# Model 7116-MWS
# Microwave Switch System
Instruction Manual

Contains Operating and Servicing Information

KEITHLEY

# 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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KEITHLEY

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# Model 7116-MWS 16-Channel Microwave Switch System Instruction Manual


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# Manual Print History

The print history shown below lists the printing dates of all Revisions and Addenda created for this manual. The Revision Level letter increases alphabetically as the manual undergoes subsequent updates. Addenda, which are released between Revisions, contain important change information that the user should incorporate immediately into the manual. Addenda are numbered sequentially. When a new Revision is created, all Addenda associated with the previous Revision of the manual are incorporated into the new Revision of the manual. Each new Revision includes a revised copy of this print history page.

Revision A (Document Number 7116MWS-901-01) ..... August 1996
Revision B (Document Number 7116MWS-901-01) ..... November 1996
Revision C (Document Number 7116MWS-901-01) ..... July 1998

# 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, 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 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.

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 technical support for information.

To clean the 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.

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# 1

# Installation

## Introduction

The Model 7116-MWS 16-Channel Microwave Switch System provides an integrated solution for multiplexed signal routing of microwave signals at frequencies up to 18GHz. The Model 7116-MWS switch system can be used to test wireless telecommunication devices and systems such as cellular phones, cordless phones, pagers, antenna systems, base stations, and other wireless transmission productions.

It consists of:

- Five 1×4 microwave RF multiplexer switch modules
- A Model 7020-MWS switching card
- A Model 7001 switching mainframe
- An off-line power supply
- Semi-rigid cables

## 7116-MWS installation instructions

WARNING

**The information on the following pages is intended for qualified service personnel only. Do not attempt these procedures unless you are qualified to do so.**

CAUTION

**To prevent flexing of the connections and possible damage, ensure that the Model 7020-MWS card is secured with its thumbscrew to the Model 7001 rear panel, and that the cable assembly is secured with its two screws to the 7020-MWS card.**

*Table 1-1*
*Model 7116-MWS rack assembly parts*

| Quantity | Description | Keithley part number | Function |
|---|---|---|---|
| 2 | Bracket, rear support | BR-21 | Attaches chassis rear to rear rack rails. |
| 4<br>4 | 10-32 Kepnut<br>10-32 x 3/8 Phillips pan head screw | 10-32 KEPNUT<br>10-32x3/8 PPH | Attaches rear support brackets to chassis. |
| 8<br>8 | Fastener, captive nut<br>10-32 x 5/8 Phillips pan head screw | FA-148<br>10-32x5/8 PPH | Attaches rear support brackets and front panel to rails. |
| 1 | 10-32 x 3/8 Phillips pan head sems screw | 10-32x3/8 PPHSEM | Connect ground cable to earth ground. |
| 2 | Semi-rigid cable | 7116-307-1 | |
| 2 | Semi-rigid cable | 7116-307-2 | |

## Parts list

Table 1-1 lists the parts supplied with the Model 7116-MWS 16-Channel Microwave Switch System.

## Rack preparation

1. Select a location in the rack. The assembly will take up to 5¼ inches of vertical space.
2. Hold up the system at the selected location in the rack. The four slotted mounting holes in the front panel dictate the location of the captive nut fasteners on the front rack rails. Mark where the fasteners are to be installed.
3. Referring to Figure 1-1, install four fasteners so the captive nuts are located behind the appropriate holes on the front rack rails.

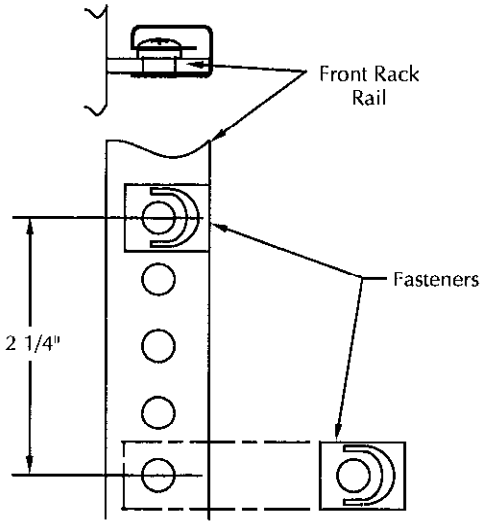



***Figure 1-1***
*Fastener installation*

## System installation

Refer to Figure 1-2 to install the chassis and support brackets in the rack.

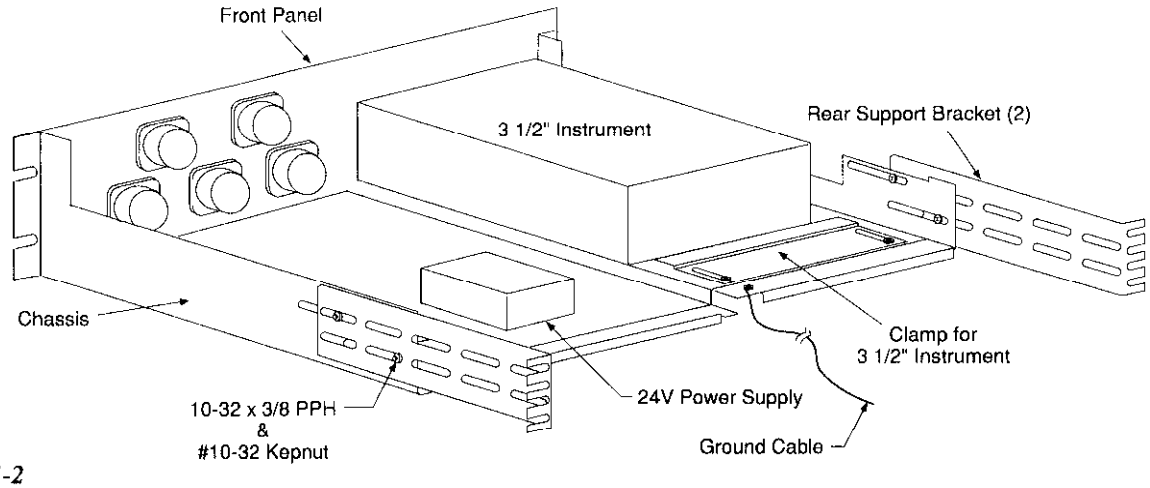



*Figure 1-2*
*Mounting kit installation*

1. Loosely attach the rear support brackets to the chassis with kepnuts and 10-32 x ⅜ screws.
2. Position the chassis assembly in the rack to adjust the support brackets, and note the location for the captive nut fasteners on the rear rack rails.
3. Install four fasteners so the captive nuts are located behind the appropriate holes on the rear rack rails.
4. Loosely attach the chassis assembly to the front and rear rack rails with 10-32 x ⅝ screws. Secure the rear support brackets to the chassis.
5. Tighten all screws.

WARNING

**The Model 7116-MWS must be separately connected to a safety earth ground to maintain protection against possible shock hazard. Failure to connect the unit to a safety earth ground may result in personal injury or death due to an electric shock.**

## System earth ground installation

1. Remove all power from the system.
2. Connect the loose end of the six foot green/yellow ground cable to a quality ground located within your facility using the #10 screw provided.

## Semi-rigid coax cable installation

WARNING

**Contact with exposed conductors carrying RF power may cause burns. Place protective caps on all unused switch inputs. All cables and connectors should be properly mated and shielded.**

1. Remove all power from the system.
2. Remove the plastic protective caps from the switch inputs shown in Figure 1-3. Leave the other caps on. Save the removed caps for future use. Connect the cables to the switches as shown in Figure 1-3 and tighten using a 5/16 inch wrench, to 7-10 in.-lb.

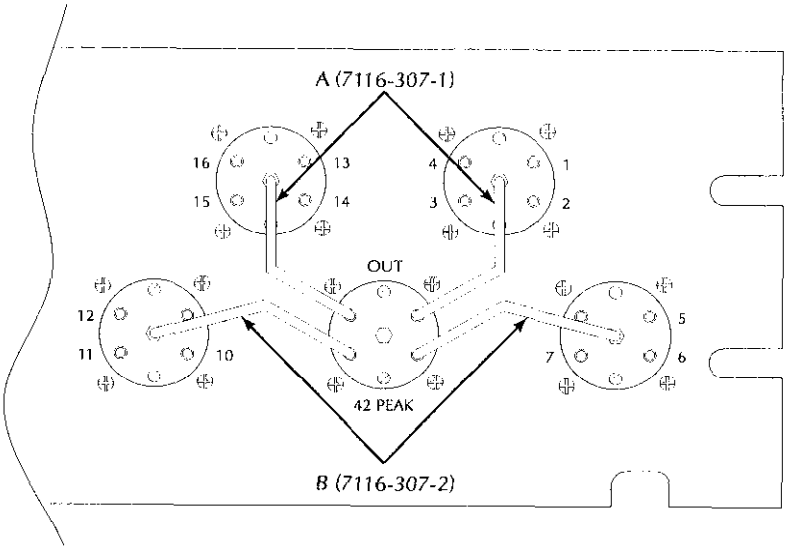



***Figure 1-3***
*Cable installation*

# 2

# Operation

## Introduction

The Model 7116-MWS system is a 16-input microwave multiplexer. Sixteen inputs are achieved by connecting five single-pole, four-throw switches together forming a tree switching network as shown in Figure 2-1.

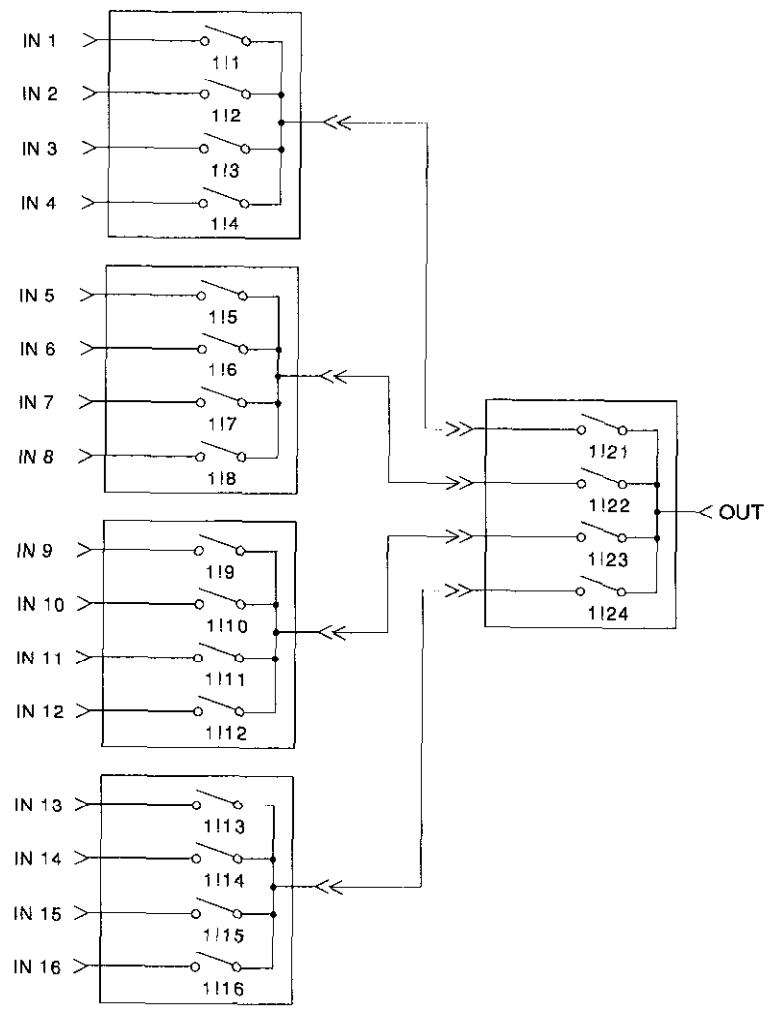



*Figure 2-1*
*Tree switching network*

## Operating instructions

To select an input channel, the Model 7001 must close two switches at the same time. Table 2-1 lists which Model 7020-MWS digital outputs must be activated to select each respective RF input. The table also shows 7001 channels used to select the inputs.

*Table 2-1*
*Model 7001 channels and memory locations for 1x16 multiplexer*

| 7116-MWS Input | 7020-MWS Digital Outputs | | | | 7001 Channels | 7001 Memory Location | 7116-MWS Relays |
|---|---|---|---|---|---|---|---|
| | Bank A | Bank B | Bank C | Bank D | | | |
| Ch. 1 | OUT 1 | | OUT 21 | | 1!1,1!21 | M1 | |
| Ch. 2 | OUT 2 | | OUT 21 | | 1!2,1!21 | M2 | K1, K5 |
| Ch. 3 | OUT 3 | | OUT 21 | | 1!3,1!21 | M3 | |
| Ch. 4 | OUT 4 | | OUT 21 | | 1!4,1!21 | M4 | |
| Ch. 5 | OUT 5 | | OUT 22 | | 1!5,1!22 | M5 | |
| Ch. 6 | OUT 6 | | OUT 22 | | 1!6,1!22 | M6 | K2, K5 |
| Ch. 7 | OUT 7 | | OUT 22 | | 1!7,1!22 | M7 | |
| Ch. 8 | OUT 8 | | OUT 22 | | 1!8,1!22 | M8 | |
| Ch. 9 | | OUT 9 | OUT 23 | | 1!9,1!23 | M9 | |
| Ch. 10 | | OUT 10 | OUT 23 | | 1!10,1!23 | M10 | K3, K5 |
| Ch. 11 | | OUT 11 | OUT 23 | | 1!11,1!23 | M11 | |
| Ch. 12 | | OUT 12 | OUT 23 | | 1!12,1!23 | M12 | |
| Ch. 13 | | OUT 13 | OUT 24 | | 1!13,1!24 | M13 | |
| Ch. 14 | | OUT 14 | OUT 24 | | 1!14,1!24 | M14 | K4, K5 |
| Ch. 15 | | OUT 15 | OUT 24 | | 1!15,1!24 | M15 | |
| Ch. 16 | | OUT 16 | OUT 24 | | 1!16,1!24 | M16 | |

Output patterns for each input are stored in the Model 7001 memory at the factory. The user can call up memory locations to select each input. For example, calling up memory location 1 selects input 1. Some programming examples are listed below.

```
PRINT #1,"output 7; :close (@ 1!1,1!21)"        'Channels select input 1
PRINT #1,"output 7; :close (@ M1)"              'Memory location 1 selects input 1
```

**NOTE**

*In either configuration of the Model 7116-MWS, as one 1 x 16 multiplexer or, with the semi-rigid jumper cables removed, as five 1 x 4 multiplexers, ensure that only one channel is closed per relay, and that no more than two relays are energized simultaneously per bank.*

For further information on operation and programming, refer to the Models 7001 and 7020 Instruction Manuals.

## Power Limits

The Model 7020-MWS card is a modified version of the Model 7020 Digital I/O Interface Card. Among other changes, the output protection network has been removed for greater sink current capacity.

CAUTION

**This card is not intended for use in applications other than the Model 7116-MWS system. The 7020-MWS and 7020 cards are not interchangeable. Damage or unintended operation may result if a Model 7020 is substituted for a 7020-MWS.**

NOTE

*A bank refers to the internal IC that is used to drive eight output channels. The card uses five driver ICs (banks) to accomodate the 40 output channels. The outputs are grouped as follows for each bank:*

Bank A = OUT 1 through OUT 8
Bank B = OUT 9 through OUT 16
Bank C = OUT 17 through OUT 24
Bank D = OUT 25 through OUT 32
Bank E = OUT 33 through OUT 40

# 3

# Service

## Introduction

The following paragraphs contain troubleshooting and replacement parts information. Schematic diagrams, and component layout drawings for the Model 7116-MWS chassis are also included. Refer to Model 7001 and 7020 manuals for further information about these components.

## Troubleshooting

WARNING

**The information in this section is intended for qualified service personnel only. Some of the procedures may expose you to hazardous voltages that could result in personal injury or death. Do not attempt to perform these procedures unless you are qualified to do so.**

### Troubleshooting equipment

The Model 2000 Digital Multimeter is recommended for troubleshooting.

### Troubleshooting procedure

Table 3-1 summarizes the procedure for verifying operation of the Model 7116-MWS. Refer to the system schematic and the chassis wiring diagram (drawing number 7116-051) for component locations.

*Table 3-1*
*Troubleshooting procedure*

| Step | Item/component | Required condition | Comment |
|---|---|---|---|
| 1 | Chassis | | All voltages referenced to chassis |
| 2 | K1-K5, pin COM | < 29VDC | Relay coil voltage |
| 3 | K1 pin 1, K5 pin 1 | < 1.5V | Close channel 1 |
| 4 | K1 pin 2, K5 pin 1 | < 1.5V | Close channel 2 |
| 5 | K1 pin 3, K5 pin 1 | < 1.5V | Close channel 3 |
| 6 | K1 pin 4, K5 pin 1 | < 1.5V | Close channel 4 |
| 7 | K2 pin 1, K5 pin 2 | < 1.5V | Close channel 5 |
| 8 | K2 pin 2, K5 pin 2 | < 1.5V | Close channel 6 |
| 9 | K2 pin 3, K5 pin 2 | < 1.5V | Close channel 7 |
| 10 | K2 pin 4, K5 pin 2 | < 1.5V | Close channel 8 |
| 11 | K3 pin 1, K5 pin 3 | < 1.5V | Close channel 9 |
| 12 | K3 pin 2, K5 pin 3 | < 1.5V | Close channel 10 |
| 13 | K3 pin 3, K5 pin 3 | < 1.5V | Close channel 11 |
| 14 | K3 pin 4, K5 pin 3 | < 1.5V | Close channel 12 |
| 15 | K4 pin 1, K5 pin 4 | < 1.5V | Close channel 13 |
| 16 | K4 pin 2, K5 pin 4 | < 1.5V | Close channel 14 |
| 17 | K4 pin 3, K5 pin 4 | < 1.5V | Close channel 15 |
| 18 | K4 pin 4, K5 pin 4 | < 1.5V | Close channel 16 |

NOTE: See Table 2-1 for information on closing channels.

## Ordering information

To place an order or to obtain information concerning replacement parts, contact your Keithley representative or the factory. When ordering parts, be sure to include the following information:

- Model numbers 7116-MWS, 7020-MWS, and 7001
- Serial number of the chassis, card, or mainframe
- Part description
- Circuit designation (if applicable)
- Keithley part number

## Factory service

If the Model 7116-MWS system must be returned to Keithley for repair, perform the following:

1. Call the Repair department at 1-800-552-1115 for a Return Material Authorization (RMA) number.
2. Complete the service form at the back of this manual and include it with the card.
3. Carefully pack the card in the original packing carton.
4. Write ATTENTION REPAIR DEPT and the RMA number on the shipping label.

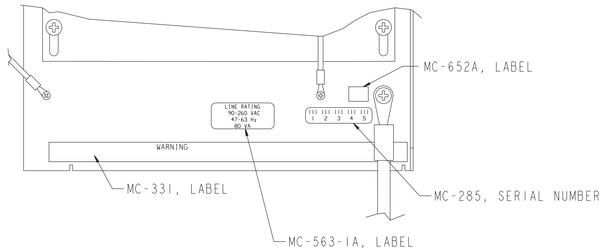
## Engineering drawings

The Model 7116-MWS schematic (7116-MWS-406), chassis assembly (7116-050), and chassis wiring (7116-051) drawings are included on the following pages.

NO. 7116-051

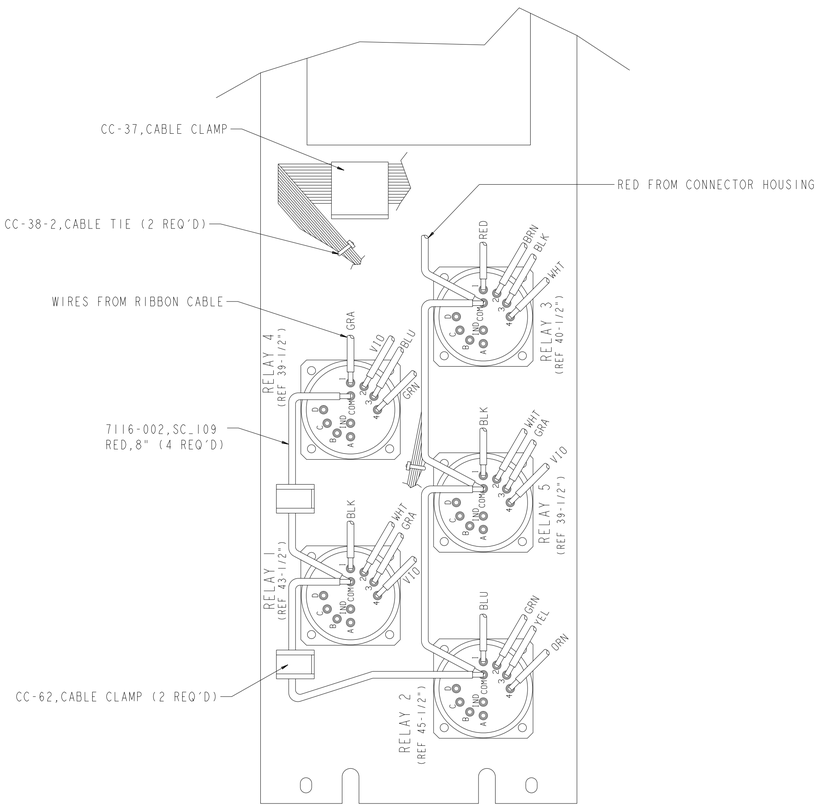
| LTR | ECA NO. | REVISION | ENG | DATE |
|---|---|---|---|---|
| B | 24568 | Re-draw Detail A, Add CC-37,CC-62,Many Updates | | |
| | | | | |
| | | | | |

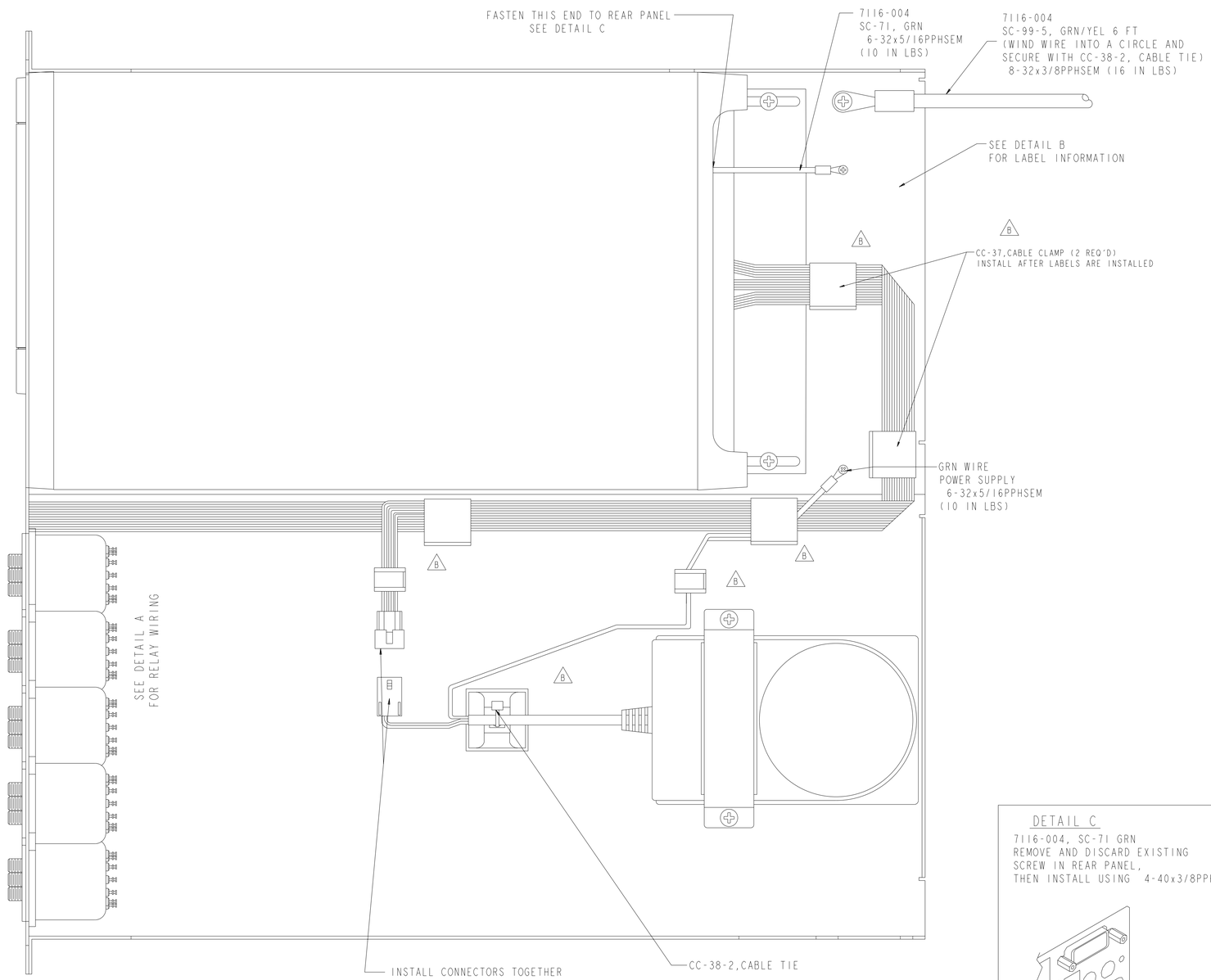
## DETAIL B




## DETAIL A △B

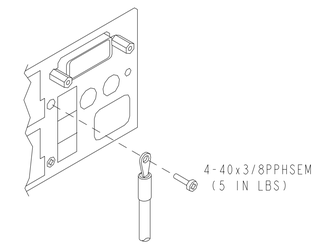
REAR VIEW FRONT PANEL




## DETAIL C

7116-004, SC-71 GRN
REMOVE AND DISCARD EXISTING
SCREW IN REAR PANEL,
THEN INSTALL USING 4-40x3/8PPHSEM




| PART NUMBER | QTY | DESCRIPTION | |
|---|---|---|---|
| 7116-050 | 1 | CHASSIS ASSEMBLY | |
| 7116-004 | 1 | CRIMP ASSEMBLY | |
| 7116-002 | 1 | WIRE CUTING CHART | △B |
| CC-38-2 | 3 | CABLE TIE | |
| MC-285 | 1 | SERIAL NUMBER | |
| MC-331 | 1 | LABEL | |
| MC-563-1A | 1 | LABEL | |
| MC-652A | 1 | LABEL | |
| 4-40x3/8PPHSEM | 1 | PHIL PAN HEAD SEMS SCREW | |
| 6-32x5/16PPHSEM | 2 | PHIL PAN HEAD SEMS SCREW | |
| 8-32x3/8PPHSEM | 1 | PHIL PAN HEAD SEMS SCREW | |
| CC-37 | 3 | CABLE CLAMP | △B |
| CC-62 | 2 | CABLE CLAMP | |

| | | | |
|---|---|---|---|
| 7116-MWS | 7116-080 | Final Inspection | 1 |
| MODEL | NEXT ASSEMBLY | NEXT PROCESS STEP | QTY |
| USED ON | | | |

| | | | |
|---|---|---|---|
| DO NOT SCALE THIS DRAWING | DIMENSIONAL TOLERANCES UNLESS OTHERWISE SPECIFIED | DATE 8/12/96 | SCALE ℛ |
| KEITHLEY Keithley Instruments Inc. Cleveland, Ohio 44139 | XX ± .015 ANG ± 1° | DRN mat | ENG APPR |
| | XXX ± .005 FRAC ± 1/64 | MATERIAL | |
| | SURFACE MAX 63 | FINISH | |

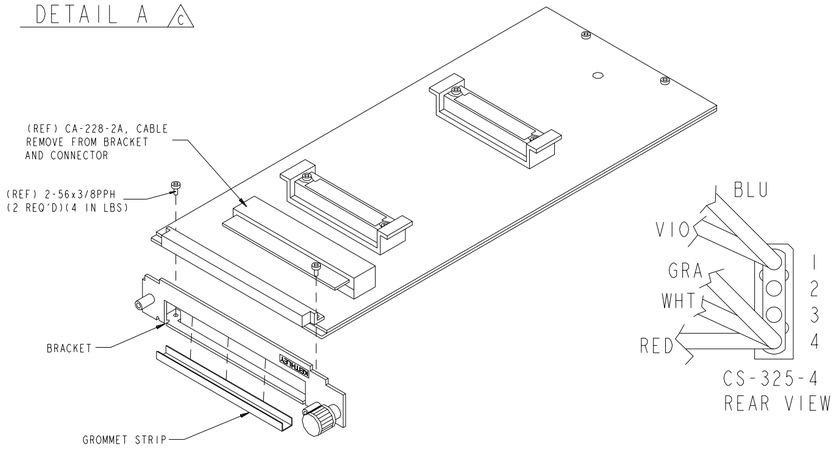
TITLE: CHASSIS WIRING

D NO. 7116-051

NO. 7116-050

| LTR | ECA NO. | REVISION | ENG | DATE |
|---|---|---|---|---|
| C | 24568 | Re-draw Detail A, Add CC-37,CC-62 | | |
| | | | | |
| | | | | |

## DETAIL A △C

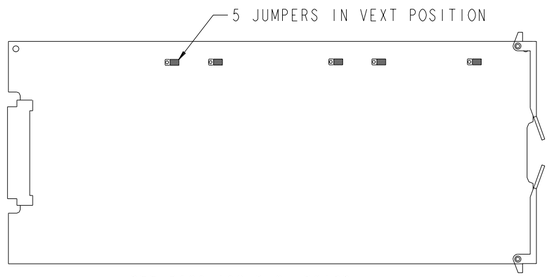






SEND CABLE TO HARNESS TO BE TRIMMED TO LENGTH.
INSTALL TRIMMED CABLE TO BRACKET.THEN PLACE CRIMPED WIRES
IN HOUSING.INSTALL CABLE AND BRACKET TO BOARD

## DETAIL B




REF:7020-102 P.C. BOARD

△C 7020-MWS, BOARD ASSEMBLY
SEE DETAIL A
INSTALL IN TOP SLOT OF 7001
RECORD SERIAL NUMBER ON 7116-MWS
HISTORY CARD. VERIFY ON 102 BOARD
THAT THE 5 JUMPERS ARE IN THE
VEXT POSITION. SEE DETAIL B.

8-32x3/8PPHSEM
(2 REQ'D)(16 IN LBS)

4288-4-302B,CLAMP
PUSH TOWARDS FRONT
PANEL AND TIGHTEN

TIGHTEN THUMB SCREW TO 7001

8-32x5/16PPHSEM
(2 REQ'D)(16 IN LBS)

7116-304A, BRACKET

TP-14-2, TAPE - 3" LONG (2 REQ'D)
PLACE ADJACENT TO EACH OTHER ON BRACKET.

MODEL 7001
REMOVE FRONT FEET

7116-004, PS-53 ASSEMBLY
REMOVE COVER ON POWER SUPPLY
WITH 3MM T-HANDLE ALLEN KEY,
THEN SEND TO TECH. WHEN RETURNED
FROM TECH, INSTALL COVER AND PLACE
POWER SUPPLY IN CHASSIS.

7116-301B, CHASSIS

△C CC-37,CABLE CLAMP
USE T-7794 FOR PLACEMENT

7116-040, FRONT PANEL ASSEMBLY

△C CC-62,CABLE CLAMP
USE T-7794 FOR PLACEMENT

8LKWA, LOCKWASHER (4 REQ'D)

8-32x1/4PPH
(4 REQ'D)(16 IN LBS)

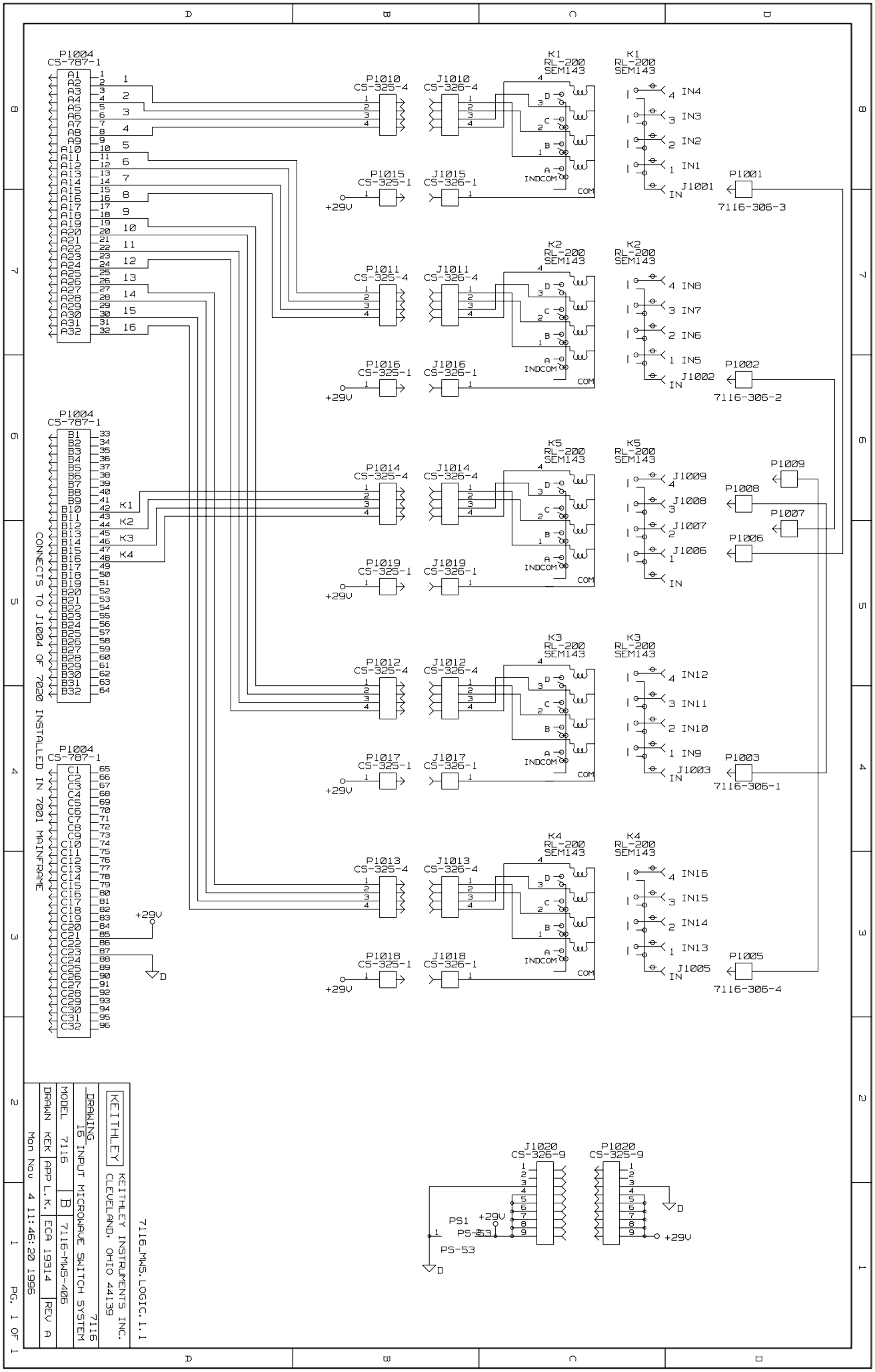
△C CC-47,CABLE CLAMP
USE T-7794 FOR PLACEMENT

TECH:
1) USE ANY DC VOLTMETER WITH .05% ACCURACY
100 VOLT RANGE.
2) CONNECT VOLTMETER INPUTS TO RED AND BLACK
TERMINALS AT THE FRONT OF THE SUPPLY.
3) ADJUST POTENTIOMETER AT THE FRONT RIGHT
OF THE SUPPLY TO GET A READING OF 29 VOLTS
BETWEEN 28.95 TO 29.05 VOLTS ON THE VOLTMETER.
4) PLACE A DROP OF LOCTITE 242 THREAD LOCKER ON
THE TOP OF THE POTENTIOMETER TO SECURE.
5) LET LOCTITE DRY AND CONFIRM VOLTAGE LEVEL
SET IN STEP 3.

| PART NUMBER | QTY | DESCRIPTION | |
|---|---|---|---|
| 7001 | 1 | MODEL 7001 | |
| 7020-MWS | 1 | BOARD ASSEMBLY | |
| 7116-004 | 1 | CRIMP ASSEMBLY | |
| 7116-040 | 1 | FRONT PANEL ASSEMBLY | |
| 7116-301B | 1 | CHASSIS | |
| 7116-304A | 1 | BRACKET | |
| 4288-4-302B | 1 | CLAMP | |
| CC-47 | 1 | CABLE CLAMP | △C |
| TP-14-2 | 2 | TAPE - 3" LONG | |
| 8-32x1/4PPH | 4 | PHIL PAN HEAD SCREW | |
| 8-32x3/8PPHSEM | 2 | PHIL PAN HEAD SEMS SCREW | |
| 8-32x5/16PPHSEM | 2 | PHIL PAN HEAD SEMS SCREW | |
| 8LKWA | 4 | LOCKWASHER | |
| CC-37 | 2 | CABLE CLAMP | △C |
| CC-62 | 2 | CABLE CLAMP | △C |
| CS-325-4 | 1 | CONNECTOR HOUSING | |

| | | | |
|---|---|---|---|
| | | | |
| 7116-MWS | 7116-051 | CHASSIS WIRING | 1 |
| MODEL | NEXT ASSEMBLY | NEXT PROCESS STEP | QTY |
| USED ON | | | |

| | | | | |
|---|---|---|---|---|
| DO NOT SCALE THIS DRAWING | DIMENSIONAL TOLERANCES UNLESS OTHERWISE SPECIFIED | DATE 8/8/96 | SCALE NONE | TITLE CHASSIS ASSEMBLY |
| KEITHLEY Keithley Instruments Inc. Cleveland, Ohio 44139 | XX = ±.015 ANG = ±1° | DRN mat | ENG APPR L.S. | |
| | XXX = ±.005 FRAC = ±1/64 | MATERIAL | C | NO. 7116-050 |
| | SURFACE MAX 63 | FINISH | | |


P1004
CS-787-1
P1010
CS-325-4
J1010
CS-326-4
K1
RL-200
SEM143
P1015
CS-325-1
J1015
CS-326-1
+29V
INDCOM
COM
IN4
IN3
IN2
IN1
J1001
P1001
7116-306-3
P1011
CS-325-4
J1011
CS-326-4
K2
P1016
CS-325-1
J1016
CS-326-1
IN8
IN7
IN6
IN5
J1002
P1002
7116-306-2
P1014
CS-325-4
J1014
CS-326-4
K5
P1019
CS-325-1
J1019
CS-326-1
J1009
J1008
J1007
J1006
P1009
P1008
P1007
P1006
P1012
CS-325-4
J1012
CS-326-4
K3
P1017
CS-325-1
J1017
CS-326-1
IN12
IN11
IN10
IN9
J1003
P1003
7116-306-1
P1013
CS-325-4
J1013
CS-326-4
K4
P1018
CS-325-1
J1018
CS-326-1
IN16
IN15
IN14
IN13
J1005
P1005
7116-306-4
K1
K2
K3
K4
CONNECTS TO J1004 OF 7020 INSTALLED IN 7001 MAINFRAME
+29V
D
J1020
CS-326-9
P1020
CS-325-9
PS1
PS-53
KEITHLEY
KEITHLEY INSTRUMENTS INC.
CLEVELAND, OHIO 44139
7116_MWS.LOGIC.1.1
DRAWING
16 INPUT MICROWAVE SWITCH SYSTEM
7116
MODEL 7116
B
7116-MWS-406
DRAWN KEK
APP L.K.
ECA 19314
REV A
Mon Nov 4 11:46:20 1996
PG. 1 OF 1

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.

KEITHLEY

**Keithley Instruments, Inc.**
28775 Aurora Road
Cleveland, Ohio 44139

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