

1260 VXI SWITCHING CARD

1260-160B/E MICROWAVE SPDT SWITCH PLUG-IN

PUBLICATION NO. 980824-160

RACAL INSTRUMENTS

Racal Instruments, Inc.

4 Goodyear St., Irvine, CA 92618-2002
Tel: (800) RACAL-ATE, (800) 722-2528, (949) 859-8999; FAX: (949) 859-7139

Racal Instruments, Ltd.

480 Bath Road, Slough, Berkshire, SL1 6BE, United Kingdom
Tel: +44 (0) 1628 604455; FAX: +44 (0) 1628 662017

Racal Systems Electronique S.A.

18 Avenue Dutatre, 78150 LeChesnay, France
Tel: +33 (1) 3923 2222; FAX: +33 (1) 3923 2225

Racal Systems Elettronica s.r.l.

Strada 2-Palazzo C4, 20090 Milanofiori Assago, Milan, Italy
Tel: +39 (0)2 5750 1796; FAX +39 (0)2 5750 1828

Racal Elektronik System GmbH.

Technologiepark Bergisch Gladbach, Friedrich-Ebert-Strasse, D-51429 Bergisch Gladbach, Germany
Tel.: +49 2204 8442 00; FAX: +49 2204 8442 19

Racal Australia Pty. Ltd.

3 Powells Road, Brookvale, NSW 2100, Australia
Tel: +612 9936 7000, FAX: +612 9936 7036

Racal Electronics Pte. Ltd.

26 Ayer Rajah Crescent, 04-06/07 Ayer Rajah Industrial Estate, Singapore 0513.
Tel: +65 7792200, FAX: +65 7785400

Racal Instruments, Ltd.

Unit 5, 25F., Mega Trade Center, No 1, Mei Wan Road, Tsuen Wan, Hong Kong, PRC
Tel: +852 2405 5500, FAX: +852 2416 4335

<http://www.racalstruments.com>



PUBLICATION DATE: November 21, 2001

Copyright 2001 by Racal Instruments, Inc. Printed in the United States of America. All rights reserved.
This book or parts thereof may not be reproduced in any form without written permission of the publisher.

WARRANTY STATEMENT

All Racal Instruments, Inc. products are designed and manufactured to exacting standards and in full conformance to Racal's ISO 9001 procedures.

For the specific terms of your standard warranty, or optional extended warranty or service agreement, contact your Racal customer service advisor. Please have the following information available to facilitate service.

1. Product serial number
2. Product model number
3. Your company and contact information

You may contact your customer service advisor by:

E-Mail: Helpdesk@racalstruments.com

Telephone: +1 800 722 3262 (USA)
 +44(0) 8706 080134 (UK)
 +852 2405 5500 (Hong Kong)

Fax: +1 949 859 7309 (USA)
 +44(0) 1628 662017 (UK)
 +852 2416 4335 (Hong Kong)

RETURN of PRODUCT

Authorization is required from Racal Instruments before you send us your product for service or calibration. Call your nearest Racal Instruments support facility. A list is located on the last page of this manual. If you are unsure where to call, contact Racal Instruments, Inc. Customer Support Department in Irvine, California, USA at 1-800-722-3262 or 1-949-859-8999 or via fax at 1-949-859-7139. We can be reached at: helpdesk@racalstruments.com.

PROPRIETARY NOTICE

This document and the technical data herein disclosed, are proprietary to Racal Instruments, and shall not, without express written permission of Racal Instruments, be used, in whole or in part to solicit quotations from a competitive source or used for manufacture by anyone other than Racal Instruments. The information herein has been developed at private expense, and may only be used for operation and maintenance reference purposes or for purposes of engineering evaluation and incorporation into technical specifications and other documents which specify procurement of products from Racal Instruments.

FOR YOUR SAFETY

Before undertaking any troubleshooting, maintenance or exploratory procedure, read carefully the **WARNINGS** and **CAUTION** notices.



This equipment contains voltage hazardous to human life and safety, and is capable of inflicting personal injury.



If this instrument is to be powered from the AC line (mains) through an autotransformer, ensure the common connector is connected to the neutral (earth pole) of the power supply.



Before operating the unit, ensure the conductor (green wire) is connected to the ground (earth) conductor of the power outlet. Do not use a two-conductor extension cord or a three-prong/two-prong adapter. This will defeat the protective feature of the third conductor in the power cord.



Maintenance and calibration procedures sometimes call for operation of the unit with power applied and protective covers removed. Read the procedures and heed warnings to avoid "live" circuit points.

Before operating this instrument:

1. Ensure the proper fuse is in place for the power source to operate.
2. Ensure all other devices connected to or in proximity to this instrument are properly grounded or connected to the protective third-wire earth ground.

If the instrument:

- fails to operate satisfactorily
- shows visible damage
- has been stored under unfavorable conditions
- has sustained stress

Do not operate until, performance is checked by qualified personnel.

This page was left intentionally blank.

Table of Contents

Chapter 1

SPECIFICATIONS	1-1
Introduction – 1260-160B/E	1-1
Power Dissipation – 1260-160B/E	1-3
Ordering Information.....	1-4

Chapter 2

INSTALLATION INSTRUCTIONS	2-1
Unpacking and Inspection	2-1
Reshipment Instructions	2-2
Installation:.....	2-2
Module Configuration.....	2-2
Front Panel Connectors 1260-160B.....	2-3
Front Panel Connectors 1260-160E.....	2-5
Mating Connectors.....	2-8

Chapter 3

MODULE OPERATION.....	3-1
Reply to the MOD:LIST? Command	3-1
Operating in Register-Based Mode.....	3-2
1260-160 Example Code.....	3-6

Chapter 4

DRAWINGS	Error! Bookmark not defined.
----------------	-------------------------------------

Chapter 5

PARTS LIST.....	5-1
-----------------	-----

Chapter 6

PRODUCT SUPPORT	6-1
-----------------------	-----

Product Support 6-1
Reshipment Instructions 6-1
Support Offices 6-2

List of Figures

Figure 1-1, 1260-160E	1-1
Figure 2-1, 1260-160B SMA Connector Designations.....	2-3
Figure 2-2, 1260-160B Relay Diagram	2-4
Figure 2-3, 1260-160B Block Diagram	2-4
Figure 2-4, 1260-160E SMA Connector Designations.....	2-5
Figure 2-5, 1260-160E Relay Diagram	2-6
Figure 2-6, 1260-160E Block Diagram	2-7

List of Tables

Table 3-1, Register Offset Addresses of the 1260-160 Module	3-3
Table 3-2, ID Register Functionality of the 1260-160.....	3-3
Table 3-3, Port A Register Functionality of the 1260-160 Module.....	3-4
Table 3-4, EPROM Descriptor Functionality of the 1260-160 Module.....	3-4

This page was left intentionally blank.

Chapter 1

SPECIFICATIONS

Introduction – 1260-160B/E

The 1260-160B and 1260-160E are microwave plug-in switch modules developed for a variety of Racal Instrument platforms such as the 1260-100 Adapt-a-Switch™ Carrier and the 1256 Switching System. These are software-controllable 2 and 5 SPDT microwave switches for DC to 18 GHz.

The 1260-160 modules include the following features:

- Standard Adapt-a-Switch™ and 1256 Switching System plug-in design, providing for ease of replacement.
- Data-Driven embedded descriptor, allowing immediate use with any platform compatible with the Adapt-a-Switch standard, regardless of firmware level.

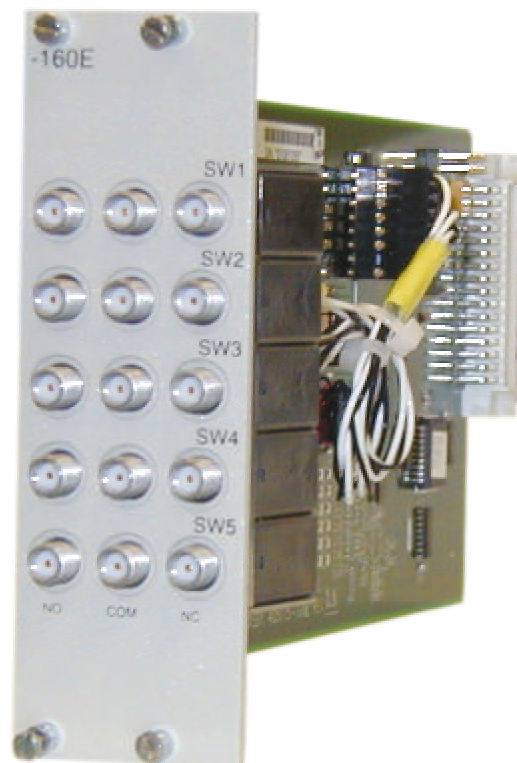


Figure 1-1, 1260-160E

Specifications – 1260-160B/E

Input / Output Specifications

Frequency Range (GHz)	DC-4	4-8	8-12.4	12.4-18
VSWR (Max dB)	1.15:1	1.25:1	1.35:1	1.5:1
Insertion loss (Max dB)	0.2	0.3	0.4	0.5
Isolation (Max dB)	80	70	65	60
RF Input Power	120W 3GHz (VSWR 1.15 or less, no contact switching, 40°C ambient)			
Contact Rating, Max.	30V, 100ma			
Relay Operate Time	15m sec typical			
Switch Contact Lifetime	5 Million cycles per position			
Available I/O Channels	Single SPDT Microwave Switch			
Shock	30g, 11 ms, ½ sine wave			
Vibration	0.013 in. P-P, 5-55 Hz			
Bench Handling	4 in., 45°			
Cooling	See 1260-100 cooling data			
Temperature				
Operating	-20°C to +60°C			
Non-operating	-40°C to +75°C			
Relative Humidity	95 +/-5% RH non condensing; 75+/- 5 %RH above 30°C; 45+/-5 %RH above 40°C			
Altitude				
Operating	10,000 feet			
Non-operating	15,000 feet			
Power Requirements				
+5 VDC Amps Maximum				
1260-160B	0.42 amps			
1260-160E	0.94 amps			
Weight				
1260-160B	6.1 oz	173 gm		
1260-160E	11.3 oz	320 gm		

Mean Time Between Failures (MTBF)	860,000 hrs. Calculated per MIL-HBK-217, ground-benign, 30°C, as design goal excluding relays. (microwave relay MTBF 5,000,000 operations per switch at rated load)
Mean Time to Repair (MTTR)	< 5 minutes

Power Dissipation – 1260-160B/E

The cooling of the Adapt-a-Switch carrier is dependent upon the chassis into which it is installed. The carrier can nominally dissipate approximately 100W. Even with all channels driven to maximum outputs, any combination and quantity of 1260-160 plug-ins may be used together in a 1260-100 without exceeding the maximum allowable power dissipation of the carrier.

If the 1260-160 will be used in conjunction with other cards, the dissipation should be computed and summed with the total worst-case dissipation of the remaining modules.

For example, a 1260-160 module would dissipate the following energy:

Quiescent power dissipation = 0.33 W maximum

Each switch energized = 0.88 W maximum

For example, a 1260-160E module would dissipate the following energy:

Quiescent power dissipation = 0.33 W maximum

With five coil energized = 4.73 W maximum

This is acceptable power dissipation for an individual plug-in module. If three additional module are likewise loaded, then the overall carrier dissipation is approximately 8.36 W for four –160B and 18.92 W for 4 –160E, both of which are well within the cooling available in most commercial VXIbus chassis.

Ordering Information

Listed below are part numbers for both the 1260-160 switch module and available mating connector accessories. Each 1260-160 uses SMA mating connectors.

ITEM	DESCRIPTION	PART #
1260-160B Microwave Switch Module	Switch Module, 2 (SPDT) DC-18 GHz Consists of: P/N 405175-160B PCB Assy P/N 980824-160 Manual	407766-002
1260-160E Microwave Switch Module	Switch Module, 5 (SPDT) DC-18 GHz Consists of: P/N 405175-160E PCB Assy P/N 980824-160 Manual	407766-005
Additional Manual		980824-160

INSTALLATION INSTRUCTIONS

Unpacking and Inspection



1. Before unpacking the switching module, check the exterior of the shipping carton for any signs of damage. All irregularities should be noted on the shipping bill and reported.

CAUTION

ESD sensitive devices. Open the instrument at an ESD safe work station.

WARNING

Connections to the 1260-160 module should be made with all RF power removed.

2. Remove the instrument from its carton, preserving the factory packaging as much as possible.
3. Inspect the switching module for any defects or damage. Immediately notify the carrier if any damage is apparent.
4. Have a qualified person check the instrument for safety before use.

Reshipment Instructions

1. Use the original packing material when returning the switching module to Racal Instruments for servicing. The original shipping carton and the instrument's plastic foam will provide the necessary support for safe reshipment.
2. If the original packing material is unavailable, wrap the switching module in an ESD Shielding bag and use plastic spray foam to surround and protect the instrument.
3. Reship in either the original or a new shipping carton.

Installation:

For instructions on installing the 1260-160 into a switching platform, refer to the user manual for that platform, in the "Getting Started" chapter under the "Inserting and Removing Plug-ins" section. Manuals are available at the Racal Instruments' web site: <http://www.racalstruments.com>.

Module Configuration

The 1260-160 modules are software-selectable multiplexer plug-ins for Racal Instruments switching platforms such as Adapt-a-Switch and 1256 System. The 1260-160s are two SPDT microwave switches for the -160B, and five SPDT microwave switches for -160E.

**Front Panel
Connectors 1260-
160B**

The 1260-160B has two front panel microwave relays, labeled SW1 and SW2, with 3 SMA connectors each. See Figure 2-1 for SMA connector designations. See Figure 2-2 for the relay diagram and Figure 2-3 for a block diagram of the 1260-160B.

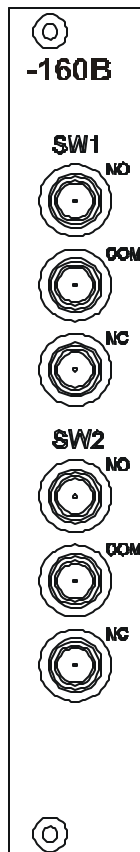


Figure 2-1, 1260-160B SMA Connector Designations

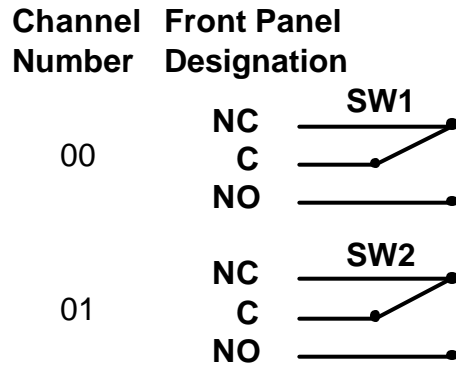


Figure 2-2, 1260-160B Relay Diagram

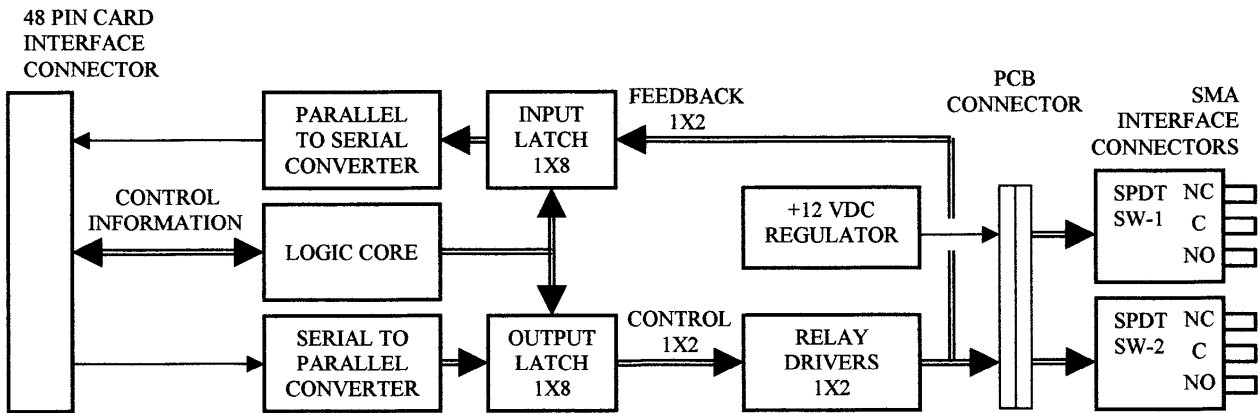


Figure 2-3, 1260-160B Block Diagram

**Front Panel
Connectors 1260-
160E**

The 1260-160E has five front panel microwave relays, labeled SW1 through SW5, with 3 SMA connectors each. See Figure 2-4 for SMA connector designations. See Figure 2-5 for the relay diagram and Figure 2-6 for a block diagram of the 1260-160E.

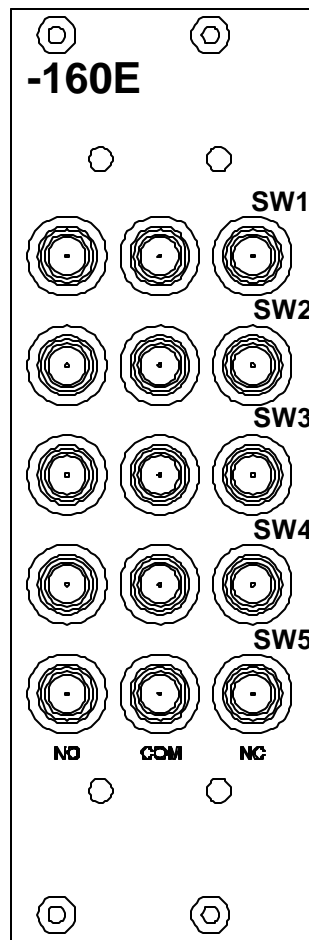
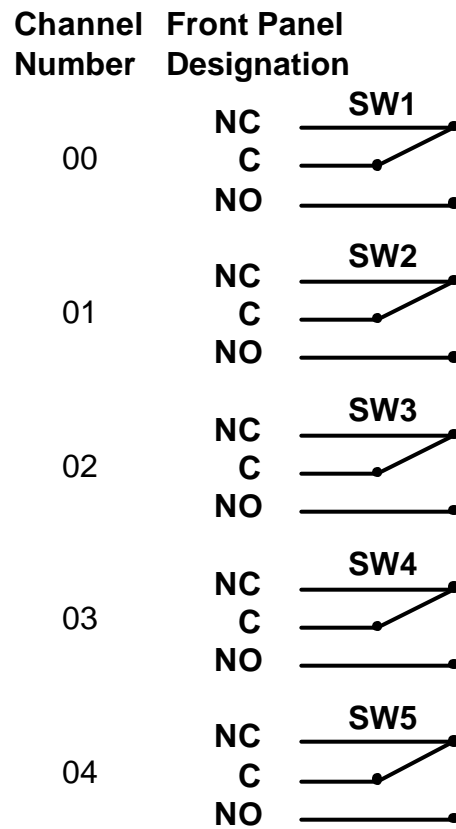


Figure 2-4, 1260-160E SMA Connector Designations

Figure 2-5, 1260-160E Relay Diagram



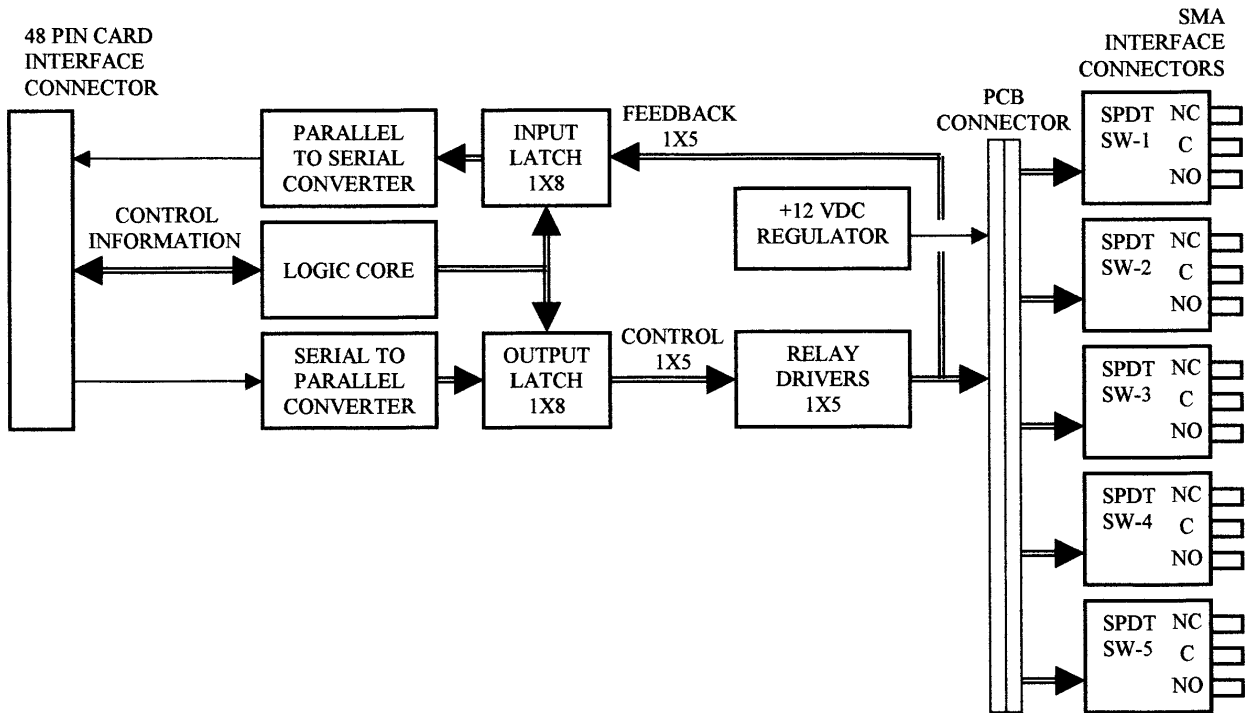


Figure 2-6, 1260-160E Block Diagram

Mating Connectors

Mating connectors are SMA type. Use connectors that are suitable for the type of connecting coax and frequency range to be used. A ¼ inch drive Deep Slotted Socket, P/N 456890, is available for installation and removal of connectors.

MODULE OPERATION

Reply to the MOD:LIST? Command

The platform containing the 1260-160 returns a reply to the MOD:LIST? command. This reply is unique for each different 1260 series switch module. The syntax for the reply is:

<module address> : <module-specific identification string>

The value of <module-specific identification string> for the 1260-160 depends on the version (1260-160B and 1260-160E). For the dual SPDT switch (1260-160B), the string value is:

```
1260-160B 2 SPDT RF SWITCHING MODULE
```

For the five SPDT switch (1260-160E), the string value is:

```
1260-160E 5 SPDT RF SWITCHING MODULE
```

Thus, for a 1260-160B whose module address is 2, the reply to this query would be:

```
2 : 1260-160B 2 SPDT RF SWITCHING MODULE
```

Operating in Register-Based Mode

The 1260-160 offers register-based mode when installed in VXI platforms that support it. In register-based mode, the 1260-160 is operated by directly writing and reading to/from ports controlling six relays each. To access the various registers the following details must be assembled to generate an absolute address that can be wrote or read from:

The port and control registers are located in the VXIbus A24 Address Space. The A24 address for a port or control register depends on:

1. The A24 Address Offset assigned to the 1260-01T module by the Resource Manager program. The Resource Manager program is provided by the VXIbus slot-0 controller vendor. The A24 Address Offset is placed into the "Offset Register" of the 1260-01T by the Resource Manager.
2. The <module address> of the 1260-160 module. This is a value in the range from 1 and 12 inclusive.
3. The 1260-160 port or control register to be written to or read from. Each register on the 1260-160 has a unique offset from the base address.

The base A24 address for the 1260-160 module may be calculated by:

$$(A24 \text{ Offset of the } 1260-01T) + (1024 \times \text{Module Address of } 1260-160).$$

The A24 address offset is usually expressed in hexadecimal. A typical value of 204000_{16} is used in the examples that follow.

A 1260-160 with a module address of 7 would have the base A24 address computed as follows:

$$\begin{aligned} \text{Base A24 Address of } 1260-160 &= 204000_{16} + (400_{16} \times 7_{10}) \\ &= 205C00_{16} \end{aligned}$$

The port and control registers for Adapt-a-Switch plug-ins and conventional 1260-Series modules are always on odd-numbered A24 addresses. For port registers, the 1260-160 reads and writes to the same location. For control registers, the 1260-160 writes to one location, but reads back from another. **Table 3-1** provides offsets relative to the base address of the module for all port and control registers of the 1260-160. To obtain the absolute address where data is to be written or read from, the base address is added to the offset:

(Base A24 1260-160 Address) + offset = absolute address

So, for our example base A24 address computed earlier, the following absolute addresses would apply for the operations indicated:

205C01 Port A read or written at this location

205E01 ID register read at this location

Before explaining the particulars of reading and writing to port and control registers, it is necessary to understand how the registers interact with the 1260-160 relays. **Table 3-2, through 3-4** provide a detailed explanation of each register and how it interacts with the 1260-160 module.

Table 3-1, Register Offset Addresses of the 1260-160 Module

Register Name	Register Offsets to Add to Base Module Address	
	Write Location (hexadecimal)	Read Location (hexadecimal)
Port A	0x01	0x01
ID	Read Only	0x201
EPROM Descriptor	Read Only	0x203

Table 3-2, ID Register Functionality of the 1260-160

Register Table		ID Register
Module Version	Bit	Functionality Description
All	0	Always Reads 0x00 (Read Only)
	1	
	2	
	3	
	4	
	5	
	6	
	7	

Table 3-3, Port A Register Functionality of the 1260-160 Module

Register Table		Port A
Module Version	Bit	Functionality Description
B, E	0	Relay SW1-1 (0: switch NC 1: switch closed)
B,E	1	Relay SW2 (0: switch NC 1: switch closed)
E	2	Relay SW3 (0: switch NC 1: switch closed)
E	3	Relay SW4 (0: switch NC 1: switch closed)
E	4	Relay SW5 (0: switch NC 1: switch closed)
	5	(not used)
	6	(not used)
	7	(not used)

Table 3-4, EPROM Descriptor Functionality of the 1260-160 Module

Register Table		EPROM Descriptor Register
Module Version	Bit	Functionality Description
All	0	Each time this register is read, it advances a memory pointer to the next memory location in the on-board EPROM. To reset this pointer to the beginning, read the ID register. This resets the memory pointer. The descriptor register contains a long string of data, typically used by the Adapt-a-Switch carrier for configuration purposes. Additionally, this data contains the card identification string for the specific type of card (i.e. 1260-160B or 1260-160E). These identification strings are located at EPROM memory locations 0x23 through 0x34.
	1	
	2	
	3	
	4	
	5	
	6	
	7	

Writing to a port location is a straightforward process. Setting a bit high in a port register causes the corresponding relay channel to close.

It is especially important to realize that a single write operation controls eight separate control lines or output devices simultaneously. Therefore if only a single bit change is desired, the following process must be observed.

1. Read the register, inverting the bit pattern.
2. Mask the appropriate bit with an 'AND' operation and a byte mask with all undesired bits set to a '1' and the desired bit set to a '0' or '1' depending on whether the bit is to be set or cleared in

the desired register.

3. Write the masked data back into the register.

As simple as this may seem, a number of products reported as faulty and sent back for repair are typically the result of inappropriate register accesses.

Because of the 1260-160 relay driver architecture, registers A and B will read back inverted from what was written to them.

The VISA I/O library may be used to control the module. The VISA function `viOut8()` is used to write a single 8-bit byte to a control register, while `viIn8()` is used to read a single 8-bit byte from the control register. The following code example shows the use of `viOut8()` to update the 1260-160 module.

1260-160 Example Code

```
#include <visa.h>

/* This example shows a 1260-01T at logical address 16 and a VXI/MXI */
/* interface */
#define RI1260_01_DESC    "VXI::16"

/* For a GPIB-VXI interface, and a logical address of 77 */
/* the descriptor would be: "GPIB-VXI::77" */

/* this example shows a 1260-160 with module address 7, port 1,
and write data of 0xAA */
#define MOD_ADDR_160 7
#define PORT_NUMBER 1
#define DATA_ITEM    0xAA

void example_operate_1260_160(void)
{
    ViUInt8 creg_val;
    ViBusAddress portA_addr, offset;
    ViSession hdl1260;    /* VISA handle to the 1260-01T */
    ViSession hdlRM;      /* VISA handle to the resource manager
*/
    ViStatus error;      /* VISA error code */

    /* open the resource manager */
    /* this must be done once in application program */
    error = viOpenDefaultRM (&hdlRM);

    if (error < 0) {
        /* error handling code goes here */
    }

    /* get a handle for the 1260-01T */
    error = viOpen (hdlRM, RI1260_01_DESC, VI_NULL,VI_NULL, &hdl1260);
    if (error < 0) {
        /* error handling code goes here */
    }
}
```

```
/* form the offset for control register 0 */
/* note that the base A24 Address for the 1260-01T */
/* is already accounted for by VISA calls viIn8() and */
/* viOut8() */

/* module address shifted 10 places = module address x 1024 */
portA_addr = (MOD_ADDR_160 << 10) + 1;
offset = portA_addr + (PORT_NUMBER << 1);

error = viOut8 (vi, VI_A24_SPACE, offset, DATA_ITEM);

if (error < 0)

    return( error );

/* close the VISA session */
error = viClose( hdl1260 );
if (error < 0) {
    /* error handling code goes here */
}
}
```

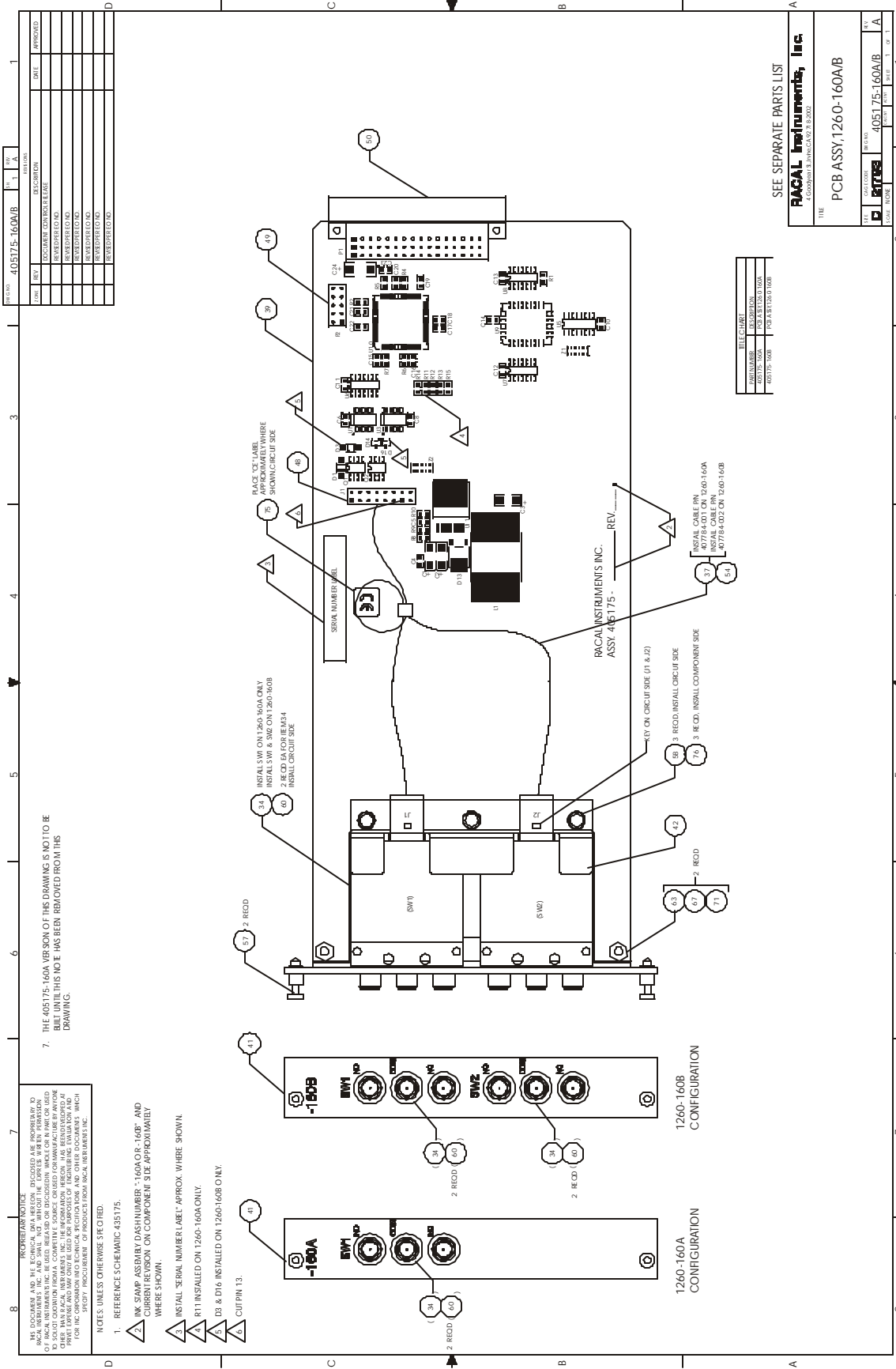
This page was left intentionally blank.

Chapter 4

DRAWINGS

405175-160B, PCB Assembly 1260-160A/B	4-3
405175-160E, PCB Assembly 1260-160E/F	4-4
435175, Schematic.....	4-5

This page was left intentionally blank.



REV	DESCRIPTION	DATE	APPROVED
1	ISSUED FOR CONSTRUCTION		
2	ISSUED FOR CONSTRUCTION		
3	ISSUED FOR CONSTRUCTION		
4	ISSUED FOR CONSTRUCTION		
5	ISSUED FOR CONSTRUCTION		
6	ISSUED FOR CONSTRUCTION		
7	ISSUED FOR CONSTRUCTION		
8	ISSUED FOR CONSTRUCTION		

7. THE 405175-160A VER. SON OF THIS DRAWING IS NOT TO BE BUILT UNTIL THIS NO E HAS BEEN REMOVED FROM THIS DRAWING.

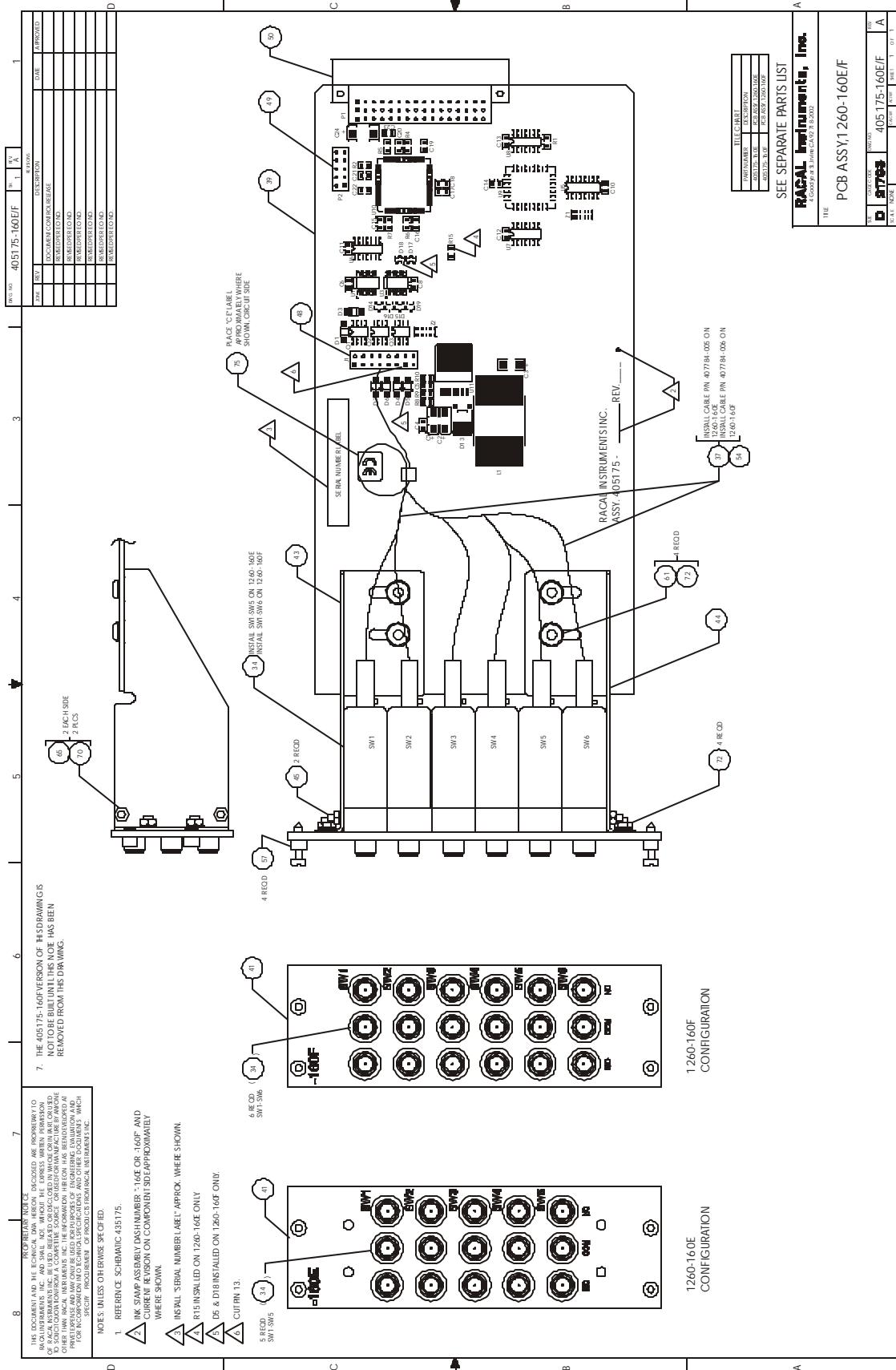
8. THE DOCUMENT AND THE TECHNICAL DATA HEREON, DISCLOSED ARE PROPRIETARY TO RACAL INSTRUMENTS, INC. AND SHALL NOT BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, INCLUDING PHOTOCOPYING, RECORDING, OR BY ANY INFORMATION STORAGE AND RETRIEVAL SYSTEM, WITHOUT THE WRITTEN PERMISSION OF RACAL INSTRUMENTS, INC. THIS DOCUMENT IS THE PROPERTY OF RACAL INSTRUMENTS, INC. AND IS TO BE USED FOR THE PURPOSES OF THIS DRAWING. IT IS TO BE DESTROYED AND NOT REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, INCLUDING PHOTOCOPYING, RECORDING, OR BY ANY INFORMATION STORAGE AND RETRIEVAL SYSTEM, WITHOUT THE WRITTEN PERMISSION OF RACAL INSTRUMENTS, INC.

NOTES UNLESS OTHERWISE SPECIFIED:
 1. REFERENCE SCHEMATIC 435175.
 2. KEY SW ASSY (U1) PART NUMBER *160A OR *160B* AND CURRENT POSITION ON COMPONENT SIDE APPROXIMATELY WHERE SHOWN.
 3. INSTALL 'SERIAL NUMBER LABEL' APPROX. WHERE SHOWN.
 4. R11 INSTALLED ON 1260-160A ONLY.
 5. D3 & D16 INSTALLED ON 1260-160B ONLY.
 6. CUT PIN 13.

1260-160A CONFIGURATION
 1260-160B CONFIGURATION

SEE SEPARATE PARTS LIST
RACAL Instruments, Inc.
 TITLE
 PCB ASSY 1260-160A/B
 PART NUMBER 405175-160A/B
 DATE 11/81
 DRAWN BY G. J. BROWN

REV	DESCRIPTION	DATE	APPROVED
1	ISSUED FOR CONSTRUCTION		
2	ISSUED FOR CONSTRUCTION		
3	ISSUED FOR CONSTRUCTION		
4	ISSUED FOR CONSTRUCTION		
5	ISSUED FOR CONSTRUCTION		
6	ISSUED FOR CONSTRUCTION		
7	ISSUED FOR CONSTRUCTION		
8	ISSUED FOR CONSTRUCTION		



Drawings 4-4

Revised 11/21/01

1	2	3	4
DWG. NO. 435175		SH. 1	REV. B
REVISIONS			
REV	DESCRIPTION	DATE	APPROVED
A	DOCUMENT CONTROL RELEASE	01/07/27	DB
B	REVISED PER EO NO. 7179	01/10/23	J. ROBINSON
	REVISED PER EO NO.		
	REVISED PER EO NO.		

NOTES:

- CAPACITOR VALUES ARE IN MICROFARADS, UNLESS OTHERWISE SPECIFIED.
- RESISTOR VALUES ARE IN OHMS, UNLESS OTHERWISE SPECIFIED.
- ALL DIGITAL PORT SIGNALS BETWEEN SHEETS ARE INDICATED USING THE FOLLOWING SYNTAX:
 -ACTIVE LOGIC LEVEL->SIGNAL NAME->WHERE ACTIVE LOGIC LEVEL IS INDICATED AS:
 L - SIGNAL IS ACTIVE LOW OR CLOCKS ON A LOW TO HIGH TRANSITION
 H - SIGNAL IS ACTIVE HIGH OR CLOCKS ON A HIGH TO LOW TRANSITION
 NONE - SIGNAL ACTIVITY IS DETERMINED BY SOFTWARE OR USER CONFIGURATION
- RESISTOR NETWORK VALUES ARE IN OHMS, +/-2% UNLESS OTHERWISE SPECIFIED.
- NOT USED.
- INDUCTOR VALUES ARE IN MICROHENRYS, UNLESS OTHERWISE SPECIFIED.

Z - SEE SHEET 2 FOR COMPONENT USAGE.

COMPONENT USAGE 43172.4	REORDER SERIALIZER 43172.4	
CONNECTOR INTERFAGE 43172.4	FRGA LOGIC CORE 43172.4	
GENERAL PURPOSE I/O WRITE-PORTS A,B 43172.4	45 TO 412 BOOST CONVERTER 43172.4	
GENERAL PURPOSE I/O READ/OX-PORTS A,B 43172.5	BYPASS CAPACITORS 43172.9	

REFERENCE DESIGNATOR(S) U1-U4	IC POWER CONNECTIONS DEVICE TYPE	+5V PIN NO.	GND PIN NO.
	74HCT1373	20	10
U6	74HCT164	14	7
U5	74HCT166	16	8
U7,U8	74HCT338	14	7
U9	27C256	32	16
U10	231805-003 (EPM7064ST)	3,19,34,39,51,66,62,61	11,26,38,43,59,74,86,96

PROPRIETARY NOTICE

THIS DOCUMENT AND THE TECHNICAL DATA HEREON, DISCLOSED, ARE PROPRIETARY PROPERTY OF RACAL INSTRUMENTS INC. AND SHALL BE USED, REPRODUCED, COPIED, OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, WITHOUT THE WRITTEN PERMISSION OF RACAL INSTRUMENTS INC. THE INFORMATION HEREON HAS BEEN DEVELOPED AT PRIVATE EXPENSE AND IS NOT TO BE USED FOR ANY OTHER PURPOSES WITHOUT THE WRITTEN PERMISSION OF RACAL INSTRUMENTS INC. SPECIFY PRODUCT FROM RACAL INSTRUMENTS INC.

RACAL Instruments, Inc.
4 Goodyear St., Irvine, CA. 92618

TITLE SCHEM, 1260-160, -162, -164

SIZE B	CAGE CODE 21793	DWG NO. 435175	REV. B
SCALE NONE		SHEET 1	OF 9

Revised 11/21/01

1	2	3	4
D		REV. B	
C		SH-2	
B		DWG. NO. 435175	
A		REV. B	

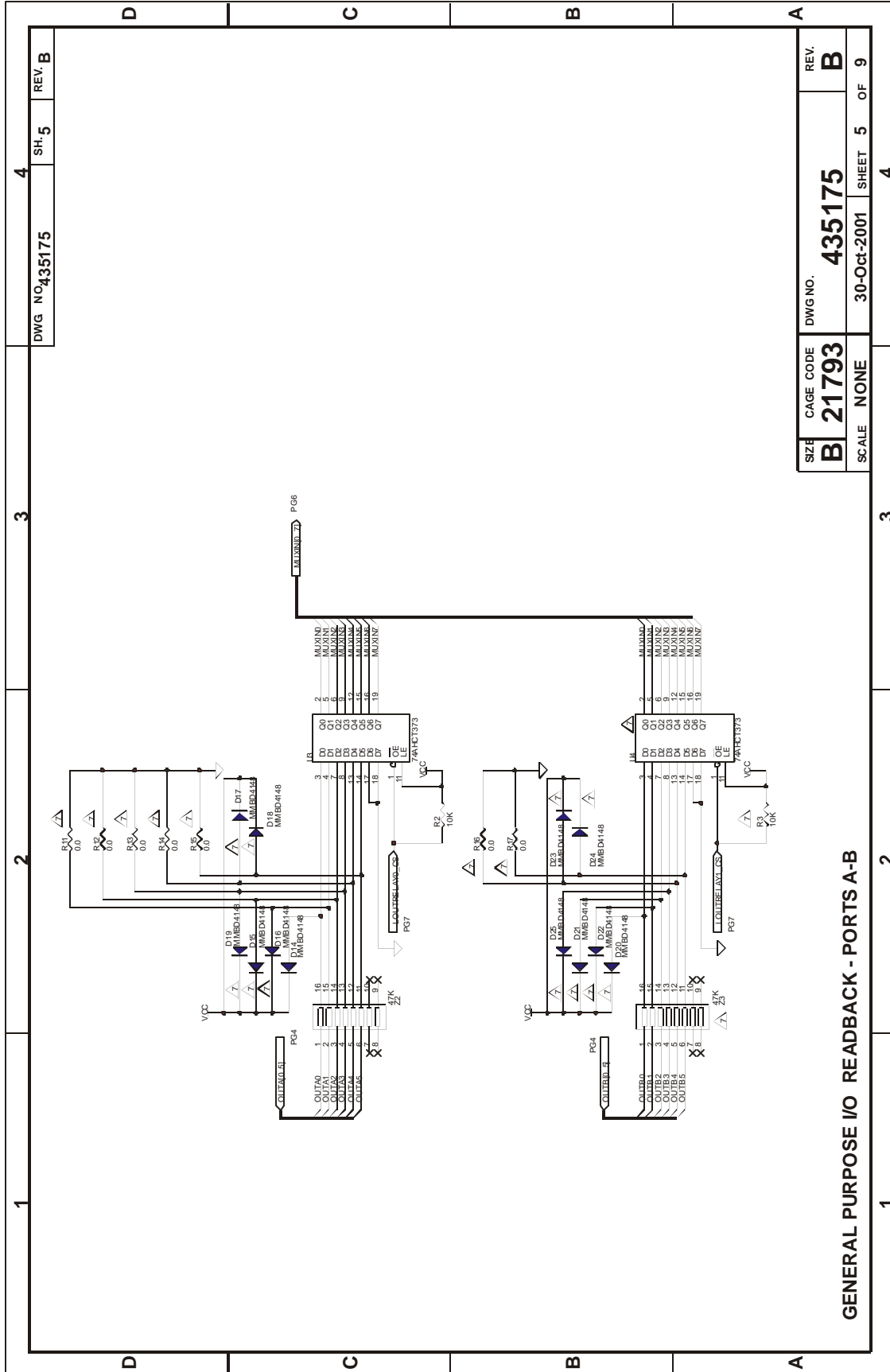
FOR REFERENCE ONLY

COMPONENT USAGE VS MODEL NUMBER (X MEANS USED)

MODEL #	1260-160A	1260-160C	1260-160E	1260-160F	1260-162A	1260-162B	1260-164A	1260-164B
PCBA SSV P1A405175-82	X	X	X	X	X	X	X	X
PCBA SSV P1A405175-18	X	X	X	X	X	X	X	X
PCBA SSV P1A405175-19	X	X	X	X	X	X	X	X
PCBA SSV P1A405175-20	X	X	X	X	X	X	X	X
PCBA SSV P1A405175-21	X	X	X	X	X	X	X	X
PCBA SSV P1A405175-22	X	X	X	X	X	X	X	X
PCBA SSV P1A405175-23	X	X	X	X	X	X	X	X
PCBA SSV P1A405175-24	X	X	X	X	X	X	X	X
PCBA SSV P1A405175-25	X	X	X	X	X	X	X	X
PCBA SSV P1A405175-26	X	X	X	X	X	X	X	X
PCBA SSV P1A405175-27	X	X	X	X	X	X	X	X
PCBA SSV P1A405175-28	X	X	X	X	X	X	X	X
PCBA SSV P1A405175-29	X	X	X	X	X	X	X	X
PCBA SSV P1A405175-30	X	X	X	X	X	X	X	X
PCBA SSV P1A405175-31	X	X	X	X	X	X	X	X
PCBA SSV P1A405175-32	X	X	X	X	X	X	X	X
PCBA SSV P1A405175-33	X	X	X	X	X	X	X	X
PCBA SSV P1A405175-34	X	X	X	X	X	X	X	X
PCBA SSV P1A405175-35	X	X	X	X	X	X	X	X
PCBA SSV P1A405175-36	X	X	X	X	X	X	X	X
PCBA SSV P1A405175-37	X	X	X	X	X	X	X	X
PCBA SSV P1A405175-38	X	X	X	X	X	X	X	X
PCBA SSV P1A405175-39	X	X	X	X	X	X	X	X
PCBA SSV P1A405175-40	X	X	X	X	X	X	X	X
PCBA SSV P1A405175-41	X	X	X	X	X	X	X	X
PCBA SSV P1A405175-42	X	X	X	X	X	X	X	X
PCBA SSV P1A405175-43	X	X	X	X	X	X	X	X
PCBA SSV P1A405175-44	X	X	X	X	X	X	X	X
PCBA SSV P1A405175-45	X	X	X	X	X	X	X	X
PCBA SSV P1A405175-46	X	X	X	X	X	X	X	X
PCBA SSV P1A405175-47	X	X	X	X	X	X	X	X
PCBA SSV P1A405175-48	X	X	X	X	X	X	X	X
PCBA SSV P1A405175-49	X	X	X	X	X	X	X	X
PCBA SSV P1A405175-50	X	X	X	X	X	X	X	X
PCBA SSV P1A405175-51	X	X	X	X	X	X	X	X
PCBA SSV P1A405175-52	X	X	X	X	X	X	X	X
PCBA SSV P1A405175-53	X	X	X	X	X	X	X	X
PCBA SSV P1A405175-54	X	X	X	X	X	X	X	X
PCBA SSV P1A405175-55	X	X	X	X	X	X	X	X
PCBA SSV P1A405175-56	X	X	X	X	X	X	X	X
PCBA SSV P1A405175-57	X	X	X	X	X	X	X	X
PCBA SSV P1A405175-58	X	X	X	X	X	X	X	X
PCBA SSV P1A405175-59	X	X	X	X	X	X	X	X
PCBA SSV P1A405175-60	X	X	X	X	X	X	X	X
PCBA SSV P1A405175-61	X	X	X	X	X	X	X	X
PCBA SSV P1A405175-62	X	X	X	X	X	X	X	X
PCBA SSV P1A405175-63	X	X	X	X	X	X	X	X
PCBA SSV P1A405175-64	X	X	X	X	X	X	X	X
PCBA SSV P1A405175-65	X	X	X	X	X	X	X	X
PCBA SSV P1A405175-66	X	X	X	X	X	X	X	X
PCBA SSV P1A405175-67	X	X	X	X	X	X	X	X
PCBA SSV P1A405175-68	X	X	X	X	X	X	X	X
PCBA SSV P1A405175-69	X	X	X	X	X	X	X	X
PCBA SSV P1A405175-70	X	X	X	X	X	X	X	X
PCBA SSV P1A405175-71	X	X	X	X	X	X	X	X
PCBA SSV P1A405175-72	X	X	X	X	X	X	X	X
PCBA SSV P1A405175-73	X	X	X	X	X	X	X	X
PCBA SSV P1A405175-74	X	X	X	X	X	X	X	X
PCBA SSV P1A405175-75	X	X	X	X	X	X	X	X
PCBA SSV P1A405175-76	X	X	X	X	X	X	X	X
PCBA SSV P1A405175-77	X	X	X	X	X	X	X	X
PCBA SSV P1A405175-78	X	X	X	X	X	X	X	X
PCBA SSV P1A405175-79	X	X	X	X	X	X	X	X
PCBA SSV P1A405175-80	X	X	X	X	X	X	X	X
PCBA SSV P1A405175-81	X	X	X	X	X	X	X	X
PCBA SSV P1A405175-82	X	X	X	X	X	X	X	X
PCBA SSV P1A405175-83	X	X	X	X	X	X	X	X
PCBA SSV P1A405175-84	X	X	X	X	X	X	X	X
PCBA SSV P1A405175-85	X	X	X	X	X	X	X	X
PCBA SSV P1A405175-86	X	X	X	X	X	X	X	X
PCBA SSV P1A405175-87	X	X	X	X	X	X	X	X
PCBA SSV P1A405175-88	X	X	X	X	X	X	X	X
PCBA SSV P1A405175-89	X	X	X	X	X	X	X	X
PCBA SSV P1A405175-90	X	X	X	X	X	X	X	X
PCBA SSV P1A405175-91	X	X	X	X	X	X	X	X
PCBA SSV P1A405175-92	X	X	X	X	X	X	X	X
PCBA SSV P1A405175-93	X	X	X	X	X	X	X	X
PCBA SSV P1A405175-94	X	X	X	X	X	X	X	X
PCBA SSV P1A405175-95	X	X	X	X	X	X	X	X
PCBA SSV P1A405175-96	X	X	X	X	X	X	X	X
PCBA SSV P1A405175-97	X	X	X	X	X	X	X	X
PCBA SSV P1A405175-98	X	X	X	X	X	X	X	X
PCBA SSV P1A405175-99	X	X	X	X	X	X	X	X
PCBA SSV P1A405175-100	X	X	X	X	X	X	X	X

1	2	3	4
D		REV. B	
C		SH-2	
B		DWG. NO. 435175	
A		REV. B	

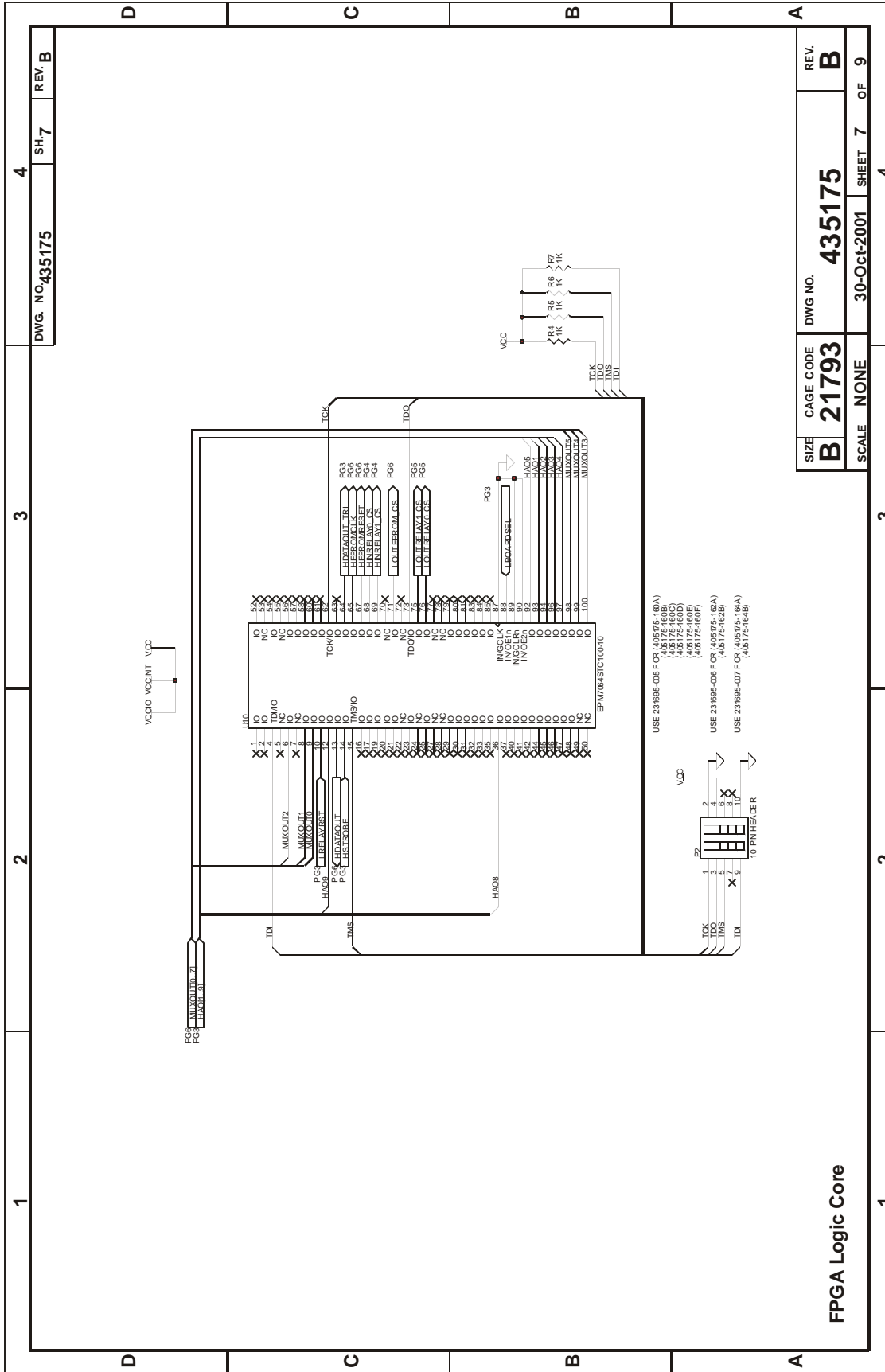
Revised 11/21/01



SIZE	CAGE CODE	DWG NO.	REV.
B	21793	435175	B
SCALE	NONE	30-Oct-2001	SHEET 5 OF 9

GENERAL PURPOSE I/O READBACK - PORTS A-B

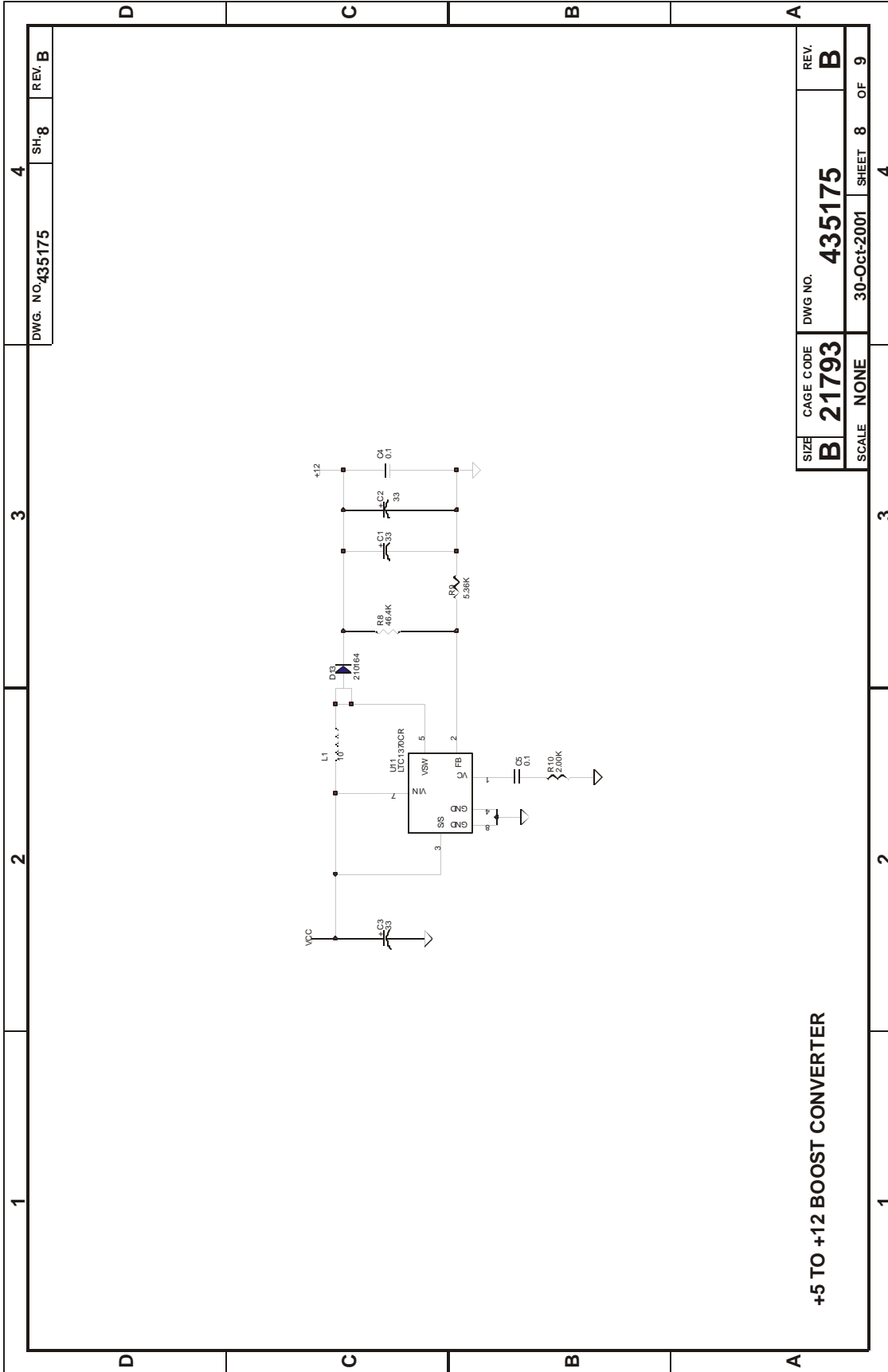
Revised 11/21/01



SIZE	CAGE CODE	DWG NO.	REV.
B	21793	435175	B
SCALE	NONE	30-Oct-2001	SHEET 7 OF 9

FPGA Logic Core

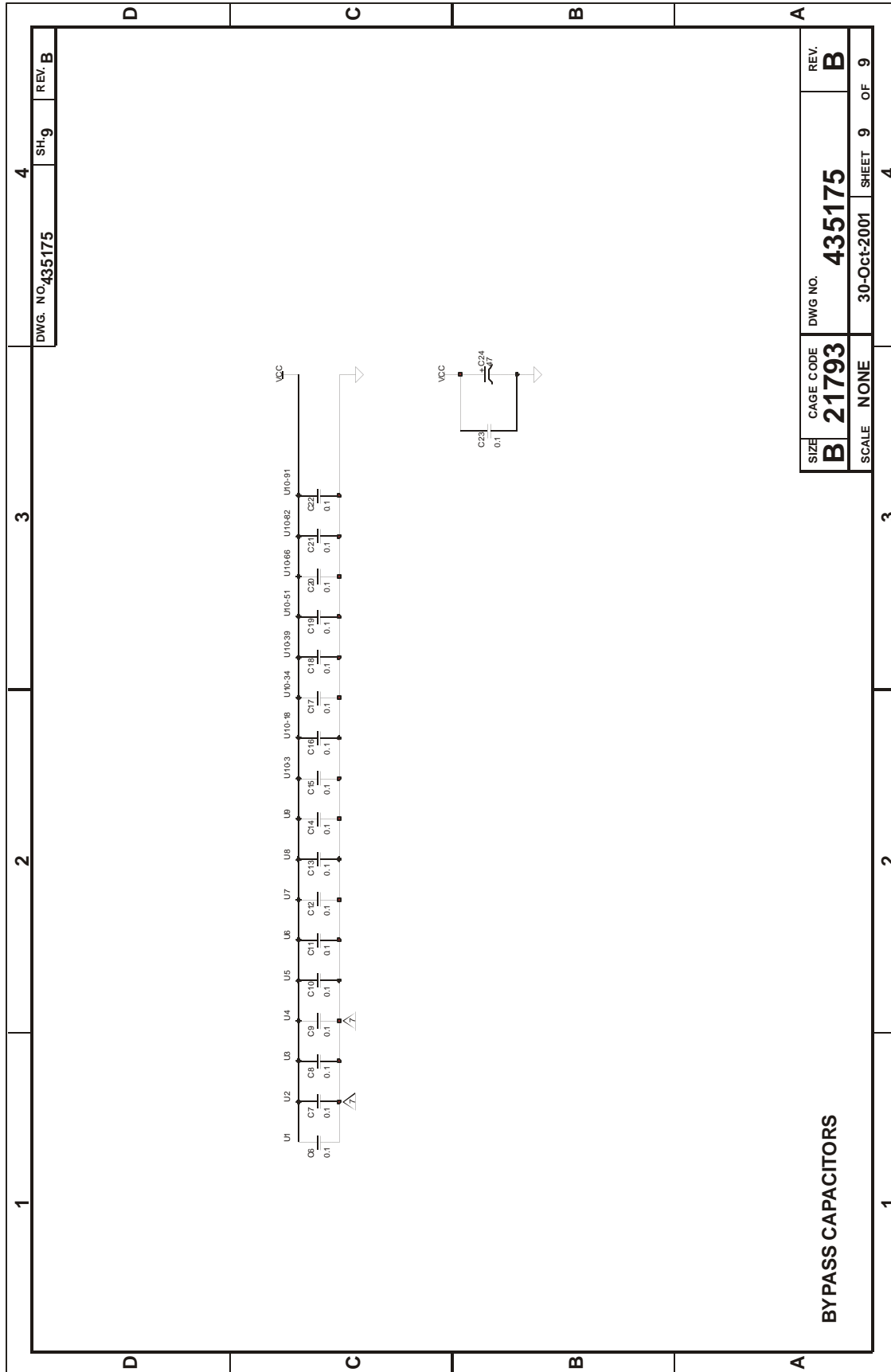
Revised 11/21/01



+5 TO +12 BOOST CONVERTER

SIZE	CAGE CODE	DWG NO.	REV.
B	21793	435175	B
SCALE	NONE	30-Oct-2001	SHEET 8 OF 9

Revised 11/21/01



BYPASS CAPACITORS

DWG. NO. 435175		4	SH-9	REV. B
SIZE	CAGE CODE	DWG NO.	REV.	
B	21793	435175	B	
SCALE	NONE	30-Oct-2001	SHEET	9 OF 9

This page was left intentionally blank.

Chapter 5

PARTS LIST

405175-160B, PCB Assembly	5-3
405175-160E, PCB Assembly	5-4

This page was left intentionally blank.

1260-160 B/E User Manual

PSR350

1 SNL

RACAL INSTRUMENTS INC.

PAGE 1

Product Structure Report

8/02/01

By Assembly/Balloon No.

Assembly: 405175-160B

Low Level Cd: 1

U/M: EA PCB ABSY, 1260-160B Rev Date: 8/02/01 Revision: A

#	Component	Description	U/N	Qty Reqd	Engineer Txt
1	050000-000	RSCH1-000.00H.06W005	-E EA	4.00000	R12 -R15
2	050000-102	RSCH2-001.00K.06W005	-E EA	4.00000	R4 -R7
3	050000-103	RBCH2-010.00K.06W005	-E EA	2.00000	R1, R2
4	050000-202	RSCH2-002.00K.06W005	-E EA	1.00000	R10
5	050117-007	RSCH2-046.40K.10W01	-E EA	1.00000	RB
6	050117-008	RSCH2-005.36K.10W01	-E EA	1.00000	R9
9	080171	RSNW2-004.700K16P08R	-E EA	1.00000	Z1
10	080171-001	RSNW2-047.000K16P08R	-E EA	1.00000	Z2
13	100168-104	CPCH2-0100 .0N0050V10%0805X7R	-E EA	18.00000	C4-C6, C5, C10-C23
14	110260	CPTA3-0047.0U0016V20	-E EA	1.00000	C24
15	130200	CPCH3-0033.040016V20	-E EA	3.00000	C1, C2 , C3
18	210153	DISLC-075.0V00.20A-1N4148	-E EA	2.00000	D14 , D16
19	210154	DISPR-200.0V01.00A-1N4003	-E EA	2.00000	D1, D3
20	210164	DISHY-035.0V08.00A	-E EA	1.00000	D13
23	231120	ICDIG-74HCT166-SHFT	-E EA	1.00000	U5
24	231131	ICDIG-74HCT164-SHFT	-E EA	1.00000	U6
25	231588-039	ICMEM-27C256-15-PLCC-B	EA	1.00000	U9
26	231597	ICLIN-B14946EY-SOIC	-E EA	1.00000	Q1
27	231598	ICDIG-74AHCT373-TBBOP	-E EA	2.00000	U1,U3
28	231603	ICDIG-74HCT393-SOIC	-E EA	2.00000	U7,U8
29	231605-005	ICPLA-EPM7064ST-TQFP	-E EA	1.00000	U10
30	231649	ICLIN-1370-DD	-E EA	1.00000	U11
32	310287	CKF1-0W010.0U20%P	-E EA	1.00000	L1
34	456948-001	RLEN-Lp2T12V w/THRDED HOLES	-N EA	2.00000	SW1, SW2
37	407784-002	CABLE ASSY,1260-160B	-N EA	1.00000	
39	415175-001	PCB,1260-160A&B,U-CUTOUT	-N EA	1.00000	
41	456920-002	PANEL,FRONT,1260-160B	-N EA	1.00000	
42	456949	BRACKET,MTG,REAR, 1260-160A&B	-N EA	1.00000	
48	601802	CON-PCB-PLG16PC.100S	-D EA	1.00000	J1
49	601935	CON-PCB-PLG10PC.100D	-D EA	1.00000	P2
50	602070	CON-PCB-PLG48PC.1003	-E EA	1.00000	P1
54	610899	TIE-CA-LKG- .062-2 00	-E EA	1.00000	
57	611444	SlC-SBDR-N2.SXO.45X11	-E EA	2.00000	
58	611469	RVT-Pp-DOM.250DX.275.063-.13	-E EA	3.00000	
60	615541	SlM-PFL1H004-40X.250	-D EA	4.00000	w/SW1, SW2
63	616403	SlMPFL9-M2.SXO.45X08	-E EA	2.00000	
67	617041	NT1HEXM2.5-0.50-STL	-D EA	2.00000	
71	617127	W1S004.202D.020T.115	-E EA	2.00000	
75	921423	LABEL, CE MARKING	-N EA	1.00000	
76	611477	W1F004.188D.020T.129SS	-E EA	3.00000	

PSR350

1 SNL

RACAL INSTRUMENTS INC.

PAGE 1

Product Structure Report

8/02/01

By Assembly/Balloon No.

Assembly: 405175-160E

Low Level Cd: 1

U/N: EA PCB ASSY, 1260-160E Rev Date: 8/02/01 Revision: A

#	Component	Description	U/N	Qty Reqd	Engineer Txt
1	050000-000	RSCH1-000.00H.06W005	-E EA	1.00000	R15
2	050000-102	RSCH2-001.00K.06W005	-E EA	4.00000	R4 -R7
3	050000-103	RSCH2-010.00K.06W005	-E EA	2.00000	R1, R2
4	050000-202	RSCH2-002.00K.06W005	-E EA	1.00000	R10
5	050117-007	RSCH2-046.40K.10W001	-E EA	1.00000	R8
6	050117-008	RSCH2-005.36K.10W01	-E EA	1.00000	R9
9	080171	RSNW2-004.700K16P08R	-E EA	1.00000	Z1
10	080171-001	RSNW2-047.000K16P08R	-E EA	1.00000	Z2
13	100168-104	CPCH2-0100.0N0050V10%0805X7R	-E EA	8.00000	C4-C6,CS, C10-C23
14	110260	CPTA3-0047.0U0016V20	-E EA	1.00000	C24
15	130200	CPCH3-0033.040016V20	-E EA	3.00000	C1, C2 , C3
18	210153	DISLC-075.0V00.20A-1N4148	-E EA	5.00000	D14 -D17 , D19
19	210154	DISPR-200.0V01.00A-1N4003	-E EA	5.00000	D1-D4,D6
20	210164	DISHY-035.0V08.00A	-E EA	1.00000	D13
23	231120	ICDIG-74HCT166-SHFT	-E EA	1.00000	U5
24	231131	ICDIG-74HCT164-SHFT	-E EA	1.00000	U6
25	231588-042	ICMEM-27C256-15-PLCC-B	EA	1.00000	U9
26	231597	ICLIN-514946EY-SOIC	-E EA	3.00000	Q1-Q3
27	231598	ICDIG-74AHCT373-TSSOP	-E EA	2.00000	U1 U3
28	231603	ICDIG-74HCT393-SOIC	-E EA	2.00000	U7,U8
29	231605-005	ICPLA-EPM7064ST-TQFP	-E EA	1.00000	U10
30	231649	ICLIN-1370--DD	-E EA	1.00000	U11
32	310287	CKF1-0W010.0U20%P	-E EA	1.00000	L1
34	310294	RLEM-1P2T12V020630V	-E EA	5.00000	SW1-SW2
37	407784-005	CABLE ASSY, 1260-160E	-N EA	1.00000	
39	415175-002	PCB,1260-160E&F,SHORT BOARD	-N EA	1.00000	
41	456920-005	PANEL,FRONT,1260-160E	-N EA	1.00000	
43	456950-001	BRACKET,MTG,RT,1260-160E&F	-N EA	1.00000	
44	456950-002	BRACKET,MTG,LF,1260-160E&F	-N EA	1.00000	
45	456951-001	ROD,THRD,2-56,3.00LG	-N EA	2.00000	
48	601731	CON-PCB-PLG16PC.100D	-D EA	1.00000	J1
49	601935	CON-PCB-PLG10PC.100D	-D EA	1.00000	P2
50	602070	CON-PCB-PLG48PC.1003	-E EA	1.00000	P1
54	610899	TIE-CA-LKG- .062-2.00	-E EA	1.00000	
57	611444	SLC-SBDR-M2.5X0.45X11	-E EA	4.00000	
61	615800-404	S1M-HBTNH004-40X.312	-D EA	4.00000	
65	617014	NT1HEX002-5655N-PSVT	-E EA	4.00000	
70	617126	W1S002.165D.01ST.088	-E EA	4.00000	
72	617167-005	NT5KPS004-40STL-ZINC	-E EA	8.00000	
75	921423	LABEL,CE MARKING	-N EA	1.00000	

Chapter 6

PRODUCT SUPPORT

Product Support

Racal Instruments has a complete Service and Parts Department. If you need technical assistance or should it be necessary to return your product for repair or calibration, call 1-800-722-3262. If parts are required to repair the product at your facility, call 1-949-859-8999 and ask for the Parts Department.

When sending your instrument in for repair, complete the form in the back of this manual.

For worldwide support and the office closes to your facility, refer to the Support Offices section on the following page.

Reshipment Instructions

Use the original packing material when returning the 1260-160B/E to Racal Instruments for calibration or servicing. The original shipping crate and associated packaging material will provide the necessary protection for safe reshipment.

If the original packing material is unavailable, contact Racal Instruments Customer Service for information.

Support Offices

Racal Instruments, Inc.

4 Goodyear St., Irvine, CA 92718-2002

Tel: (800) RACAL-ATE, (949) 859- 8999, FAX: (949) 849-7139

Racal Instruments, Ltd.

480 Bath Road, Slough, Berkshire, SL1 6BE, United Kingdom

Tel: +44 (0) 1628 604455; FAX: +44 (0) 1628 662017

Racal Systems Electronique S.A.

18 Avenue Dutartre, 78150 LeChesnay, France

Tel: +33 (1) 3955 8888; FAX: +33 (1) 3955 6735

Racal Systems Elettronica s.r.l.

Strada 2-Palazzo C4, 20090 Milanofiori Assago, Milan, Italy

Tel: +39 (02) 5750 1796; FAX +39 (02) 5750 1828

Racal Elektronik System GmbH.

Technologie Park Bergisch Gladach Friedrich-Ebert-Strasse

51429 Bergisch Gladbach, Germany

Tel:+49 2204 92220; FAX: +49 2204 21491

Racal Australia Pty. Ltd.

3 Powells Road, Brookvale, NSW 2100, Australia

Tel: +61 (2) 9936 7000, FAX: +61 (2) 9936 7036

Racal Electronics Pte. Ltd.

26 Ayer Rajah Crescent, 04-06/07 Ayer Rajah Industrial Estate,
Singapore 0513.

Tel: +65 7792200, FAX: +65 7785400

Racal Instruments, Ltd.

Unit 5, 25F., Mega Trade Center, No 1, Mei Wan Road, Tsuen
Wan, Hong Kong, PRC

Tel: +852 2405 5500, FAX: +852 2416 4335