

# **RAD3200 SYSTEM**

**RADBASE 3200  
RAD A/D 3200  
RDS 3200  
USBEXT 3200  
RPM 1000  
MSCP 3200**

## **INSTRUCTION and SERVICE MANUAL**

072004

---

1722 North Madson Street  
Liberty Lake, WA 99019  
Tel: (800) 935-5151  
(509) 891-9970  
Fax: (509) 891-9481  
web site: [www.scanivalve.com](http://www.scanivalve.com)  
e-mail: [scanco@scanivalve.com](mailto:scanco@scanivalve.com)



# WARRANTY

Scanivalve Corporation, Liberty Lake, Washington, hereafter referred to as Seller, warrants to the Buyer and the first end user that its products will be free from defects in workmanship and material for a period of twelve (12) months from date of delivery. Written notice of any claimed defect must be received by Seller within thirty (30) days after such defect is first discovered. The claimed defective product must be returned by prepaid transportation to Seller within ninety (90) days after the defect is first discovered. Seller's obligations under this Warranty are limited to repairing or replacing, at its option, any product or component part thereof that is proven to be other than as herein warranted.

Surface transportation charges covering any repaired or replacement product or component part shall be at Seller's expense; however, inspection, testing and return transportation charges covering any product or component part returned and redelivered, which proves not to be defective, shall be at the expense of Buyer or the end user, whichever has returned such product or component part.

This Warranty does not extend to any Seller product or component part thereof which has been subjected to misuse, accident or improper installation, maintenance or application; or to any product or component part thereof which has been repaired or altered outside of Seller's facilities unless authorized in writing by Seller, or unless such installation, repair or alteration is performed by Seller; or to any labor charges whatsoever, whether for removal and/or reinstallation of the defective product or component part or otherwise, except for Seller's labor charges for repair or replacement in accordance with the Warranty. Any repaired or replacement product or component part thereof provided by Seller under this Warranty shall, upon redelivery to Buyer, be warranted for the unexpired portion of the original product warranty.

**THIS WARRANTY IS IN LIEU OF AND EXCLUDES ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, ARISING BY OPERATION OF LAW OR OTHERWISE, INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, AND IN NO EVENT SHALL SELLER BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES.**

In the event of a failure:

- 1) Notify Scanivalve Corporation, Technical Service Department. Include model number and serial number. On receipt of this information, service data or shipping instructions will be forwarded. This may be transacted by telephone or e-mail.
- 2) On receipt of shipping instructions, forward the product, transportation prepaid. Repairs will be made and the product returned.
- 3) All shipments should be made via "Best Way". The product should be shipped in the original packing container or wrapped in protective material and surrounded by a minimum of four (4) inches of a shock absorbing material.

**Scanivalve Corp.**  
**1722 N. Madson Street**  
**Liberty Lake, WA 99019**  
**Telephone: (800)935-5151 (509)891-9970**  
**Fax: (509)891-9481**  
[scanco@scanivalve.com](mailto:scanco@scanivalve.com)  
[www.scanivalve.com](http://www.scanivalve.com)

# Table of Contents

General Description .....	1
Getting Started .....	2
Hardware .....	2
RAD3200 Front Panel Controls and Indicators .....	3
Power/Trigger Input .....	3
Communication Input .....	3
Power Switch .....	3
Power Indicator .....	3
Data Indicator .....	3
Software .....	4
RAD.exe .....	4
Software Installation .....	4
System Operation .....	5
Ethernet Interface Software .....	5
Operation .....	6
ZOC Modules .....	6
USB Communications .....	6
Configuration Variables .....	6
Identification Variables - List I .....	7
Module Profile Variables - List P .....	7
Module Variables - List MI x .....	8
General Scan Variables - List s .....	9
Conversion Variables - List c .....	9
Temperature Offset Variables - List o .....	9
Scan Group Variables - List sg x .....	10
System Variables - List sys .....	11
TelNet Host Operation .....	13
HyperTerminal Ethernet Operation .....	13
RAD3200 Module Coefficient Installation .....	14
Interface Programs .....	14
Power Requirements .....	15
External Trigger .....	16
Hardware Trigger .....	16
Software Trigger .....	16
RAD A/D 3200 - Remote A/D Modules .....	18
RDS 3200 - Remote Digital Switch .....	20
System Connections .....	23
ZOC Input Connections .....	25
USB Cable .....	26
USB Extender .....	27
RPM1000 Power Supply .....	30
System Installation Drawings .....	32
Typical ZOC33 System .....	32

Typical ZOC33 Duplex System .....	33
Typical ZOC33 Valveless System .....	34
Accessories and Information .....	35
MSCP3200 Solenoid Control Pack .....	35
Ethernet Connections .....	38

## Figures and Illustrations

Figure 1 - RAD3200 with 8 A/D modules .....	1
Figure 2 - RAD3200 Physical Measurements and Mounting Dimensions .....	2
Figure 3 - Power Input Wiring .....	15
Figure 4 - RAD3200 Exploded View .....	17
Figure 5 - Pressure A/D Module .....	18
Figure 6 - RDS 3200 - Remote Digital Switch .....	20
Figure 7 - RDS3200 Dimensions .....	21
Figure 8 - RDS3200 Pinouts .....	21
Figure 9 - RAD3200 System with Standard USB .....	23
Figure 10 - RAD3200 System with Extended USB .....	24
Figure 11- Typical Input Wiring - ZOC module to RAD3200 .....	25
Figure 12 - USB to RAD3200 Cable - Non-Extended .....	26
Figure 13 - USBEXT 3200 Dimensions .....	27
Figure 14 - USB Extender Cable - USBEXT 3200 to RAD3200 .....	28
Figure 15 - USBEXT 3200 Exploded View .....	29
Figure 16 - RPM1000 Dimensions and Output wiring .....	30
Figure 17 - Power and Trigger Cable - RPM1000 to RAD3200 .....	31
Figure 18 - MSCP3200 .....	35
Figure 19 - MSCP3200 Exploded View .....	36
Figure 20 - Cable - RDS3200 to MSCP3200 .....	37
Figure 21 - RJ - 45 Plug and Jack .....	38

## Tables

Table 1 - RAD3200 A/D Module DIP Switch Settings .....	19
Table 2 - RDS 3200 DIP Switch Settings .....	22

## Specifications - RAD3200

Inputs	1 to 8 A/D Modules
Channel Inputs	512 Maximum
ZOC Module Supported	ZOC17, ZOC22B, ZOC33, ZOCEIM
Interface Connectors	
RAD USB	Cannon MDM-15SH003K-A174
RAD Power	Cannon MDM-9PH003L-A174
A/D Module	Cannon MDM-15SL2P
Power Requirements	
RADBASE	+ 15 Vdc @ 41 mA -15 Vdc @ 4mA + 5 Vdc @ 610 mA
A/D Module(Each)	+ 15 Vdc @ 105 mA - 15 Vdc @ 5.5 mA
ZOC Module(Each)	+ 15 Vdc @ 120 mA - 15 Vdc @ 16 mA
External Trigger	4 to 15 Vdc @ 6.5 ma
Communications Protocol	USB V1.1
Typical Data Acquisition Rate	200 samples/channel/sec
Dimensions (LxWxH)	
RAD Base	2.6875 in x 1.75 in x 1.75 in(68.2625 mm x 44.45 mm x 44.45 mm)
A/D Module	0.311 in x 1.75 in x 1.75 in(7.8994 mm x 44.45 mm x 44.45 mm)
RDS Module	0.45 in x 1.75 in x 1.75 in(11.4 mm x 44.45 mm x 44.45 mm)
Weight	
RAD Base	.31 lbs (141 grams)
A/D Module	.05 lbs (23 grams)
RDS Module	.05 lbs (23 grams)
Operating Temperature	0°C to 55°C
Storage Temperature	-40°C to 85°C

# RPM1000 Specifications

## Power Requirements

Voltage	88 to 264 Vac, 47 to 440 Hz
Current 115 Vac	3.2 A (Max)
230 Vac	1.8 A (Max)
Inrush 115 Vac	15 A @ 25°C cold start
230 Vac	30 A @ 25°C cold start

## Outputs

RAD Power	+5 Vdc @ 10.0 A
	+15 Vdc @ 4.0 A (7.5A peak)
	-15 Vdc @ 1.0 A

Ripple and Noise 1% peak to peak maximum

Line Regulation  $\pm 0.5\%$  max at full load

Overvoltage Protection Output #1 only - set to 112 - 132% of nominal

Overcurrent Protection All circuits protected to short circuit protection

Temperature Coefficient All outputs  $\pm 0.04\%/^{\circ}\text{C}$  Maximum

Output Connector PT02A-16-8S

Mating Connector PT06A-16-8P-SR

Dimensions (LxWxH) 10.0 in x 5.00 in x 2.70 in (25.40 cm x 12.70 cm x 6.86 cm)

Weight 3 lbs 6 oz ( 1.53 kg )

Operating Temperature 0°C to 70°C Derate linearly from 100% load at 50°C to 50% load at 75°C

Storage Temperature -40°C to 85°C

Relative Humidity 5% to 95% non-condensing

## General Description

The RAD3200 is designed to permit non DSA Electronic Pressure Scanners to be utilized in an Ethernet system. Each RAD3200 can accept up to 8 Analog to Digital Modules. Each A/D module can interface to one ZOC Electronic Pressure Scanner. A ZOC Electronic Pressure Scanner may have 16 to 64 inputs.

The RAD3200 is designed for use in applications where space is at a premium or where portability is important. A RAD3200 may be configured with as few as one(1), or as many as eight(8) A/D's, depending upon the test requirements. A long distance USB driver may be added to the RAD3200 to permit the RAD to be separated up to 150 feet(45.7 meters) from the Host Computer.

When a ZOC module is to be used with a RAD3200, it must have an RTD installed so a three dimensional Pressure/Temperature characterization table can be generated. These coefficients can then be downloaded into the RAD3200 and used to generate Engineering Unit data. RAD to ZOC module cables are limited to 15 feet(4.6 meters). For optimum results, and to fully utilize the capabilities of the RAD3200, the ZOC module should also have a TEDS chip installed. This chip contains a unique serial number and all of the information regarding the module. At power up, or when command, the RAD3200 will output this information to the Host computer.

The RAD3200 must be connected, via USB, to a Host Computer running Windows 2000 Professional or Windows XP.

For more information on specific applications, please contact Scanivalve Corp, Product Support Department.

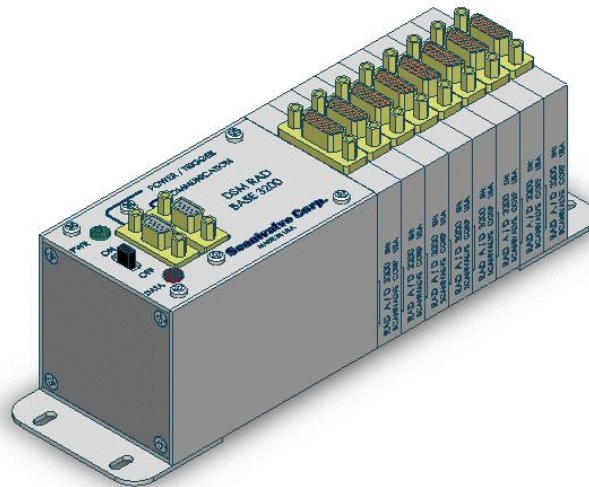


Figure 1 - RAD3200 with 8 A/D modules

## Getting Started

A RAD3200 consists of a Base unit containing a power supply, an optional USB long distance driver, a temperature A/D board, and a Buss board. Each RAD base unit may have 1 to 8 A/D modules connected. Each A/D module can interface to one ZOC Electronic Pressure Scanner Module. A RAD3200 requires three(3) DC voltages for power,  $\pm 15$  Vdc and +5 Vdc. A RAD3200, with the optional USB Long Distance Driver installed, may be up to 150 feet from a Host Computer.

## Hardware

The RAD3200 is furnished with a set of mounting ears so the unit may be mounted in a convenient location. Figure 2 shows the mounting dimensions and details. Dimensions in parentheses are millimeters.

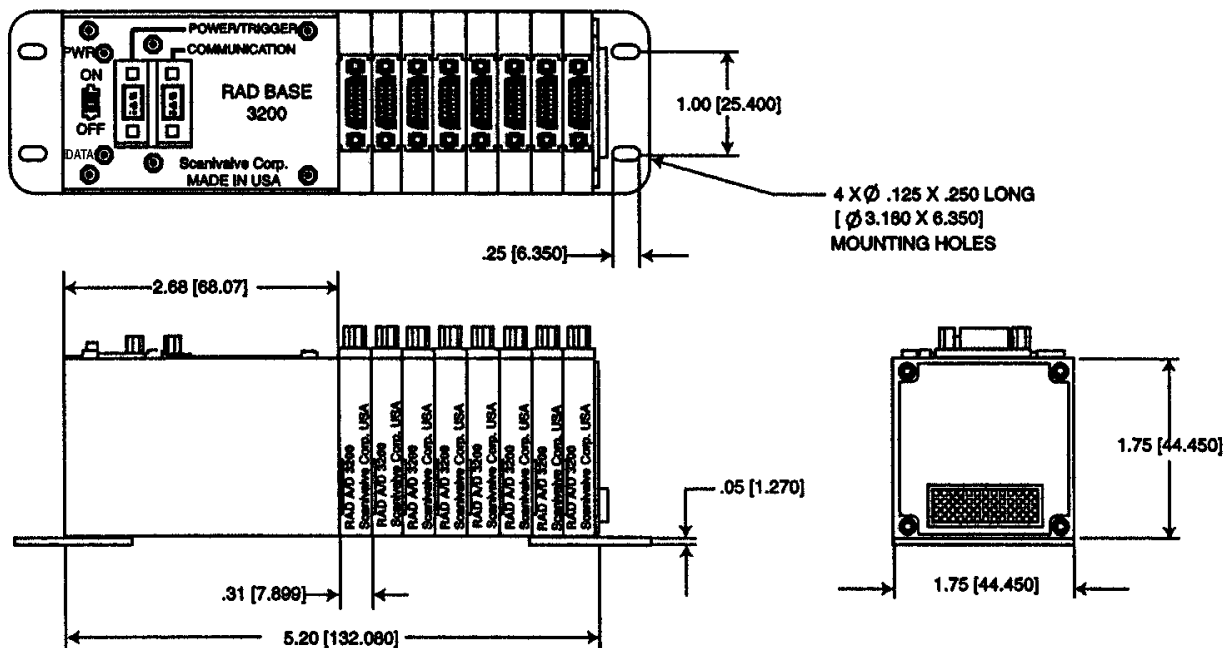


Figure 2 - RAD3200 Physical Measurements and Mounting Dimensions

## **RAD3200 Front Panel Controls and Indicators**

### **Power/Trigger Input**

This is the main power input. The External Trigger Input is also part of this connector.

### **Communication Input**

This is the USB communications connection from the Host Computer.

### **Power Switch**

This switch controls the power bus of the RAD3200 module. Modifications to the RAD hardware configuration may be made when this switch is in the off position. The RAD3200 software must be commanded to update the configuration when the changes are complete and this switch is set to the on position. If this switch cannot be accessed, then the RAD3200 must be powered down before hardware configuration changes are made.

### **Power Indicator**

A green led that will be illuminated when power is applied to the RAD3200.

### **Data Indicator**

This red led will be illuminated when the RAD3200 has established communications with a Host computer.

## Software

When the RAD3200 is mounted and the power requirements are met, the unit is ready to be configured for use. All configuration variables must be set using RAD.exe. A user may connect another computer to the RAD3200 Host computer and communicate by one of several associated programs:

### RAD.exe

The RAD executable program controls the operation of the RADBASE, A/D Modules and RDS module. This software must be installed on a Host Computer interfaced to the RAD3200 by a USB connection. The software is written to operate in Windows 2000 Professional® or Windows XP®. This software must be installed on the Host Computer along with drivers specific to the Operating System. The software is contained on an installation disk labeled: RAD3200 System Software Installation. This disk is included with every RAD3200 System.

## Software Installation

**NOTE:** Do not connect the RAD to the Host Computer until this procedure calls for the connection.

On the Host Computer, Insert the Installation disk into a CD drive.

Select Start, Select Run.

For a Windows 2000 Professional Installation, Enter:

x:\2kinstall.bat and click OK      Where x is the Floppy Drive designator

For a Windows XP Installation, Enter:

x:\xpinstall.bat and click OK      Where x is the Floppy Drive designator

A DOS Window will open, the progress of the installation may be monitored by watching this screen. When the installation is complete, close the DOS window.

Click on My Computer,

Click on Drive C,

Click on the RAD Folder.

When this folder has opened, Insert the floppy disk with the ZOC module MPF file in the floppy drive and copy the MPF file into this folder.

Connect the USB cable from the RADUSB Extender to the host computer and apply power to the RAD32200 and the RADUSB Extender.

Switch the RAD the power supply to ON.

Switch the RAD On/Off switch to ON.

Connect the RADUSB Extender power supply to the RADUSB Extender

Windows should find the USB extender and the RAD. If Windows asks for a Driver, the driver is on the installation disk. When this portion of the installation is complete, Start the RAD.exe program.

When the RAD.exe program is started, a DOS window will open. The RAD program will start by finding drivers, then appear to open. Any keystroke will result in errors. This is normal.

Close the DOS window, and Re-start the RAD.exe program. The program will now run properly.

## System Operation

Once the software is installed, the system operation should be as follows:

1. Set the DIP Switches in each A/D Module to an address corresponding to the hardware location where it is installed on the RADBASE.
2. If an RDS Module is installed, the DIP switches must be set to position 9.
3. Install the A/D Modules and RDS.
4. Connect all cables as shown in Figures 7 or 8, depending on the system configuration.
5. Switch the RAD On/Off switch to ON, energize the RAD Power Supply energize the RADUSB Extender if it is being used..
6. If the USB Extender is not used, wait 5 seconds. If the USB Extender is being used, wait until the green Link light on the USB Extender is energized
7. Open the RAD folder and start the RAD.exe program.

## Ethernet Interface Software

TelNet	A program furnished with Windows 95 and 98. This permits a network connection to the RAD3200 system. A TelNet session is described later in this manual
HyperTerminal	A terminal program furnished with Windows NT, 2000 and XP. This program should be configured for Ethernet Communications.
RADLink	A program written by Scanivalve Corp. This program allows a user to communicate with a RAD3200. It operates in Windows 9x, NT, 2000, and XP.
RAD3200 LabView VI	A driver written by Scanivalve Corp for use with LabView versions 4.0.1 and higher.

## Operation

This section contains information and procedures required for the proper operation of the RAD3200 series modules.

The RAD3200 series modules are designed to be connected to a host computer. The Host computer must have RAD Support software installed for the RAD to function correctly. When power is first applied, a RAD3200 will self boot and execute a program named: **RAD.EXE**. When the RAD3200 is ready to accept commands a prompt symbol will be transmitted to the host computer.

## ZOC Modules

The RAD3200 will support any existing ZOC Module. The ZOC modules must have an added ID Chip and an RTD for the user to obtain optimum performance from the system. The modified modules use a slightly different input cable. This cable has wiring for the ID Chip and the RTD. Modules should only be connected and disconnected with power removed from the RAD3200. After the modules are connected, power may be applied. If the modules have all of the modifications, the RAD3200 will identify the modules and find the appropriate MPF file for that module. If the modules do not have the ID chips installed, the configuration of the system will have to be updated manually. If a manual update is required, it is very important to verify that the modules are connected to the proper inputs. Otherwise, data may be invalid.

## USB Communications

The RAD3200 communicates with a Host Computer via a USB connection. A wiring diagram is shown in figure 11. System drawings are shown in Figures 9 and 10.

## Configuration Variables

The RAD3200 contains many configuration variables which must be set up properly in order for the RAD3200 to function correctly. These variables are arranged in groups to aid the user. This section contains recommended setup information. It is expected that the information in this section will permit a user to set up and check out a RAD system. The user must be aware that the setup may need to be modified depending upon test requirements. It is recommended that a user read, and be completely familiar with, the RAD3200 Software Requirements Specification before attempting to modify the configuration variables.

The RAD3200 Configuration Variables are set up to default settings that will generally permit the user to communicate using STANDARD USB connection

Please refer to the RAD3200 Software Requirements Specification for more information on the proper syntax and methods for verifying and/or modifying Configuration Variables.

### Identification Variables - List I

The first variables to set are the Identification variables. The Identification variables set the Input and Output Interfacing. A List I command to the RAD3200 will result in the following:

```
SET NL 0
SET DISPIN 0
SET HAVESER 2 9600
SET HAVENET 0
SET CONOUT 2
SET SEROUT 2
SET NETOUT 2
SET FORMAT 0
SET SERIN 1
SET NETIN 0
SET IFUSER 1
SET ECHO 0
SET CAL 0 9600
SET CALSCHED 0 rp
SET AUX 0 9600
SET AUXSCHED 0 rp
```

### Module Profile Variables - List P

These variables do not need to be set by the user unless the modules connected to the RAD do not have ID chips installed. If the ID chips are installed, the modules report this information to the RAD. If the ID chips are not installed, the RAD3200 software uses this information to map the correct coefficient file to the module input. A List P command to the RAD3200 will result in the following:

```
SET DSMSN 18
SET SN1 232
SET SN2 235
SET SN3 0
SET SN4 0
SET SN5 0
SET SN6 0
SET SN7 0
SET SN8 0
```

**Module Variables - List MI x** Where x = the module position number

At bootup, the RAD3200 obtains the module ID information from the ID chip and maps module coefficients and configuration variables into memory. The module configuration variables include setting the number of ports, the full scale values and the number of negative points in the module calibration. For more information, refer to the RAD3200 Series Software Requirements Specification. For example, two 32 channel modules, one with a full scale of 15 psi and the other with a full scale of 5 psi, connected to positions 1 and 2, should look as follows:

```
REM1 1 Comment line 1
REM1 2 Comment line 2
REM1 3 Comment line 3
REM1 4 Comment line 4
SET TYPE1 0
SET ENABLE1 1
SET SN1 0232
SET NUMPORTS1 32
SET NPR1 15
SET LPRESS1 1..32 -18.0
SET HPRESS1 1..32 18.0
SET NEGPTS1 1..32 4
```

```
REM2 1 Comment line 1
REM2 2 Comment line 2
REM2 3 Comment line 3
REM2 4 Comment line 4
SET TYPE2 0
SET ENABLE2 1
SET SN2 0235
SET NUMPORTS2 32
SET NPR2 15
SET LPRESS2 1..32 -6.0
SET HPRESS2 1..32 6.0
SET NEGPTS2 1..32 4
```

A 64 channel module with ranges of 15 and 50 psi connected to position 3 would be set up as follows:

```
REM3 1 Comment line 1
REM3 2 Comment line 2
REM3 3 Comment line 3
REM3 4 Comment line 4
SET TYPE3 0
SET ENABLE3 1
SET SN3 0111
SET NUMPORTS3 64
SET NPR3 15
SET LPRESS3 1..32 -18.0
SET LPRESS3 33..64 -60
SET HPRESS3 1..32 18.0
SET HPRESS3 33..64 60
SET NEGPTS3 1..64 4
```

### **General Scan Variables - List s**

This group sets up the scan function. This is the group to define the scan rate, trigger and some output functions. The default settings follow:

```
SET FM 1
SET IFC 0 0
SET TIMESTAMP 0
SET PERIOD 500
SET ADTRIG 0
SET SCANTRIG 0
SET PAGE 0
SET QPKTS 0
SET SIMMODE 0
SET BINADDR 0 0.0.0.0
```

### **Conversion Variables - List c**

Once the modules have been defined and enabled, the conversion variables should be set to the units desired. The following are the default settings:

```
SET A2DCOR 1
SET ZC 0
SET UNITSCAN PSI
SET CVTUNIT 1.000000
SET BIN 0
SET EU 0
SET CALZDLY 15
SET MPBS 20
SET CALPER 500
SET CALAVG 256
SET FILLONE 0
SET MAXEU 9999
SET MINEU -9999
SET STARTCALZ 0
```

### **Temperature Offset Variables - List o**

These are factory set based on the RTD's used to measure the ZOC module temperature. The settings should not be modified by an end user.

```
SET TEMPB1 -43.5028
SET TEMPB2 -43.5028
SET TEMPB3 -43.5028
SET TEMPB4 -43.5028
SET TEMPB5 -43.5028
SET TEMPB6 -43.5028
SET TEMPB7 -43.5028
SET TEMPB8 -43.5028
```

### Temperature Gain Variables - List g

These are factory set based on the RTD's used to measure the ZOC module temperature. The settings should not be modified by an end user.

```
SET TEMPM1 0.0730
SET TEMPM2 0.0730
SET TEMPM3 0.0730
SET TEMPM4 0.0730
SET TEMPM5 0.0730
SET TEMPM6 0.0730
SET TEMPM7 0.0730
SET TEMPM8 0.0730
```

### Scan Group Variables - List sg x      Where x = the Scan Group Number

Each RAD3200 can have as many as 8 different scan groups set up. A scan group is enabled by entering a channel or range of channels in the chanx variable. A scan group must be cleared by first setting CHANx to 0 before entering a new range of channels to be scanned. Refer to the RAD3200 Software Requirements Specification for more information on Scan Groups. A user must be aware that a maximum of 128 channels may be displayed in a HyperTerminal or Telnet application. The following example will scan the modules enabled in the MI examples with an average of 16 samples:

```
List sg 1
SET AVG1 16
SET FPS1 0
SET CHAN1 1-1..3-64
```

If a user wished to scan each enabled module at different averages, then 3 scan groups could be set up. Examples follow:

```
List sg 1
SET AVG1 16
SET FPS1 0
SET CHAN1 1-1..1-32
```

```
List sg 2
SET AVG2 32
SET FPS2 0
SET CHAN2 2-1..2-32
```

```
List sg 3
SET AVG3 8
SET FPS3 0
SET CHAN3 3-1..3-64
```

## System Variables - List sys

At power up, the A/D and ZOC modules with ID chips report their setup information to the RAD system. This information should be reviewed to insure that the system is set up as required for the immediate test requirements. An example of the data returned from a list sys command follows:

```
RAD Serial Number 103
LOC A2DSN -MODEL- -SN- CHAN VALVE -NPR1- -NPR2- XDUCER -CAL-DATE-
1      111  ZOC33   300  64    X1   15.00  15.00   DIF   8/16/2002
2      110
3
4
5
6
7
8
LOC -MODEL- -SN- CHAN  DESCRIPTION
9      RDS   103   8    REMOTE DIGITAL SWITCH [DOUT 1-8]
10
11
12
13
14
15
16
```

The RADBASE 3200 is Serial number 103. It has two RAD A/D 3200 modules connected and an RDS in slot 9.

RAD A/D3200 Sn 111 is installed in Location 1, ZOC33 Sn 300 is connected to this A/D module. The ZOC33 has 64 channels. It is not duplexed. The Full Scale pressure range of the module is 15.00 psi. The module is set up as a normal Differential Pressure Module. It was last calibrated August 16, 2002.

RAD A/D3200 Sn 110 is installed in location 2. If a ZOC module is connected to this A/D, it does not have an ID Chip installed, or the ID Chip is not responding.

RDS3200 Sn 103 is installed in location 9. The DOUT commands will function correctly.

If the RDS is not installed correctly, the returned data will appear as follows

RAD Serial Number 103

LOC	A2DSN	-MODEL-	-SN-	CHAN	VALVE	-NPR1-	-NPR2-	XDUCER	-CAL-DATE-
1	111	ZOC33	300	64	X1	15.00	15.00	DIF	8/16/2002

2 110

3

4

5

6

7

8

LOC	-MODEL-	-SN-	CHAN	DESCRIPTION
-----	---------	------	------	-------------

9

10	RDS	103	8	REMOTE DIGITAL SWITCH [DOUT 9-16]
----	-----	-----	---	-----------------------------------

11

12

13

14

15

16

WARNING: No RDS present at location 9

## TelNet Host Operation

A host computer may be used to control the RAD3200 without special software. The host must be operating in Windows 95/98/ME/NT/2000/XP. The host to RAD3200 connection should be made using an Ethernet connection.

Open a **TelNet** session.

Select: Terminal

Select: Preferences

Enable Local Echo

Set the Emulation to VT100/ANSI

Select: Connect

Select: Remote System

Host Name: Enter the IP address of the Host Computer

Port: Select: Telnet

TermType: Select: vt100

If the computer opens a Dial Up Box,

Click on Cancel

When the TelNet session is open, any command listed in the Software Requirements Specification may be entered. Responses will be displayed in the TelNet Window. Please refer to the Software Requirements Specification furnished with the DSM.

Newer versions of Windows may not include TelNet. These versions do include a version of HyperTerminal that may be configured to operate as a Serial or Ethernet Interface program.

## HyperTerminal Ethernet Operation

Open the HyperTerminal program

Select: Start

Select: Programs

Select: Accessories

Click on Hyperterminal

A HyperTerminal Window will open

Double Click: Hyperterminal.exe

A New Connection Window will open

Enter a name for the session and Click OK

A Connect to Window will open

Click on the down arrow by the Connect Using Box and click on TCP/IP(Winsock)

Enter the IP address of the Host Computer in the Host Address Box

The HyperTerminal window will indicate that a connection has been made.

Check the setup

Select: File

Select: Properties

A Properties Window will open.

Click on the Settings Tab

Emulation Mode should be Auto Detect

Terminal should be ANSI

Click on the ASCII Setup Button

For best operation, The check boxes for:

Send line ends with line feeds, and Echo typed characters locally may have to be checked

## Calibration

All modules that will be used with a RAD3200 must be fitted with an RTD so the RAD3200 can determine the temperature of the module. This is critical to allow a user to achieve the best possible accuracy in a system. A module, once calibrated, may be used in any position in a DSM. It may even be moved to a different RAD3200 with no loss in accuracy.

The key to this capability is the module profile (coefficient) files and the module list. The module profile files (mpf files) contain module setup information and calibration coefficients. Each module should have its own unique MPF file, identified as xxxx.mpf: where xxxx is the serial number of the module. The module list contains a listing of module serial numbers vs the input position.

At boot up, the RAD3200 software looks for the file: sn.gpf. This file contains the module profile list. The software reads the file. If a input position has a number greater than 0 assigned to it, the software looks for the corresponding MPF file in the RAD3200 folder on the Hard Disk and maps the setup and coefficients into the RAD3200 RAM memory. If an MPF file cannot be found, default configuration information is entered into memory.

## RAD3200 Module Coefficient Installation

When a RAD3200 and modules are purchased as a system, the module coefficients are included on floppy disks as MPF files. These files must be installed in the same directory as the RAD.EXE file. It is recommended that the files also be loaded into a colder named: \MPF for backup.

## Interface Programs

Scanivalve Corp has written two programs to assist a user with DSM-Host communication. One, **RADLINK**, has been written in Visual Basic for operation in a Windows 95/98/NT/2000/XP environment. The other, **RAD3200 LabView VI**, is a driver for LabView. It also is written for operation in a Windows 95/98/NT/2000/XP environment. For more information contact Scanivalve Corp, Sales and Marketing.

## Power Requirements

The RAD3200 requires three well regulated voltages for proper operation, + 15 Vdc, -15 Vdc and + 5 Vdc. The + 5 Vdc input is the most critical of the three voltages. When very small gauge wires are used in the power cables, this voltage could have significant voltage drops. The voltage drop will be excessive when the total resistance in the power lines exceed 0.25 ohms. It is recommended that Sense lines be used with this voltage to eliminate the possibility of voltage losses. The wiring of the power input is shown in Figure 3.

**NOTE:** The power to the RAD3200 must be removed before connecting or disconnecting ZOC Modules, A/D Modules, or RDS Modules. If the power is not off when modifying the RAD configuration, the RAD3200 and the system components may be damaged.

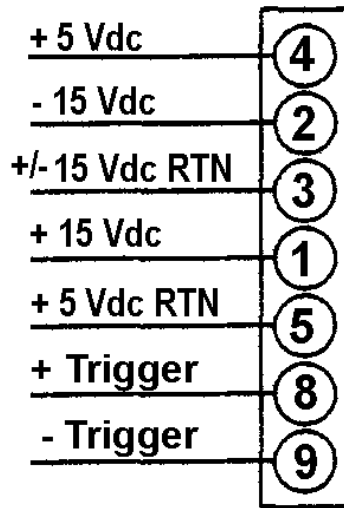


Figure 3 - Power Input Wiring

## External Trigger

The RAD3200 Series modules may be triggered externally by a hardware or software trigger. The setting of ADTRIG and SCANTRIG determine the function of the trigger input.

### Hardware Trigger

The external trigger input is optically isolated to prevent grounding problems. It is a TTL level, edge sensing device. It requires a minimum signal of 4Vdc @ 6.5 mA. It may accept voltages as high as 15 Vdc. The external trigger will only be active if SCANTRIG or ADTRIG is set to 1. If SCANTRIG is set to 1, a hardware trigger will initiate the SCAN function. If ADTRIG is set to 1, the module enters the SCAN mode and waits for a trigger when a SCAN command is issued by the Client/host, The module will return an averaged frame of data for each trigger pulse received. This will continue to the FPS variable(Frames per Scan) value or until a STOP command is issued.

### Software Trigger

The software trigger will only be active if ADTRIG is set to 1. When a SCAN command is issued by the Client/host, the module will enter the SCAN mode and wait for a trigger. An averaged frame of data will be output as soon as a <TAB> character (9 HEX or Control I) is received. Data will be output with each successive trigger command to the FPS variable (Frames per Scan) value or until a STOP command is issued.

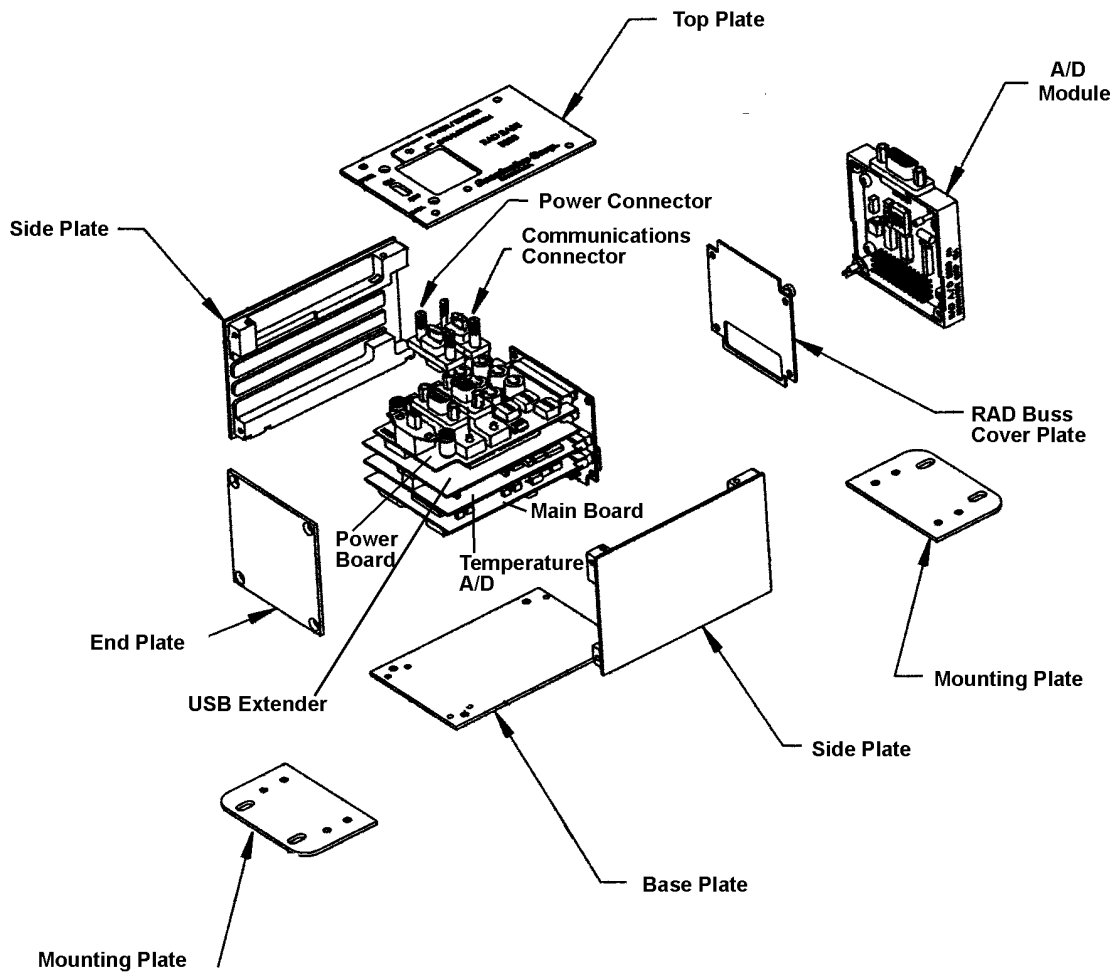


Figure 4 - RAD3200 Exploded View

## RAD A/D 3200 - Remote A/D Modules

Each RAD3200 may have up to 9 A/D modules connected. One for Temperature and eight for Modules. The Temperature A/D is installed in the RADBASE. The other 8 pressure A/D modules may be connected and disconnected as needed for a given test requirement. Only one A/D is required for the temperature measurement as the modules, and hence the sensor, change temperature very slowly. The temperature and pressure A/D's are **NOT** interchangeable.

Each A/D module has an ID chip installed. The ID chip identifies the module by type, location and serial number. Each module can be characterized to correct for zero and gain errors, thus minimizing system errors. This information is contained in the ID chip. When the RAD.exe program is started, the software identifies each A/D and maps the correction coefficients into memory. These data are used during the conversion of the analog inputs to an engineering unit to minimize errors from the A/D's.

The A/D modules have a DIP switch used to identify the position of the A/D. This switch must be set by the user when the A/D is installed. The A/D modules DIP switches must be set for a position between 1 and 8 (binary 0 - 7). The actual physical position of the modules is not important. A truth table showing the DIP switch settings is shown in Table 1.

The temperature A/D has a gain of 2.916. The pressure A/D has a gain of 2.854.

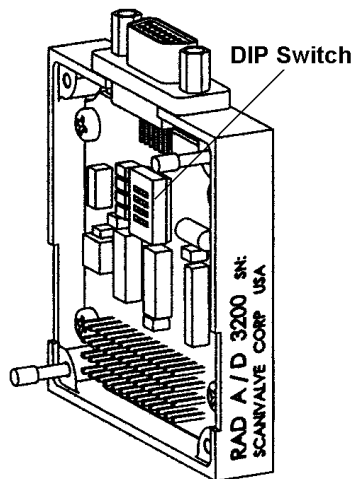


Figure 5 - Pressure A/D Module

Position	SW1	SW2	SW3	SW4
1	ON	ON	ON	ON
2	OFF	ON	ON	ON
3	ON	OFF	ON	ON
4	OFF	OFF	ON	ON
5	ON	ON	OFF	ON
6	OFF	ON	OFF	ON
7	ON	OFF	OFF	ON
8	OFF	OFF	OFF	ON

Table 1 - RAD3200 A/D Module DIP Switch Settings

## RDS 3200 - Remote Digital Switch

The RDS, Remote Digital Switch, contains eight(8), software controlled and optically isolated, switches. The switches are controlled by the Digital Output Configuration Variables or the DOUT Commands in the RAD software. For more information on the Digital Outputs, please refer to the RAD.exe Software Requirements Specification.

Each switch is rated for 1 A at 60 V. The Voltage may be AC or DC. If the switches will be used to switch power, the power must be supplied by the user.

The RDS has a four position DIP switch that is used to set the address, or position in the RAD3200. The RDS must always be the last unit in the system. The A/D modules may be installed in positions 1 through 8 (binary 0 - 7). An RDS is always position 9( binary 8) or higher. The RAD may accept up to 8 RDS Modules which must be programmed as positions 9 through 16 (binary 8 to 15) respectively. A truth table for the RDS DIP switch setting is shown in Table 2.

The first RDS must be installed in location 9. The DOUT commands will not function unless the first RDS is in that location. If an RDS is not installed correctly, an error will be reported at boot up.

A mating connector, Cannon MDM-21PH003L-A174, is supplied with each RDS. The pinout of the RDS is shown in Figure 8.

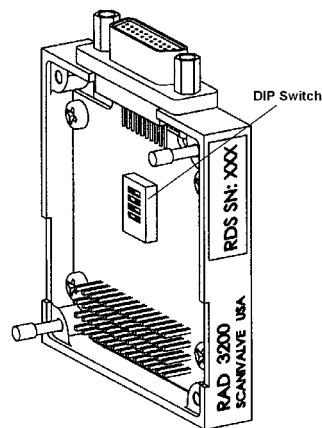


Figure 6 - RDS 3200 - Remote Digital Switch

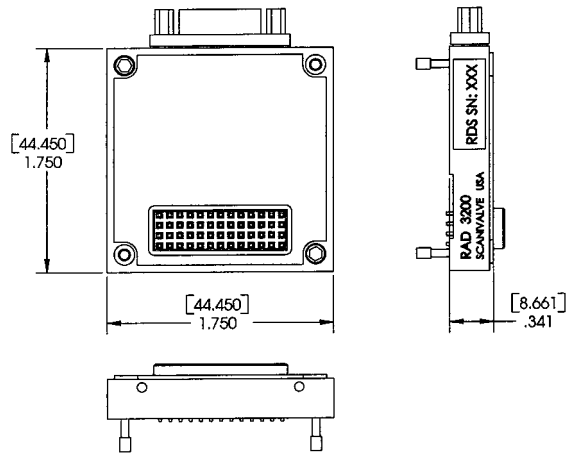


Figure 7 - RDS3200 Dimensions

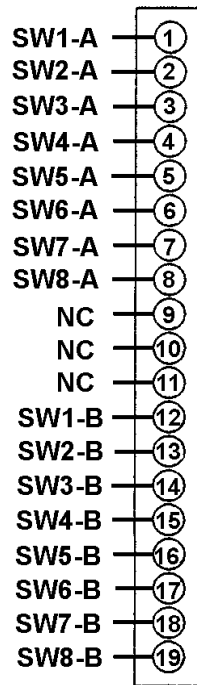


Figure 8 - RDS3200 Pinouts

Position	Channels	SW1	SW2	SW3	SW4
9	1 - 8	ON	ON	ON	OFF
10	9 - 16	OFF	ON	ON	OFF
11	17 - 24	ON	OFF	ON	OFF
12	25 - 32	OFF	OFF	ON	OFF
13	33 - 40	ON	ON	OFF	OFF
14	41 - 48	OFF	ON	OFF	OFF
15	49 - 56	ON	OFF	OFF	OFF
16	57 - 64	OFF	OFF	OFF	OFF

Table 2 - RDS 3200 DIP Switch Settings

## System Connections

The RAD3200 is designed to be used in a system configuration. The configurations may vary greatly with test requirements. This figures in this section document two of the possible configurations. Figure 9 shows the RAD3200 used in a standard USB system. In this system the USB cable may not exceed 9.8 feet(3 meters). Figure 10 shows the RAD3200 in a system where the RAD3200 may be separated from the host by a distance that exceeds the limitations of standard USB. For this installation, a USB Extender is added in line and a USB Extender board is added to the RAD3200. The USB extender cable may not exceed 150 feet(45.7 meters).

All systems have other limitations. The cables from the RAD A/D modules to the ZOC modules may not exceed 15 feet(4.8 meters). The power cable from the RPM1000 to the RAD3200 should not exceed 25 feet.

If the optional SPC3000 calibrators are used, the RS232 cable may not exceed 12 feet(3.7 meters) unless an RS232 extender is used.

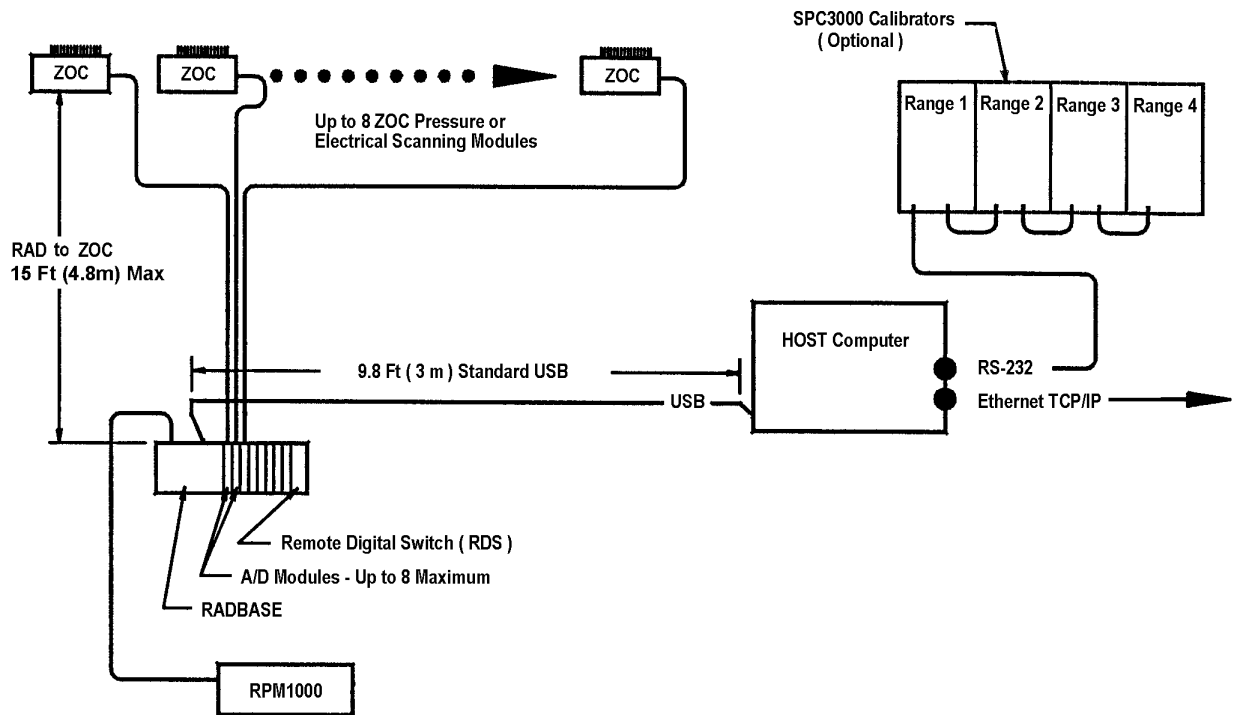


Figure 9 - RAD3200 System with Standard USB

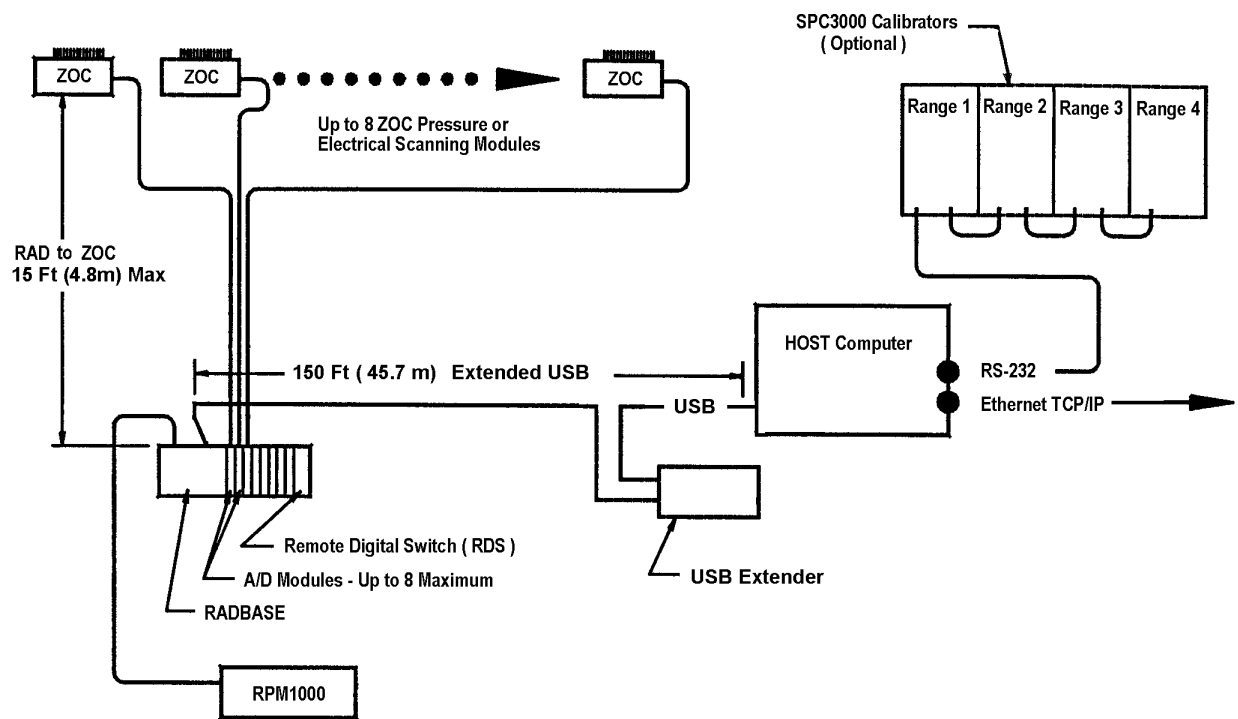


Figure 10 - RAD3200 System with Extended USB

## ZOC Input Connections

Each RAD3200 is designed to accept inputs from up to 8 ZOC 14, 17, 22, 23, or 33 modules or any combination. Each ZOC module may have up to 64 Pressure inputs. The ZOC modules must have an RTD and TEDS Chip installed. The RTD is used to measure the temperature of the module so the proper temperature plane in the pressure conversion tables can be selected. The TEDS Chip is used to identify the module to the host computer so the proper Module Profile File can be selected by the RAD3200 software. Figure 11 shows the typical input wiring for a ZOC module.

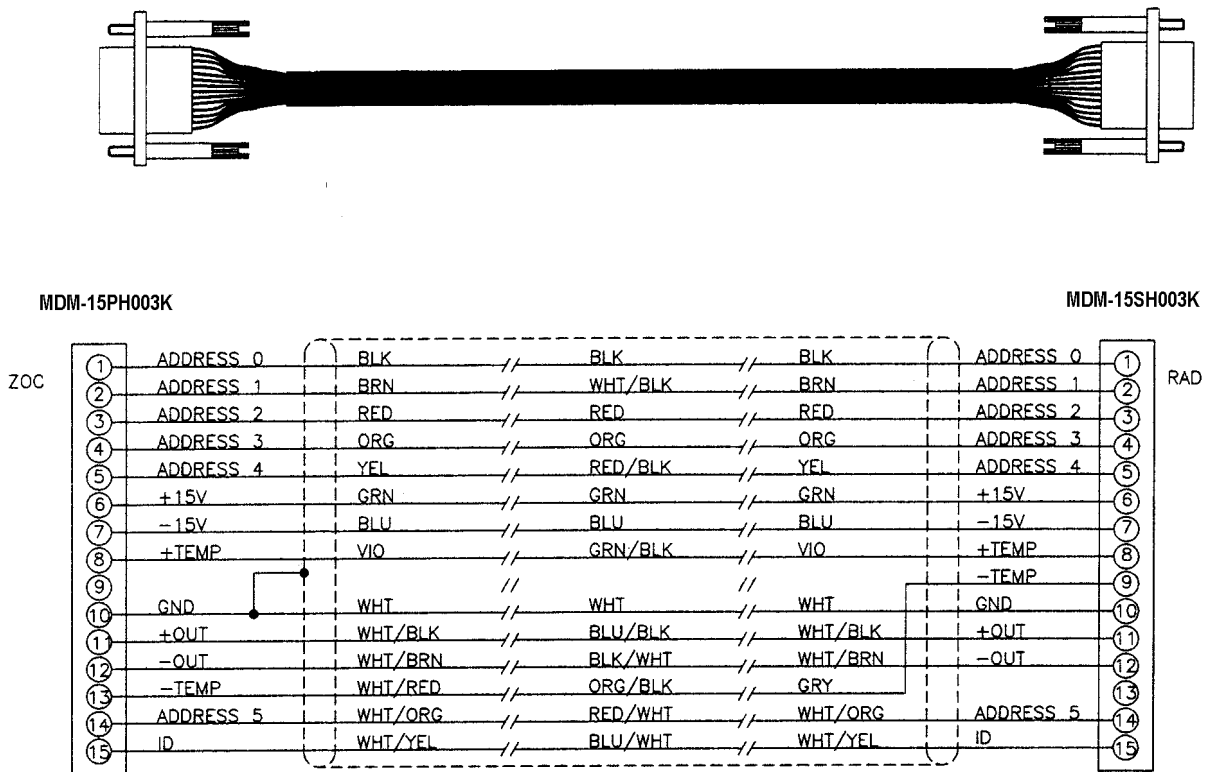


Figure 11- Typical Input Wiring - ZOC module to RAD3200

## USB Cable

For installations where the RAD3200 will be separated from the Host Computer by distances less than 9.8 feet(3 meters), a non-extended cable may be used. If an extender board is installed in the RAD3200 it must be removed to be able to safely use this cable.

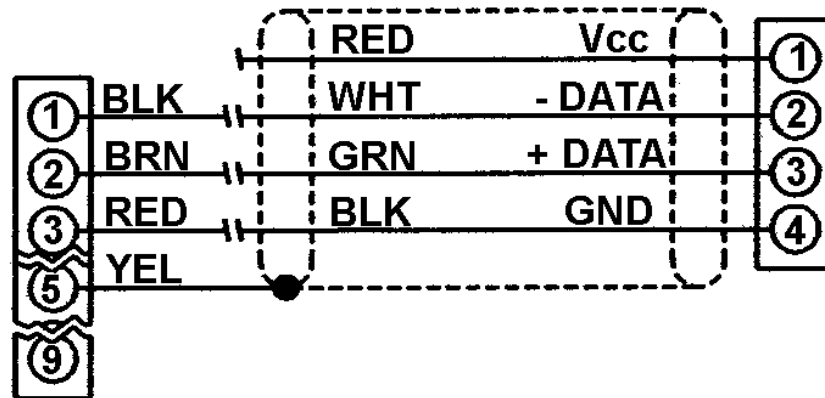
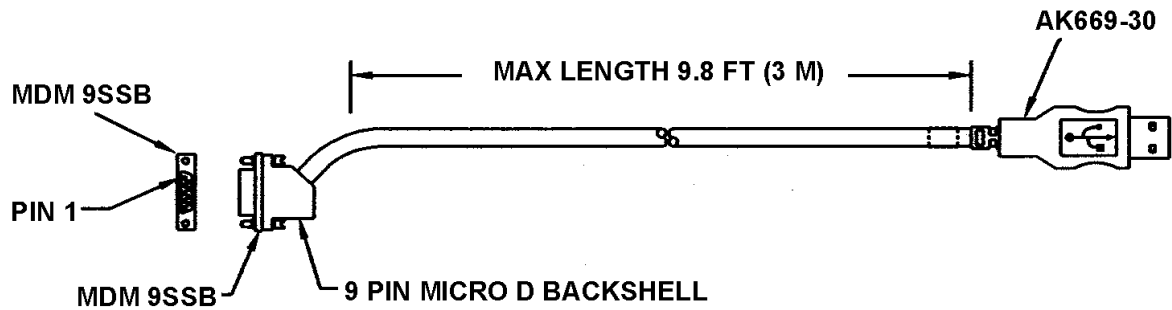


Figure 12 - USB to RAD3200 Cable - Non-Extended

# USB Extender

When the RAD3200 must be separated from the Host Computer by distances greater than 9.8 feet(3 meters), a USB Extender must be used. An extender board must be installed in the RAD3200 and a USB Extender, manufactured by Scanivalve Corp, must be connected between the Host USB cable and the RAD3200. An exploded drawing of a RAD USB Extender is shown in Figure 15. The USB Extender Cable is documented in Figure 14.

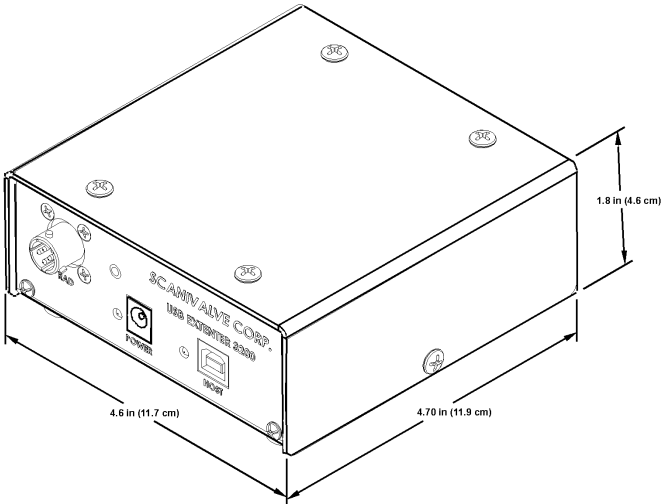


Figure 13 - USBEXT 3200 Dimensions

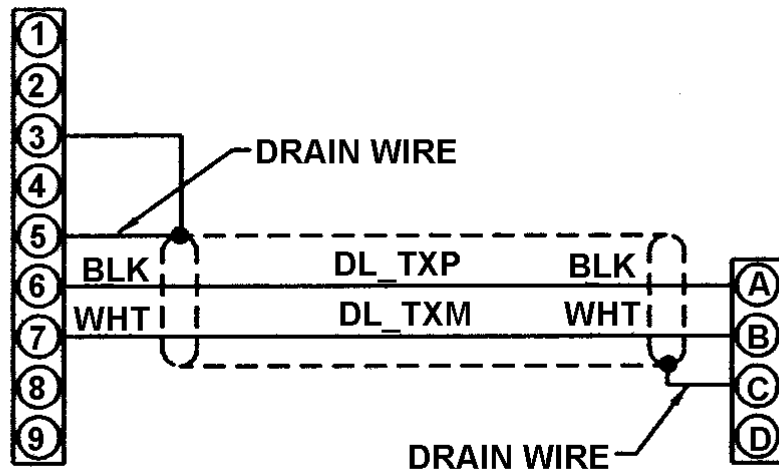
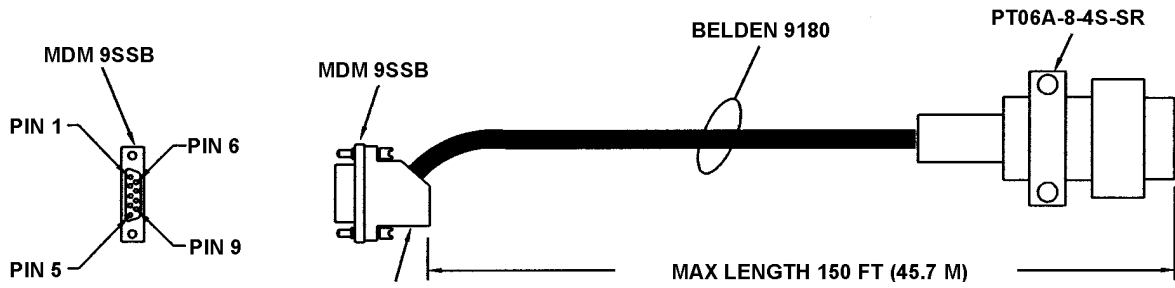


Figure 14 - USB Extender Cable - USBEXT 3200 to RAD3200

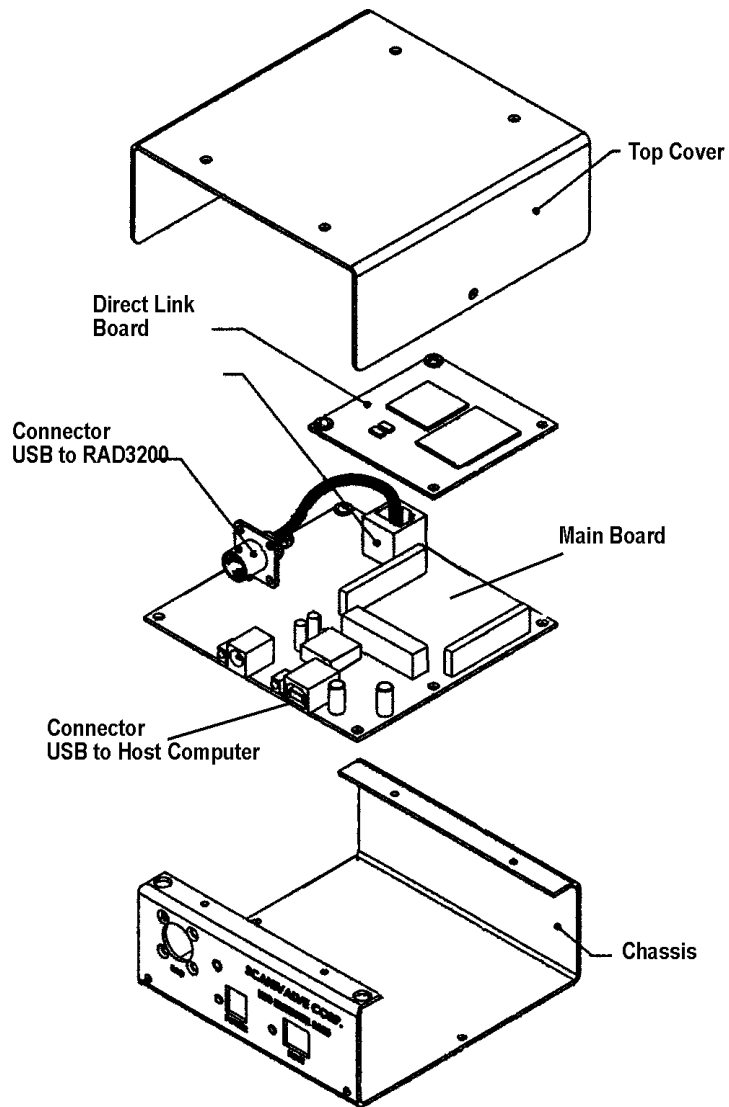


Figure 15 - USBEXT 3200 Exploded View

## RPM1000 Power Supply

Scanivalve Corp manufactures a Power Supply as an accessory to the RAD3200. This power supply will output the  $\pm 15$  Vdc and +5 Vdc voltages required by the RAD3200. It also outputs 24 Vdc which can be used to power solenoids and other auxiliary devices. A dimensional drawing of the RPM1000 and the Output connector wiring is shown in Figure 16. The dimensions in parentheses are millimeters. Specifications are listed at the beginning of the manual. Figure 17 documents the Power and Trigger Cable.

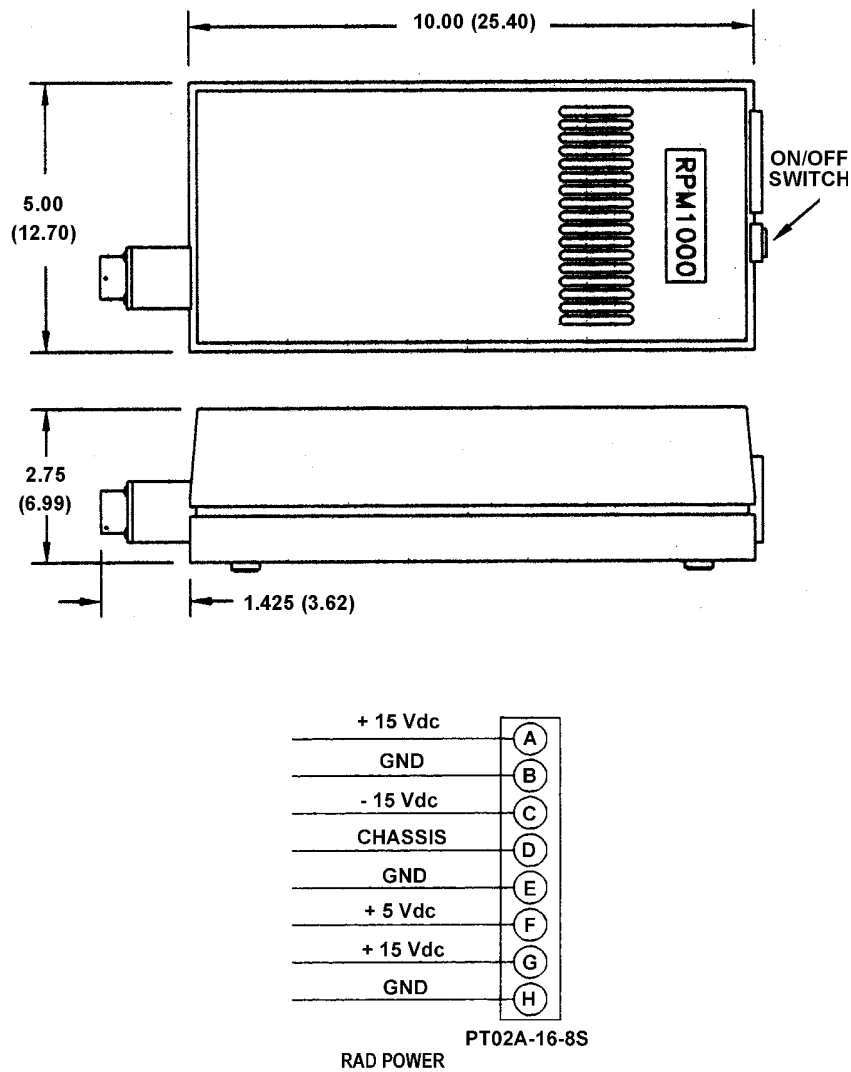


Figure 16 - RPM1000 Dimensions and Output wiring

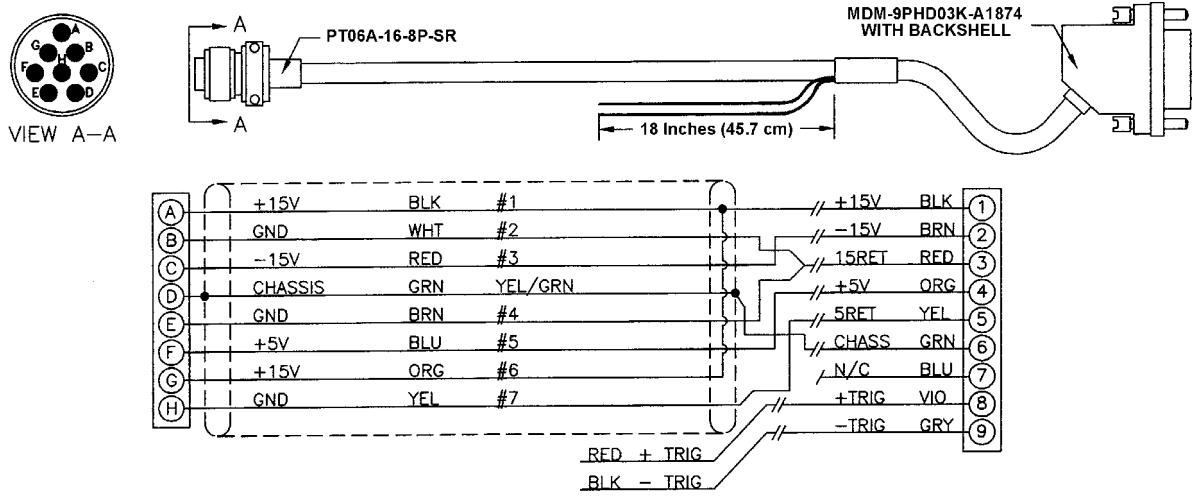
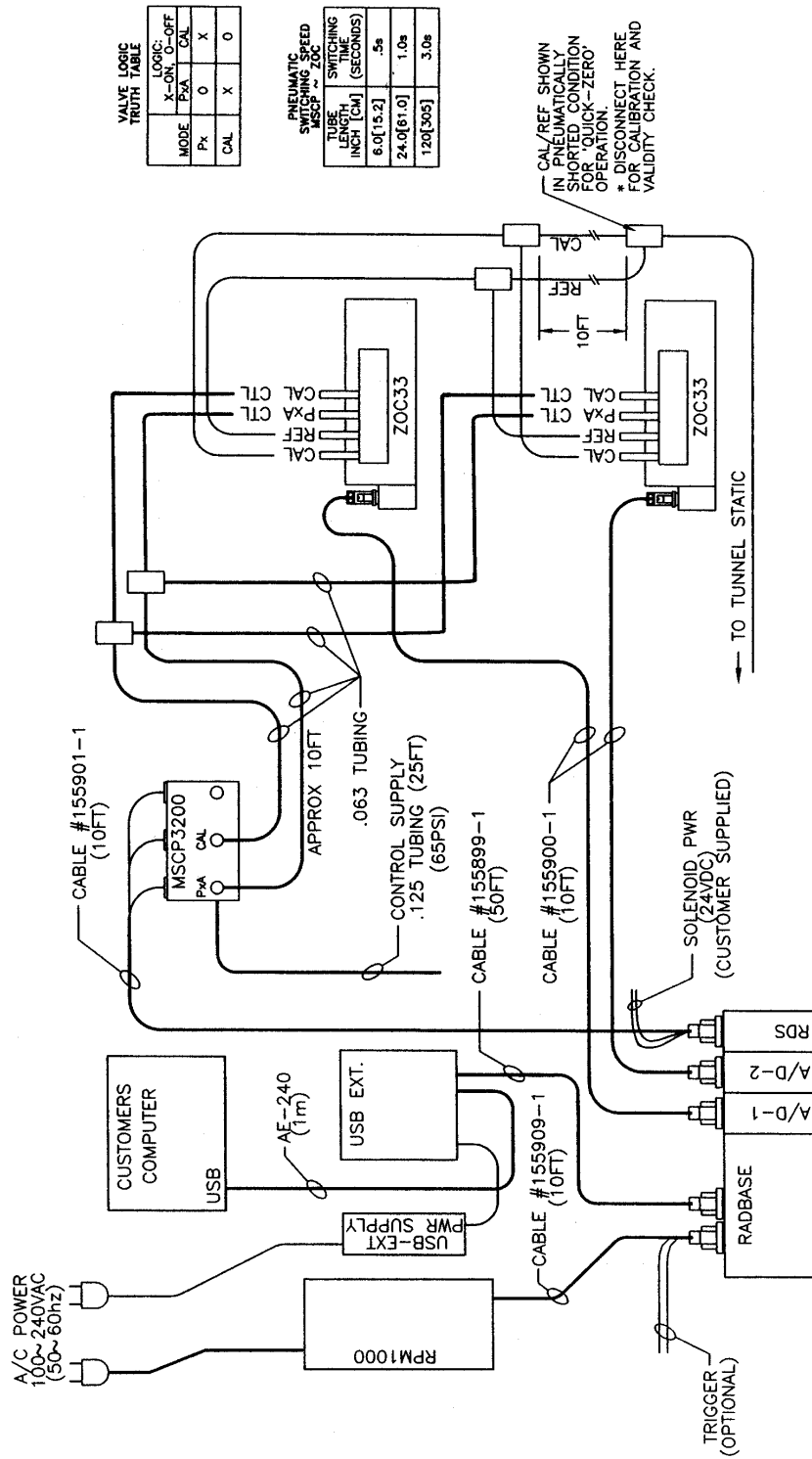


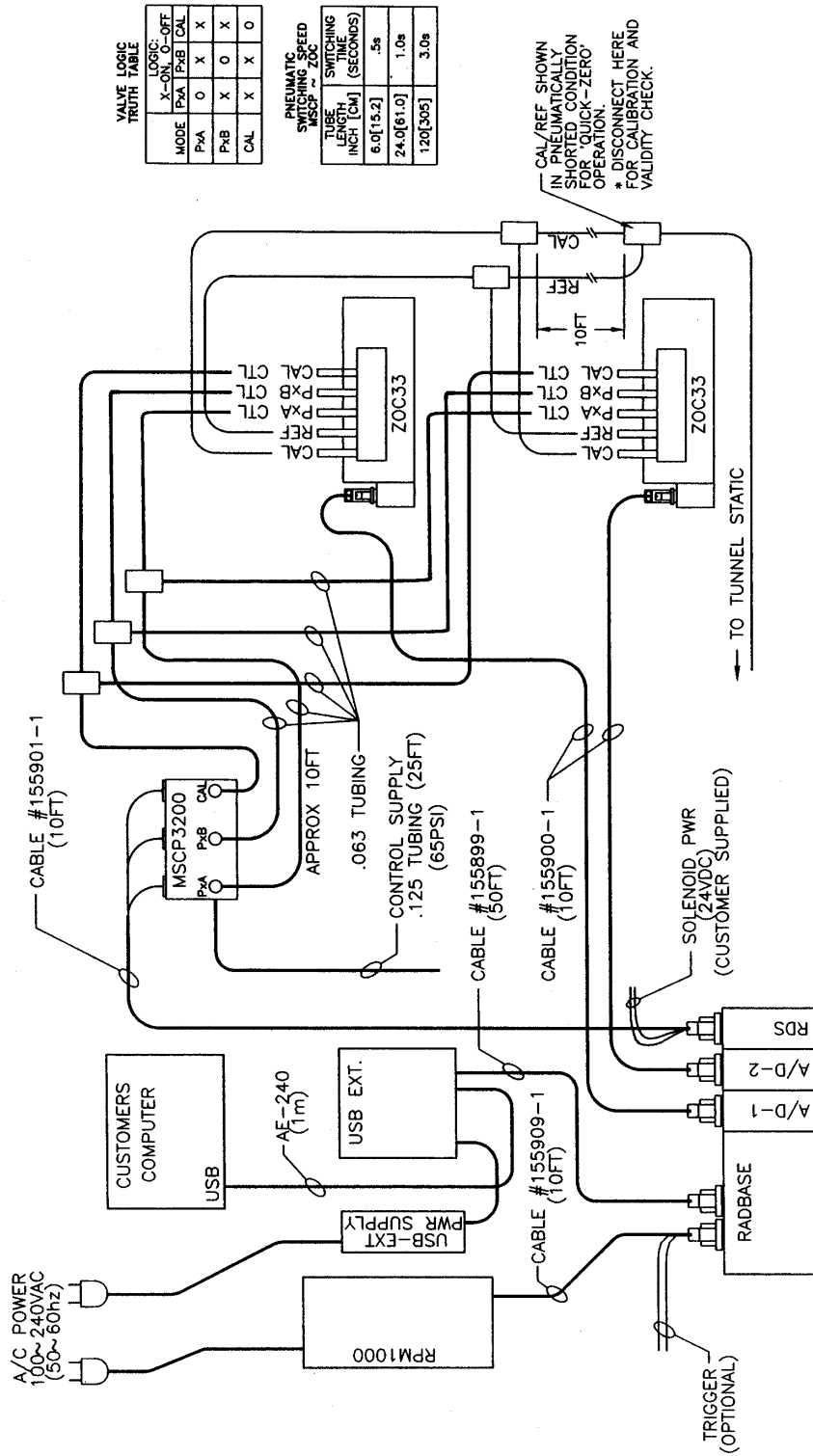
Figure 17 - Power and Trigger Cable - RPM1000 to RAD3200

# System Installation Drawings

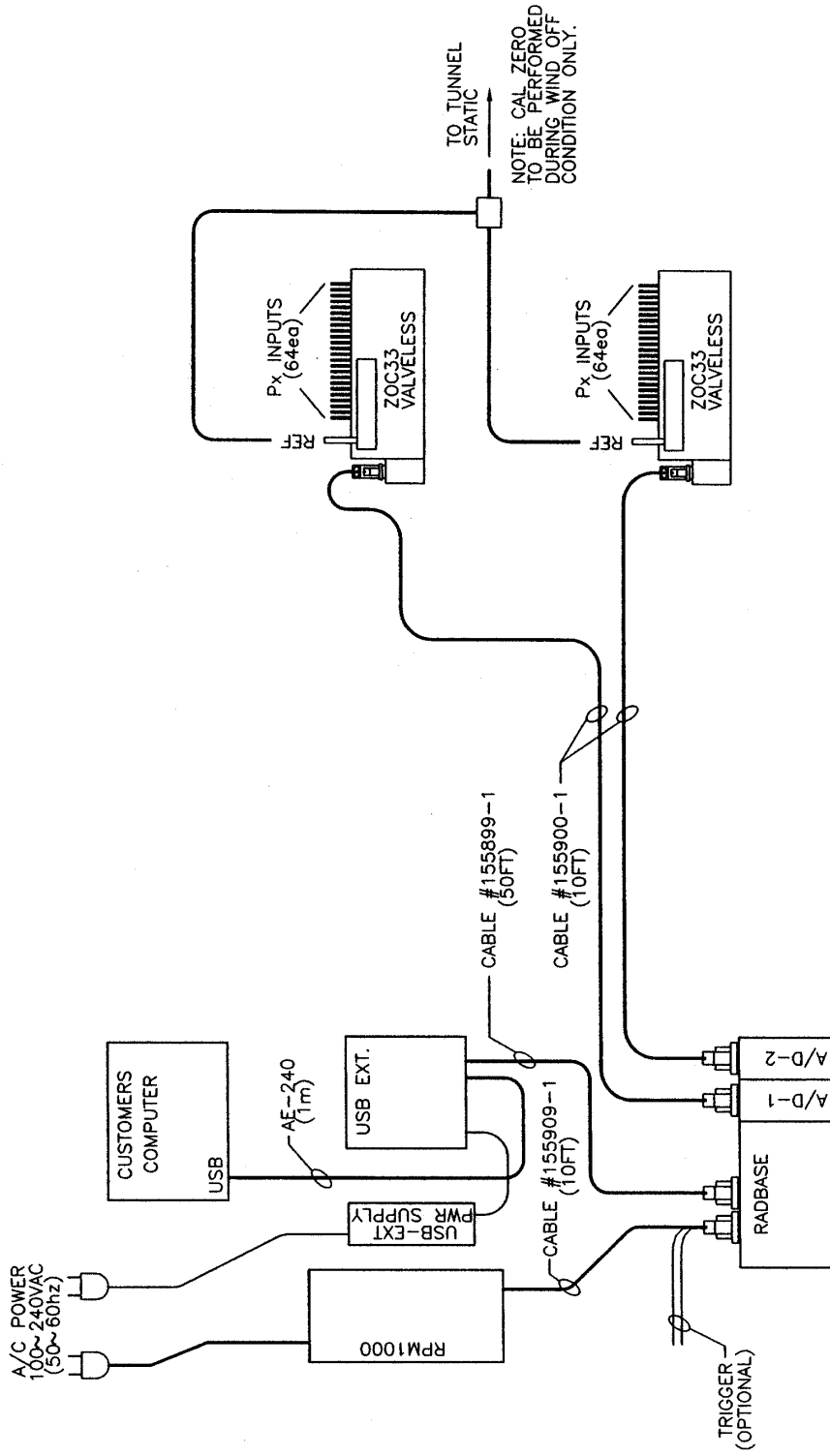
## Typical ZOC33 System



# Typical ZOC33 Duplex System



# Typical ZOC33 Valveless System



## Accessories and Information

### MSCP3200 Solenoid Control Pack

The RAD3200 may be used to control solenoids to switch control pressures to a ZOC module. This requires the addition of a RDS module to the RADBASE and a MSCP3200 Solenoid Control Pack. The RDS is a switching module that can switch an external voltage to an input on the MSCP3200. The MSCP 3200 is available with +24 Vdc, +12 Vdc or +5 Vdc Solenoids. The Solenoid control cable is shown in Figure 20.

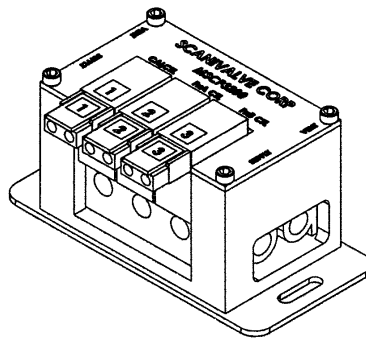


Figure 18 - MSCP3200

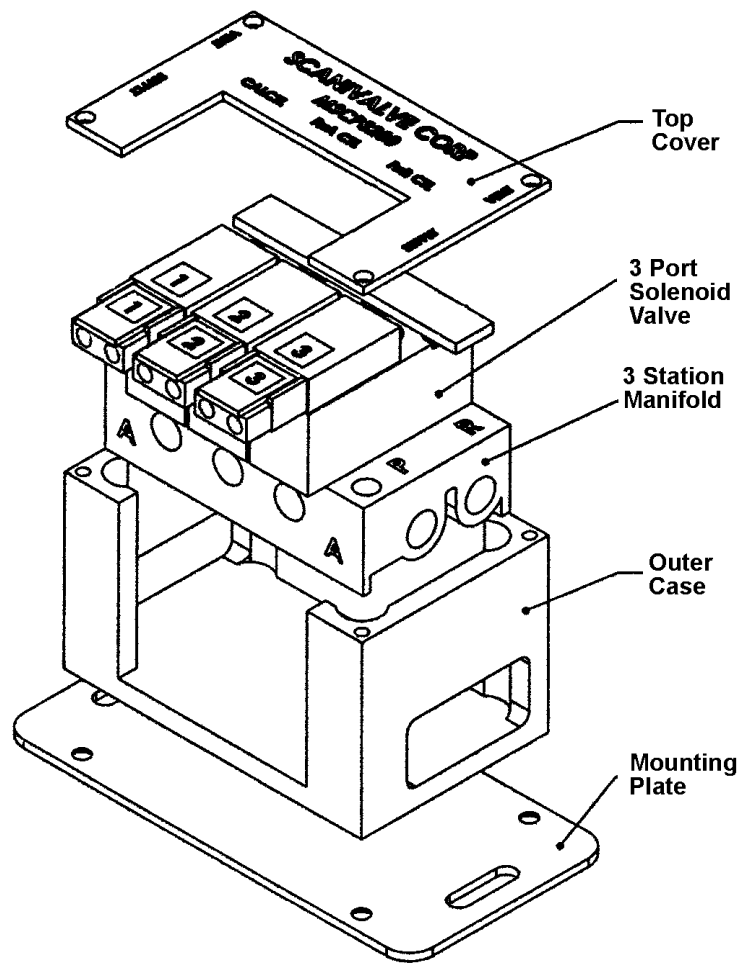


Figure 19 - MSCP3200 Exploded View

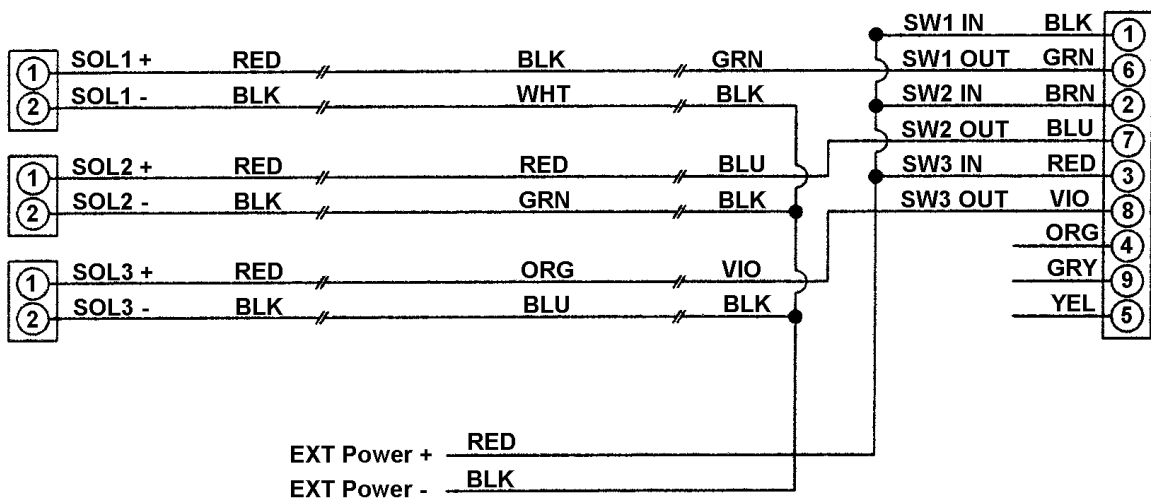
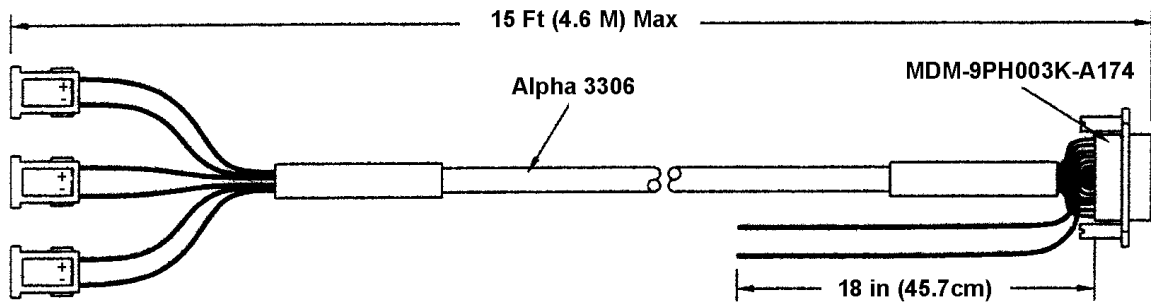


Figure 20 - Cable - RDS3200 to MSCP3200

## Ethernet Connections

The wiring of the Ethernet Straight and Cross-Wired cables is shown below for customer reference.

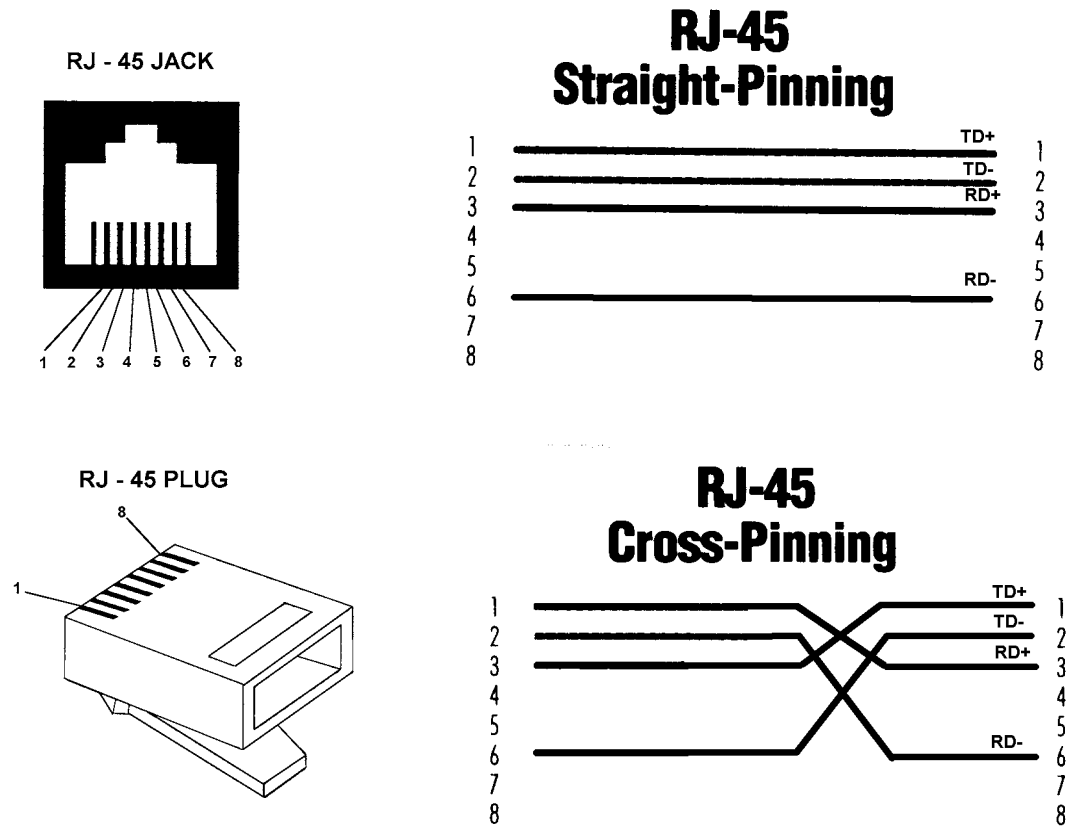


Figure 21 - RJ - 45 Plug and Jack