

ARTISAN®
TECHNOLOGY GROUP

Your **definitive** source for quality pre-owned equipment.

**Artisan Technology Group**
(217) 352-9330 | sales@artisantg.com | artisantg.com

**Full-service, independent repair center**
with experienced engineers and technicians on staff.

**We buy your excess, underutilized, and idle equipment**
along with credit for buybacks and trade-ins.

**Custom engineering**
so your equipment works exactly as you specify.

- Critical and expedited services
- In stock / Ready-to-ship
- Leasing / Rentals / Demos
- ITAR-certified secure asset solutions

**Expert team | Trust guarantee | 100% satisfaction**

All trademarks, brand names, and brands appearing herein are the property of their respective owners.

Find the *Keithley 7059* at our website: ***Click HERE***

FILE COPY

KEITHLEY

# Model 7059
# Low Voltage Scanner Plug-In Card
# Instruction Manual

**Publication Date: February 1989**
**Document Number: 7059-901-01 Rev. E**

Artisan Scientific - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisan-scientific.com

# WARRANTY

Keithley Instruments, Inc. warrants this product to be free from defects in material and workmanship for a period of 1 year from date of shipment.

Keithley Instruments, Inc. warrants the following items for 90 days from the date of shipment: probes, cables, rechargeable batteries, diskettes, and documentation.

During the warranty period, we will, at our option, either repair or replace any product that proves to be defective.

To exercise this warranty, write or call your local Keithley representative, or contact Keithley headquarters in Cleveland, Ohio. You will be given prompt assistance and return instructions. Send the product, transportation prepaid, to the indicated service facility. Repairs will be made and the product returned, transportation prepaid. Repaired or replaced products are warranted for the balance of the original warranty period, or at least 90 days.

## LIMITATION OF WARRANTY

This warranty does not apply to defects resulting from product modification without Keithley's express written consent, or misuse of any product or part. This warranty also does not apply to fuses, software, non-rechargeable batteries, damage from battery leakage, or problems arising from normal wear or failure to follow instructions.

THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR USE. THE REMEDIES PROVIDED HEREIN ARE BUYER'S SOLE AND EXCLUSIVE REMEDIES.

NEITHER KEITHLEY INSTRUMENTS, INC. NOR ANY OF ITS EMPLOYEES SHALL BE LIABLE FOR ANY DIRECT, INDIRECT, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF THE USE OF ITS INSTRUMENTS AND SOFTWARE EVEN IF KEITHLEY INSTRUMENTS, INC., HAS BEEN ADVISED IN ADVANCE OF THE POSSIBILITY OF SUCH DAMAGES. SUCH EXCLUDED DAMAGES SHALL INCLUDE, BUT ARE NOT LIMITED TO: COSTS OF REMOVAL AND INSTALLATION, LOSSES SUSTAINED AS THE RESULT OF INJURY TO ANY PERSON, OR DAMAGE TO PROPERTY.

KEITHLEY **Keithley Instruments Division / Keithley Instruments, Inc.**
28775 Aurora Road / Cleveland, Ohio 44139 / U. S. A. / (216) 248-0400 / Telex: 98-5469 / Telefax: (216) 248-6168
**WEST GERMANY:** Keithley Instruments GmbH / Heiglhofstr. 5 / München 70 / 089-710070 / Telex: 52-12160 / Telefax: 089-7100259
**GREAT BRITAIN:** Keithley Instruments, Ltd. / 1 Boulton Road / Reading, Berkshire RG2 0NL / 0734-861287 / Telex: 847 047 / Telefax: 0734-860695
**FRANCE:** Keithley Instruments SARL / 3 Allee des Garays / B.P. 60 / 91124 Palaiseau / Z.I. / 1-6-0115 155 / Telex: 600 933 / Telefax: 1-6-0117726
**NETHERLANDS:** Keithley Instruments BV / Avelingen West 49 / 4202 MS Gorinchem / P.O. Box 559 / 4200 AN Gorinchem / 01830-35333 / Telex: 24 484 / Telefax: 01830-30821
**SWITZERLAND:** Keithley Instruments SA / Kriesbachstr. 4 / 8600 Dübendorf / 01-821-9444 / Telex: 828 472 / Telefax: 0222-315366
**AUSTRIA** Keithley Instruments GesmbH / Rosenhügelstrasse 12 / A-1120 Vienna / 0222) 84 65 48 / Telex: 131677 / Telefax: (0222) 81 35 07
**ITALY:** Keithley Instruments SRL / Viale S. Gimignano 4/A / 20146 Milano / 02-4120360 or 02-4156540 / Telefax: 02-4121249

Artisan Scientific - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisan-scientific.com

# SPECIFICAITONS

## MODEL 7059 LOW VOLTAGE SCANNER CARD

**CHANNELS PER CARD:** 10.
**CONTACT CONFIGURATION:** 2-pole Form A, common guard connection.
**CONNECTOR TYPE:** Screw terminal, No. 18 AWG maximum wire size.
**RELAY DRIVE CURRENT:** 13mA per relay typical.
**MAXIMUM SIGNAL LEVEL:** 200V, 100mA, 2VA peak (resistive load).
**CONTACT LIFE:** $10^8$ closures (cold switching); $10^6$ closures (at maximum signal level).
**CONTACT RESISTANCE:** $<2\Omega$ to rated life.
**CONTACT POTENTIAL:** $<1\mu V$ input to output with copper leads ($<200nV$ typical $<1$ minute after actuation).
**WARM UP:** 1 hour for thermal stability.
**ACTUATION TIME:** $<2ms$, exclusive of mainframe.
**CHANNEL ISOLATION:** $>10^{12}\Omega$ and $<10pF$.
**INPUT ISOLATION,**
**Differential:** $>10^9\Omega$ and $<50pF$.
**Common Mode:** $>10^9\Omega$ and $<150pF$.
**COMMON MODE VOLTAGE:** $<200V$ peak.
**ENVIRONMENT,**
**Operating:** 0° to 50°C, up to 35°C at 70% RH.
**Storage:** −25° to 65°C.
**DIMENSIONS, WEIGHT:** 32mm high × 114mm wide × 272mm long (1¼" × 4½" × 10¾"). Net weight 0.35kg (12½ oz.).

**NOTE**

Because of the high impedance of the board special care should be taken in both handling and using the board to prevent degradation of performance. Handle the board only by the edges when using it and keep the board free of body oils, dirt and contaminants. To clean the board use Freon® TMS or TE or equivalent and a clean cotton swab or soft brush. Care should be taken to ensure that the solvent is not contaminated before using it on the board. After the solvent has been applied blow dry the board with dry nitrogen gas.

### SAFETY SYMBOLS AND TERMS

The symbol ⚠ denotes that the user should refer to the operating instructions.

The symbol  denotes that a high voltage may be present on the terminal(s).

The **WARNING** used in this manual explains dangers that could result in personal injury or death.

The **CAUTION** used in this manual explains hazards that could damage the instrument.

Artisan Scientific - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisan-scientific.com

# TABLE OF CONTENTS


**SECTION 1—GENERAL INFORMATION**

1.1 Introduction ..... 1
1.2 Warranty Information ..... 1
1.3 Manual Addenda ..... 1

**SECTION 2—OPERATION**

2.1 Introduction ..... 3
2.2 Wiring and Installation ..... 3
2.3 Operating Considerations ..... 3
2.4 Operating Hints ..... 4

**SECTION 3—MAINTENANCE**

3.1 Introduction ..... 5
3.2 Required Test Equipment ..... 5
3.3 Performance Verification ..... 5
3.3.1 Thermal Offset Test ..... 5
3.3.2 Contact Resistance Test ..... 6
3.3.3 Isolation Test ..... 7

**SECTION 4—REPLACEABLE PARTS**

4.1 Introduction ..... 9
4.2 Replaceable Parts ..... 9
4.3 Ordering Information ..... 9
4.4 Factory Service ..... 9
4.5 Component Layout and Schematic Diagram ..... 9


# LIST OF FIGURES


1 Plug-In Card Installation and Assembly ..... 3
2 How to Use GUARD Connections ..... 4
3 Test Set Up for Thermal Offset Test ..... 6
4 Shorting HI and LO of all Channels on Card ..... 6
5 Test Set Up for Contact Resistance Test ..... 7
6 Channel Isolation Test Setup ..... 8
7 GUARD Differential Isolation Test Setup ..... 9
8 Common Mode Isolation Test Setup ..... 9
9 Model 7059 Component Location Drawing ..... 13
10 Model 7059 Schematic Diagram ..... 15


# LIST OF TABLES


1 Recommended Test Equipment ..... 5
2 Model 7059 Replaceable Parts List ..... 12


Artisan Scientific - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisan-scientific.com

# SECTION 1
# GENERAL INFORMATION

## 1.1 INTRODUCTION

The Model 7059 is a low-voltage scanner plug-in card which is field-installable in the Model 705 and Model 706 scanner mainframes. The Model 7059 will switch up to 10 channels. For low-level transducer and thermocouple output switching the Model 7059 is designed to introduce a minimum of thermal voltage error ( $< 1\mu V$ input to output with copper leads), and ensure that high isolation ($10^{12}\Omega$) is maintained between input signals. Expected relay life ($10^6$ closures) is obtained when signals less than 10V or 10mA are switched. However, peak signals up to 200V or 100mA may be switched with the scanner. Quick disconnect screw terminals are used to facilitate input and output connections to the scanner plug-in card (relay card). The plug-in card is easily removed through the rear panel of the scanner mainframe.

## 1.2 WARRANTY INFORMATION

Warranty information is stated on the inside front cover of this manual. If there is a need for service, contact the Keithley representative or authorized repair facility in your area. Check the back cover of this manual for addresses. The service form supplied at the end of the manual should be used to provide the repair facility with adequate information concerning any difficulty.

## 1.3 MANUAL ADDENDA

Improvements or changes to this manual will be explained on an addendum included with this manual.



Artisan Scientific - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisan-scientific.com

# SECTION 2
# OPERATION

## 2.1 INTRODUCTION

This section provides information needed to use the Model 7059 with the Model 705 and Model 706 mainframes.

## 2.2 WIRING AND INSTALLATION

1. Wiring Configuration—The Model 7059 has a guarded, 2-pole switching configuration. The Model 7059 will switch any one of the 10 signals to one output, or switch one signal to any one of 10 outputs.
   A. Wiring is accomplished by means of barrier strip terminals.
   B. Signal path resistance is typically less than 0.5Ω per contact; less than 2Ω at end of life.
   C. A guard surrounds all analog signal paths..
2. Installation—Refer to the Model 705 and Model 706 Instruction Manuals for scanner card installation instructions.

## 2.3 OPERATING CONSIDERATIONS

1. Signal Level—10V peak, 10mA peak with a resistive load for expected life. Absolute maximum peak instantaneous rating: 200V, 100mA, or 2VA with a resistive load.
2. Isolation—Guarded interchannel resistance is nominally greater than $10^{12}\Omega$ and less than 10pF at room temperature, at less than 70% relative humidity.
3. Maximum Levels—200V peak between signal line pairs or from signal lines to guard or mainframe (digital) common.
4. *Operating Environment—0° to 50°C up to 35°C at 70% relative humidity.*

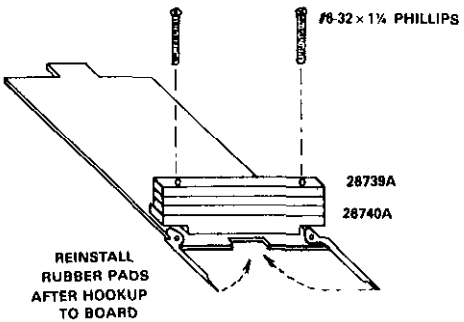



**Figure 1. Plug-In Card Installation and Assembly**



Artisan Scientific - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisan-scientific.com

## 2.4 OPERATING HINTS

The clamp-type screw terminals will accept up to #18 AWG wire. In order to ensure thermal offset less than 1$\mu$V solid copper wires should be used throughout the measurement hook-up.

To most effectively eliminate error voltages produced by leakage currents, the GUARD terminal should be connected to the reference connection on the channel which is most sensitive to error (that is, the one which has the lowest source voltage versus the highest series resistance). For instance, two sources are connected to the Model 7059; one having an equivalent source of 1V with a series resistance of 100kΩ, and the other having a source voltage of .1V with a 1kΩ series resistance. The 100kΩ source resistance will develop 100 times the error voltage as the 1kΩ source resistance. Its source voltage however, is only ten times as large on the 1V/100kΩ channel. The GUARD would therefore be connected to the reference point of this channel (see Figure 2).

Reactances in the system will cause transients during switching. These should not exceed the ratings given in the specifications. If they do, relay contact life will be degraded.

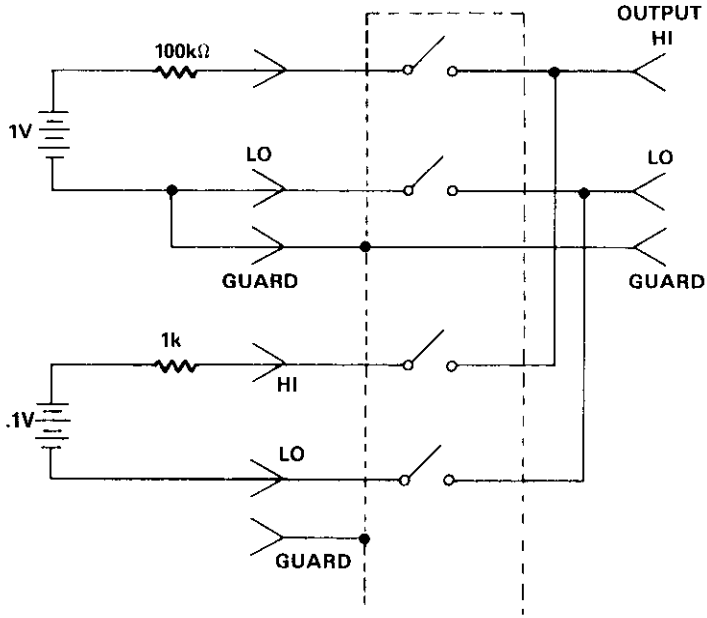



**Figure 2. How To Use GUARD Connection**



Artisan Scientific - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisan-scientific.com

# SECTION 3
# MAINTENANCE

## 3.1 INTRODUCTION

This section contains a performance verification procedure. Since there is no calibration adjustments, no recalibration is necessary. Recommended maintenance would include inspection of the scanner plug-in board and card-edge connectors to ensure good electrical contact. In industrial environments annual cleaning using dry nitrogen gas and Freon® TMS or TE is recommended. The verification procedure should be performed every 12 months or at the time maintenance is performed on the mainframe.

## 3.2 REQUIRED TEST EQUIPMENT

Recommended test equipment is given in Table 1. Test equipment other than recommended may be substituted if specifications equal or exceed the stated characteristics.

**Table 1. Recommended Test Equipment**

| Item | Description | Minimum Specification | MFG | Model |
|---|---|---|---|---|
| A | Microvoltmeter | Zero drift less than 150nV. | KI | 181 |
| B | Accessory Shorting Plug | | KI | 1488 |
| C | Accessory Low Thermal Cable | | KI | 1506 |
| D | Chart Recorder | | H-P | 7035B |
| E | Signal Generator | TTL compatible square wave to 10Hz, and 1 pulse per 30 min. | | |
| F | Scanner Mainframe | | KI | 705 |
| G | Ohmmeter or Multimeter | 1Ω Sensitivity | KI | 195 |
| H | Accessory Kelvin Leads | | KI | 1641 |
| I | Oscilloscope | Triggered Sweep | TEK | 7000 series |
| J | Power Supply | 10.00V, 100V DC | KI | 230 |
| K | Electrometer | $10^{-10}$A Sensitivity | KI | 614 or 619 |

## 3.3 PERFORMANCE VERIFICATION

This section gives procedures needed to verify that the operation of the Model 7059 is within specifications. The thermal offset should be carried out in a temperature controlled environment of 23° ±1°C. Other tests may be performed within environmental limits given in the specifications.

### 3.3.1 Thermal Offset Test

1. The input of the Model 181 should be shorted with the Model 1488 shorting plug. After power is applied, the Model 181 should be allowed to stabilize for four hours. During this time the analog output of the Model



Artisan Scientific - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisan-scientific.com

181 should be connected to the chart recorder and a recording made to establish a baseline for the voltage measurements (see Figure 3).

2. The 10 input connections on the Model 7059 plug-in card should be shorted together between HI and LO with a short piece of solid copper wire. That is, connect all the HI and LO terminals together as shown in Figure 4. (The OUTPUT terminals of the Model 7059 should be connected to short copper wires to facilitate connecting the alligator clips on the Model 1506 cable.) With the Model 1506 cable attached to the output, the plug-in card should then be inserted into the mainframe and power applied to the mainframe. Set the Model 705 to the reset mode and allow it to warm up along with the Model 181.
3. After the warm up time has elapsed and a stable baseline is visible on the chart recorder, the shorting plug on the Model 181 should be removed and the Model 1506 cable from the Model 7059 connected in its place. Set the Model 705 scanner mainframe to Channel 1, Channel mode and the Single program mode. The scanner mainframe should now be clocked at a rate of 1 channel every 15 (900 second interval time) minutes. The thermal EMF generated in each channel will be visible as deflection from the baseline on the recording. The maximum deflection should be no more than $\pm 1\mu V$ from the baseline for any channel.

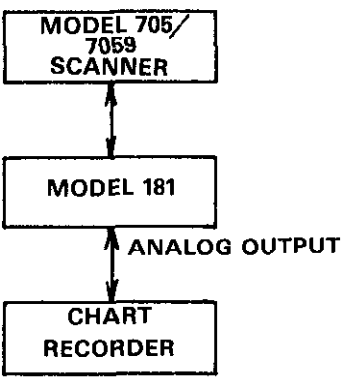



**Figure 3. Test Set Up for Thermal Offset Test**

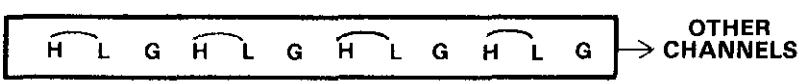



**Figure 4. Shorting HI and LO of all Channels on the Card**

### 3.3.2 Contact Resistance Test

1. Set up—Connect a short (1" or less) piece of copper wire (#18 AWG) to the input and also the output of the pole (signal HI or LO) or the channel to be tested (see Figure 5 for the test set up diagram).
2. Zero the Model 195 with the Model 1641 leads shorted together.
3. After the Model 195 is zeroed connect the leads from the Model 195 to the barrier strips on the Model 7059 via the short piece of copper wire on the terminal strips. Arrange the leads such that the plug-in card can be inserted into the Model 705 mainframe without disturbing the test lead connections to the terminal strips.



Artisan Scientific - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisan-scientific.com

4. Insert the Model 7059 into the mainframe, apply power and select the channel which is to be tested. The total signal path resistance can now be measured. The reading should be $< 0.5\Omega$ upon initial shipment from the factory and $< 2\Omega$ after usage.

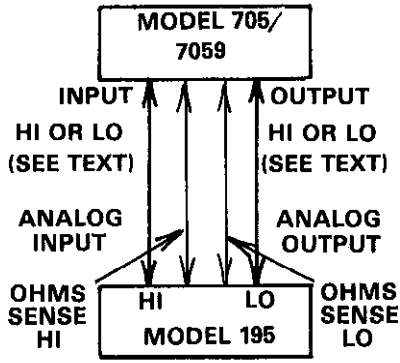



**Figure 5. Test Set Up For Contact Resistance Test**

### 3.3.3 Isolation Test

Channel Isolation

A. This test measures the leakage resistance between two channels on the board. One channel is to be open and the other closed. Set up the test circuit shown in Figure 6.
B. Short the HI and LO connections of each channel on the Model 7059.
C. Set the Model 705 to the Channel mode, Channel 1 and the Step mode. Set the electrometer to Amps and program the Model 230 to output 100V. Take the electrometer out of ZERO CHECK. Program Channel 1 as open and the other channels as closed.
D. Take the reading on the electrometer. The reading should be less than $1 \times 10^{-10}$A. Using Ohm's Law calculate the channel isolation. For example: $R = E/I = 100V/1 \times 10^{-10}A = 1 \times 10^{12}\Omega$. Due to the capacitance of the circuit, the offset current may be high until the capacitance of the circuit is charged up. Wait until the readings settle out.
E. Manually scan through Channel 1 through 10 repeating step C and D for each channel.

Input Isolation, Differential (Guarded)

A. This test measures the differential input isolation which is the leakage resistance between a guarded channel's HI and LO connections. Set up the test circuit shown in Figure 7.
B. Set the Model 705 to the Channel mode, Channel 1 and the Step mode. Set the electrometer to Amps and program the Model 230 to output 100V. Take the electrometer out of ZERO CHECK.
C. Take the reading on the electrometer. The reading should be less than $1 \times 10^{-7}$A. Using Ohm's Law calculate the isolation (leakage resistance). For example: $R = E/I = 100V/10^{-7}A = 1 \times 10^{9}\Omega$. Due to the capacitance of the circuit, the offset current may be high until the capacitance is charged up. Wait until the readings settle out.
D. Manually scan Channels 1 through 10 repeating step B and C for each channel.



Artisan Scientific - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisan-scientific.com

Input Isolation, Common Mode

A. This test measures the leakage resistance between signal lines and power line ground. Set up the test circuit shown in Figure 8.
B. Short the input HI and LO terminals of each channel with a short piece of solid copper wire. Do not connect the channels together, just short the HI and LO terminals.
C. Insert the Model 7059 into the mainframe and set the Model 705 to the Channel mode, Channel 1 and the Step mode.
D. Set the electrometer to Amps and program the Model 230 to output 100VDC. Take the electrometer out of ZERO CHECK.
E. Take the reading on the electrometer. The reading should be less than $1 \times 10^{-7}$A. Using Ohm's Law calculate the isolation (leakage resistance). For example: $R = E/I = 100V/1 \times 10^{-7}A = 1 \times 10^{9}\Omega$. Due to the capacitance of the circuit, the offset current may be high until the capacitance is charged up. Wait until the readings settle out.
F. Manually scan Channels 1 through 10 repeating step D and E for each channel.

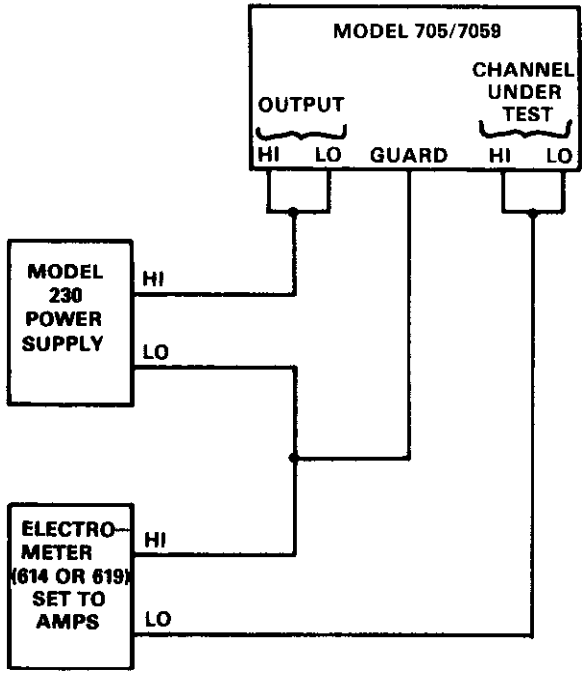



**Figure 6. Channel Isolation Test Set Up**



Artisan Scientific - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisan-scientific.com

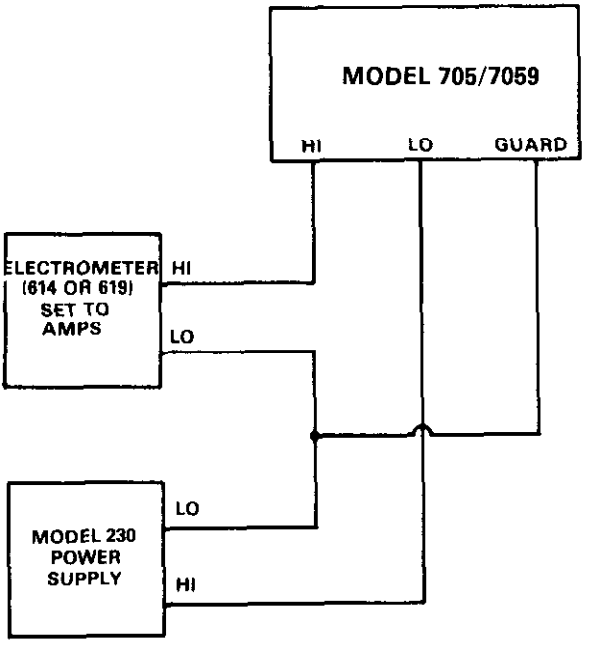



Figure 7. GUARD Differential Isolation Test Set Up

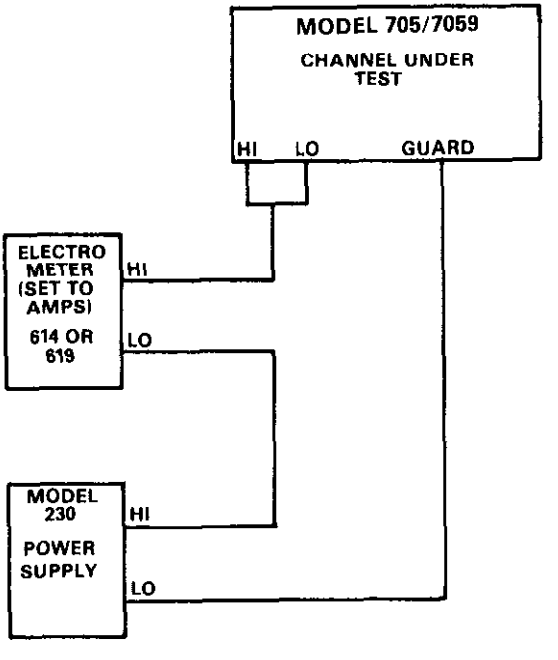



Figure 8. Common Mode Isolation Test Set Up



Artisan Scientific - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisan-scientific.com

# SECTION 4
# REPLACEABLE PARTS

## 4.1 INTRODUCTION

This section contains replacement parts information, a schematic diagram and component layout for the Model 7059.

## 4.2 REPLACEABLE PARTS

Parts are listed alpha-numerically in order of their circuit designation. Table 2 contains parts list information for the Model 7059.

## 4.3 ORDERING INFORMATION

To place an order, or to obtain information concerning replacement parts, contact your Keithley representative or the factory. See the inside front cover for addresses. When ordering include the following information:

1. Instrument Model Number
2. Instrument Serial Number
3. Part Description
4. Circuit Description (if applicable)
5. Keihtley Part Number

## 4.4 FACTORY SERVICE

If the instument is to be returned for service, please complete the service form which follows this section and return it with the instrument.

## 4.5 COMPONENT LAYOUT AND SCHEMATIC DIAGRAM

Figure 9 contains a component layout of the Model 7059 while, Figure 10 contains the Model 7059 schematic diagram.



Artisan Scientific - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisan-scientific.com

## Table 2. Model 7059 Replaceable Parts

| Circuit Desig. | Description | Keithley Part No. |
|---|---|---|
| C101 | Capacitor, 10uF, 25V, Aluminum Electrolytic | C-314-10 |
| J1001 | 3 pin Terminal Strip (2 required) | CS-457-2 |
| J1002 | 10 pin Terminal Strip (3 required) | CS-457-1 |
| J1003 | 3 pin Terminal Strip | CS-475-1 |
| J1004 | 10 pin Terminal Strip | CS-457-2 |
| J1005 | 10 pin Terminal Strip | CS-457-2 |
| K101 | Relay | RL-77 |
| K102 | Relay | RL-77 |
| K103 | Relay | RL-77 |
| K104 | Relay | RL-77 |
| K105 | Relay | RL-77 |
| K106 | Relay | RL-77 |
| K107 | Relay | RL-77 |
| K108 | Relay | RL-77 |
| K109 | Relay | RL-77 |
| K110 | Relay | RL-77 |
| | MECHANICAL PARTS | |
| | Clamp, Assembly, Upper | 7055-303-03 |
| | a. Clamp, Upper | 7055-305 |
| | b. Strip, Rubber | 26621 |
| | Clamp, Assembly, Lower | 7055-308 |
| | a. Clamp, Cable, Lower | 7055-307 |
| | b. Strip, Rubber | 26621 |
| | No. 6-32 x 5/16 Phillips Pan Head Screw (2 required) | |
| | No. 6-32 x 1 Phillips Pan Head Screw (2 required) | |



Artisan Scientific - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisan-scientific.com

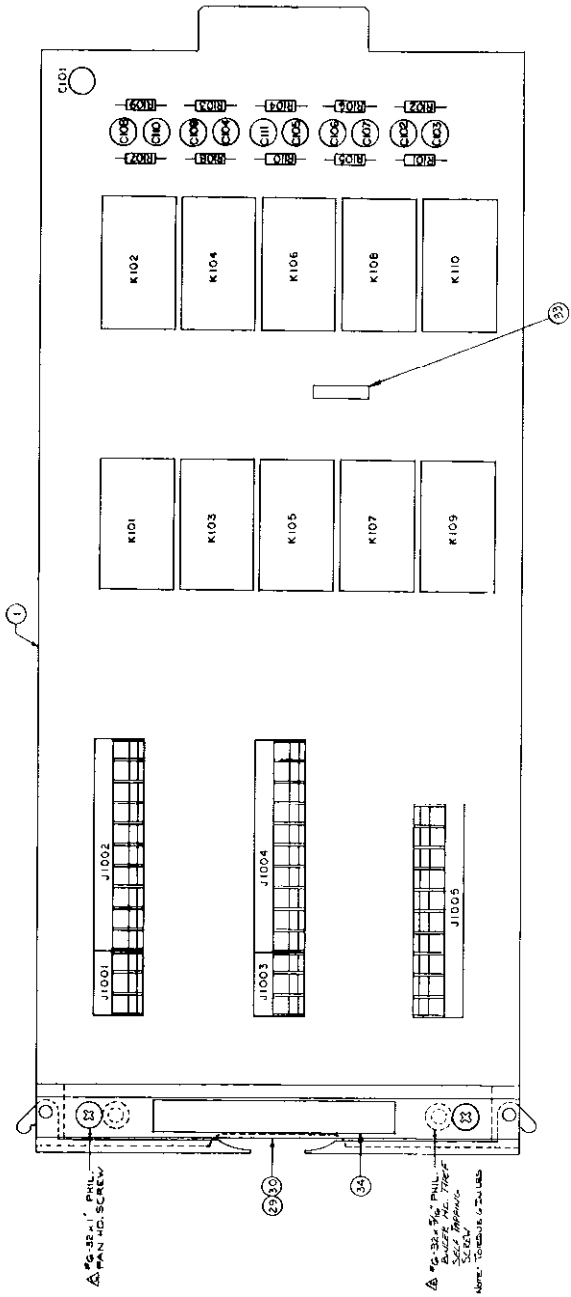



**Figure 9. Model 7059 Component Location Drawing**



Artisan Scientific - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisan-scientific.com

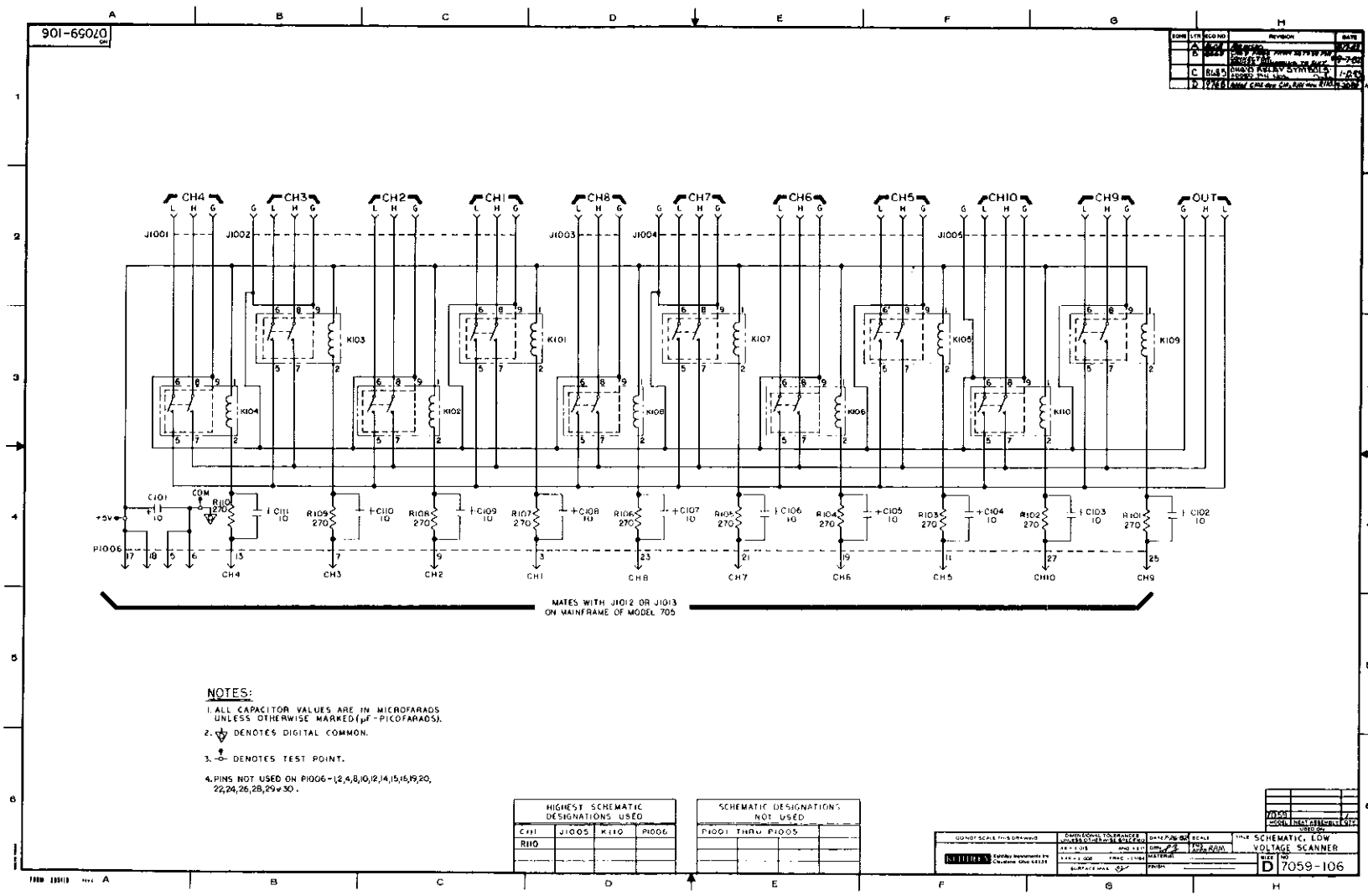



**Figure 10. Model 7059 Schematic Diagram**



Artisan Scientific - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisan-scientific.com

KEITHLEY

# SERVICE FORM

**Model No.** _____ **Serial No.** _____ **Date** _____

**Name and Telephone No.** _____

**Company** _____

List all control settings, describe problem and check boxes that apply to problem. _____

_____

_____

☐Intermittent ☐Analog output follows display ☐Particular range or function bad; specify _____
☐IEEE failure ☐Obvious problem on power-up ☐Batteries and fuses are OK
☐Front panel operational ☐All ranges or functions are bad ☐Checked all cables

Display or output (circle one)

☐Drifts ☐Unable to zero
☐Unstable ☐Will not read applied input
☐Overload

☐Calibration only ☐C of C required
☐Data required

(attach any additional sheets as necessary.)

Show a block diagram of your measurement system including all instruments connected (whether power is turned on or not). Also, describe signal source.

Where is the measurement being performed? (factory, controlled laboratory, out-of-doors, etc.)

_____

_____

What power line voltage is used? _____ Ambient Temperature? _____ °F

Relative humidity? _____ Other? _____

Any additional information. (If special modifications have been made by the user, please describe.) _____

_____

Be sure to include your name and phone number on this service form.

Artisan Scientific - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisan-scientific.com

KEITHLEY

**Keithley Instruments Division / Keithley Instruments, Inc.**
28775 Aurora Road / Cleveland, Ohio 44139 / U. S. A. / (216) 248-0400 / Telex: 98-5469 / Telefax: (216) 248-6168

| | |
|---|---|
| WEST GERMANY: | Keithley Instruments GmbH / Heiglhofstr. 5 / München 70 / 089-71002-0 / Telex: 52-12160 / Telefax: 089-7100259 |
| GREAT BRITAIN: | Keithley Instruments, Ltd. / 1 Boulton Road / Reading, Berkshire RG 2 ONL / 0734-861287 / Telex: 847 047 / Telefax: 0734-863665 |
| FRANCE: | Keithley Instruments SARL / 3 Allee des Garays / B.P. 60 / 91124 Palaiseau / Z.I. / 1-6-0115 155 / Telex: 600 933 / Telefax: 1-6-0117726 |
| NETHERLANDS: | Keithley Instruments BV / Avelingen West 49 / 4202 MS Gorinchem / P.O. Box 559 / 4200 AN Gorinchem / 01830-35333 / Telex: 24 684 / Telefax: 01830-30821 |
| SWITZERLAND: | Keithley Instruments SA / Kriesbachstr. 4 / 8600 Dubendorf / 01-821-9444 / Telex: 828 472 / Telefax: 0222-315366 |
| AUSTRIA | Keithley Instruments GesmbH / Rosenhugelstrasse 12 / A-1120 Vienna / (0222) 84 65 48 / Telex: 131677 / Telefax: (0222) 84 35 97 |
| ITALY: | Keithley Instruments SRL / Viale S. Gimignano 4/A / 20146 Milano / 02-4120360 or 02-4156540 / Telefax: 02-4121249 |

©1982, Keithley Instruments, Inc.

Artisan Scientific - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisan-scientific.com

**Artisan Technology Group** is an independent supplier of quality pre-owned equipment

## Gold-standard solutions

Extend the life of your critical industrial, commercial, and military systems with our superior service and support.

## We buy equipment

Planning to upgrade your current equipment? Have surplus equipment taking up shelf space? We'll give it a new home.

## Learn more!

Visit us at **artisantg.com** for more info on price quotes, drivers, technical specifications, manuals, and documentation.

Artisan Scientific Corporation dba Artisan Technology Group is not an affiliate, representative, or authorized distributor for any manufacturer listed herein.

We're here to make your life easier. How can we help you today?

(217) 352-9330 | sales@artisantg.com | artisantg.com

ARTISAN® TECHNOLOGY GROUP