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Model 7066 Relay Switch Card

Instruction Manual

Contains Operating and Servicing Information

KEITHLEY

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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.

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Model 7066 Relay Switch Card
Instruction Manual

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Safety Precautions

The following safety precautions should be observed before using this product and any associated instrumentation. Although some instruments and accessories would normally be used with non-hazardous voltages, there are situations where hazardous conditions may be present.

This product is intended for use by qualified personnel who recognize shock hazards and are familiar with the safety precautions required to avoid possible injury. Read the operating information carefully before using the product.

The types of product users are:

Responsible body is the individual or group responsible for the use and maintenance of equipment, for ensuring that the equipment is operated within its specifications and operating limits, and for ensuring that operators are adequately trained.

Operators use the product for its intended function. They must be trained in electrical safety procedures and proper use of the instrument. They must be protected from electric shock and contact with hazardous live circuits.

Maintenance personnel perform routine procedures on the product to keep it operating, for example, setting the line voltage or replacing consumable materials. Maintenance procedures are described in the manual. The procedures explicitly state if the operator may perform them. Otherwise, they should be performed only by service personnel.

Service personnel are trained to work on live circuits, and perform safe installations and repairs of products. Only properly trained service personnel may perform installation and service procedures.

Exercise extreme caution when a shock hazard is present. Lethal voltage may be present on cable connector jacks or test fixtures. The American National Standards Institute (ANSI) states that a shock hazard exists when voltage levels greater than 30V RMS, 42.4V peak, or 60VDC are present. **A good safety practice is to expect that hazardous voltage is present in any unknown circuit before measuring.**

Users of this product must be protected from electric shock at all times. The responsible body must ensure that users are prevented access and/or insulated from every connection point. In some cases, connections must be exposed to potential human contact. Product users in these circumstances must be trained to protect themselves from the risk of electric shock. If the circuit is capable of operating at or above 1000 volts, **no conductive part of the circuit may be exposed.**

As described in the International Electrotechnical Commission (IEC) Standard IEC 664, digital multimeter measuring circuits (e.g., Keithley Models 175A, 199, 2000, 2001, 2002, and 2010) are Installation Category II. All other instruments' signal terminals are Installation Category I and must not be connected to mains.

Do not connect switching cards directly to unlimited power circuits. They are intended to be used with impedance limited sources. NEVER connect switching cards directly to AC mains. When connecting sources to switching cards, install protective devices to limit fault current and voltage to the card.

Before operating an instrument, make sure the line cord is connected to a properly grounded power receptacle. Inspect the connecting cables, test leads, and jumpers for possible wear, cracks, or breaks before each use.

For maximum safety, do not touch the product, test cables, or any other instruments while power is applied to the circuit under test. ALWAYS remove power from the entire test system and discharge any capacitors before: connecting or disconnecting cables or jumpers, installing or

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removing switching cards, or making internal changes, such as installing or removing jumpers.

Do not touch any object that could provide a current path to the common side of the circuit under test or power line (earth) ground. Always make measurements with dry hands while standing on a dry, insulated surface capable of withstanding the voltage being measured.

The instrument and accessories must be used in accordance with its specifications and operating instructions or the safety of the equipment may be impaired.

Do not exceed the maximum signal levels of the instruments and accessories, as defined in the specifications and operating information, and as shown on the instrument or test fixture panels, or switching card.

When fuses are used in a product, replace with same type and rating for continued protection against fire hazard.

Chassis connections must only be used as shield connections for measuring circuits, NOT as safety earth ground connections.

If you are using a test fixture, keep the lid closed while power is applied to the device under test. Safe operation requires the use of a lid interlock.

If a  screw is present, connect it to safety earth ground using the wire recommended in the user documentation.

The  symbol on an instrument indicates that the user should refer to the operating instructions located in the manual.

The  symbol on an instrument shows that it can source or measure 1000 volts or more, including the combined effect of normal and common mode voltages. Use standard safety precautions to avoid personal contact with these voltages.

The **WARNING** heading in a manual explains dangers that might result in personal injury or death. Always read the associated information very carefully before performing the indicated procedure.

The **CAUTION** heading in a manual explains hazards that could damage the instrument. Such damage may invalidate the warranty.

Instrumentation and accessories shall not be connected to humans.

Before performing any maintenance, disconnect the line cord and all test cables.

To maintain protection from electric shock and fire, replacement components in mains circuits, including the power transformer, test leads, and input jacks, must be purchased from Keithley Instruments. Standard fuses, with applicable national safety approvals, may be used if the rating and type are the same. Other components that are not safety related may be purchased from other suppliers as long as they are equivalent to the original component. (Note that selected parts should be purchased only through Keithley Instruments to maintain accuracy and functionality of the product.) If you are unsure about the applicability of a replacement component, call a Keithley Instruments office for information.

To clean an instrument, use a damp cloth or mild, water based cleaner. Clean the exterior of the instrument only. Do not apply cleaner directly to the instrument or allow liquids to enter or spill on the instrument. Products that consist of a circuit board with no case or chassis (e.g., data acquisition board for installation into a computer) should never require cleaning if handled according to instructions. If the board becomes contaminated and operation is affected, the board should be returned to the factory for proper cleaning/servicing.

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SPECIFICATIONS

MODEL 7066 RELAY SWITCH CARD

CHANNELS PER CARD: 10

CONTACT CONFIGURATION: 2-pole, Form A or Form B (jumper selectable).

CONNECTOR TYPE: Quick disconnect screw terminals, No. 14 AWG maximum wire size.

RELAY DRIVE CURRENT: 80mA per relay typical.

MAXIMUM SIGNAL LEVEL: 250V DC or RMS, 350V peak. 2A DC or RMS. 60W DC, 125VA AC (resistive load).

CONTACT LIFE: 10^8 closures (cold switching); 10^5 closures (at maximum signal level).

CONTACT RESISTANCE: $<0.1\Omega$ initial, $<2\Omega$ to rated life.

CONTACT POTENTIAL: $<30\mu V$ per contact pair, input to output with copper leads ($<10\mu V$ typical).

ACTUATION TIME: <3ms, exclusive of mainframe.

CHANNEL ISOLATION: $>10^9\Omega$.

INPUT ISOLATION: $>10^9\Omega$

COMMON MODE VOLTAGE: 350V peak.

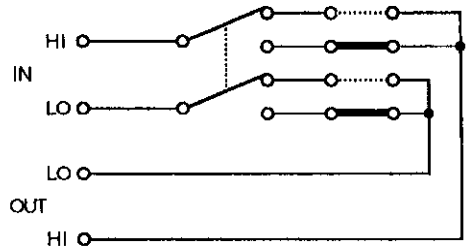
ENVIRONMENT,

Operating: 0° to 50°C, up to 35°C at 70% R.H.

Storage: −25° to 65°C.

DIMENSIONS, WEIGHT: 32mm high × 114mm wide × 272mm long (1¼" × 4½" × 10¾"). Net weight 0.28kg (10 oz.).

EACH CHANNEL :



Provides 10 channels of 2-pole switching, with a quick disconnect terminal block for each channel.

Configuration is DPST-N.O. (Form A). Normally closed connection is available by moving jumpers.

Specifications subject to change without notice.

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SECTION 1
GENERAL INFORMATION

1.1 INTRODUCTION

1.1.1 Product Description

The Model 7066 Relay Switch Card provides 10 separate channels using 10 two-pole relays. As shipped, the switches are configured for double-pole single-throw (DPST), normally open (NO) operation. Features of the relay switch card include:

- Quick disconnect terminal blocks for each channel.
- Moveable relay jumpers to configure any switch to be normally closed (NC).
- Separate, isolated IN/OUT circuits for each channel.

1.1.2 Manual Overview

The instruction manual is organized in the following manner:

- Section 1 General Information—Includes a product description and an overview of the manual, information on warranty, manual addenda, safety symbols and terms, unpacking and inspection, and specifications.
- Section 2 Operation—Includes safety information, wiring and installation, operating instructions, and some typical applications.
- Section 3 Performance Verification—Provides the procedure to check proper operation of the card.
- Section 4 Replaceable Parts—Includes a parts list, schematic diagram and a component layout.

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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 for addresses. The service form supplied at the end of the manual should be used to provide the service facility with information concerning any difficulty.

1.3 MANUAL ADDENDA

Product improvements or changes to this manual will be explained on an addendum included with the manual. It is recommended that this information be incorporated immediately into the appropriate places in the manual.

If an additional instruction manual is required, order the manual package (Keithley Part Number 7066-901-00). The manual package includes an instruction manual and all pertinent addenda.

1.4 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.

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1.5 UNPACKING AND INSPECTION

The Model 7066 was inspected both electrically and mechanically before shipment. Upon receiving the Model 7066, unpack all items from the shipping carton and check for any obvious damage that may have occurred during transit. Report any damage to the shipping agent. Retain and use the original packaging materials in case reshipment is necessary. The following items are shipped with every Model 7066:

Model 7066 Relay Switch Card
Model 7066 Instruction Manual

1.6 SPECIFICATIONS

Detailed specifications of the Model 7066 precede the table of contents of this manual.

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SECTION 2
OPERATION

2.1 INTRODUCTION

This section contains safety information, wiring instructions for the various relay configurations, an installation procedure of the card in a scanner, operating instructions, and some typical applications for the card.

2.2 SAFETY PRECAUTIONS

1. Make sure the scanner mainframe is grounded through a properly earth grounded receptacle before operation.
2. Inspect all test lead connections for wear and defects such as cracks, exposed wires, (etc). Correct any defect found before operating the relay card with the mainframe.
3. Do not exceed the Model 7066's maximum allowable voltages as defined in the specifications.
4. Turn off all power supplies and discharge any residual power before installing or removing the Model 7066 from the scanner mainframe.
5. Turn off all power supplies and discharge any residual power before connecting or disconnecting wires and jumpers from the Model 7066.
6. The Model 7066 is not intended to directly switch high power mains circuitry. Switching low power mains circuitry is explained in paragraph 2-5.

2.3 WIRING

Each channel on the Model 7066 consists of a two-pole relay that has a quick disconnect terminal block. As shipped, each relay is configured for double-pole single-throw (DPST), normally open (NO) operation. The relay card can be wired for different switch configurations as explained in this section.

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WARNING

To avoid electrical shock that could result in severe injury or death, always remove all power from external sources before making or breaking connections to the relay card.

CAUTION

When switching a circuit that approaches the current limit (2A) or a circuit with high fault current capability (such as AC mains), it is required that a 2A fuse be wired in series with the input to protect the card.

Peak transients must be clamped to <400V. See paragraph 2.5 for clamping information.

Notes:

1. To maintain $>10^9\Omega$ input isolation, keep the card and terminal blocks clean. Body oil and dirt from touching can degrade the isolation resistance.
2. To prevent overheating, do not place loads on the card. All loads should be outside of the scanner.
3. Shielding—Shielded cables should be used when switching above 50V or high current. The shield should be connected preferably to a guard circuit or to earth ground. This helps prevent excessive radiation from the cables from interfering with any equipment. The cable rating must exceed the maximum allowable signal levels as defined in the specifications.
4. RFI Filtering—RFI on inputs or outputs may cause problems with other cards installed in the scanner and with low level measurements. RFI filtering on these lines may be required in order to operate the cards to their full specifications.
5. Reactive loads require voltage clamping (for inductive loads) and current limiting (for capacitive loads). See paragraph 2.5 for more information.

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2.3.1 NO and NC Jumpers

At the factory, both poles of each relay are configured for normally open (NO) operation. That is, the circuit is not closed until the relay is energized. The positions of the jumpers for NO operation are shown in Figure 2-1(A).

A pole of any relay channel can be configured to be normally closed (NC) by moving the jumper to the alternate position. In the NC configuration, the circuit is broken when the relay is energized. Figure 2-1(B) shows the position of the jumpers for configuring both poles of a relay for NC operation.

2.3.2 DPST Configuration

To use a channel in the double-pole single-throw (DPST) configuration, simply connect the source to the IN terminals of the terminal block and the load across the OUT terminals as shown in Figure 2-2. The procedure to make connections to the terminal block is provided in the next paragraph.

NOTE

The DPST configuration can be changed to a SPST configuration by connecting one of the loads to common. Thus, one pole of the relay is not used in that circuit.

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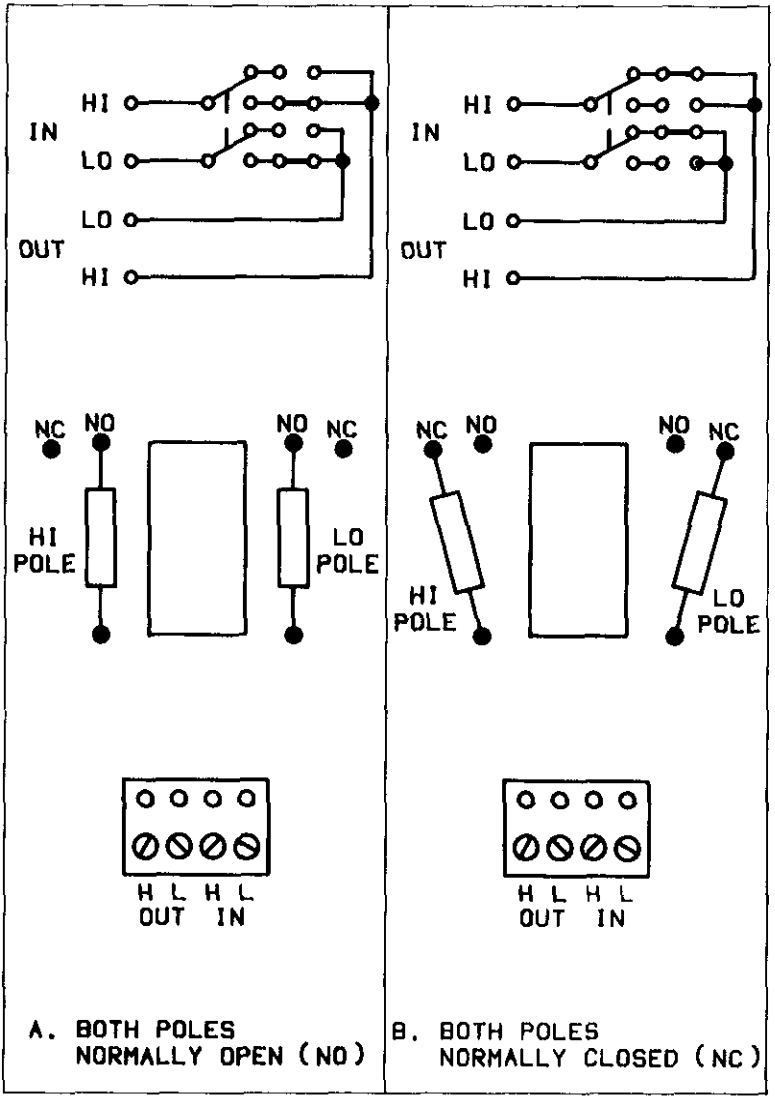


Figure 2-1. Jumper Positions for NO and NC Operation

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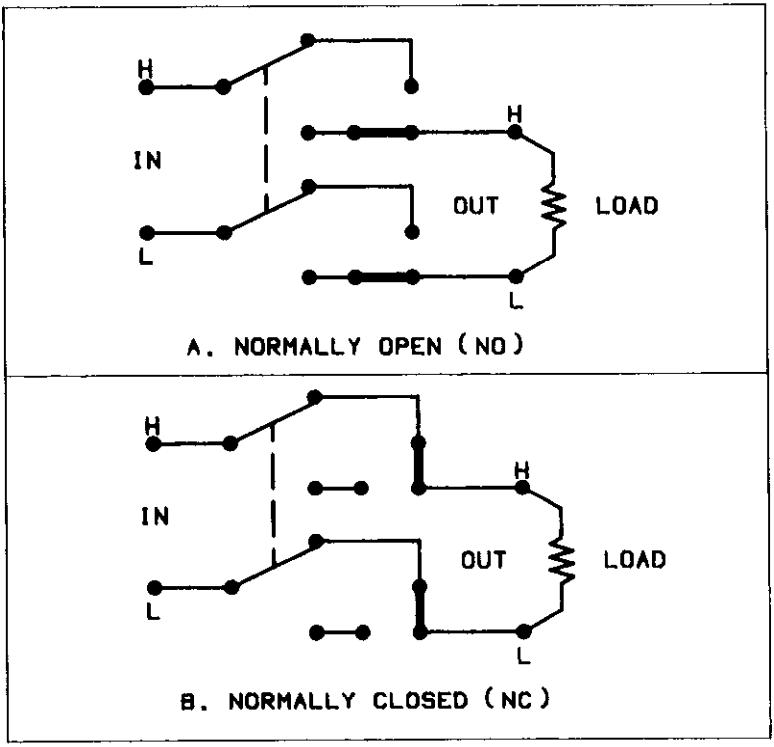


Figure 2-2. DPST Configuration

2.3.3 Terminal Block Connections

Perform the following procedure to wire circuitry to the terminal blocks of the Model 7066:

WARNING

Make sure all power is off and stored energy in external circuitry is discharged.

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1. Remove the terminal block, for the appropriate channel, from the relay card by simply pulling it off the PC board.
2. Using an insulated screwdriver, connect the circuitry to the terminal block as shown in Figure 2-3. The screw terminals accept #14 to #26 AWG wire.
3. Reinstall the terminal block on the relay card. Make sure the pins on the card are properly mated to the terminal block.
4. Repeat steps 1 through 3 if it is desired to wire additional terminal blocks.
5. Referring to Figure 2-4, remove one screw from the cable clamp of the relay card and route the terminal block wires as shown.
6. Reassemble and tighten the cable clamp. The clamp serves as a strain relief for the terminal block wires.

NOTE

To order extra terminal blocks, order Keithley part number CS-521-3. See paragraph 4.3 for ordering information.

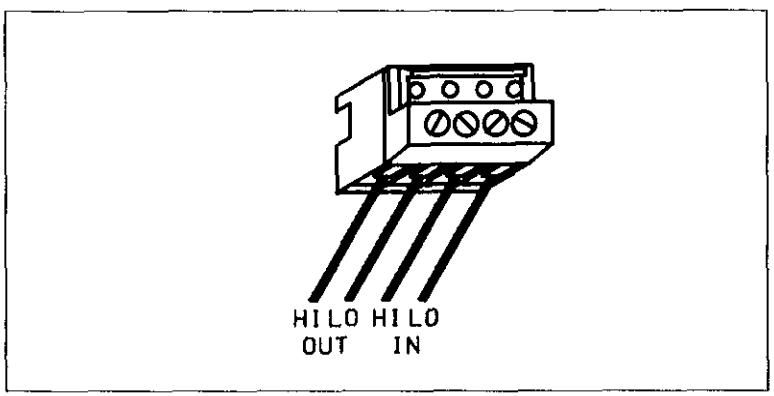


Figure 2-3. Quick Disconnect Terminal Block

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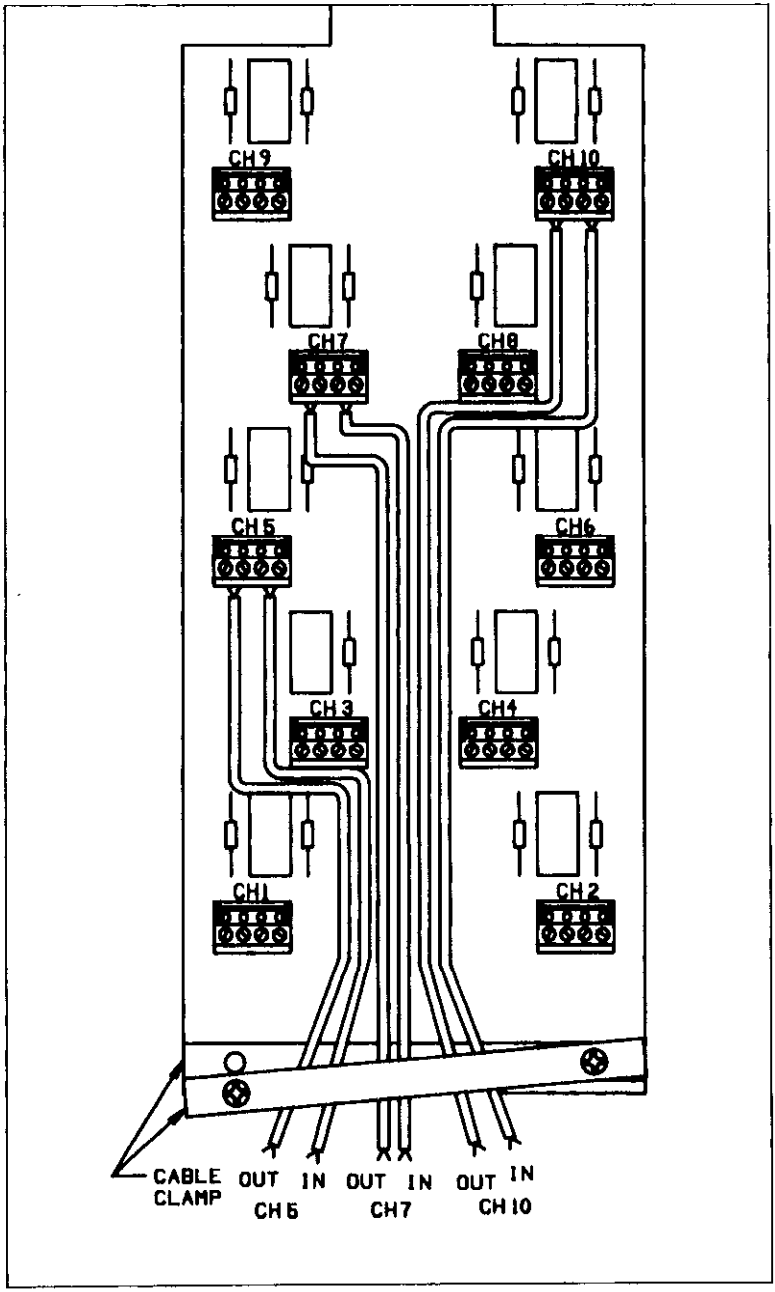


Figure 2-4. Typical Wire Routing

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2.3.4 Other Configurations

A variety of different relay configurations can be set up.

SPDT Configuration—In this configuration, the relay switches a single-pole input from one load to another. Referring to Figure 2-5, wire the relay card as follows:

1. Cut or remove the normally open jumper of the high pole.
2. Add a jumper between the high pole and the normally closed position of the low pole.

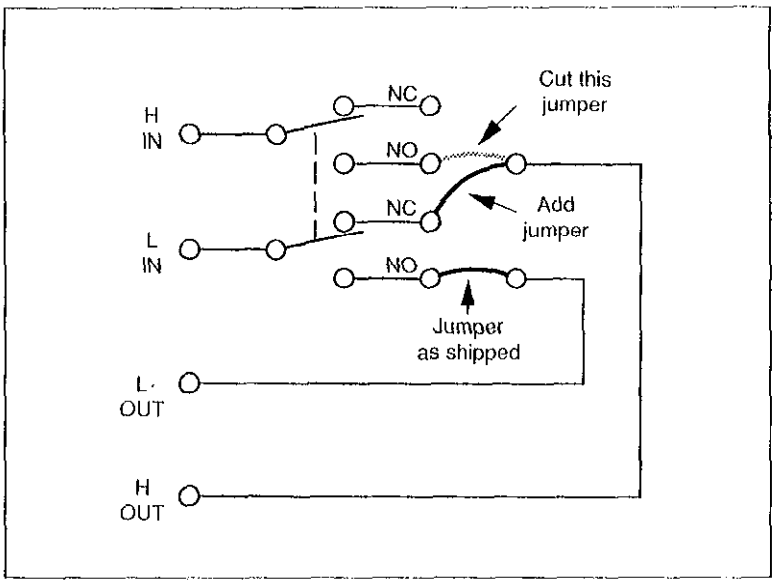


Figure 2-5. SPDT Configuration

DPDT Configuration—In this configuration, one relay is used to switch a double-pole input from one load to another. Referring to Figure 2-6, wire the relay card as follows:

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1. On the controlling channel, set the relay jumpers to be normally open or normally closed. On the other channel, remove the relay jumpers.
2. Install jumpers from the controlling channel to the second channel as shown. Note: If the relay on the controlling channel is normally closed, run the jumpers from the NO side of the switches.
3. Wire the loads to the two channels and connect the input to the controlling channel.

NOTE

A 4PDT configuration can be accomplished by setting up another DPDT configuration and energizing both controlling relays simultaneously. Also, a 6PDT configuration is possible using three DPDT setups.

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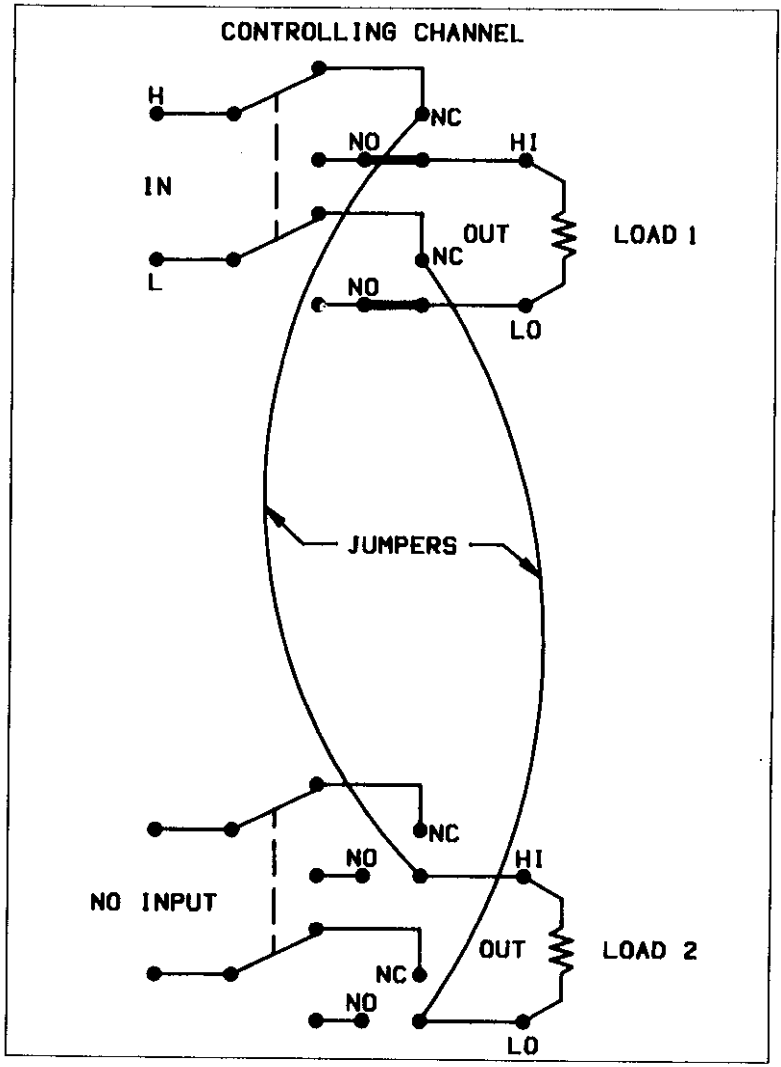


Figure 2-6. DPDT Configuration

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Four-Pole Configurations—In this configuration, two relays are energized at the same time to control two separate circuits. Depending on how the relay jumpers are positioned, both loads, no loads or one load can be selected when the relays are energized. Figure 2-7 shows the 4PST-NO configuration with the relays normally open. Wire the relay card as follows:

1. Set the relay card jumpers as desired. Table 2-1 lists which load is connected to the input for the various relay jumper positions.
2. Connect the circuits to the two channels.

NOTE

6PST and 8PST configurations are possible by adding a third and fourth channel respectively.

Table 2-1. Four-Pole Jumper Configuration

Jumper Configurations		
Ch1	**Ch2**	**Selected Load***
NO	NO	A, B
NC	NC	None
NO	NC	A
NC	NO	B

*Both relays energized.

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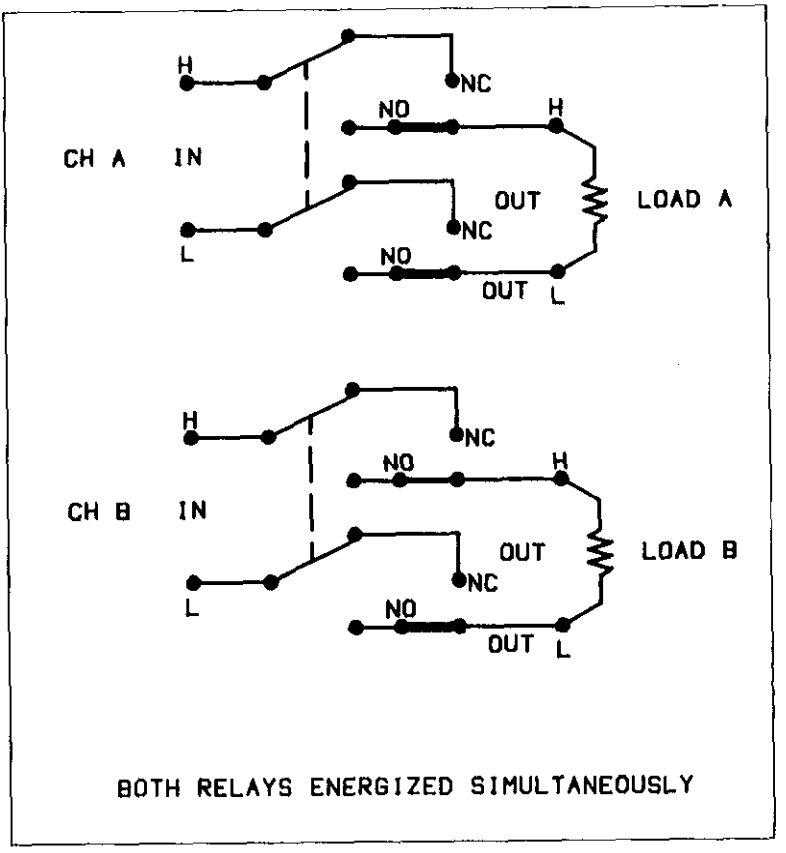


Figure 2-7. 4PST Configuration

2.4 INSTALLATION AND REMOVAL

WARNING
Make sure all power is off and stored energy in external circuitry is discharged.

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2.4.1 Relay Card Installation

Before installing the Model 7066 into the scanner mainframe, it must be wired with the desired configuration as explained in paragraph 2.3. Once the card is configured, plug it into the appropriate slot in the rear panel of the scanner mainframe. In the Model 705, the relay card is placed horizontally into the unit. In the Model 706, the relay card is placed vertically in the unit. The relay card is placed in the mainframe with the card edge first. Align the card with the grooves in the slot and insert the card to its full depth into the mainframe. Make sure the card is properly seated into the connector in the mainframe. With the card fully inserted, push the locking tabs forward to the center of the card to lock it in the mainframe.

NOTE

Refer to the scanner mainframe's instruction manual for complete details.

2.4.2 Relay Card Removal

To remove a relay card, first turn off the mainframe and all other equipment connected to the card. Unfasten the locking tabs on the card by pulling the tabs outward. Grasp the end of the card and carefully pull it out of the mainframe.

2.5 OPERATION

WARNING

User supplied lethal voltage may be present on the PC board or the connectors. Maximum voltage terminal to terminal is 350V peak. Maximum voltage terminal to chassis is 350V peak.

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Model 7066 operation consists of three parts:

1. Wiring the Model 7066 for the desired configuration.
2. Installing the Model 7066 in a scanner mainframe.
3. Controlling the channels from the scanner.

Refer to paragraph 2.3 for wiring information, paragraph 2.4 for card installation information and the scanner instruction manual for information concerning control of the channels.

When the Model 7066(s) is the only card(s) in the scanner being used, it is recommended that the scanner be used in the 2-pole or 4-pole mode. The Model 7066 can be used with other scanner cards in any scanner pole configuration. Tables 2-2 through 2-5 list the scanner channels that control relay switch card channels for all the pole configurations of the scanner. The card numbers refer to the designated slots in the scanner where a Model 7066 may be physically located. Each table includes data for the 10 card locations in the Model 706. Since the Model 705 can only accommodate two cards, only the data for cards 1 and 2 is relevant.

Operation Notes:

1. To ensure the reliability of relay performance, it is recommended that not more than three relays be energized simultaneously when using the Model 705 Scanner. In the Model 706, the number of relays that can be energized simultaneously depends on factors such as temperature and ventilation. Refer to Table 2-15 in the Model 706 Instruction Manual and use the data for the Model 7053 card since those relays consume the same power as the relays for the Model 7066.
2. Power Limits—To prevent overheating or damage to the relay contacts, never exceed the signal level specifications of the relay. Maximum voltage is 250V DC or RMS, 350V peak. The current limit is 2A DC or RMS. The power limit is 60W DC, 125VA AC using a resistive load. Reactive loads require clamping and surge limiting.

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3. Reactive Loads—Operation is specified for resistive loads. Reactive loads require voltage clamping (for inductive loads) and current surge limiting (for capacitive loads) to prevent damage to the relays and to external circuitry.
   A. Inductive Loads—Inductive reaction voltage, $L\frac{di}{dt}$, must be limited to less than 250V in DC circuits or 350V peak in AC circuits. Also, consider the load when determining the voltage limit. Clamping circuits that can be used are shown in Figure 2-8.
   B. Capacitive Loads—The initial surge current from a capacitive reactive load must be limited. Figure 2-9 shows circuits that can be used to limit current surges. To protect the relay, limit current to 2A. Also consider the load when determining the current surge limit.
4. AC Mains Switching—The Model 7066 may be used to switch low power AC mains as long as the following restrictions are adhered to:
   A. Do not exceed the signal level specifications of the card.
   B. A 2A fuse must be used to limit current.
   C. Line filtering must be used to limit voltage transients and RF noise. A clamping circuit to protect the card from AC mains transients is shown in Figure 2-10.
5. Switching Speed—Relay actuation time is 10msec maximum, plus mainframe programming time. Maximum relay speed is 50 cycles per second at low level loads. For maximum relay life, operating speed should be limited to 20 cycles per minute at full rated load to avoid overheating of relay contacts.

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Table 2-2. Scanner Control of Model 7066 4-Pole Mode

Card#	Scanner Channel Numbers	7066 Relays Controlled
1, 2	01-10	1-10
3, 4	11-20	1-10
5, 6	21-30	1-10
7, 8	31-40	1-10
9, 10	41-50	1-10

NOTE: Model 705 can accomodate 2 cards; Model 706 can accomodate 10 cards.

Table 2-3. Scanner Control of Model 7066 2-Pole Mode

Card#	Scanner Channel Numbers	7066 Relays Controlled
1	01-10	1-10
2	11-20	1-10
3	21-30	1-10
4	31-40	1-10
5	41-50	1-10
6	51-60	1-10
7	61-70	1-10
8	71-80	1-10
9	81-90	1-10
10	91-100	1-10

NOTE: Model 705 can accomodate 2 cards; Model 706 can accomodate 10 cards

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Table 2-4. Scanner Control of Model 7066 1-Pole Mode

CARD 1		CARD 2		CARD 3		CARD 4		CARD 5	
Scanner Ch. No.	Relay Controlled	Scanner Ch. No.	Relay Controlled	Scanner Ch. No.	Relay Controlled	Scanner Ch. No	Relay Controlled	Scanner Ch. No.	Relay Controlled
01, 02	1	21, 22	1	41, 42	1	61, 62	1	81, 82	1
03, 04	2	23, 24	2	43, 44	2	63, 64	2	83, 84	2
05, 06	3	25, 26	3	45, 46	3	65, 66	3	85, 86	3
07, 08	4	27, 28	4	47, 48	4	67, 68	4	87, 88	4
09, 10	5	29, 30	5	49, 50	5	69, 70	5	89, 90	5
11, 12	6	31, 32	6	51, 52	6	71, 72	6	91, 92	6
13, 14	7	33, 34	7	53, 54	7	73, 74	7	93, 94	7
15, 16	8	35, 36	8	55, 56	8	75, 76	8	95, 96	8
17, 18	9	37, 38	9	57, 58	9	77, 78	9	97, 98	9
19, 20	10	39, 40	10	59, 60	10	79, 80	10	99, 100	10

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Table 2-4. Scanner Control of Model 7066 1-Pole Mode (Cont.)

CARD 6		CARD 7		CARD 8		CARD 9		CARD 10	
Scanner Ch. No.	Relay Controlled	Scanner Ch. No.	Relay Controlled	Scanner Ch. No.	Relay Controlled	Scanner Ch. No	Relay Controlled	Scanner Ch. No.	Relay Controlled
101, 102	1	121, 122	1	141, 142	1	161, 162	1	181, 182	1
103, 104	2	123, 124	2	143, 144	2	163, 164	2	183, 184	2
105, 106	3	125, 126	3	145, 146	3	165, 166	3	185, 186	3
107, 108	4	127, 128	4	147, 148	4	167, 168	4	187, 188	4
109, 110	5	129, 130	5	149, 150	5	169, 170	5	189, 190	5
111, 112	6	131, 132	6	151, 152	6	171, 172	6	191, 192	6
113, 114	7	133, 134	7	153, 154	7	173, 174	7	193, 194	7
115, 116	8	135, 136	8	155, 156	8	175, 176	8	195, 196	8
117, 118	9	137, 138	9	157, 158	9	177, 178	9	197, 198	9
119, 120	10	139, 140	10	159, 160	10	179, 180	10	199, 200	10

NOTE: Model 705 can accomodate 2 cards; Model 706 can accomodate 10 cards.

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Table 2-5. Scanner Control of Model 7066 Matrix Mode (0-Pole)

CARD 1		CARD 2		CARD 3		CARD 4		CARD 5	
Scanner Ch. No.	Relay Controlled	Scanner Ch. No.	Relay Controlled	Scanner Ch. No.	Relay Controlled	Scanner Ch. No	Relay Controlled	Scanner Ch. No.	Relay Controlled
01, 1	1	06, 1	1	11, 1	1	16, 1	1	21, 1	1
01, 2	6	06, 2	6	11, 2	6	16, 2	6	21, 2	6
02, 1	2	07, 1	2	12, 1	2	17, 1	2	22, 1	2
02, 2	7	07, 2	7	12, 2	7	17, 2	7	22, 2	7
03, 1	3	08, 1	3	13, 1	3	18, 1	3	23, 1	3
03, 2	8	08, 2	8	13, 2	8	18, 2	8	23, 2	8
04, 1	4	09, 1	4	14, 1	4	19, 1	4	24, 1	4
04, 2	9	09, 2	9	14, 2	9	19, 2	9	24, 2	9
05, 1	5	10, 1	5	15, 1	5	20, 1	5	25, 1	5
05, 2	10	10, 2	10	15, 2	10	20, 2	10	25, 2	10

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Table 2-5. Scanner Control of Model 7066 Matrix Mode (0-Pole) (Cont.)

CARD 6		CARD 7		CARD 8		CARD 9		CARD 10	
Scanner Ch. No.	Relay Controlled	Scanner Ch. No.	Relay Controlled	Scanner Ch. No.	Relay Controlled	Scanner Ch. No	Relay Controlled	Scanner Ch. No.	Relay Controlled
26, 1	1	31, 1	1	36, 1	1	41, 1	1	46, 1	1
26, 2	6	31, 2	6	36, 2	6	41, 2	6	46, 2	6
27, 1	2	32, 1	2	37, 1	2	42, 1	2	47, 1	2
27, 2	7	32, 2	7	37, 2	7	42, 2	7	47, 2	7
28, 1	3	33, 1	3	38, 1	3	43, 1	3	48, 1	3
28, 2	8	33, 2	8	38, 2	8	43, 2	8	48, 2	8
29, 1	4	34, 1	4	39, 1	4	44, 1	4	49, 1	4
29, 2	9	34, 2	9	39, 2	9	44, 2	9	49, 2	9
30, 1	5	35, 1	5	40, 1	5	45, 1	5	50, 1	5
30, 2	10	35, 2	10	40, 2	10	45, 2	10	50, 2	10

NOTE: Model 705 can accomodate 2 cards; Model 706 can accomodate 10 cards.

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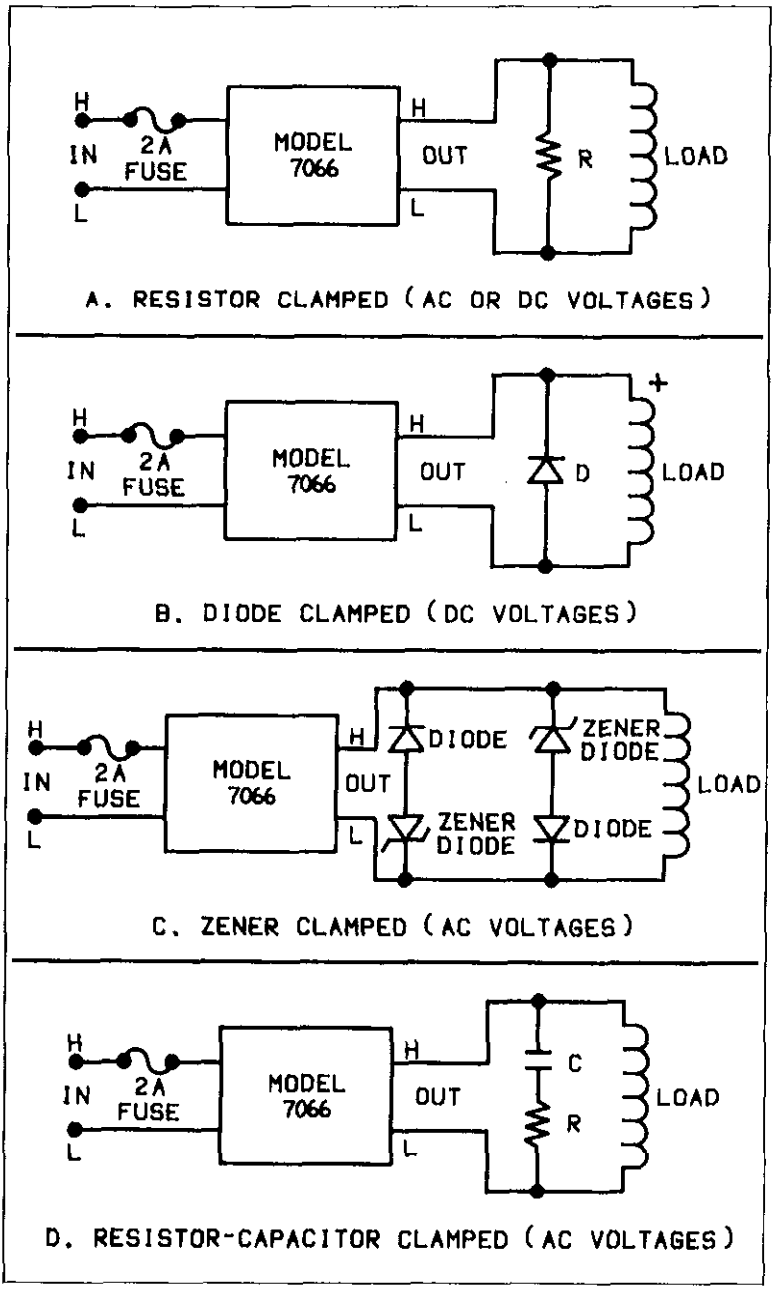


Figure 2-8. Limiting Inductive Reaction Voltage

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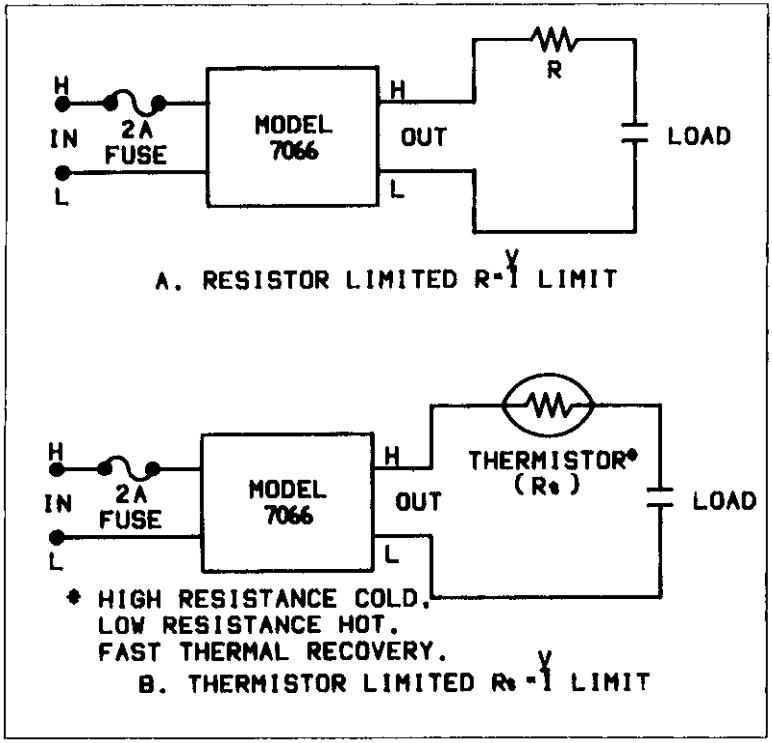


Figure 2-9. Limiting Capacitive Reaction Current

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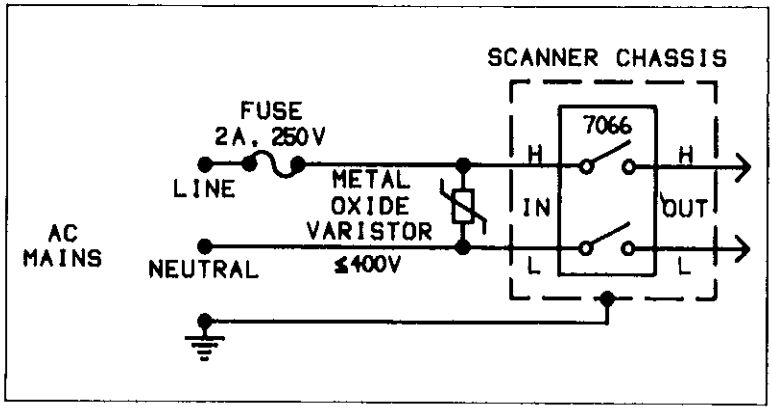


Figure 2-10. Clamping AC Mains Transients

2.6 TYPICAL APPLICATIONS

Independent IN/OUT circuits for each channel, and the flexibility of normally open (NO) or normally closed (NC) contacts provide the means to configure the Model 7066 for particular setups. This section provides some typical examples on how the relay switch card can be used.

2.6.1 Switching Sources and Supplies

The circuit shown in Figure 2-11 controls a power supply that powers the internal circuitry of the device under test (DUT), while a second relay is used to switch the input of the DUT from a short condition to the level of the source.

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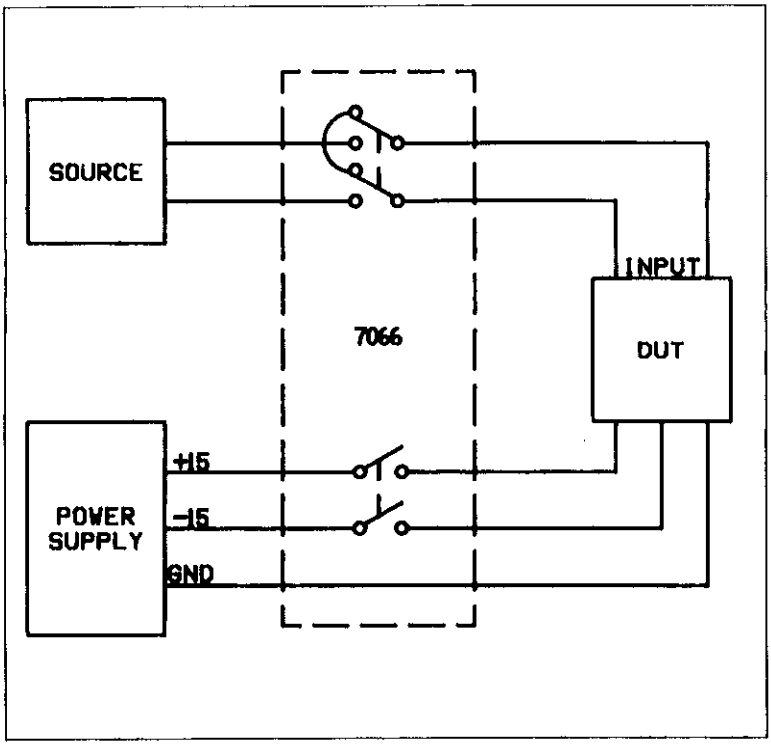


Figure 2-11. Switching Sources and Supplies

2.6.2 Switching Loads

The circuit shown in Figure 2-12 uses the Model 7066 to control two separate outputs of a DUT to their loads, while a Model 7056 General Purpose Scanner Card is used to switch the DMM from one load to another. This application shows how the Model 7066 can be used with other scanner cards.

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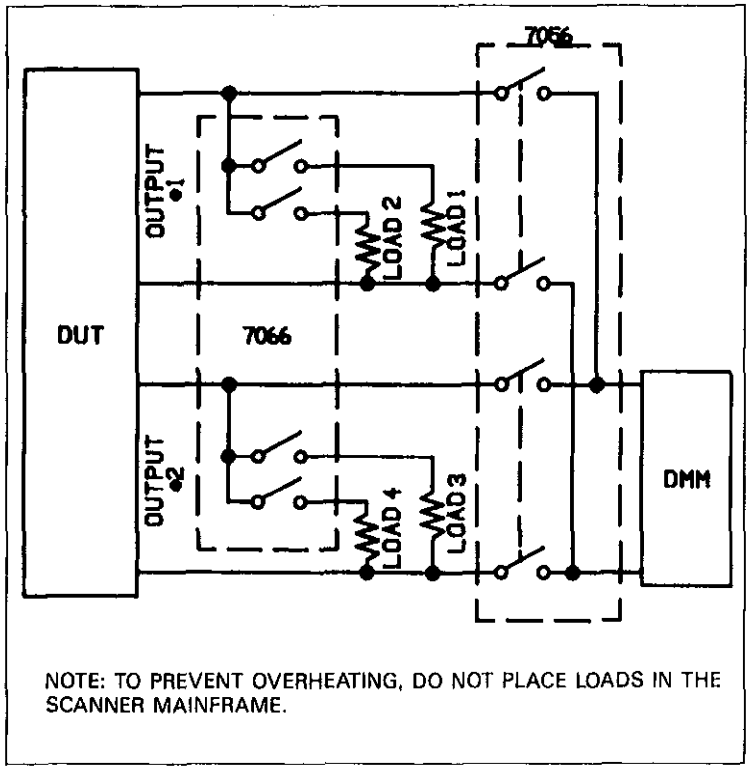


Figure 2-12. Switching Loads

2.6.3 Other Applications

The Model 7066 can be used to activate indicators, alarms and external control circuitry (i.e. activating a relay circuit that is used to start a motor).

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SECTION 3
SERVICING INFORMATION

3.1 INTRODUCTION

This section contains a performance verification procedure. Recommended maintenance includes inspection of the relay card and the card edge connector to ensure good electrical contact, and the verification of the input isolation and contact resistance specifications. The Model 7066 does not require calibration.

3.2 REQUIRED TEST EQUIPMENT

Recommended test equipment for performance verification is provided in Table 3-1. Test equipment other than the recommended equipment may be substituted if specifications equal or exceed the stated specifications in Table 3-1.

Table 3-1. Recommended Test Equipment

Description	Specification	Mfg.	Model
Scanner Mainframe	—	Keithley	705 or 706
DMM	200MΩ full scale (±2%), 100mΩ resolution (±0.05%)	Keithley	175

3.3 ENVIRONMENTAL CONDITIONS

Performance verification should be done in an environment that is within the specified operating temperature range of the relay card.

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3.4 VERIFICATION PROCEDURE

In general, verification consists of measuring the resistance of each relay switch in an open and closed state. Perform the following procedures to verify the input isolation and contact resistance specifications of the Model 7066:

1. Connect four wires to one of the quick-disconnect terminal blocks. This one block will be used to check all 10 channels.
2. Connect the terminal block to a channel on the relay card.
3. Install the Model 7066 in a scanner mainframe.
4. Referring to Figure 3-1(A), connect the DMM to the H terminals of the relay.
5. Turn on the scanner and the DMM.
6. Select the ohms function on the DMM and open the appropriate channel from the front panel of the scanner.
7. If the relay switch is normally open (NO), verify that the input isolation is >200MΩ. If the relay switch is normally closed (NC), verify that the contact resistance is <2Ω.
8. Close the channel from the front panel of the scanner.
9. If the relay switch is NO, verify that the contact resistance is <2Ω. If the relay switch is NC, verify that the input isolation is >200MΩ.
10. Referring to Figure 3-1(B), connect the DMM to the L terminals of the relay.
11. Repeat steps 6 through 9 to check the L switch of the relay.
12. Turn off the scanner and pull out the relay card from the mainframe.
13. Remove the terminal block from the channel just checked and connect it to the next channel to be checked.
14. Repeat the above basic procedure (steps 2 through 13), to check each channel.

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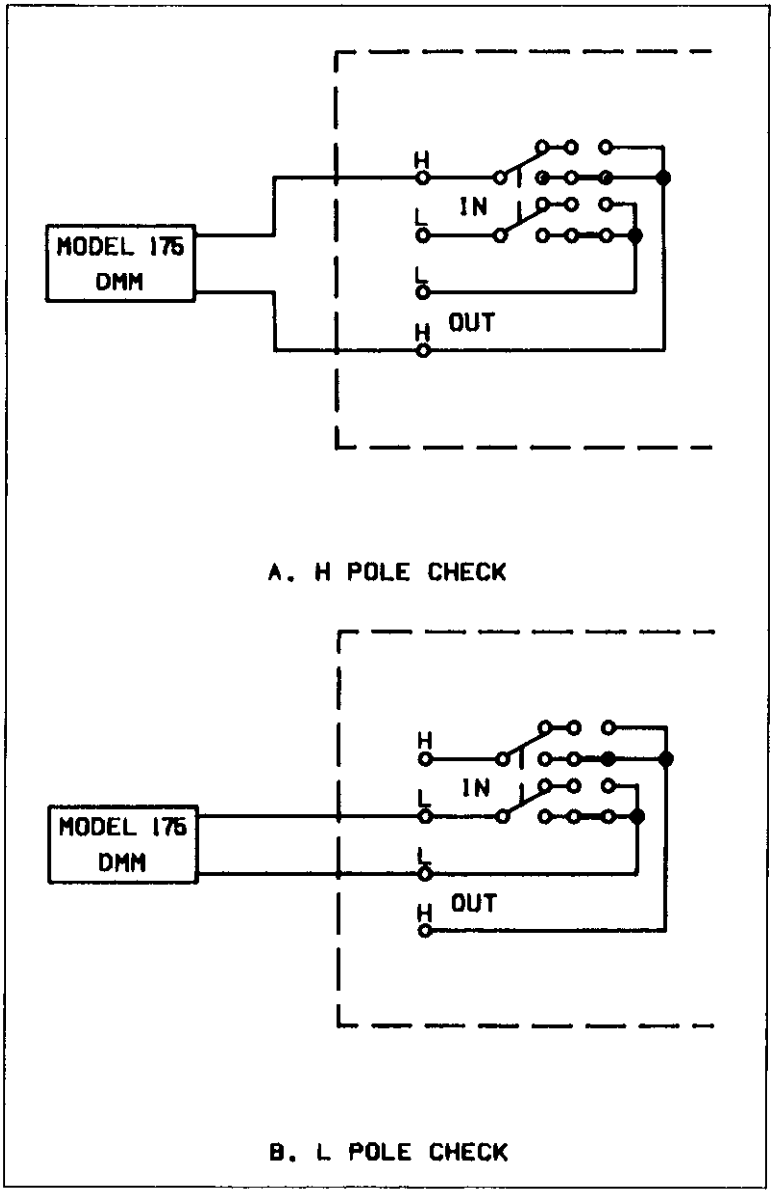


Figure 3-1. Performance Verification Setup

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SECTION 4
REPLACEABLE PARTS

4.1 INTRODUCTION

This section contains replacement parts information, a schematic diagram and a component layout for the Model 7066.

4.2 REPLACEABLE PARTS

Parts are listed alpha-numerically in the order of their circuit designations.

4.3 ORDERING INFORMATION

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

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

4.4 FACTORY SERVICE

If fault can be isolated to a particular scanner card, then it is sufficient to return just the card(s). Otherwise, send back both the card(s) and scanner mainframe. For service, photo copy and complete the service form which follows this section and return it with the equipment.

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4.5 COMPONENT LAYOUT and SCHEMATIC DIAGRAM

Figure 4-1 contains a component layout of the Model 7066. Figure 4-2 contains a schematic diagram of the Model 7066.

Table 4-1. Model 7066, Parts List

Circuit Desig.	Description	Sch. Loc.	Keithley Part No.
C1	Capacitor, 0.1μF	D7	C-237-.1
J1-J10	Terminal Block	Sev.	CS-521-3
K1-K10	Relay	Sev.	RL-98
W1-W20	Jumper	Sev.	J-3
	Cable Clamp Assembly, Upper	—	7055-303-11
	Cable Clamp Assembly, Lower	—	7055-308

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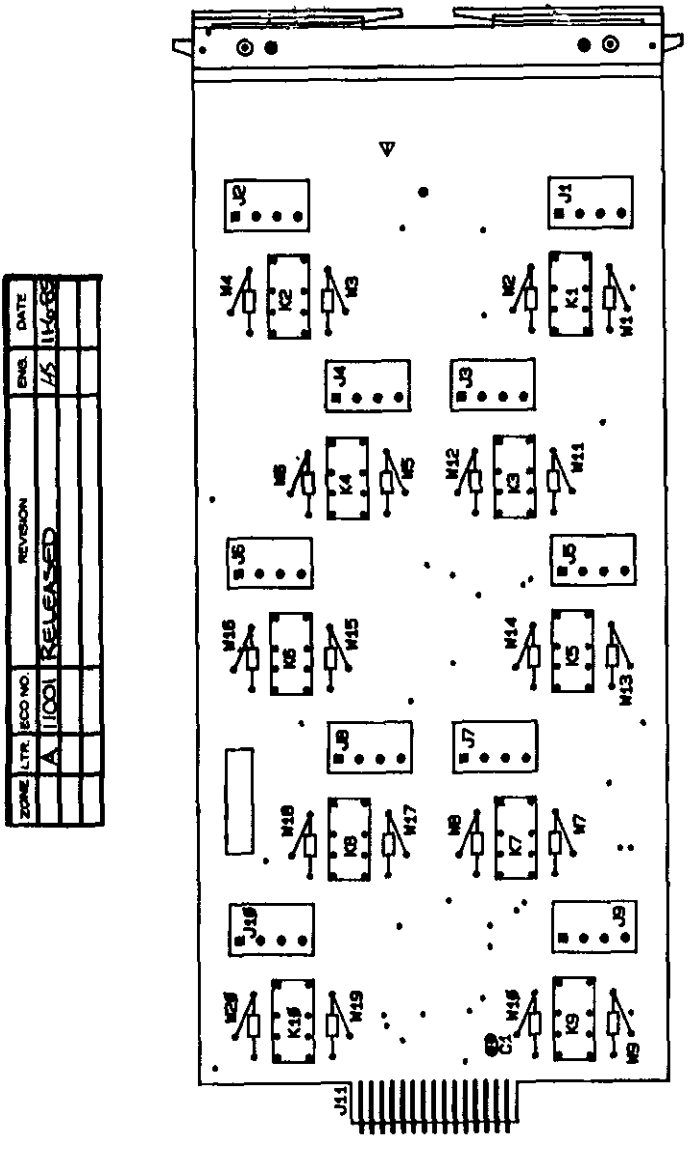


Figure 4-1. Model 7066, Component Location Drawing

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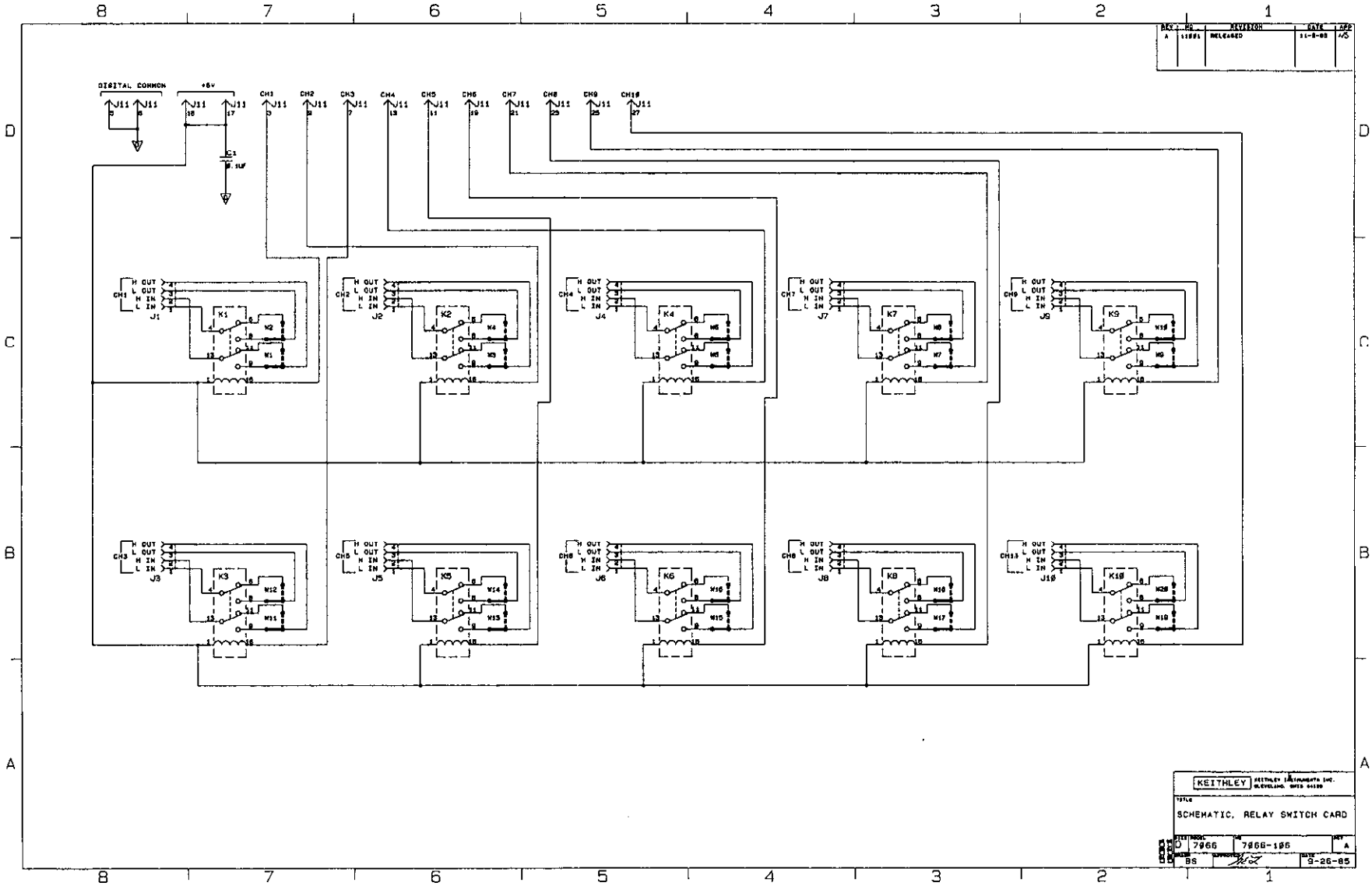


Figure 4-2. Model 7066, Schematic Diagram

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

Display or output (check one)

- ❑ Drifts
- ❑ Unstable
- ❑ Overload
- ❑ Unable to zero
- ❑ Will not read applied input

- ❑ Calibration only
- ❑ Data required
- ❑ Certificate of calibration 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.

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