B+K PRECISION

DYNASCAN CORPORATION
1801 West Belle Plaine Avenue, Chicago, Illinois 60613

480-173-9-001C

INSTRUCTION MANUAL

B+K PRECISION 283

3½-DIGIT

DIGITAL MULTIMETER

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Product of DYNASCAN CORPORATION
1801 West Belle Plaine Avenue, Chicago, Illinois 60613

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FOR

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INTRODUCTION

The B & K-Precision Model 283 Digital Multimeter is a significant contribution to the instrumentation market. Low cost and high performance have been engineered into this instrument to make available to the engineer, technician, maintenance and service personnel, and training institutions a digital multimeter that is competitively priced with existing analog meters and which, at the same time, exceeds the performance of these meters. In addition, the basic instrument has been designed for maximum simplicity of operation and minimum error of reading.

The basic design features of this instrument make it an ideal replacement for existing multimeters and FET/VOM's. The instrument measures DC and AC voltage, current and ohms. It has high input impedance (10 megohms) on all voltage ranges, and a wide resistance measurement range (100 ohms full range to 10 megohms full range), with 100% overrange. In addition to providing equivalent functions and ranges, the inherent accuracy of this instrument provides a significant margin of improved performance over analog multimeters.

A selectable High/Low Ohms feature, generally not available on digital multimeters, permits making in-circuit resistance measurements at voltage levels below the conduction threshold of semiconductors.

The overload protection system was designed to provide maximum protection of the instrument with minimum user inconvenience, in the event of extreme overload accidents.

A battery pack option is available which makes the Model 283 completely portable and isolated. The pack mounts inside the meter's case, requiring only a screwdriver for installation. This option provides more than 8 hours' continuous use before an overnight recharge is needed and unlimited use while plugged into an AC line.

SPECIFICATIONS

DC VOLTAGE

Ranges	±0-1.000, 10.00, 100.0, 1000V.
Overrange	100 percent to ±1.999, 19.99, 199.9, 1500V.
Maximum DC Input	1500 volts DC, or DC + AC peak.
Accuracy	±.5 percent of reading, ±1 digit, 1, 10, 100V range. ±1.0 percent of reading, ±1 digit, 1000V range.
Input Impedance	10 megohms.
Polarity Indication	Automatic; minus sign shown, plus sign implied.
Overrange Indication	If the input voltage exceeds 200 percent of full range, the top and bottom segments on the first digit will flash while the display reads "000" (= □□□). The polarity of overrange is indicated.
Circuit Protection, All Voltage Ranges	±1500 VDC or 1500 VDC + AC peak.

AC VOLTAGE

(Average reading circuitry calibrated to read RMS value of pure sine wave.)

Ranges	0-1.000, 10.00, 100.0, 1000V RMS.
Overrange	100 percent, to 1.999, 19.99, 199.9, 1000V RMS.
Maximum AC Input	1000V RMS or 1500V peak.
Accuracy	±1 percent of reading, ±1 digit, 1, 10, 100V ranges. ±1.5 percent of reading, ±1 digit, 1000V range.

Frequency Response	±1 percent accuracy: 40 Hz to 400 Hz on 1, 10 and 100V range. ±1.5 percent accuracy: 40 Hz to 400 Hz on 1000V range.
Input Impedance	10 megohms.
Overrange Indication	If the input voltage exceeds 200 percent of full range, the top and bottom segments of the first digit will flash while the display reads "000" (= □□□).
Circuit Protection, All Voltage Ranges	1000V RMS or 1500 VDC + AC peak.

DC CURRENT

Ranges	0-1.000, 10.00, 100.0, 1000mA.
Voltage Drop (Measured at Instrument Terminals)	250mV (650mV on 1000mA range) maximum.
Overrange	100 percent, to 1.999, 19.99, 199.9 and 1999mA.
Accuracy	±1 percent of reading, ±1 digit, 1, 10, and 100mA range. ±1.5 percent of reading, ±1 digit, 1000mA range.
Polarity Indication	If a DC current of negative polarity is applied to the input, the minus sign will light. The plus sign is implied.
Overrange Indication	If the input current exceeds 200 percent of full range, the top and bottom sigments of the first digit will flash while the display reads "000" (= □□□). The polarity of overrange is indicated.
Circuit Protection, All Ranges	Fuse and diodes. Fuse externally accessible at front panel.

AC CURRENT

Ranges	0-1.000, 10.00, 100.0, 1000mA.
Voltage Drop (Measured at Instrument Terminals)	250mV RMS (650mV RMS on 1000mA range) maximum.
Overrange	100 percent, to 1.999, 19.99, 199.9 and 1999mA.
Accuracy	±1.5 percent of reading, ±1 digit, 1, 10 and 100mA range. ±2 percent of reading, ±1 digit, 1000mA range.
Frequency Response	40 Hz to 400 Hz at stated accuracy.
Overrange Indication	If the input current exceeds 200 percent of full range, the top and bottom segments of the first digit will flash while the display reads "000" (= □□□).
Circuit Protection, All Ranges	Fuse and diodes. Fuse externally accessible at front panel.

RESISTANCE

Ranges	0-100.0 ohms; 1.000, 10.00, 100.0, 1000k ohms; 10.00 megohms.
Overrange	100 percent, to 199.9 ohms; 1.999, 19.99, 199.9, 1999k ohms; 19.99 megohms.
Accuracy	±1 percent of reading, ±1 digit, 1k ohm to 1000k ohm ranges, in HIGH ohms function. ±2 percent of reading, ±1 digit, 10 megohms range, HIGH ohms function and 100 ohm to 1000k ohm range, LOW ohms function.

Maximum Test Currents

100Ω	1mA
1kΩ	1mA
10kΩ	100μA
100kΩ	10μA
1000kΩ	1μA
10MΩ	100nA

Polarity	VOLTS/OHMS (red) jack is positive for all ranges.
Maximum Open Circuit Voltage	8 volts.
Voltage with Full Scale Reading	0.2 volt in LOW ohms. 2 volts in HIGH ohms.
Circuit Protection, All Ranges	-500V to +1000 VDC + AC peak, continuous. Will withstand momentary overloads to ±1000 VDC + AC peak with no component failure.

GENERAL

Operating Temperature	15°C to 35°C.
Stated Accuracy Measured At	25°C ±1°C.
Temperature Coefficients	±0.025%/°C on DC Volts. ±0.05%/°C all other functions.
Power Source	117 VAC 50/60 Hz factory wired (user may change to 100V or 234V by moving internal transformer tap).
Power Consumption	7 watts max.; 12 watts max. if also charging battery.
Line Cord	3-wire, detachable.
Sampling Rate	3 readings per second.
Settling Time, All Ranges & Functions	Less than one second.

Accessories Included	Two test leads.
Optional	BP-83 Rechargeable Battery Pack.
	PR-21 Isolation/Direct Probe (aids DC measurements in presence of RF).
	PR-23 RF Detector/Demodulator Probe, 15 kHz to 250 MHz.
	PR-28 High-Voltage Probe. LC-83 Carrying Case.
Dimensions	3-5/8" x 7" x 9", excluding handle and tilt stand.
Weight	6 lbs.

CONTROLS AND FEATURES

(See Fig. 1)

FUNCTION SWITCH. Selects the type of measurement to be performed. Also used to turn the instrument ON and OFF.

ZERO ADJUSTMENT. Used to zero the display with the test leads shorted on any range or function. Precise zero indicated by flashing minus (-) sign in DCV or DCA.

RANGE SWITCH. Selects the desired range for the measurement selected by the FUNCTION switch.

POSITIVE (VOLTS/OHMS) TEST LEAD JACK. "Hot" input jack. In voltage measurements the test lead connected to this jack is normally applied to the potential point in the circuit most removed from signal ground or earth ground.

NEGATIVE TEST LEAD JACK. Common connection to the instrument input; it should be connected to ground or a low impedance point when measuring voltage. The jack doubles as the 2A-3AG fuse holder.

CURRENT (mA) TEST LEAD JACK. This jack is used when measuring DC and AC currents.

MINUS SIGN. A minus (-) indication will be displayed on DC Volts or DC Current for a negative voltage or current respectively. **NOTE:** The positive (+) sign is implied and is not displayed.

NUMERICAL READOUTS. 3½-digit display. First display indicates minus sign and 1; last three displays indicate numerals from "0" to "9".

HANDLE. For carrying the instrument.

TILT STAND. Can be used to raise front of the 283 for convenient viewing angle.

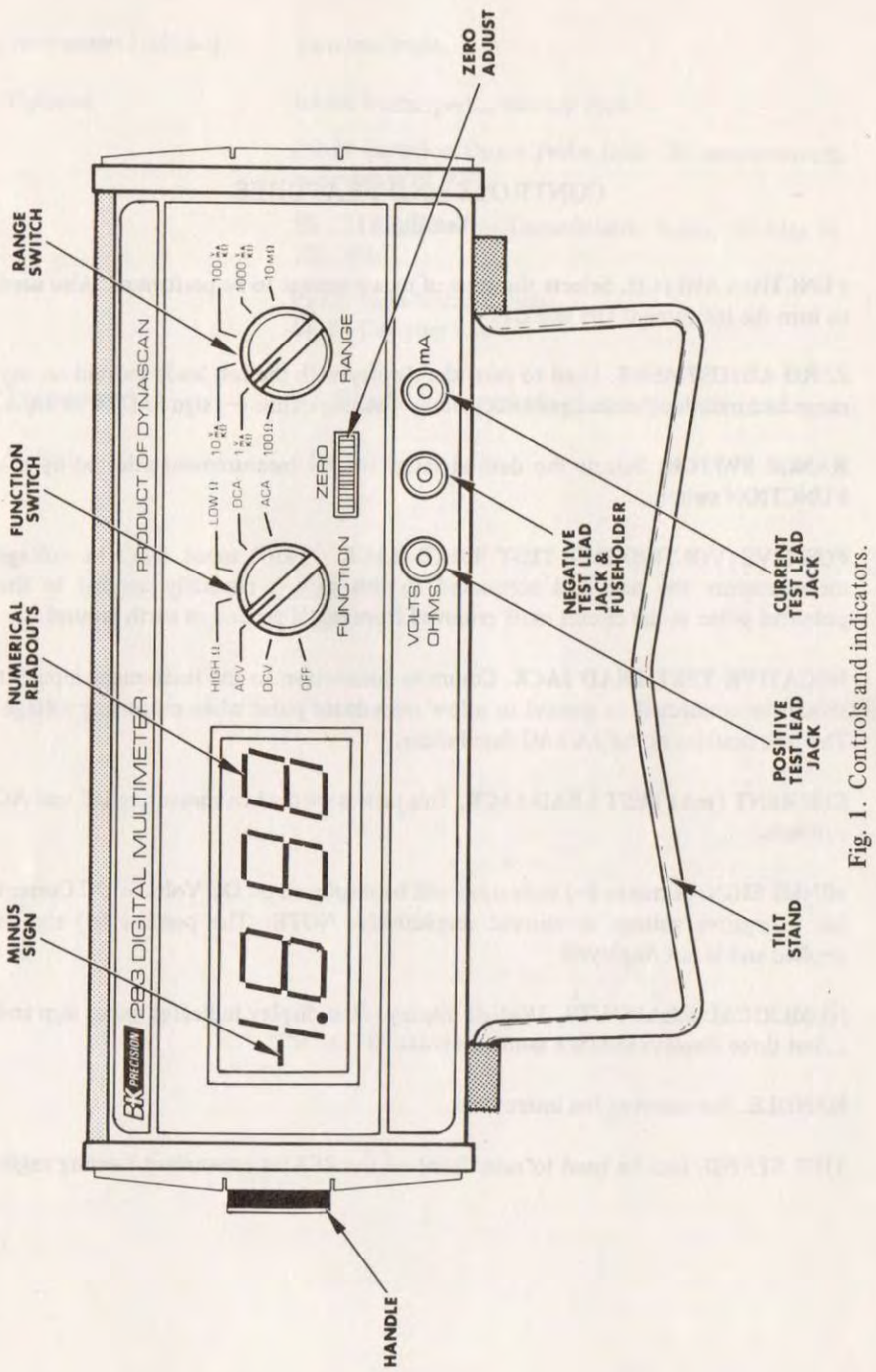


Fig. 1. Controls and indicators.

OPERATION

1. PREPARATION AND CHECK

a. Plug the red test lead into the VOLTS/OHMS jack, and the black test lead into the black jack.

b. Turn unit on by setting the FUNCTION switch to HIGH Ω and the RANGE switch to 10kΩ.

c. Without a resistance connected across the test leads, the overrange indicating should occur, and shorting the test leads should produce a zero reading. Check ZERO adjustment.

d. Return FUNCTION switch to ACV or DCV and RANGE switch to 1000V. It is good practice to leave the instrument in this position when not in use to prevent accidental overloads.

SAFETY PRECAUTIONS

A certain amount of danger is always present when working on electrical equipment, and therefore, the user is cautioned to always familiarize himself as much as possible with the equipment to be tested, before any work is performed. It should be kept in mind that high voltages often appear at unexpected points in defective equipment.

When testing high voltage circuits, develop the habit of keeping one hand in your pocket to minimize the hazard of accidental shock. It is also important to have a properly insulated floor or floor covering to stand on while taking measurements. Be particularly careful to avoid contact with nearby objects which could provide a ground return path.

It is good practice to *remove operating power* before connecting test leads. An isolation transformer always should be used in equipment having the chassis tied to one side of the AC power line.

Table 1

INTERPRETATION OF DIGITAL DISPLAY READINGS

TO MEASURE	SET FUNCTION SWITCH	SET RANGE SWITCH	DISPLAY FULL SCALE	READINGS ARE IN:	RESOLUTION †
DC VOLTS					
0-2V	DCV	1V	1.999	Volts	1mV
0-20V		10V	19.99	Volts	10mV
0-200V		100V	199.9	Volts	0.1V
0-1500V		1000V	*1500**	Volts	1.0V
AC VOLTS					
0-2V	ACV	1V	1.999	Volts	1mV
0-20V		10V	19.99	Volts	10mV
0-200V		100V	199.9	Volts	0.1V
0-1000V		1000V	*1000***	Volts	1.0V
DC CURRENT					
0-2mA	DCA	1mA	1.999	mA	1μA
0-20mA		10mA	19.99	mA	10μA
0-200mA		100mA	199.9	mA	100μA
0-2 Amp		1000mA	1999	mA	1mA
AC CURRENT					
0-2mA	ACA	1mA	1.999	mA	1μA
0-20mA		10mA	19.99	mA	10μA
0-200mA		100mA	199.9	mA	100μA
0-2 Amp		1000mA	1999	mA	1mA
OHMS					
0-200Ω	OHMS	100Ω	199.9	Ohms	0.1Ω
0-2000Ω	(HIGH or LOW)	1kΩ	1.999	Kilohms	1Ω
0-20kΩ		10kΩ	19.99	Kilohms	10Ω
0-200kΩ		100kΩ	199.9	Kilohms	100Ω
0-2MΩ		1000kΩ	1999	Kilohms	1kΩ
0-20MΩ		10MΩ	19.99	Megohms	10kΩ

NOTES

*Do not exceed input levels of 1500 VDC or DC + AC peak.

**Do not exceed input levels of 1000 VRMS or 1500V peak.

† Resolution indicates the change in the measured value that is required to shift the least significant (right hand) digit, one count.

TABLE 1 is provided as an aid to operation of the Model 283 and, in addition, provides interpretation of the displays obtained. Note that the decimal location changes with the position of the RANGE switch. The significance of the decimal location must be known to assure proper interpretation of the readings obtained.

2. DC VOLTAGE MEASUREMENTS

a. Set FUNCTION switch to the DCV position.

b. Short the test leads and zero the instrument by turning the ZERO control until the MINUS sign just lights or flickers with a zero reading displayed.

c. Set RANGE switch as required for the voltage amplitude to be measured. If the magnitude of the voltage is not known, set the RANGE switch to the 1000V position and reduce the settings as required to obtain a satisfactory reading.

d. If the voltage exceeds that of the range selected, the overrange indication will operate and flash. Select a higher voltage range.

3. AC VOLTAGE MEASUREMENTS

a. Place the FUNCTION switch in the ACV position.

b. Set the RANGE switch to the desired voltage range. If the voltage exceeds that of the range selected, the overrange indication will operate and flash. Select a higher voltage range.

4. RESISTANCE MEASUREMENTS

CAUTION

Do not attempt to measure resistance in a circuit in which the power is applied. Remove the power and make sure that all capacitors are discharged before attempting in-circuit resistance measurements.

a. OUT-OF-CIRCUIT:

(1) Set the FUNCTION switch to the HIGH Ω position.

(2) Set the RANGE switch to the desired position.

(3) If the resistance value being measured exceeds the value of the range selected, the overrange circuitry is energized and will flash. Select a higher range.

b. IN-CIRCUIT:

(1) The Model 283 has selectable LOW and HIGH ohms ranges. Conventional resistance measurements can be performed on all ranges. The LOW ohms positions limit the maximum test voltage developed across the measured resistance to 0.2 volt with a full scale reading. This low voltage permits accurate measurements of in-circuit resistances shunted by semiconductor junctions.

The applied test voltage is proportional to the resistance reading observed, varying from zero with the test leads shorted to .2 volt for a full scale reading. For example, in the 100Ω range with a resistance reading of 50.0 ohms, the voltage developed across the resistance under test is .05 volt.

When using the HIGH ohms positions, a full-scale voltage of 2 volts is developed across the measured resistance. Again, the voltage developed across the measured resistance is proportional to the resistance reading observed. Reversing the leads will result in the same reading (within 1%) if there is no shunting by a semiconductor, and is a good quick check that the accuracy of the measurement is not being affected by semiconductors.

c. OUT-OF-CIRCUIT SEMICONDUCTOR TESTS:

In addition to conventional resistance measurements, the HIGH ohms ranges can be used to verify that a semiconductor junction is good by checking the front-to-back ratio.

(1) Select the 1kΩ range.

(2) Remove device from circuit.

(3) Connect the test leads to the device (e.g.: diode, base-emitter or base-collector junction) and then reverse the lead connections. Observe the meter reading for both conditions.

	TEST RESULT	CONDITION
(a)	Overrange, both polarities	Junction Open
(b)	Zero or Low Reading, both polarities	Junction Shorted
(c)	Overrange in one direction and In-Range Reading in the other	Junction Probably Good

(4) The in-range reading of Step (c) can be used to determine whether the device under test is silicon or germanium. A reading of 400 to 700 indicates the device is silicon. An indication of 100 to 300 indicates the device is germanium.

(5) The "I-V" curve of the device may be drawn using the accurate current sources of the 283. With the FUNCTION switch set to HIGH Ω, note the reading for each position of the RANGE switch, 1kΩ through 10MΩ. Disregarding the decimal point location, each reading is numerically the voltage in mV across the device junction with the current through it listed as Maximum Test Current in specifications section.

5. DC CURRENT MEASUREMENTS

a. Place the FUNCTION switch in the DCA position.

b. Place the RANGE switch in the desired current range position. Always set the RANGE switch to the 1000mA position if the magnitude of current to be measured is not known.

c. Connect the plus (+) test lead to the current ("mA") test lead jack.

CAUTION

Use care in making current measurements. Make sure that the meter is connected *in-series* with the loads in which the current is to be measured. Never connect the meter across a voltage source with the FUNCTION switch set for current. Doing so may either blow the overload protection fuse or damage the equipment under test.

When connecting the multimeter to read current, first remove power to the circuit. The following rules will insure that the proper current polarity is indicated.

(1) When inserting the multimeter between the positive side of the power source and the load, connect the positive lead to the power source and the negative lead to the load.

(2) When inserting the multimeter between the negative side of power source and the load, connect the negative lead to the power source and the positive lead to the load.

d. Apply power and read current.

e. If the polarity of the current being measured is negative, the polarity sensing circuit will be energized, and the value displayed will be preceded by a minus (−) sign.

f. If the magnitude of the current being measured exceeds that indicated on the RANGE switch, the overrange circuitry will operate. When this occurs, immediately remove power from the circuit under test and select a higher current range before proceeding further.

NOTE

Current ranges are fuse protected. If inoperative, refer to FUSE REPLACEMENT section.

6. AC CURRENT MEASUREMENTS

a. Set the FUNCTION switch to the ACA position.

b. Set the RANGE switch to the desired position. If in doubt about the magnitude of the current to be measured, use the highest current range and then adjust the RANGE switch as required to obtain a satisfactory reading.

c. Connect the plus (+) test lead to the current ("mA") test lead jack.

d. When connecting the multimeter for current measurements remove the power from the circuit being tested while the connections are being made. Reapply the power and read current.

e. If the magnitude of the current being measured exceeds the range selected, the overrange circuitry will operate. When this occurs, immediately remove power from the circuit under test and select a higher current range before proceeding further.

NOTE

Current ranges are fuse-protected. If inoperative, refer to FUSE REPLACEMENT section.

BATTERY PACK BP-83 ACCESSORY

INSTALLATION (Refer to Fig. 2)

1. With the Model 283 unplugged, remove the two screws on the back that fasten the cover. Lift the rear of the cover slightly and slide it forward to expose the inside of the instrument.

2. There is a pair of black plastic connectors near the transformer which join the transformer wires to the main circuit board. Carefully pull the connectors apart, holding them by the shells, not by the wires.

3. Place the BP-83 assembly in the space near the transformer, with the battery against the rear of the chassis. Locate the battery so that the terminal polarity is as shown in Fig. 2. Slide the assembly back, so that the hooked tab of the bracket fits through the slot at the rear of the chassis and push it down.

4. Insert the two screws supplied through the bottom of the chassis into the BP-83 bracket and tighten them snugly.

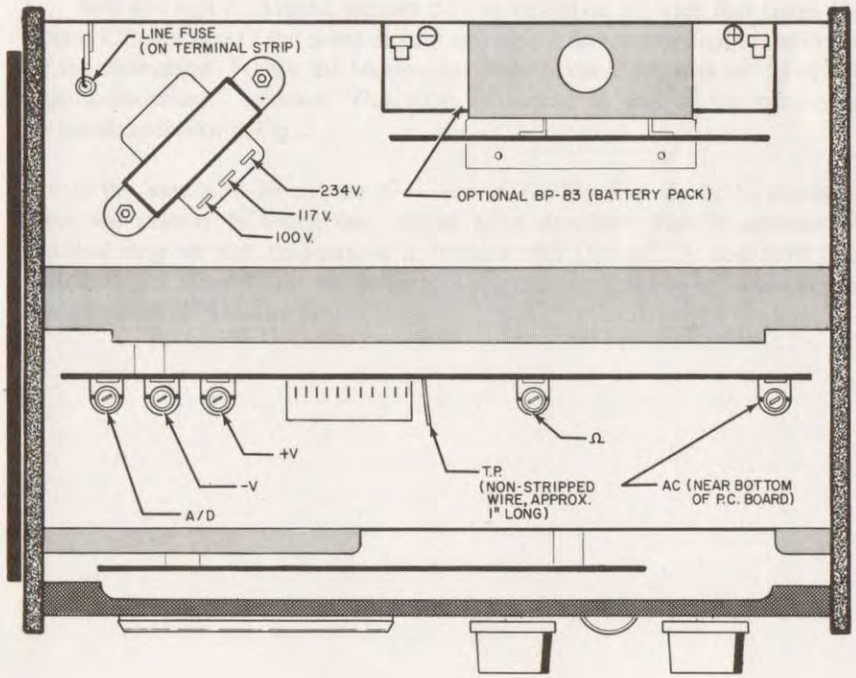


Fig. 2. Internal view.

5. Connect the two plastic connectors of step 2 to the corresponding connectors of the BP-83 (they only fit one way – do not force).

6. Check polarity stamped on battery against Fig. 2, then connect the short red (+) and black (−) wires to the battery terminals. Replace cover.

OPERATION

Whenever the instrument is plugged into an AC outlet, the battery is being charged. The charging rate varies with the battery's state of charge to prevent overcharging. When operating away from AC power, the unit may be used continuously for more than eight hours before the display dims and an overnight recharge is needed. The meter can be used while recharging, although this lengthens the charge time required.

100V and 234V LINE OPERATION

(Refer to Fig. 2)

The Model 283 is factory-connected for use with 117V, 50/60 Hz AC lines. To operate it on 100V or 234V 50/60 Hz power, an internal connection must be moved, as follows:

With the unit unplugged, remove the two screws on the back that fasten the cover. Lift the rear of the cover slightly and slide it forward to expose the inside of the instrument. Locate the transformer and lift the white wire off its center "quick-disconnect" terminal. This must be moved to one of the two other terminals as shown in Fig. 2.

If the unit is to be run on 234V power, the line fuse should be changed. Note the manner in which the original 1/8A slow-blow fuse is soldered to terminal strip on rear, then remove it. Replace with 1/16A-250V slow-blow fuse supplied. The wires within the detachable line cord are color-coded according to the European DIN standard.

THEORY OF OPERATION

(Refer to Block Diagram, Fig. 3)

The Model 283 operates by converting the various types of input signals into a scaled DC voltage which is then transformed into digital information by the integrator and logic circuits.

Voltage inputs are applied through the attenuator (resistor network RN1) to a high impedance voltage follower (IC1) for a 2 volt full scale swing. AC voltages are then full-wave rectified, filtered, and scaled to produce a DC voltage equal to the RMS value of a sine wave.

Resistance measurements are made by generating a precision constant current (controlled by IC4) which develops a DC voltage across the measured resistor proportional to its resistance. The signal is then applied to the follower and processed as for voltage measurements with the exception that, when LOW Ω is selected, the current source is divided by 10 and the gain of the voltage follower is switched from x1 to x10, to provide a full scale swing from 0.2 volts at its input. The RANGE switch picks the magnitude of the current generated (1mA max.).

For current measurements, the input is passed through one of four small shunt resistances to develop 0.2 volts for a full scale reading. This voltage is applied to the voltage follower in its gain of 10 mode.

The output of the voltage follower (or of the AC-to-DC converter) is converted to digital format by the dual-slope integrator (1C2C) and the L.S.I. logic chip (1C6). The 2 references used for the integration are derived from a highly stable zener (D11) with fixed current drive.

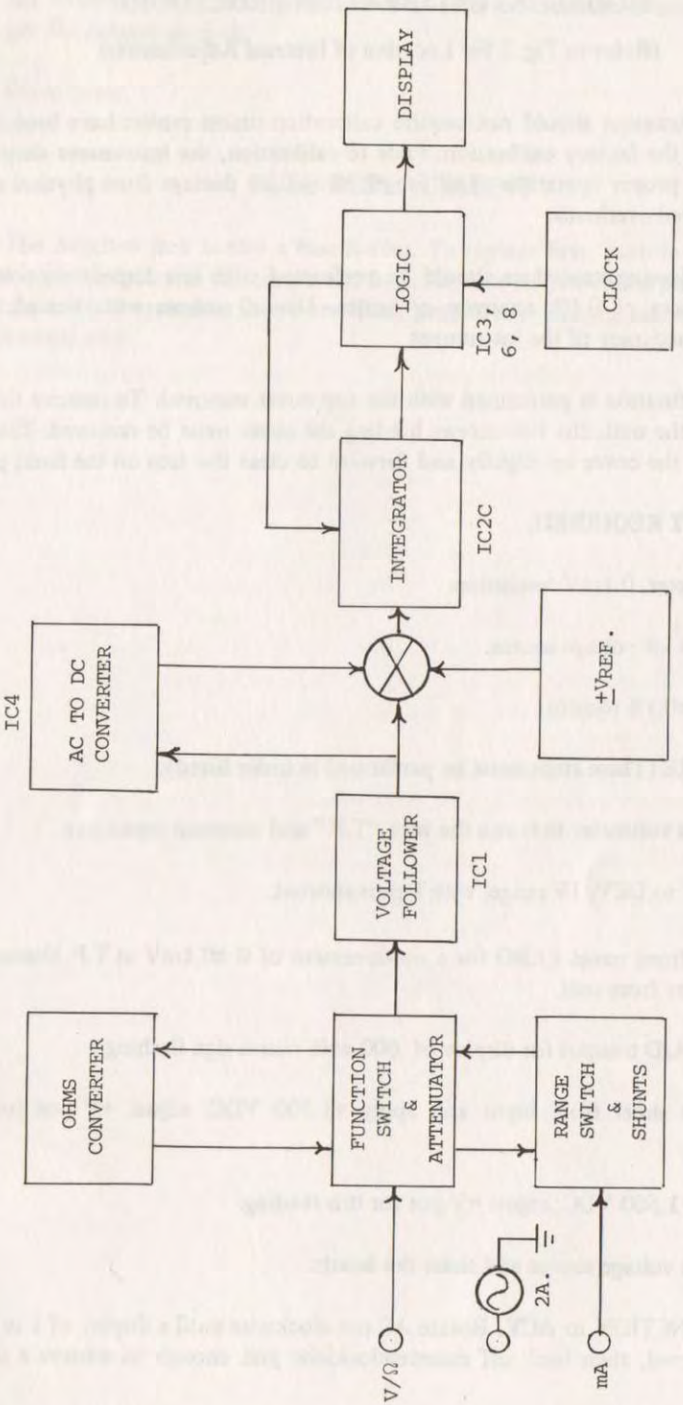


Fig. 3. Block diagram.

MODEL 283 CALIBRATION PROCEDURE

(Refer to Fig. 2 for Location of Internal Adjustments)

The instrument should not require calibration unless repairs have been made that change the factory calibration. Prior to calibration, the instrument should be checked for proper operation of all functions and for damage from physical abuse or unprotected overloads.

The following procedure should be performed with low impedance constant voltage sources of 0.1% accuracy or better. Use of sources with less accuracy reduces the accuracy of the instrument.

The calibration is performed with the top cover removed. To remove the top cover from the unit, the two screws holding the cover must be removed. Then lift the back of the cover up slightly and forward to clear the tabs on the front panel.

EQUIPMENT REQUIRED:

DCV meter, 0.1mV resolution.

1.5V ±0.1% voltage source.

1.5kΩ ±0.1% resistor.

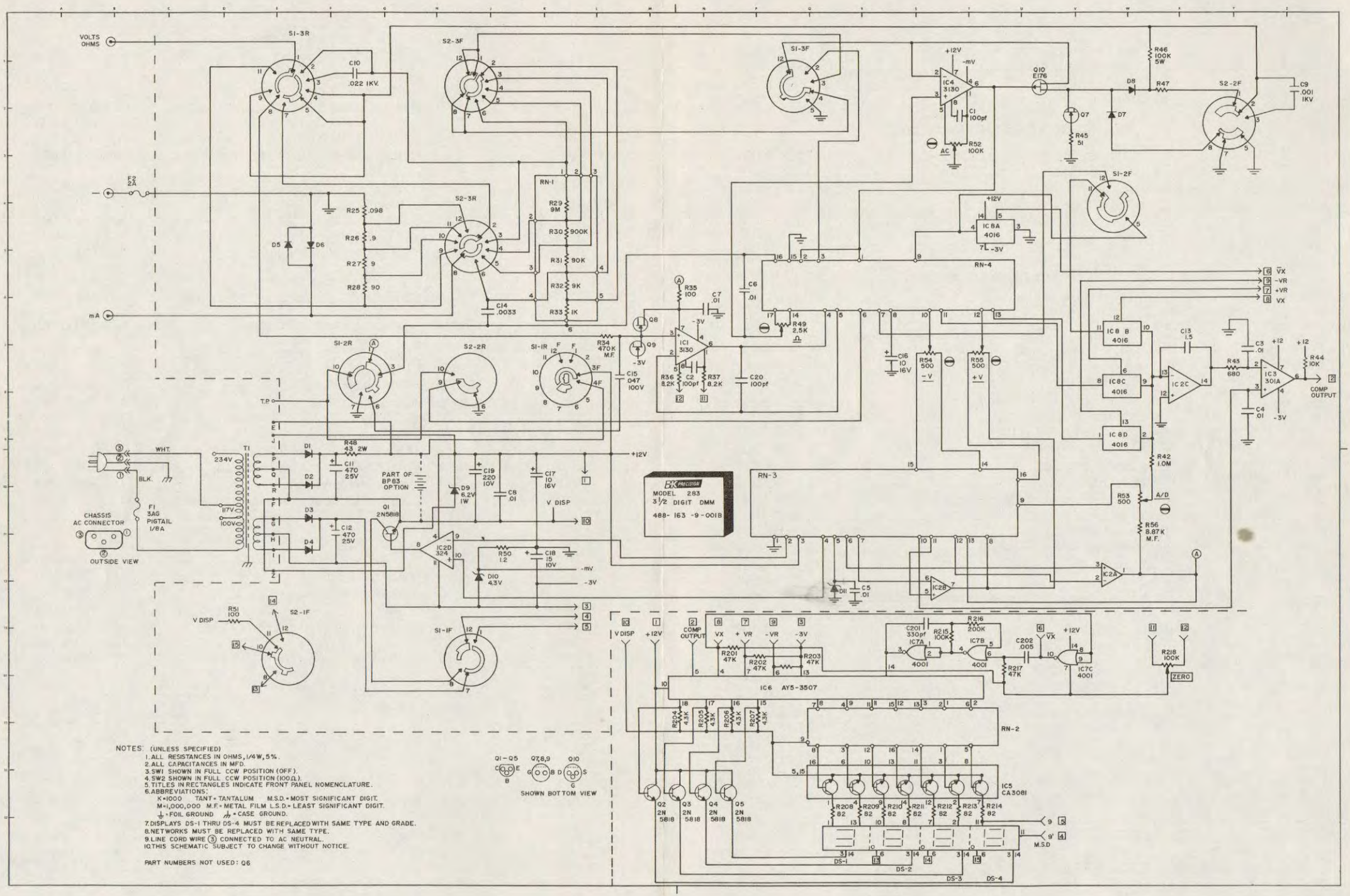
PROCEDURE (These steps must be performed in order listed):

1. Connect voltmeter between the wire "T.P." and common input jack.
2. Set unit to DCV, 1V range, with inputs shorted.
3. Adjust front panel ZERO for a measurement of 0 ±0.1mV at T.P. Disconnect voltmeter from unit.
4. Adjust A/D trimpot for display of .000 with minus sign flashing.
5. Remove short from input and apply +1.500 VDC; adjust +V pot for this reading.
6. Apply -1.500 VDC; adjust -V pot for this reading.
7. Remove voltage source and short the inputs.
8. Set FUNCTION to ACV. Rotate AC pot clockwise until a display of 1 or 2mV is observed, then back off counterclockwise just enough to achieve a steady zero.

9. Set FUNCTION to HIGH Ω and connect reference resistor to inputs. Adjust Ω pot for correct reading.
10. Close cover.

FUSE REPLACEMENT

The negative jack is also a fuse holder. To replace fuse, push in and turn the insert counterclockwise to remove the fuse. *Replace only with the proper 2A-3AG type fuse.* To re-assemble, insert new fuse, push in and turn the insert clockwise to the internal stop.



NOTES: (UNLESS SPECIFIED)

1. ALL RESISTANCES IN OHMS, 1/4W, 5%.
2. ALL CAPACITANCES IN MFD.
3. SW1 SHOWN IN FULL CCW POSITION (OFF).
4. SW2 SHOWN IN FULL CCW POSITION (100Ω).
5. TITLES IN RECTANGLES INDICATE FRONT PANEL NOMENCLATURE.
6. ABBREVIATIONS:
   K=1000 TANT=TANTALUM M.S.D.=MOST SIGNIFICANT DIGIT.
   M=1,000,000 M.F.=METAL FILM L.S.D.=LEAST SIGNIFICANT DIGIT.
   ⏚=FOIL GROUND ⏚=CASE GROUND.
7. DISPLAYS DS-1 THRU DS-4 MUST BE REPLACED WITH SAME TYPE AND GRADE.
8. NETWORKS MUST BE REPLACED WITH SAME TYPE.
9. LINE CORD WIRE (3) CONNECTED TO AC NEUTRAL.
10. THIS SCHEMATIC SUBJECT TO CHANGE WITHOUT NOTICE.

PART NUMBERS NOT USED: Q6

Q1-Q5 Q7,8,9 Q10

SHOWN BOTTOM VIEW

B & K-PRECISION MODEL 283 PARTS LIST

488-16309-002-B

SCHEMATIC SYMBOL	DESCRIPTION	B & K PART NUMBER
	RESISTORS	
R25	0.098Ω, ½W, ½% Wirewound	004-125-9-001
R26	0.9Ω, 1W, ½% Wirewound	004-160-9-001
R27	9Ω, ½W, ½% Metal Film	011-088-9-001
R28	90Ω, ½W, ½% Metal Film	011-089-9-001
R34	470kΩ, ½W, 5% Metal Film	011-102-8-474
R46	100kΩ, 5W, 10% Metal Glaze	004-161-9-001
R47	Special, High Voltage Current Limiter, Base Resistance, 2kΩ ±40%	004-163-9-001
R49	2.5kΩ Trimpot	008-236-9-001
R52	100kΩ Trimpot	008-238-9-001
R53, 54, 55	500Ω Trimpot	008-237-9-001
R56	8.87kΩ, ¼W, 1%, Metal Film	011-122-9-001
R218	100kΩ Multi-turn Potentiometer	008-254-9-001
	CAPACITORS	
C1, 2, 20	100pF, 500V, 10% Pre-formed Ceramic Disc	020-044-9-001
C3, 4, 5 6, 7, 8	.01μF, 100V, −20, +80% Pre-formed Ceramic Disc.	020-101-9-001
C9	.001μF, 1kV, 10% Pre-formed Ceramic Disc.	020-138-9-001
C10	.022μF, 1kV, 20% Pre-formed Polyester	025-103-9-001
C11, 12	470μF, 25V Electrolytic	022-095-9-001
C13	1.5μF, 100V P.F. Polyester	025-101-9-001
C14	.0033μF, 100V, 20% P.F. Polyester	025-105-9-001
C15	.047μF, 100V, 10% Polyester	025-094-9-001
C16, 17	10μF, 16V, 20% Pre-formed Tantalum	027-010-9-001
C18	15μF, 10V, 20% Pre-formed Tantalum	027-009-9-001
C19	220μF, 10V Electrolytic	022-109-9-001
C201	330pF, 500V, 10%, Pin Lead, Ceramic Disc	020-151-9-001
202	.005μF, 500V, 20%, Pin Lead, Ceramic Disc	020-152-9-001
	DIODES	
D1, 2, 3, 4	Diode, 1A, 600V	151-050-9-001
D5, 6	Diode, Protection Silicon	151-054-9-001
D7	Diode, Silicon Low Leakage	151-055-9-001
D8	Diode, 1N4007	151-053-9-001
D9	Diode, Zener 6.2V, 5%, 1W (1N4735A)	152-037-9-001
D10	Diode, Zener 1N749A (4.3V)	152-062-9-001
D11	Diode, Reference Zener 1N4565 (6.4V)	152-066-9-001
	TRANSISTORS	
Q1, 2, 3, 4, 5	Silicon 2N5818	176-051-9-001
Q7, 8, 9	FET, N-Channel Clamp Diode	182-036-9-001
Q10	FET, P-Channel	182-035-9-001
	INTEGRATED CIRCUITS	
IC1, IC4	CA3130 FET Op Amp	307-073-9-001
IC2	IC324 Quad Op Amp	307-060-9-001
IC3	IC301 Op Amp	307-074-9-001
IC5	CA3081 Transistor Array	037-075-9-001
IC6	AY-5-3507	307-077-9-001
IC7	IC4001 Quad Gates	307-072-9-001
IC8	IC4016 Quad Bilateral Switch	307-076-9-001

COMPOSITE
499-086-9-001-B

SCHEMATIC SYMBOL	DESCRIPTION	B & K PART NUMBER
	NETWORKS	
RN1	Resistor Network, Input	012-011-9-001
RN2	Resistor Network, Display	012-007-9-001
RN3	Resistor Network	012-008-9-001
RN4	Resistor Network	012-009-9-001
	TRANSFORMERS AND SWITCHES	
T1	Power Transformer	065-116-9-001
S1	Switch, Function	083-186-9-001
S2	Switch, Range	083-187-9-001
	DISPLAYS	
DS1, 2, 3, 4	H.P. 5082-7650	238-008-9-001
	MISCELLANEOUS	
F1	Fuse 1/8A, 3AG Pigtail	193-011-9-001
F1	Fuse 1/16A, 3AG Pigtail (240V Wired Unit)	193-004-9-001
F2	Fuse, 2 Amp, 3AG	191-251-3-002
	Bracket, P.C. Board	251-157-9-001
	Cover, Top	253-042-9-902
	Chassis, Main	257-067-9-902
	Decorative Inlay (Side Panel)	260-063-9-001
	Front Panel Overlay	260-069-9-001
	Bracket, Handle Mounting	261-067-9-001
	Case End Panel, Right	271-041-9-001
	Case End Panel, Left	271-042-9-001
	Terminal Strip	345-013-9-001
	Fuse Housing, ½ (2 req'd)	380-247-9-001
	Bezel, Display	280-250-9-001
	Filter, Transparent red	280-251-9-001
	Foot, Front	381-059-9-001
	Foot, Rear	381-061-9-001
	Line Cord	420-022-9-001
	Test Lead, Black	522-062-9-001
	Test Lead, Red	522-063-9-001
	Fuseholder/Jack Assembly	523-115-9-001
	Tinnerman (for window)	652-042-9-001
	"E" Ring, Bowed (for fuse housing)	741-082-9-001
	Handle	746-030-9-001
	Knob	751-130-9-001
	P.C.B., Plastic Standoff	759-062-9-001
	Spring, Fuse Contact	767-038-9-001
	Receptacle, Chassis AC	770-018-9-001
	Banana Jack, Red	774-001-9-001
	Stand, Wire Form	804-005-9-001

NOTE: Standard value resistors are not listed. Values may be obtained from schematic diagram. Minimum charge $5.00 per invoice. Orders will be shipped C.O.D. unless previous open account arrangements have been made or remittance accompanies order. Advance remittance must cover postage or express charges. Specify serial number when ordering replacement parts.

B & K Division of DYNASCAN CORPORATION

2815 W. Irving Park Rd., Chicago, Illinois 60618
Phone: 312/583-4360
Factory Authorized Parts & Service Centers

492 - 036 - 0 - 777

The following will handle any parts and/or service problems, either in or out of warranty. Your nearest service center has been selected for quality and prompt attention to your needs. Please take advantage of this service facility established for your benefit. This list is subject to change without notice. Please contact service center **before** forwarding equipment for repair.

TEST EQUIPMENT

ALABAMA
Arnold's Instrument Service
2116 Dauphin Island Pkwy.
Mobile, AL 36605
205/478-3230

ARIZONA
Arizona Certified Electronics
2629 N. 1st Ave.
Tucson, AZ 85719
602/623-2432

Arizona Electric Standard Lab
1845 W. Campbell Ave.
Phoenix, AZ 85015
602/264-9351

ARKANSAS
Electronics Sales & Service
7515 Geyer Springs Rd.
Little Rock, AR 72209
501/565-0774

CALIFORNIA
Electronic Service Co.
8128 Orion Ave.
Van Nuys, CA 91406
213/780-3071

Guaranteed Electronics
5822 Mission St.
San Francisco, CA 94112
415/334-5900

Teletek Enterprises, Inc.
2749 Kilgore Rd.
Rancho Cordova, CA 95670
916/635-1331

Valley Scientific
P.O. Box 7751
5510 Air Terminal Dr. East
Fresno, CA 93727
209/291-6381

CANADA
Atlas Electronics Limited
50 Wingold Ave.
Toronto, Ont., Canada M6B 1P7
416/781-6174

COLORADO
House of TV Repair
1445 Florence St.
Aurora, CO 80010
303/366-1581

Clyde N. Still Electronics
2630 W. Kiowa
Colorado Springs, CO 80904
303/633-8404

CONNECTICUT
L & L Electronics
186 N. Main St.
Branford, CT 06405
203/488-4814

DISTRICT OF COLUMBIA
Electronic Maintenance
308 Carroll St. N.W.
Washington, DC 20012
202/882-2333

FLORIDA
Azalea Park Appliance, Inc.
1201 W. Pine St.
Orlando, FL 32805
305/425-1440

Elecon Corp.
3986 39th
St. Petersburg, FL 33709
813/522-5451

IDAHO
Idaho Instrument Service
410 Elm St. N.
Twin Falls, ID 83301
208/733-5636

ILLINOIS

Dynascan Corp.
2815 W. Irving Park Rd.
Chicago, IL 60618
312/583-4360

E.I.L. Instruments, Inc.
9708 Industrial Dr.
Bridgeview, IL 60455
312/430-2292

INDIANA

E.I.L. Instruments, Inc.
7061 Twin Oaks Dr., Suite M
Indianapolis, IN 46226
317/545-1373

Electro-Lab Services, Inc.
510 Williams Rd.
Evansville, IN 47712
812/423-5211

KANSAS

Main Electronics, Inc.
225 Ida
Wichita, KS 67211
316/267-3581

KENTUCKY

Louisville Meter Service
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Louisville, KY 40220
502/454-3432

LOUISIANA

Telcom of New Orleans, Inc.
4239 Banks St.
New Orleans, LA 70119
504/482-8732

MARYLAND

E.I.L. Instruments, Inc.
1830 York Rd.
Timonium, MD 21093
301/252-1260

O-Tronics
1237 Queen Anne Ave.
Odenton, MD 21113
301/672-1127

MASSACHUSETTS

Electric Service Center
39 Hollis St.
E. Pepperell, MA 01437
617/433-6940

MICHIGAN

Electro Instrument Repair
Div. Instrument Specialties, Inc.
1024 West 14 Mile Rd.
Clawson, MI 48017
313/435-3311

MICHIGAN (cont'd)

Main Electronics
5558 S. Pennsylvania Ave.
Lansing, MI 48910
517/882-5035

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Lane Electronics, Inc.
3805 Chouteau
Kansas City, MO 64117
816/455-0308

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Cape Girardeau, MO 63701
314/334-2055

Scherrer Instruments
7170 Manchester Ave.
St. Louis, MO 63143
314/644-5362

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Bellevue, NE 68005
402/291-2200

Bob's Industrial Electronics
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North Platte, NE 69101
308/532-8017

Electrometrics Co.
404 South 11th
Lincoln, NE 68508
402/477-3434

Midwestern Laboratories
14965 Grover St.
Omaha, NE 68144
402/334-5606

NEW JERSEY

Hosica Laboratories
715 Main St.
North Caldwell, N.J. 07425
201/256-7724

NEW MEXICO

Bradley Electronics
6344 Linn, N.E.
Albuquerque, NM 87100
505/268-6930

NEW YORK

Altair Electronics Service, Inc.
474 Thurston Rd.
Rochester, N.Y. 14619
716/235-1470

NEW YORK (cont'd)
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1008 Utica Ave.
Brooklyn, N.Y. 11203
212/345-5656

NORTH CAROLINA
Music Center Repairs
213 East Main St.
Cherryville, N.C. 28021
704/435-5304

Speed Instrument
Div. Owen-Barbot, Inc.
Hwy.#401 North Box 11456
Raleigh, N.C. 27604
919/876-4919

OHIO
E.I.L. Instruments, Inc.
7915 South Suburban Rd.
Dayton, OH 45459
513/435-2134

Pioneer Cleveland
Div. Pioneer Standard Electronics, Inc.
4800 E. 131 St.
Cleveland, OH 44105
216/587-3600

Pioneer Dayton Instrument Lab
1900 Troy
Dayton, OH 45404
513/236-9900

OKLAHOMA
Stark's Avionics & Comm. Service
1604 N.E. Woodlands
Ponca City Airport
Ponca City, OK 74601
405/765-8264

OREGON
Westcon
1910 N. Killingsworth St.
Portland, OR 97217
503/285-6629

PENNSYLVANIA
American Instrument Service, Inc.
441-45 N. 5th St.
Philadelphia, PA 19123
215/923-6760

Dynatronics, Inc.
Route 611
Tannersville, PA 18372
717/629-0050

E.I.L. Instruments, Inc.
1844 Ardmore Blvd.
Pittsburgh, PA 15221
412/731-5230

RHODE ISLAND
E.I.L. Instruments, Inc.
6810 Post Rd.
North Kingstown, R.I. 02852
401/885-1773

SOUTH CAROLINA
King's
114 S. Main St.
Bishopville, S.C. 29010
803/484-5482

TENNESSEE
Instrument Repair Service
468 N. Watkins
Memphis, TN 38104
901/278-0762

TEXAS
Border Electronics Services
1704 E. Paisano
P.O. Box 3804
El Paso, TX 79923
915/532-2524

Central Instrument Laboratory
777 S. Central Expressway
Richardson, TX 75080
214/234-2862

Champion Instrument Laboratory
624 S. Tatar Road
Pasadena, TX 77506
713/473-6680

The Measurements Company
8100 S. Kirkwood, Suite 105
Houston, TX 77072
713/498-7478

Moore Electronic Service, Inc.
3511 Pinemont, Suite A-4
Houston, TX 77018
713/682-4430

Osmond Associates
1716 E. Yandell
El Paso, TX 79902
915/542-0024

Whitlock Instrument
1306 North Texas Street
Odessa, TX 79762
915/337-3412

UTAH
Salt Lake Instruments Service
129 W. 17th South
Salt Lake City, UT 84115
801/487-2541

VIRGINIA

E.I.L. Instruments, Inc.
5400 Cherokee Ave.
Alexandria, VA 22312
703/354-4330

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Veradale, WA 99037
509/926-9037

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2727 N.E. Blakeley St.
Seattle, WA 98105
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The Lectronic Shoppe
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Everson, WA 98247
206/966-3621

Sutherlands, Inc.
952 Industry Dr.
Building 26
Tukwila, WA 98188
206/575-4075

WISCONSIN

Electro-Mechano Co.
241 E. Erie St.
Milwaukee, WI 53202
414/272-4050

PUERTO RICO

E.I.L. Instruments, Inc.
Marginal, A12
Urbanization Los Angeles
Carolina, Puerto Rico 00630
809/791-4115

SOUTH AMERICA

Teleroman CIA LTDA
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Ecuador
513– –525 Casilla 3906

AUSTRALIA

Parameters, PTY, LTD.
P.O. Box 480
Crows Nest, N.S.W.
Australia 2065

Dynascan Corporation — 6460 W. Cortland — Chicago, Illinois 60635
Printed in U.S.A.

B+K PRECISION REGISTRATION CARD

B & K - PRECISION Test Equipment is designed and built to the highest standards of quality and reliability. It is warrantied for one year from the date of purchase against defects in materials or workmanship. To validate this warranty, please complete this card and mail it within 15 days of purchase.

Name

B&K-PRECISION Model No.

Company

Serial No. —

Address

City

State_____ Zip

Purchased: Month Day Year

Company Telephone: Area Code Number —

1. Why did you select this B&K-PRECISION instrument?
   - A. ___ Recommended by an associate
   - B. ___ Recommended by the distributor
   - C. ___ Like other B&K-PRECISION Products I own
   - D. ___ Saw an ad in:
     1. ☐ Electronics Design
     2. ☐ Electronic Products
     3. ☐ Electronic Technical/Dealer
     4. ☐ Radio Electronics
     5. ☐ Popular Electronics
     6. ☐ Other _____

2. What will this test equipment be used for?
   - A. ___ Laboratory (Research and Development)
   - B. ___ Production Testing
   - C. ___ Incoming Inspection
   - D. ___ Equipment Maintenance
   - E. ___ School Training
   - F. ___ Television/Radio Repair
   - G. ___ Hobby
   - H. ___ Other _____

3. Used at full time job ☐, at home ☐, both ☐

4. Specific application for this test equipment?

   _____

   _____

5. New products you would like to see us make:

   _____

   _____

   _____

6. Test equipment you will buy in the next 12 months?

   _____

7. Would you like to receive a full-line catalog of B&K - PRECISION Test Equipment? ☐ Yes ☐ No

   Other Literature?_____

8. What product or service does your company provide?

   _____

9. About how many employees? _____

10. User's Job?
    - A. ___ Engineer/R&D
    - B. ___ Technician
    - C. ___ Production Line
    - D. ___ Incoming Inspection
    - E. ___ Teacher
    - F. ___ Student
    - G. ___ Service/Maintenance Worker
    - H. ___ Other _____

11. What related technical, special interest, or hobby magazines do you read most often?

    _____

12. General Comments:

    _____

    _____

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491-172-9-001

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WARRANTY SERVICE INSTRUCTIONS

1. Refer to the maintenance section of the instruction manual for adjustments that may be applicable.
2. Defective parts removed from units which are within the warranty period should be sent to the factory prepaid with model and serial number of product from which removed and date of product purchase. These parts will be exchanged at no charge.
3. If the above-mentioned procedures do not correct the difficulty, pack the product securely (preferably in original carton or double-packed). A detailed list of troubles encountered must be enclosed as well as your name and address. Forward prepaid (express preferred) to the nearest B & K-Precision authorized service agency.

Contact your local B & K-Precision Distributor for the name and location of your nearest service agency, or write to

Service Department

B & K-PRECISION

DYNASCAN CORPORATION

2815 West Irving Park Road

Chicago, Illinois 60618

ONE YEAR LIMITED WARRANTY

"B & K-Precision warrants that each product manufactured by it will be free from defects in material and workmanship under normal usage and service for a period of one year after its purchase new from an authorized B & K-Precision distributor. Our obligation under this warranty is limited to repairing, or replacing any product or component which we are satisfied does not conform with the foregoing warranty and which is returned to our factory or our authorized service contractor, transportation prepaid, and we shall not otherwise be liable for any damages, consequential or otherwise. *The foregoing warranty is exclusive and in lieu of all other warranties (including any warranty of merchantability), whether expressed or implied.* Such warranty shall not apply to any product or component (i) repaired or altered by anyone other than B & K-Precision or its authorized service contractor without B & K-Precision's prior written approval; (ii) tampered with or altered in any way or subjected to misuse, negligence or accident; (iii) which has the serial number altered, defaced or removed; or (iv) which has been improperly connected, installed or adjusted otherwise than in accordance with B & K-Precision's instructions. B & K-Precision reserves the right to discontinue any model at any time or change specifications or design without notice and without incurring any obligation. *The warranty shall be void and there shall be no warranty of any product or component if a B & K-Precision warranty registration card is not properly completed and postmarked to the B & K-Precision factory within ten days after the purchase of the product from an authorized B & K-Precision distributor.*"