switch). Operation of switches in same as VOLTAGE selection switches (direct readout of selected frequency, and 20% overrange capability).
3	VOLTAGE RANGE Switch	Selects desired output voltage range. Controls decimal point location in VOLTAGE readout. Also controls prefix for unit of measurement (window to left of "V" will be blank or have the prefix "m", depending upon range selected).
4	FREQUENCY RANGE-Hz Switch	Selects desired output frequency range. Controls decimal point location in FREQUENCY readout. Also controls prefix for unit of measurement (window to left of "Hz" will be blank or have either "K" or "M" for a prefix, depending upon range selected).
5	VOLTAGE ERROR -% Switch	Enables voltage error measurement feature and selects multiplier for VERNIER scale indication. When in X1 position, indication is read directly; when in X.1 position, indication must be multiplied by 0.1 (divided by 10). <i>NOTE: If the switch is left in the error position the error selected by the switch and dial positions are automatically entered on all outputs.</i>
6	VERNIER Scale	Indicates voltage error of instrument under test in percent of selected calibrator output, when voltage error measurement feature is enabled and instrument under test is brought to proper indication by VERNIER \pm control. Highest graduations are ± 3.0 , subject to selected multiplier.
7	VERNIER \pm Control	Adjusts output of calibrator up to $\pm 3\%$ when voltage error measurement feature is enabled, bringing instrument under test to proper indication, in order to determine amount of voltage error.
8	SENSE HI, SENSE LO Terminals	Provide front panel connection to sense inputs for external sensing (1V, 10V and 100V ranges only).
9.	OUTPUT HI, OUTPUT LO terminals	Provide front panel connection to calibrator output.
10	 (Ground) Terminal	Provides front panel connection to chassis, and to earth ground when power cord is properly connected. Refer to paragraph 2-30.
11	GUARD Terminal	Provides front panel connection to internal guard shield and is used to reduce effects of common-mode voltages. Refer to paragraph 2-32.

Table 2-1. FRONT PANEL CONTROLS, INDICATORS AND TERMINALS (Contd.)

FIG. & INDEX NO.	NAME	FUNCTION
2-2, 12	OVERLOAD Indicator	Lights to indicate overloaded calibrator output, and remains lit until overload condition is removed.
13	SENSE Switch and Indicators	<p>Selects desired sensing mode:</p> <p>INT Enables internal sensing mode (local sensing); sensing takes place at the output of Attenuator Assembly, A6.</p> <p>EXT Enables external sensing mode (remote sensing); sensing takes place at load, when sensing leads are connected between load and SENSE terminals. (Can only be selected on V ranges; on mV ranges, internal sensing is automatically selected.)</p> <p>Indicator for selected sensing mode lights.</p>
14	PHASE LOCK Switch and Indicator	<p>Switches phase lock feature on and off. When in ON position, causes oscillator to phase-lock to external reference signal applied to appropriate rear panel BNC connector. Refer also to paragraph 2-34. Indicator lights when phase lock is switched on.</p> <p><i>NOTE: If the PHASE LOCK Switch is ON and no phase reference signal is present the output frequency will be at the lower end of the search pattern.</i></p>
15	CONTROL Switch and Indicators	<p>Selects desired calibrator control mode:</p> <p>REM Places calibrator in remote control mode by enabling remote interface (Option -01) and inhibiting front panel controls, except for POWER switch.</p> <p>LOCAL Places calibrator in local control mode by enabling front panel controls.</p> <p>Indicator for selected control mode lights.</p>
16	MODE Switch and Indicators	<p>Selects the desired calibrator operating mode:</p> <p>STDBY Places calibrator in standby mode by removing selected output voltage from output terminals</p> <p>OPER Places calibrator in normal operating mode. If the 1000V range is selected but a 5205A is not connected the mode switch will not go into operate.</p> <p>Indicator for selected operating mode lights.</p> <p><i>NOTE: The calibrator automatically reverts to standby after a 30 second warm-up delay when power is initially applied.</i></p>
17	POWER Switch and Indicator	Switches calibrator on and off. Indicator lights when power is switched on.

2-12. OPERATING NOTES

2-13. The following paragraphs describe various conditions which should be considered before operating the 5200A.

2-14. AC Line Connection

2-15. The input power cord plug is a three-prong polarized connector which permits connection to any of the power line voltages described in paragraph 2-6. Ensure that the round pin is connected to a high quality earth ground. The 5200A is energized by means of the front panel POWER switch.

2-16. Load Connections

2-17. Connection of the load (i.e. the voltmeter or other device or system using the calibrator output) to the 5200A may be made at the front panel, or at either of two rear panel connectors. The front panel connectors are shown in Figure 2-2; the rear panel connectors are shown in Figure 2-3.

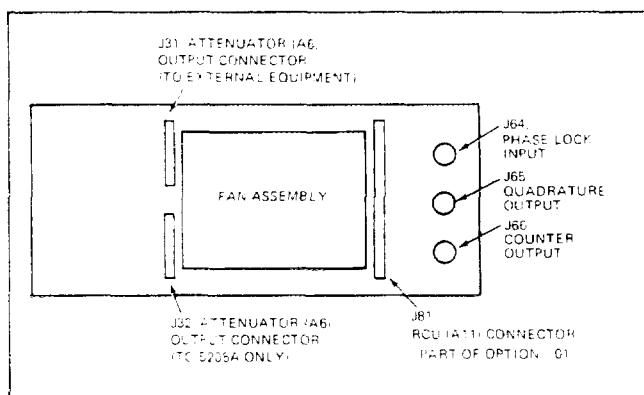


Figure 2-3. REAR PANEL CONNECTORS

2-18. FRONT PANEL

2-19. Front panel terminals permit connection of the load in several different configurations as shown in Figures 2-4, 2-6 and 2-7. Figure 2-4 shows a simple load connection with neither sensing or guarding (from common mode voltages). Sense connections are described in paragraph 2-27 and guard connections are described in paragraph 2-31.

2-20. REAR PANEL

2-21. A pair of printed circuit board edge connectors is accessible through openings in the rear panel when the cover plates are removed. The lower connector (shown in Figure 2-3) provides connection to the companion Model 5205A Precision Power Amplifier as described in paragraph 2-22,

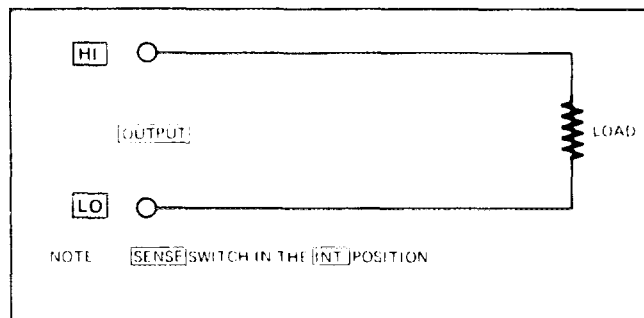


Figure 2-4. SIMPLE LOAD CONNECTION (WITH INTERNAL SENSE).

while the upper connector provides the calibrator output to any other external equipment by means of a user-supplied cable and a 5200A-4023 *(A6A1) connector assembly. The pin assignments of the printed circuit board output connector are shown in Figure 2-5 and should be referenced when constructing the interconnecting cable. If the guard feature is to be used, the interconnecting cable must be shielded. Refer also to the guard connection information contained in paragraph 2-31, and the sense connection information contained in paragraph 2-27.

*P/N 346577 (See A6A1 Parts Listing).

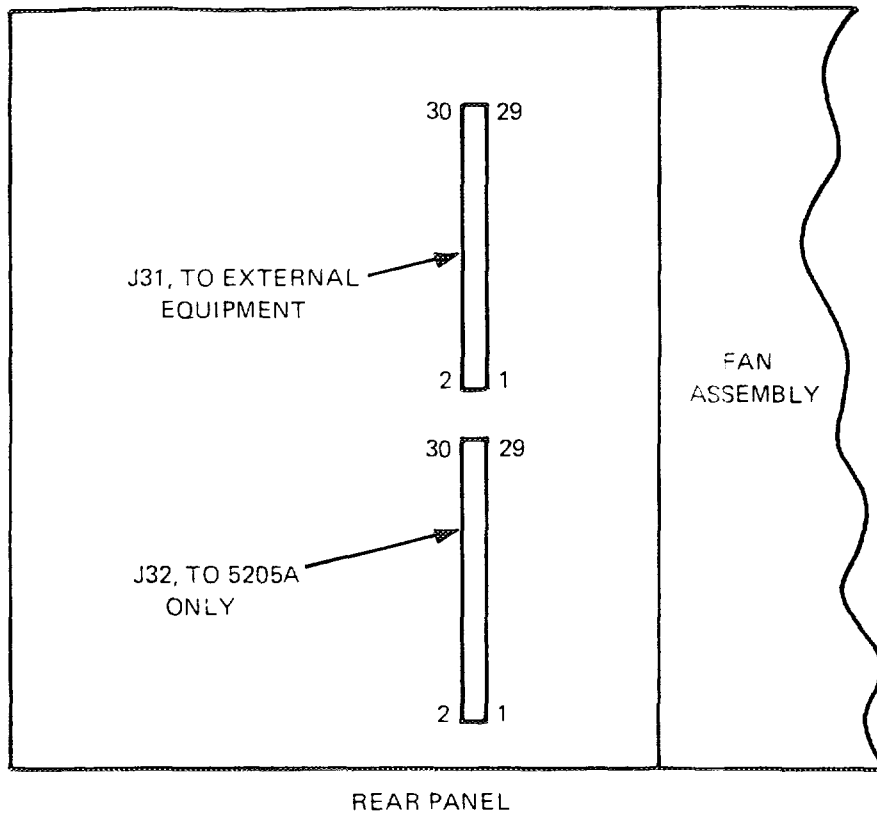
2-22. Model 5200A to Power Amplifier (5205A/5215A Connections)

2-23. The 5200A AC Calibrator output can be extended past its normal maximum 120V ac output by connecting it to either of the Fluke precision amplifiers available. Either the Model 5205A or Model 5215A can be connected to the 5200A with the cable (Fluke Part Number 341560) provided with the power amplifier. The cable mates to J32, on the 5200A (see Figure 3-2) and the 25-pin connector on the rear panel of the power amplifier marked 5200A.

2-24. Auxiliary Outputs

2-25. The 5200A is equipped with a pair of auxiliary outputs which appear at BNC connectors on the rear panel as shown in Figure 2-3. The upper connector provides a signal which leads the fundamental (main) output by 90 degrees and which has an amplitude proportional to that of the selected fundamental output. This output (quadrature) has a maximum amplitude of 10V rms, $\pm 10\%$ when the VOLTAGE decade switches are set to 100 percent of any selected amplitude range, and is reduced proportionally to 1V at the 10 percent setting.

2-26. A second auxiliary output provides a 3 volt pulse signal for application to an external frequency counter. The counter output is short-circuit protected and appears at a BNC connector shown in Figure 2-3.



J31		J32	
PIN NO.	FUNCTION	PIN NO.	FUNCTION
2	GUARD CONNECTION	1	5205A STANDBY STATUS
19	SENSE INPUT-LOW	3	5205A CONTROL
22	CALIBRATOR OUTPUT-LOW	5	+5V RETURN
27	SENSE INPUT-HIGH	7	+5V SUPPLY
29	CALIBRATOR OUTPUT-HIGH	11	5205A OPERATE COMMAND
		15	5205A OVERLOAD TRIP
		21	GUARD CONNECTION
		23	5205A SENSE-HIGH
		25	5205A INPUT-HIGH
		27	5205A INPUT-LOW
		29	5205A SENSE-LOW

Figure 2-5. CALIBRATOR OUTPUT CONNECTORS, PIN ASSIGNMENT

2-27. External (Remote) Sensing

2-28. When a load is connected to the calibrator output, and when the IR drop across the output leads is significant, the rated accuracy of the calibrator is available at the load if external sensing is used. High and low sense terminals and connectors are provided for this purpose, on the front panel output and on both of the rear panel outputs, and may be used when operating in the 1V, 10V and 100V ranges only. (Internal sensing is automatically selected on all three mV ranges, regardless of the position of the SENSE switch.) Polarities must be matched with the output terminals. Figure 2-6 shows a typical calibrator output connection using the external sense feature, but not the guard feature.

CAUTION!

When the external sense function is not being used, the front panel SENSE switch must be in the INT position in order to prevent higher-than-selected output voltages.

2-29. Ground Connections

2-30. A ground terminal is provided at the front panel output. The ground terminal is connected directly to the equipment chassis and to earth ground via the power cord. Note that no connection to chassis is provided at the two rear panel Attenuator output connectors.

2-31. Guard Connections

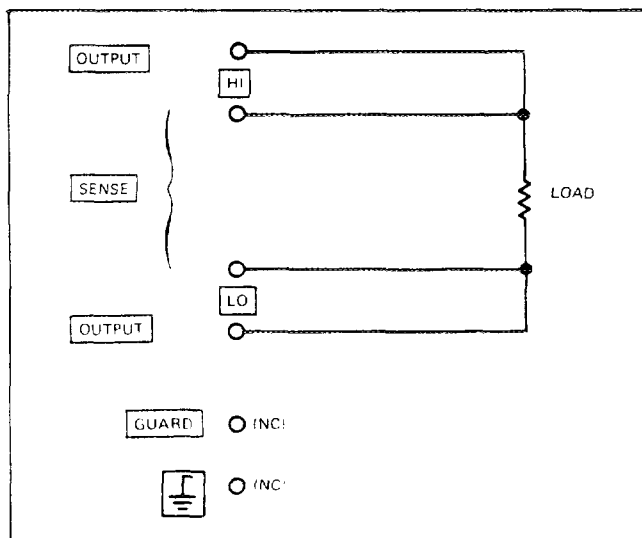


Figure 2-6. EXTERNAL SENSE CONNECTIONS

2-32. The calibrator is equipped with a guard shield that isolates its internal circuitry from the chassis and earth ground. Guard terminals and connectors are provided at the front panel and both rear panel calibrator outputs, and when used, greatly reduce errors caused by common-mode voltages. A typical connection of a load to the calibrator

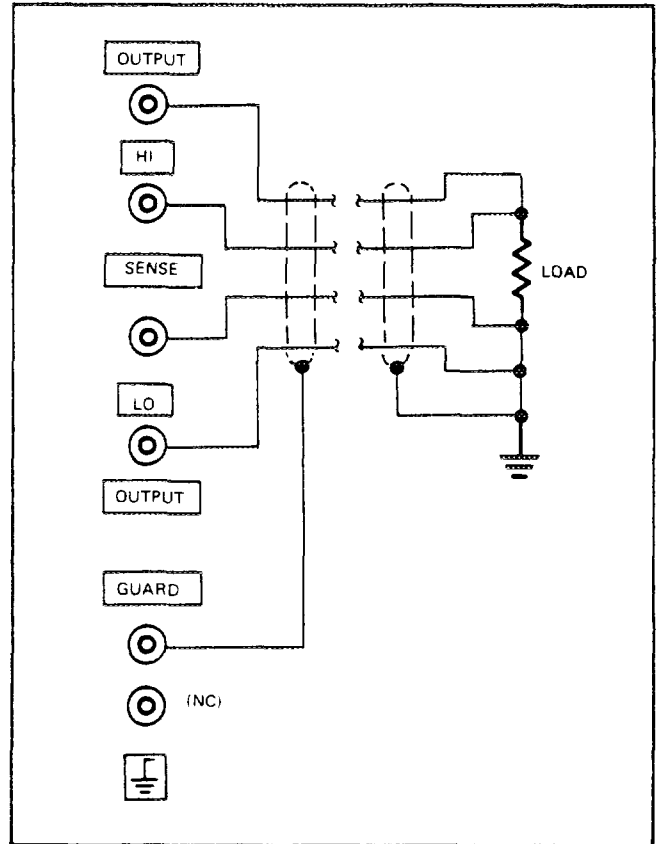


Figure 2-7. GUARD CONNECTIONS

output using the guard and remote sense features is shown in Figure 2-7.

2-33. External Frequency Input

2-34. The output frequency of the 5200A can be phase-locked to an external reference input signal if they are within $\pm 2\%$ of each other. The external reference signal should be between 1V and 10V rms, sine wave or square wave. Connection of the external reference signal is made to the calibrator by means of the BNC connector shown in Figure 2-3.

NOTE!

If the PHASE LOCK switch is ON and no phase reference signal is present, the output frequency will be at the lower end of the search pattern.

5200A

cade switches shown in Figure 2-2. (The CONTROL switch must be set to LOCAL in order to control the 5200A from the front panel.) Five frequency ranges provide outputs of 10 Hz to 1.1999 MHz. The FREQUENCY RANGE - Hz switch provides the necessary range selection. When used with the 5205A Precision Power Amplifier, the output signal meets specification only to 100 kHz.

NOTE!

If the PHASE LOCK switch is on and no phase reference signal is present, the output frequency will be at the lower extreme of the phase lock capture range (typically 4% below the selected output frequency).

2-50. Voltage Error Measurement

2-51. In the local mode of control (only), the 5200A can be used to measure the amount of voltage error (expressed as a percentage of the output) present in a voltmeter under calibration. To measure voltmeter error, proceed as follows:

- a. Set the MODE switch to STDBY.
- b. Set the VOLTAGE ERROR - % switch to X.1.
- c. Set the VOLTAGE RANGE and the FREQUENCY RANGE - Hz switches to the desired ranges.

- d. Set the VOLTAGE and the FREQUENCY decade switches to the desired values.
- e. Connect the voltmeter under measurement to the calibrator output using one of the previously described methods of connection.
- f. Select the proper voltage range on the voltmeter to correspond with the calibrator output selected in steps c and d.
- g. Set the MODE switch to OPER.
- h. Adjust the VERNIER control to obtain an indication on the voltmeter that corresponds to the selected calibrator output voltage. (If necessary, set the VOLTAGE ERROR - % switch to X1.)
- i. Read the amount and polarity of voltmeter error directly from the VERNIER scale.
- j. Return the VOLTAGE ERROR - % switch to OFF.

2-52. REMOTE OPERATION

2-53. Remote operation of the 5200A is controlled by an external programming source when the calibrator is equipped with the --01 Option. Refer to Section 6 of this manual for remote programming information used with this option.