

**DSM 3005/ARINC
DSM 3005/ENET
DIGITAL SERVICE MODULE**

INSTRUCTION and SERVICE MANUAL

0902

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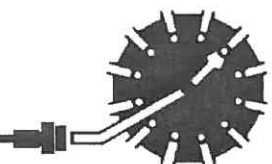
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Specifications

Module Inputs	8
Channel Inputs	512 Maximum
Interface Connectors	
ZOC Interface	Cannon MDM-15SH003K
Digital Input	PT06A-12-10S
Digital Output	PT06A-12-10P
Power Requirements	+9 to +36 Vdc
Communications Protocol	
DSM3005/ARINC	ARINC 429 and RS232
DSM3005/ENET	Ethernet 10Base-2 or 10Base-T and RS232
Typical Data Acquisition Rate	200 samples/channel/sec
Communications Configuration	
ARINC 429	
Receive	
Voltage Levels	Differential tri-state
Logic 1	+6.5Vdc to +13Vdc
Logic 0	-6.5Vdc to +13Vdc
Null	-2.5Vdc to +2.5Vdc
Channels	
CEI-400-44	2
CEI-420A-88	8
Bit Rate	100 kHz
Parity	Odd
Transmit	
Voltage Levels	Differential tri-state
Channels	
CEI-400-44	2
CEI-420A-88	8
Bit Rate	100 kHz
Parity	
Ethernet	TCP/IP 10Base-T
RS232	115200 BAUD (100, 300, 1200, 2400, 4800, 9600, 19200, 38400, or 57600) 8 data bits, 1 stop bit, no parity
Dimensions (LxWxH)	7.50in x 6.25in x 4.625in(190.5mm x 158.75mm x 117.5mm)
Weight	5.0 lbs (2.27kg)
Operating Temperature	0°C to 50°C
Storage Temperature	-40°C to 85°C
Operating and Storage Humidity	0 to 95% (non-condensing)

General Description

The DSM3005 is a stand alone Interface Module designed to permit non DSA Electronic Pressure Scanners to be utilized in an ARINC 429 or Ethernet system. Each DSM can accept up to 8 ZOC Electric Pressure Scanners, each with up to 64 inputs. The ZOC modules must have an RTD installed in order to achieve the benefits of the Digital Sensor Array Technology.

The DSM contains 9 A/D's, 8 to measure pressure inputs and one to measure temperature inputs. It also contains an imbedded computer, RAM memory, and a hard disk drive. The DSM uses Windows 95® as an operating system. Connections for a floppy drive, monitor and keyboard and mouse are available inside the DSM. A user may connect to these inputs and operate the DSM as a stand alone computer.

When a ZOC module is to be used with a DSM, it first must have an RTD installed so a three dimensional Pressure/Temperature characterization table can be generated. These coefficients can then be downloaded into the DSM and used to generate Engineering Unit data.

The DSM 3005 is designed for use in Applications such as Flight Test, Automobile Road Test or any other test that require a ruggedized unit. It has been tested for Shock and Vibration to 10g's using MIL-810D, Method 514.3. For more information or copies of test reports, please contact Scanivalve Corp, Product Support Department.

The DSM 3005/ARINC has two outputs, ARINC 429 and RS 232. The DSM 3005/ENET also has two outputs, Ethernet 10Base-2 or 10Base-T and RS232

Installation

This section will contain any special Installation and cable connections.

Getting Started

The DSM3005 is a stand alone pressure scanning system. It incorporates a microprocessor, RAM, a Hard Disk, and other interface boards to scan pressures in non DSA Electronic Pressure Scanners. These pressures are converted to Engineering Units using the same methods as the Digital Sensor Array. A user should be familiar with Windows 95 to best understand the operation of the DSM 3005.

Hardware

The DSM3005 is furnished with a set of mounting ears so the unit may be mounted in a convenient location. It is important to note that the DSM3005 has a Solid State hard disk drive built into the module. This drive is a non rotating disk drive designed for rough service. If the DSM3005 could be subjected to shock and vibration levels above 10 g's, shock mounts **MUST** be used. It is recommended that the DSM be shock mounted no matter what vibration levels are expected. Figure 1 shows the mounting dimensions and details. Dimensions in parentheses are centimeters.

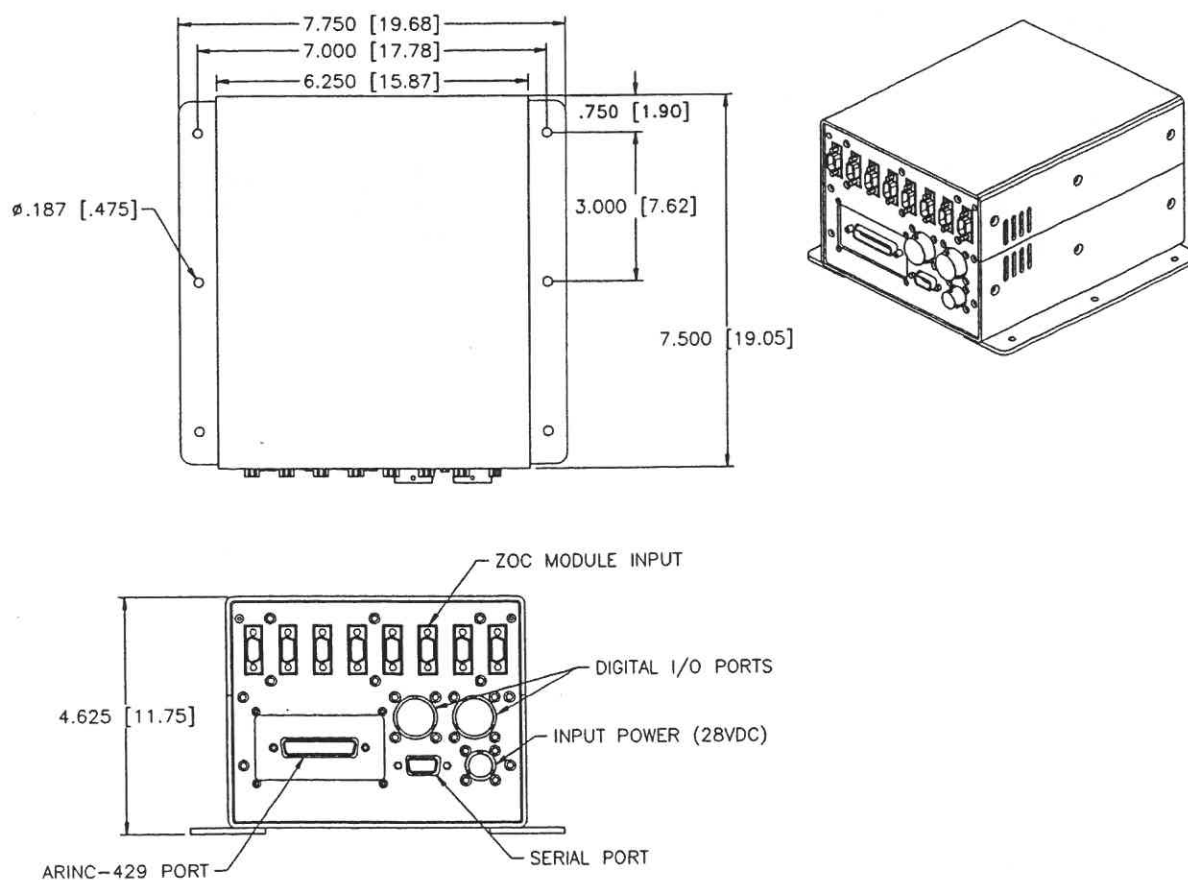


Figure 1 - DSM Physical Measurements and Mounting Dimensions

Power Requirements

The DSM 3005 may be operated on DC voltages from +12 to +32 Volts. This supply should be a regulated power supply, but it does not need to be "Instrumentation Grade". Power connections are made through the PT02A-10-6P input. A mating connector, PT06A-10-6S-SR, is furnished with the DSM3005. The wiring of the power input is shown in Figure 2.

It is very important to insure that the cooling fan is operating whenever power is applied to the DSM. If the cooling fan is not functioning, the DSM **MUST** be shut down as soon as possible. The processor will overheat and could be damaged if cooling air flow is lost.

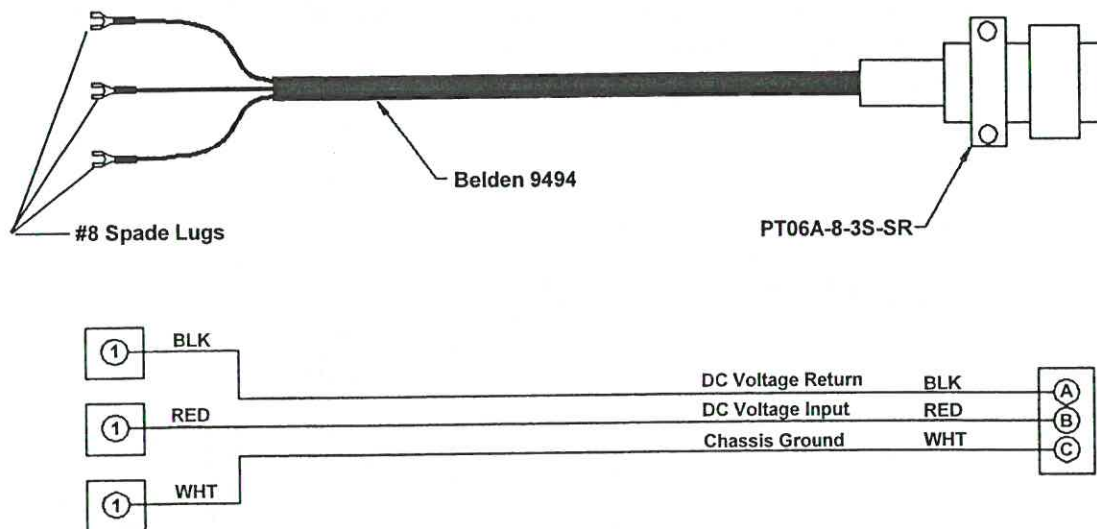


Figure 2 - Power Input Wiring

ARINC 429 Connections

DSM3005 modules configured for ARINC429 may have a 2 channel or 8 channel ARINC card installed. The 2 channel card is a Condor Engineering part number CEI-400-44. The 8 channel card is a Condor Engineering part number CEI-420A-88

CEI-400-44

A DSM 3005/ARINC with the CEI-400-44 ARINC card has one ARINC 429 connection. It has two channels each of which can be programmed to output different scan groups. ARINC data can only be output in Engineering Units. The ARINC card will not output Raw A/D counts. The wiring is shown in Figure 3.

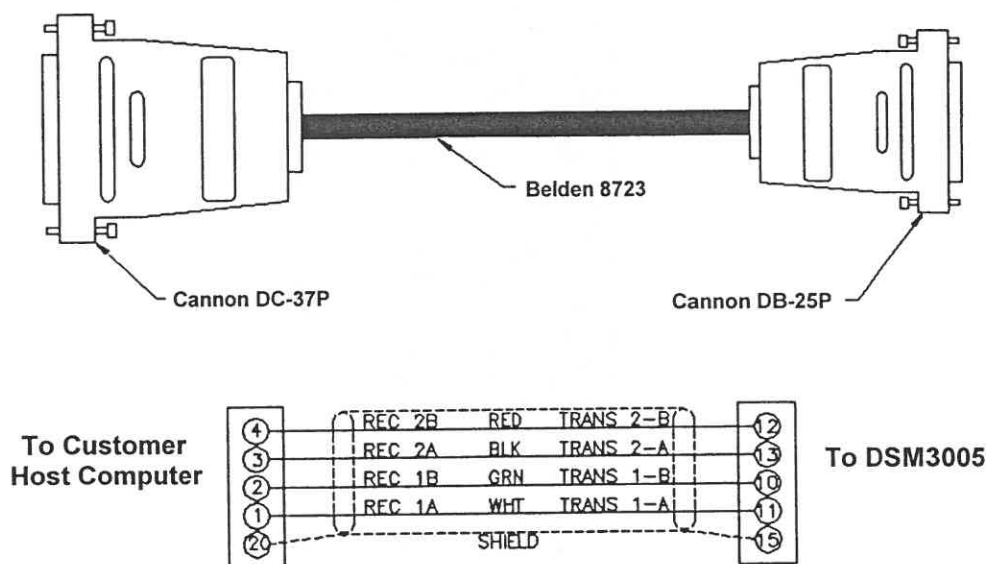


Figure 3 - 2 channel ARINC 429 Cable and Pinouts

CEI-420A-88

A DSM 3005/ARINC with the CEI-420A-88 ARINC card has one ARINC 429 connection. It has eight channels each of which can be programmed to output different scan groups. ARINC data can only be output in Engineering Units. The ARINC card will not output Raw A/D counts. The wiring is shown in Figure 4.

DB-25P

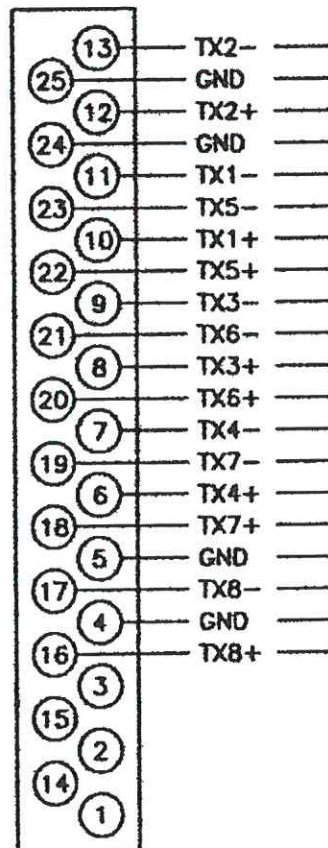


Figure 4 - 8 Channel ARINC output pinouts

Ethernet Connections

The DSM3005/ENET has two Ethernet connections, 10Base-2 and 10Base-T. The Ethernet Adapter Module is a PCM-3660 PC 104 Module. It provides two Ethernet connections: a BNC for a 10Base-2 connection, and a RJ45 for a 10Base-T connection. The software will auto detect the active connection and disable the other. All connections must conform to IEEE802.3. The DSM3005/ENET Ethernet is 100% Novell NE2000 compatible.

For more information refer to the DSA 3000 Software Requirements Specification.

The RJ-45 jack is shown below for customer reference. It is recommended that Category 5 cables be used. A cable with straight-pinning should be used when the DSM will be connected to a hub. The cross-pinning cable should be used when the DSM is connected directly to a host computer.

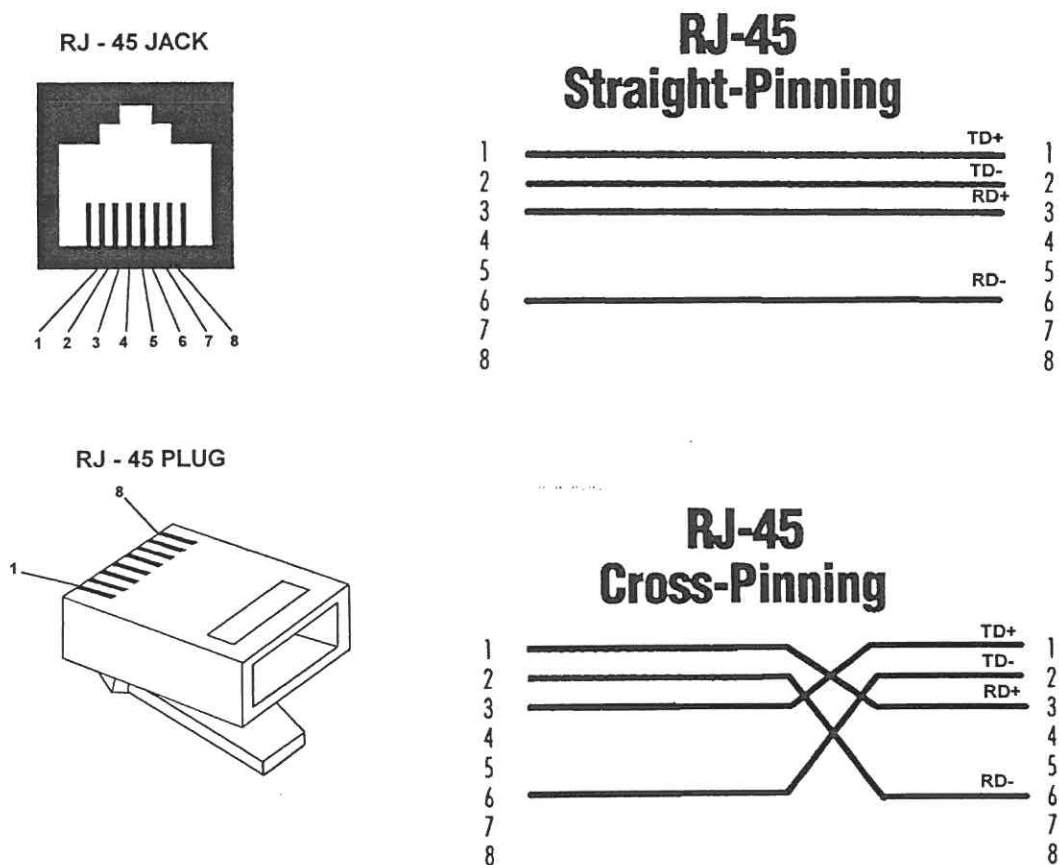


Figure 5 - RJ - 45 Plug and Jack

Serial Connection

Each DSM 3005 has one Serial connection. This connection conforms to the RS232C standard. The connector wiring is shown in Figure 6 below.

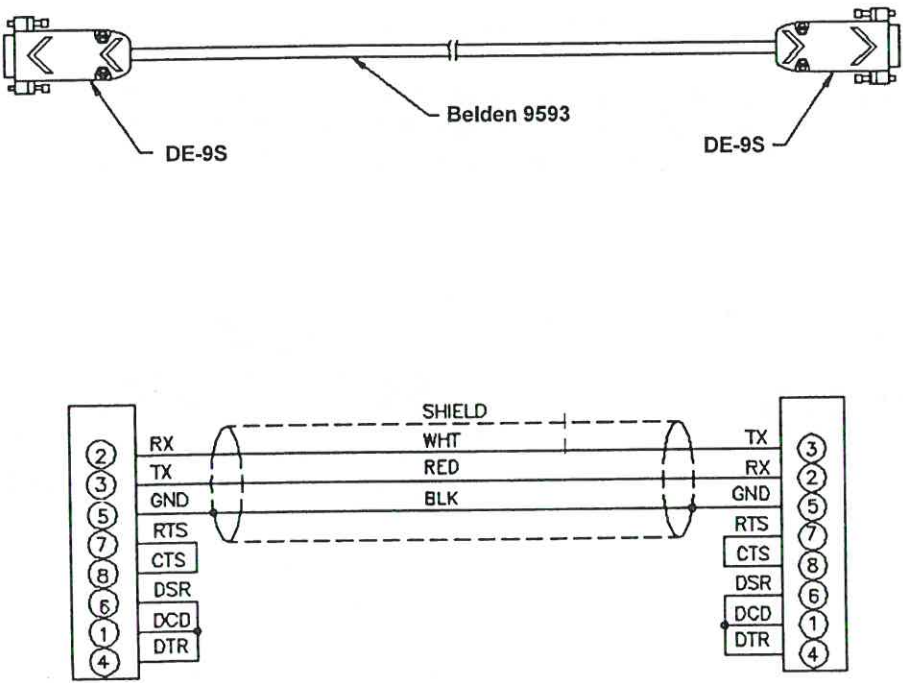


Figure 6 - RS232C Wiring

Digital I/O Connections

Each DSM has a Digital Input and a Digital Output connector. A maximum of Five(5) Digital Inputs and/or Five(5) Digital Outputs may be configure. Configuration information may be found in the Software Specification

Digital Inputs are edge triggered. The input pulse should have a minimum voltage of 5 Vdc and a maximum voltage of 15 Vdc.

Digital Outputs are 28 Vdc @ 500 mA maximum.

Figure 6 shows the wiring of the Digital Inputs, Figure 7 shows the wiring of the Digital Outputs.

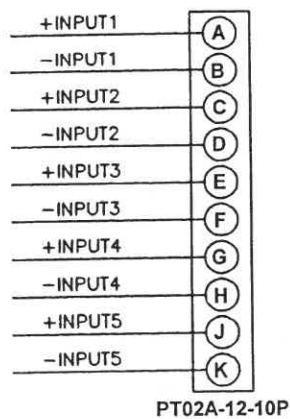


Figure 7 - Digital Input Wiring

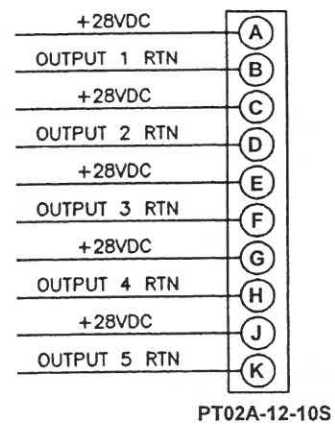


Figure 8 - Digital Output Wiring

ZOC Input Connections

Each DSM is designed to accept inputs from up to 8 ZOC 14, 17, 22, or 33 modules or any combination. Each ZOC module may have up to 64 Pressure inputs. The DSM can scan each module at different rates and does not have to scan all channels in each module. The ZOC modules must have an RTD installed so the DSM can measure the temperature of the module. The input connectors are Cannon MDM-15SH003K. Figure 9 shows the typical input wiring for a ZOC module. Figure 9 shows the typical wiring for a ZOC module installed in a Thermal Control Unit.

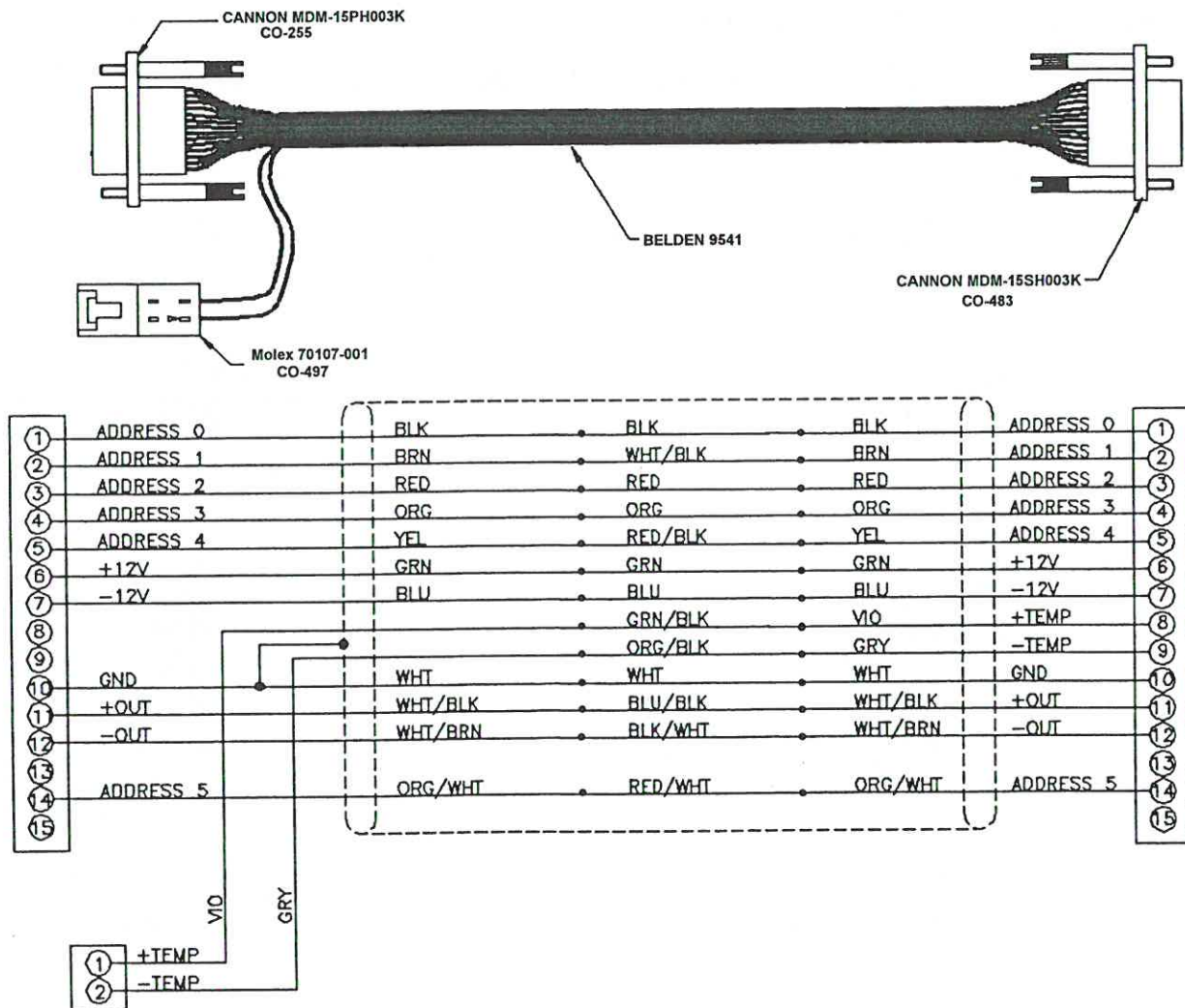


Figure 9 - Typical Input Wiring - ZOC module to DSM

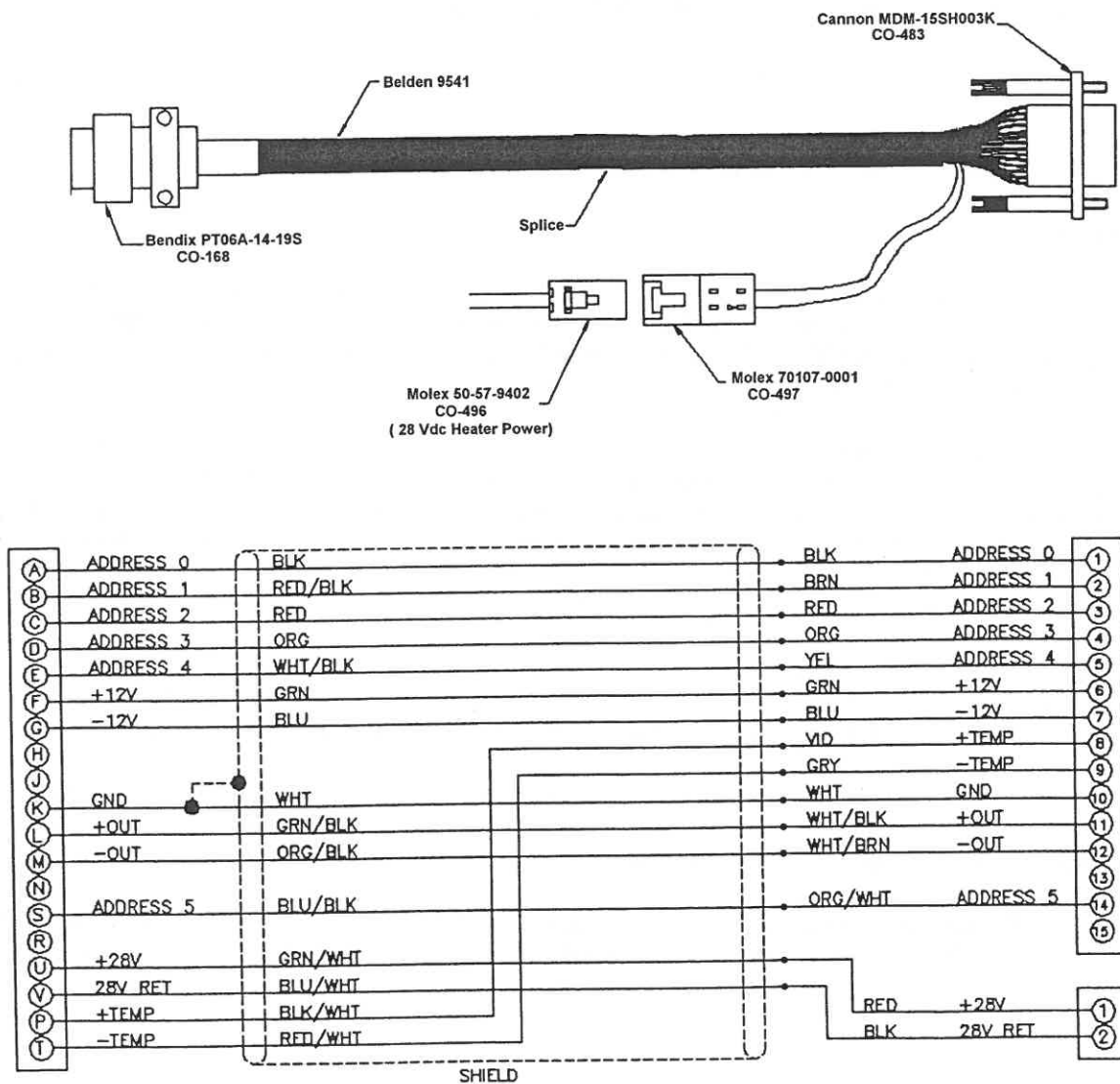


Figure 10 - Typical Wiring - ZOC module in a TCU to a DSM

Software

When the DSM is mounted and the power requirements are met, the unit is ready to be configured for use. All configuration variables must be set using a communications program or by using the DSM3001 as a stand alone computer. A user may remove the top cover and connect a keyboard, a floppy disk drive, and a monitor to the DSM3005 and use it as a computer. The DSM uses Windows 95 as an operating system.

A user may connect another computer to the DSM and communicate by one of the following protocols and associated programs:

ARINC 429

PC429 Card Control Panel Software written by Pacific Avionics

Ethernet

TelNet - A program furnished with Windows 95, 98 and NT. This permits a network connection to a unit with TCP/IP capabilities. A TelNet session is the simplest method of communication with a DSM/DSMENCL/SPCENCL. All DSM commands may be entered by this method. A TelNet session is described later in this manual

DSMLinkC - A program written in Visual Basic by Scanivalve Corp for Ethernet communication. This program allows a user to communicate with most units of the DSM family. It permits a user to set up a DSM and even collect data. It contains software for on line calibrations when a DSM is used with an SPC3000. It will not operate with a unit configured for ARINC 429 or Serial communications only. It operates in Windows 95, Windows 98, or Windows NT. The installation, setup, and operation of this program is described in a separate manual.

DSM LabView VI - A driver written by Scanivalve Corp for use with LabView versions 4.0.1 and higher. This program provides basic communications only. Communications must be Ethernet. The installation, setup, and operation of this program is described in a separate manual.

DSM LabWindows CVI - A program written by Scanivalve Corp. This may be used as a stand alone program or as part of a LabView program. It provides basic communications only. The installation, setup, and operation of this program is described in a separate manual.

DSM HPVee - A program written by Scanivalve Corp for use with HPVee. It provides basic communications only. The installation, setup, and operation of this program is described in a separate manual.

RS232

HyperTerminal - A serial terminal program furnished with Windows 95.

Other commercially available programs such as LapLink may be used to load configuration files to the DSM.

Operation

This section contains information and procedures required for the proper operation of the DSM 3000 series modules.

The DSM 3000 series modules are a stand alone data system. They use Windows 95 as an operating system. When power is first applied, a DSM will self boot and execute a program named: **DSM.EXE**. The entire boot up process requires approximately 2-3 minutes. When the DSM is ready to accept commands a prompt symbol will be transmitted to the host computer.

Operation of the DSM may be monitored or controlled by connecting a computer to the Ethernet connection, the RS232 port or by removing the top cover and connecting a monitor and keyboard to the processor board.

Modules

The DSM will support any existing ZOC Module. The ZOC modules must have an added RTD so the DSM can properly determine the temperature plane to be used. The modified modules use a slightly different input cable. This cable has wiring for the RTD. Modules should only be connected and disconnected with power removed from the DSM. After the modules are connected, power may be applied. Configuration of the DSM may be checked during warm up. At this time, if calibration coefficients have been installed, it is very important to verify that the modules are connected to the proper inputs. Otherwise, data may be invalid.

RS232 Communications

Any RS232 Communications program such as: Windows Terminal, HyperTerminal, or Procomm may be used to communicate with the DSM. The host computer should be set up for 9600 BAUD, 8 data bits, 1 stop bit, and no parity. A wiring diagram is shown in figure 4.

Local Connections

The DSM may be operated in the local mode by removing the top cover(or access plate in models equipped with that feature) and connecting a monitor, keyboard, and mouse(COM1) to the connection points provided on the processor board. Refer to figure 14 for more information.

In the Local Mode, the DSM operates as a stand alone computer.

Ethernet Connections

Some DSM's are equipped with Ethernet cards. These modules have both 10Base-2 and 10Base-T connections. The modules auto detect the connection. No variables need to be modified to use either connection.

TelNet Host Operation

A host computer may be used to control the DSM without special software. The host must be operating in Windows 95. The host to DSM 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: 191.30.5.xxx

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 address of the DSM 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

HyperTerminal Serial 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 Direct to COM2 (this is an example, the actual port to be used should be selected)

A COM Properties window will open

Enter the BAUD rate to be used. This must match the BAUD rate set in the DSM.

8 Data Bits

No Parity

No Flow Control

Click OK

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

Configuration Variables

The DSM contains many configuration variables which must be set up properly in order for the DSM to function correctly. These variables are arranged in groups to aid the user in the setup of the DSM. 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 DSM. 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 DSM Software Requirements Specification before attempting to set up a DSM.

The DSM Configuration Variables are set up to default settings that will generally permit the user to communicate using RS232. If communications cannot be established, then the setup will have to be started in the local mode. This requires a keyboard, monitor(VGA or better), and a mouse. Refer to figure 13 for more information on connecting these devices.

Please refer to the DSM 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. A List I command to the DSM will result in the following:

```
List I
SET NL 0
SET DISPIN 0
SET HAVESER 2 9600
SET HAVENET 0
SET HAVEARINC 0
SET CONOUT 2
SET SEROUT 2
SET NETOUT 2
SET ARINC1OUT 0
SET ARINC2OUT 0
SET FORMAT 0
SET SERIN 1
SET NETIN 0
SET DSA1 0 115200
SET DSA2 0 115200
SET IFUSER 1
SET ECHO 1
SET ARINC1SCALE 20
SET ARINC2SCALE 20
```

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

Each module connected to a DSM must be defined and enabled. Definition of the module includes setting the number of ports, the full scale values and the number of negative points in the module calibration. A multi range module must have each group of ports defined. The high and low pressure units should be set no more than 20% over the actual range to permit some overpressure indication. A list MI command must be entered for each module. 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:

```
LIST mi 1
SET TYPE1 0
SET ENABLE1 1
SET SN1 0000
SET NUMPORTS1 32
SET LPRESS1 1..32 -18.0
SET HPRESS1 1..32 18.0
SET NEGPTS1 1..32 4
```

```
LIST mi 2
SET TYPE2 0
SET ENABLE2 1
SET SN2 0000
SET NUMPORTS2 32
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:

```
LIST mi 3
SET TYPE3 0
SET ENABLE3 1
SET SN3 0000
SET NUMPORTS3 64
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
```

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:

```
List c
SET ZC 0
SET UNITSCAN PSI
SET CVTUNIT 1.000000
SET BIN 0
SET EU 0
SET CALZDLY 15
```

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:

```
List s
SET PERIOD 500
SET ADTRIG 0
SET SCANTRIG 0
SET PAGE 0
SET QPKTS 0
SET SIMMODE 0
```

Digital I/O Variables - List d

This group sets up the Digital Inputs and Outputs. If functions such as Scan, Purge and Calibrate Zero are to be controlled externally, the applicable variable must be set correctly. The defaults follow:

```
List d
SET DOUTPU 0
SET DOUTCALZ 0
SET DOUTPGSEQ 0
SET DOUTPG 0
SET DINCALZ 0
SET DINSCAN 0
SET DINPG 0
SET DLYPGSEQ 1
SET DLYPG 10
```

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

Each DSM 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 DSM 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
```

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.

```
List o
SET TEMPB0 -43.5028
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
```

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.

List g

```
SET TEMPM0 0.0730
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
```

Interface Programs

Scanivalve Corp has written two programs to assist a user with DSM-Host communication. These programs are only compatible with the DSM3005/ENET. One, **DSMLinkC**, has been written in Visual Basic for operation in a Windows 95/98/NT environment. The other, **DSM LabView VI**, is a driver for LabView. It also is written for operation in a Windows 95/NT environment. For more information contact Scanivalve Corp, Sales and Marketing.

Digital I/O Control

A DSM has five(5) Digital Inputs and five(5) Digital Outputs that may be configured to operate, control, or monitor certain external functions. Some of the more common uses are documented in this section.

Initiate CALZ

A Digital Input may be configured to initiate a **CALZ**. The input must transition from a logic zero to a logic one to be valid.

Three possible actions may occur.

1. If the DSM is in the **READY** mode: A **CALZ** will be initiated.
2. If the DSM is in the **SCAN** mode: The **SCAN** will be suspended. A **CALZ** will be initiated, **SCAN** will continue when the **CALZ** is complete
3. If the DSM is in any other mode: Nothing will occur.

SCAN Start/Stop

A Digital Input may be configured to initiate or terminate a **SCAN**. The input must transition from a logic zero to a logic one to be valid.

Three possible actions may occur.

1. If the DSM is in the **READY** mode: A **SCAN** will be initiated.
2. If the DSM is in the **SCAN** mode: The **SCAN** will be terminated.
3. If the DSM is in any other mode: Nothing will occur.

Purge Sequence Control

A Digital Input may be configured to initiate a Purge Sequence. The input must transition from a logic zero to a logic one to be valid.

The Purge Sequence may be initiated in two ways:

1. Issue the **PURGE** command when the DSM is in **READY** mode
2. Apply a signal, to the digital input assigned to purge, when the DSM is in **READY** or **SCAN** mode.

Purge Command

The following is the sequence for a purge operation when **PURGE** is initiated by the Purge command:

1. The DSM receives the Purge command and is in the **READY** mode.
2. The digital output are set according to the **DOUTPGSEQ** configuration variable.
3. These output remain set until **DLYPGSEQ**, configurable from 0 to 5 seconds, times out. If 0 is set, No Delay occurs. Default is 1 second.
4. The digital output are set according to **DOUTPG** configuration variable.
5. These output remain set until **DLYPG**, configurable from 0 to 3600 seconds, times out or a **STOP** command is issued. When 0 is set, the delay is infinite. A **STOP** command must be used to terminate the Purge Sequence when delay is set to 0. Default is 10 seconds.
6. When the Purge Sequence is complete, the digital output are set according to the **DOUTPGSEQ** configuration variable.
7. These output remain set for the delay set in **DLYPGSEQ**.
8. When **DLYPGSEQ** times out the DSM returns to the **READY** mode.

Purge Digital I/O

The following is the sequence for a Purge operation when initiated by the purge digital input, as assigned by the **DINPG** configuration variable:

1. The purge signal is received by the DSM. If the DSM is in the **READY** mode, the Purge Sequence will be initiated. If the DSM is in the **SCAN** mode, the **SCAN** function is suspended for the duration of the purge sequence.
2. The digital output are set according to the **DOUTPGSEQ** configuration variable.
3. These output remain set until **DLYPGSEQ**, configurable from 0 to 5 seconds, times out. If 0 is set, no delay occurs. Default is 1 second.
4. The digital output are set according to **DOUTPG** configuration variable.
5. These output remain set until **DLYPG**, configurable from 0 to 3600 seconds, times out or a **STOP** command is issued. When 0 is set, the Delay is infinite. A **STOP** command must be used to terminate the Purge Sequence when delay is set to 0. Default is 10 seconds.
6. When the Purge Sequence is complete, the digital output are set according to the **DOUTPGSEQ** configuration variable.
7. These output remain set for the delay set in **DLYPGSEQ**.
8. When **DLYPGSEQ** times out, the DSM returns to the mode it was in when the digital signal was received. If the DSM initiated the Purge Sequence from the **READY** mode, it will return to the **READY** mode. If the DSM initiated the Purge Sequence from the **SCAN** mode, the **SCAN** function will be resumed.

Maintenance

The DSM3005 is built from subassemblies. Many of these subassemblies are shared with other variations of the DSM family. All of the subassemblies are field replaceable. This section will describe each of the subassemblies.

The major subassemblies are:

- DSM Processor Board
- ZOC Module Interface Board
- A/D Boards
- ARINC 429 Interface Board
- Digital I/O Board
- I/O Connector Board
- Power Supply
- Hard Disk Drive
- Cooling Fan

Figure 11 is an exploded view of the DSM3005. Each of the major subassemblies is identified

Figure 12 shows the Internal Cable Connections of the DSM 3005.

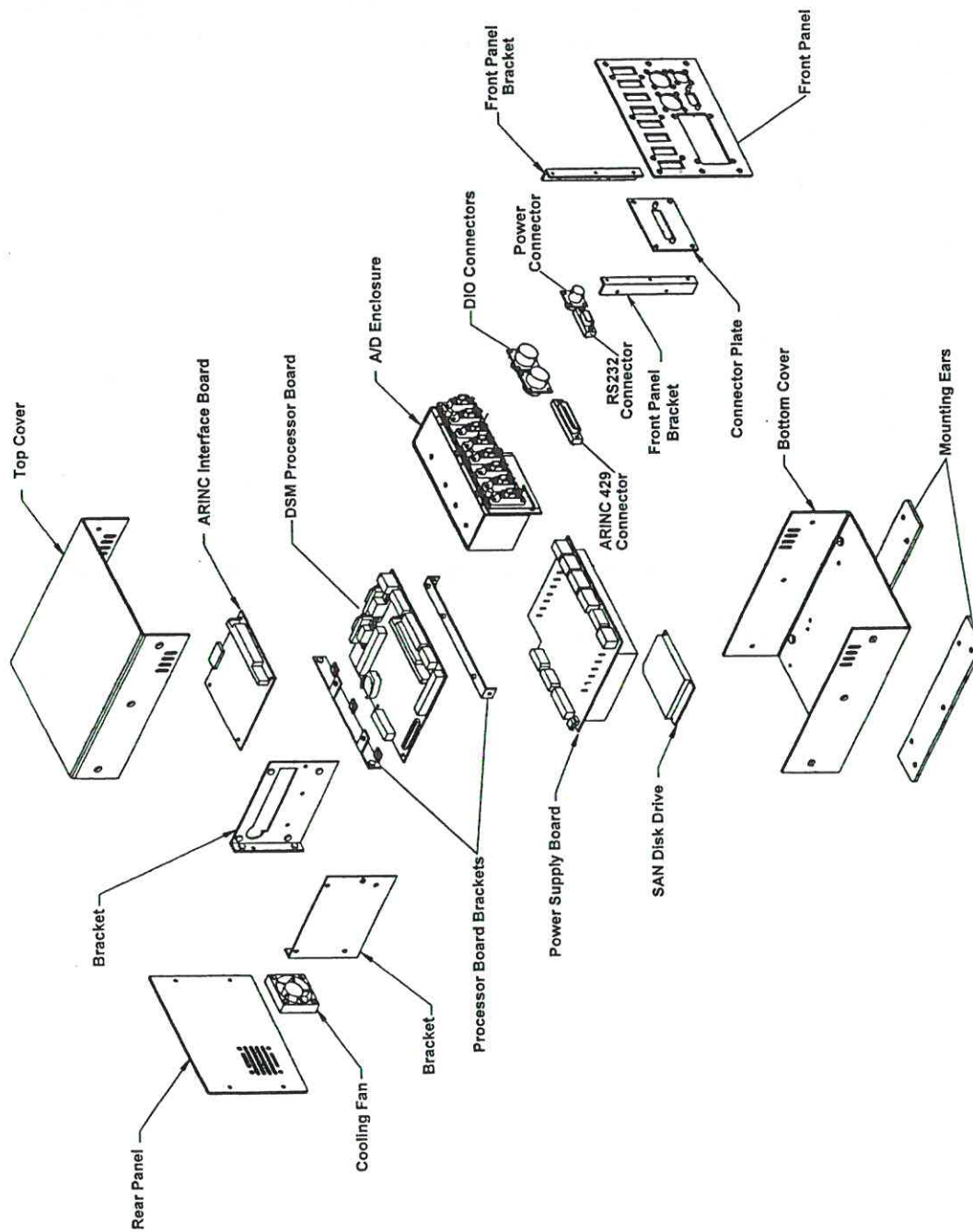


Figure 11 - DSM 3005/ARINC Exploded View

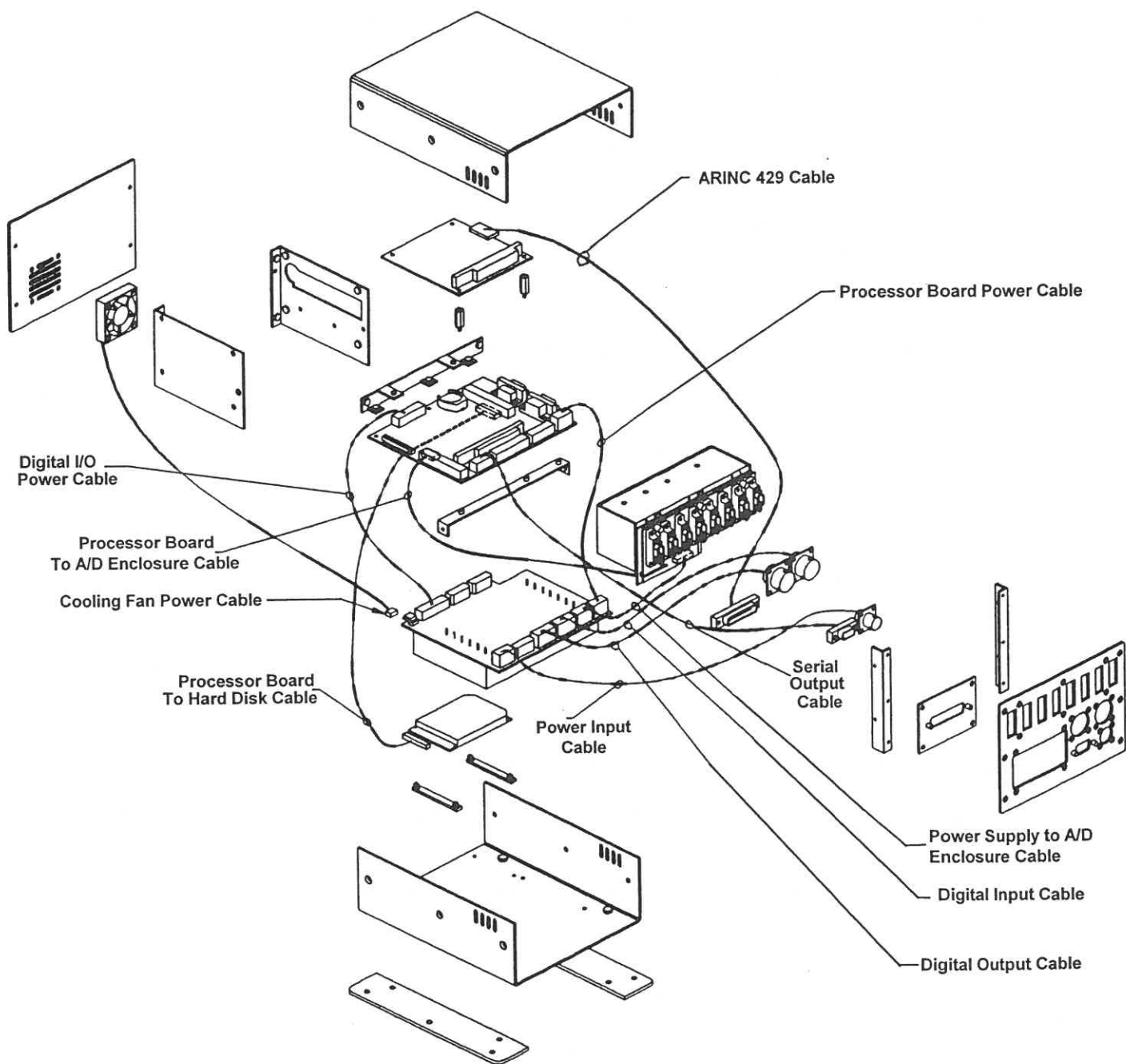


Figure 12 - DSM 3005/ARINC Internal Cable Connections

DSM Processor Board

All variations of the DSM 3000 series modules are stand alone computers. The heart of the system is a Cardio microprocessor. The supporting chip set is a Falconer chip set designed for mobile computing and compatible with both the Intel486™ and AMD Am486DX5 for embedded applications. The processor board contains all of the connections required for the DSAENCL 3000 to operate in a stand alone mode.

The processor board contains the following blocks:

CPU

Intel 486DX4-75MHz (All units shipped prior to August 15, 1999)

Am486DX5-133MHz (All units shipped after August 15, 1999)

I/O Block

Interrupt Controller

DMA Controller

Parallel I/O port

Serial I/O ports

Real Time Clock

IDE Interface - Support for large capacity IDE HDD(up to 8.4 gB)

FDD Interface (up to 2 drives)

Memory Block

DRAM (8MB)

Flash ROM (256kB) - for BIOS

Keyboard Interface

PS2 style keyboard

PS2 Mouse

Video Block

CRT (800 x 600)

STN mono/color (640 x 480)

TFT color (640 x 480)

Figure 13 shows the Installation and Replacement of the Cardio Processor.

A block diagram of the processor board is shown in Figure 14

Figures 15 and 16 show the layout of the processor board with all of the major blocks and connection points identified,

Figures 17 through 25 show the schematic diagram of the processor board.

The processor board has two switches.

S1 is the processor reset switch. Refer to figure 14 for the location of this switch.

S2 is an eight position DIP switch. It is used to set the IRQ and the base address of the A/D Interface.

Refer to figure 14 for the location of this switch. Tables 1, 2, and 3 document the switch settings.

DSM Processor Board DIP Switch(S2) Settings

0 = Closed (on) 1 = Open (Off)

Default Settings in Bold

Table 1 - A/D IRQ Selection

IRQ	SW2-1	SW2-2	SW2-3
15	0	0	0
12	0	0	1
11	0	1	0
10	0	1	1
9	1	0	0
7	1	0	1
5	1	1	0
3	1	1	1

Table 2 - A/D Base Address Selection (Port I/O)

Base Address	SW2-4	SW2-5	SW2-6	SW2-7	SW2-8
200	0	0	0	0	0
220	0	0	0	1	0
240	0	0	1	0	0
260	0	0	1	1	0
280	0	1	0	0	0
2A0	0	1	0	1	0
2C0	0	1	1	0	0
2E0	0	0	1	1	0
300	1	0	0	0	0
320	1	0	0	1	0
340	1	0	1	0	0
360	1	0	1	1	0
380	1	1	0	0	0
3A0	1	1	0	1	0
3C0	1	1	1	0	0
3E0	1	1	1	1	0

Table 3 - A/D Base Address Selection (Memory Mapped)

Base Address	SW2-4	SW2-5	SW2-6	SW2-7	SW2-8
C000	0	0	0	0	1
D000	0	1	0	0	1
E000	1	0	0	0	1
F000	1	1	0	0	1

Cardio Processor Replacement Procedure

Although the Cardio Processor should not require replacement during normal use, It is possible that the processor could be upgraded as faster and more powerful processors are available in this package.

NOTE: It is important that anyone changing a Cardio Processor carefully observe proper ESD practices. Failure to do this may result in damage to the Processor and/or the DSM.

Procedure

Reference Figures 11 and 13

1. Remove power from the DSM.
2. Disconnect all ZOC module inputs.
3. Place the DSM on a solid surface with the Front Panel to the left.
4. Remove the Top Cover.
5. Disconnect all cables from the Processor Board
6. Remove the three leftmost screws that secure the Fan Bracket.
7. Remove the screws that secure the Lower Processor Bracket to the Side Brackets.
8. Lift the Fan Bracket and Processor Board from the DSM.
9. Disconnect the Upper Processor Board Bracket from the Fan Bracket.
10. The Cardio is installed on the bottom side of the Processor Board. Remove the 2 mm nuts that secure the retainer and lift the retainer off. Be careful to not lose the rubber pieces that secure the Cardio.
11. Remove the Cardio by pulling it straight out..
12. Install the replacement by inserting it straight into the power connector.
13. Replace the rubber bumpers, the retainers and the 2 mm nuts.
14. Reconnect the Upper Bracket to the Fan Bracket and reinstall it into the DSM.
15. Reinstall the Lower Bracket to the Side Brackets.
16. Reconnect all cables to the Processor Board.
17. Replace the Top Cover.
18. Reconnect the ZOC Modules and the Power inputs.
19. Restart the DSM. The new processor will have to have its CMOS set up.

For more information or assistance, Contact:

Scanivalve Corp
Product Support Department
1722 Madson Street
Liberty Lake, Washington 99019
(800) 935-5151 or (509) 891-9970
FAX (509) 891-9481

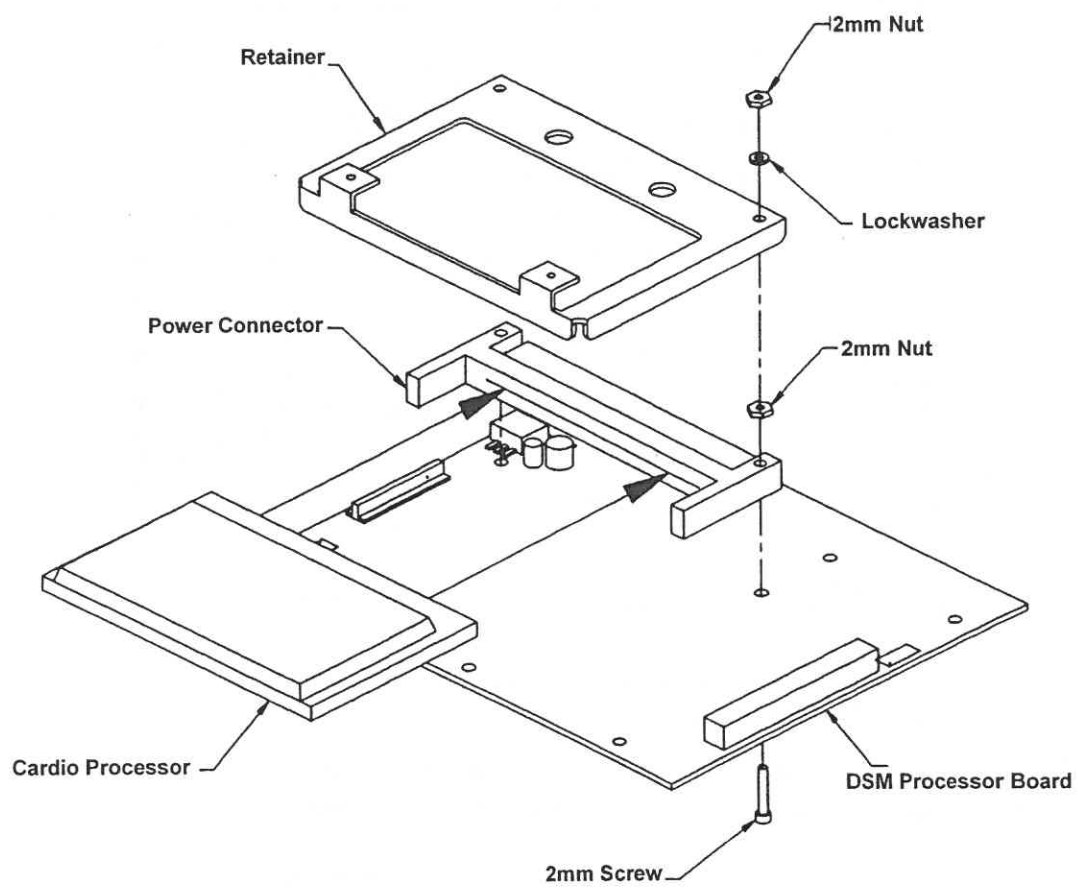


Figure 13 - Cardio Processor Replacement

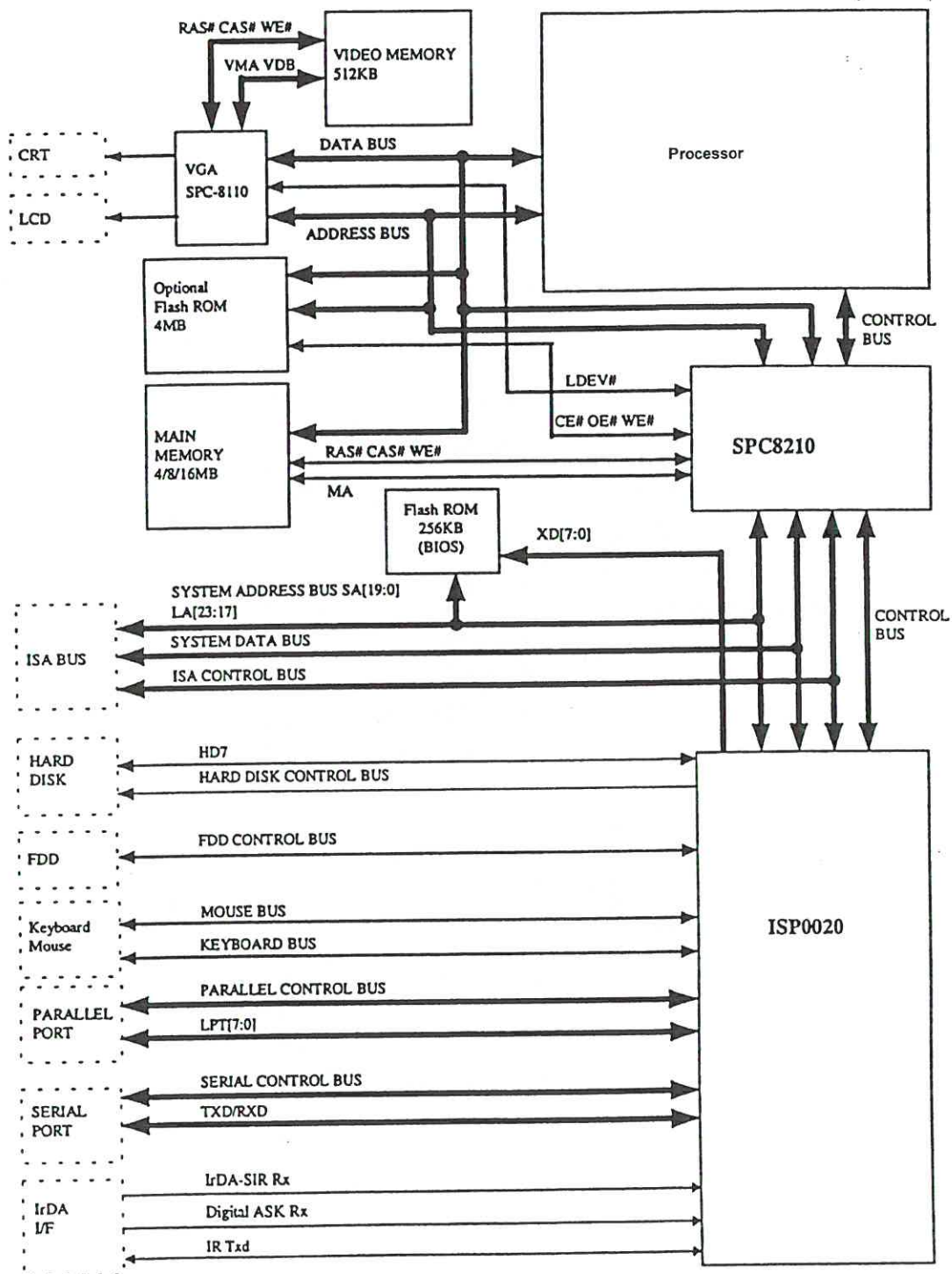


Figure 14 - DSM Processor Board Block Diagram

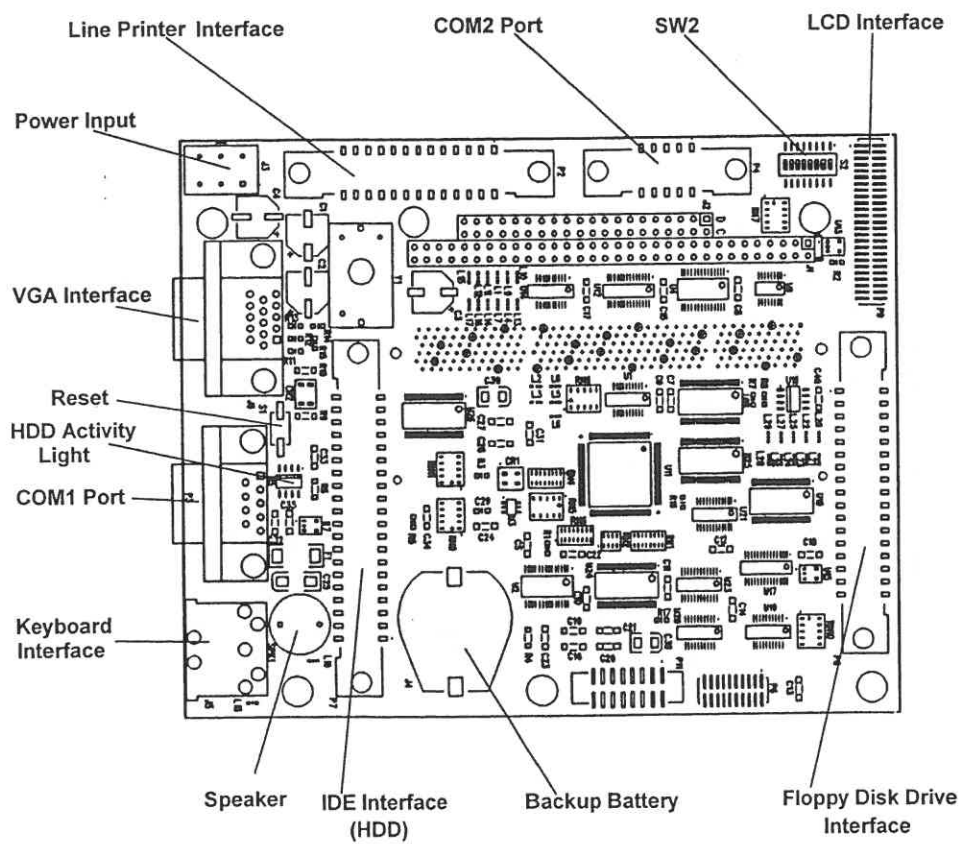


Figure 15 - DSM Processor Board Top View

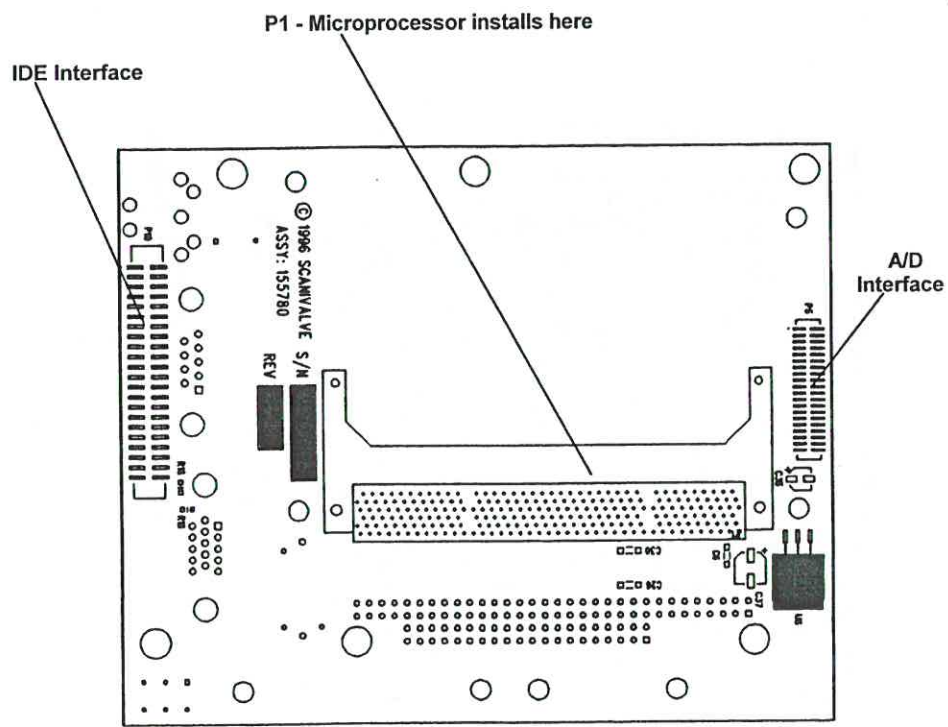


Figure 16 - DSM Processor Board Bottom View

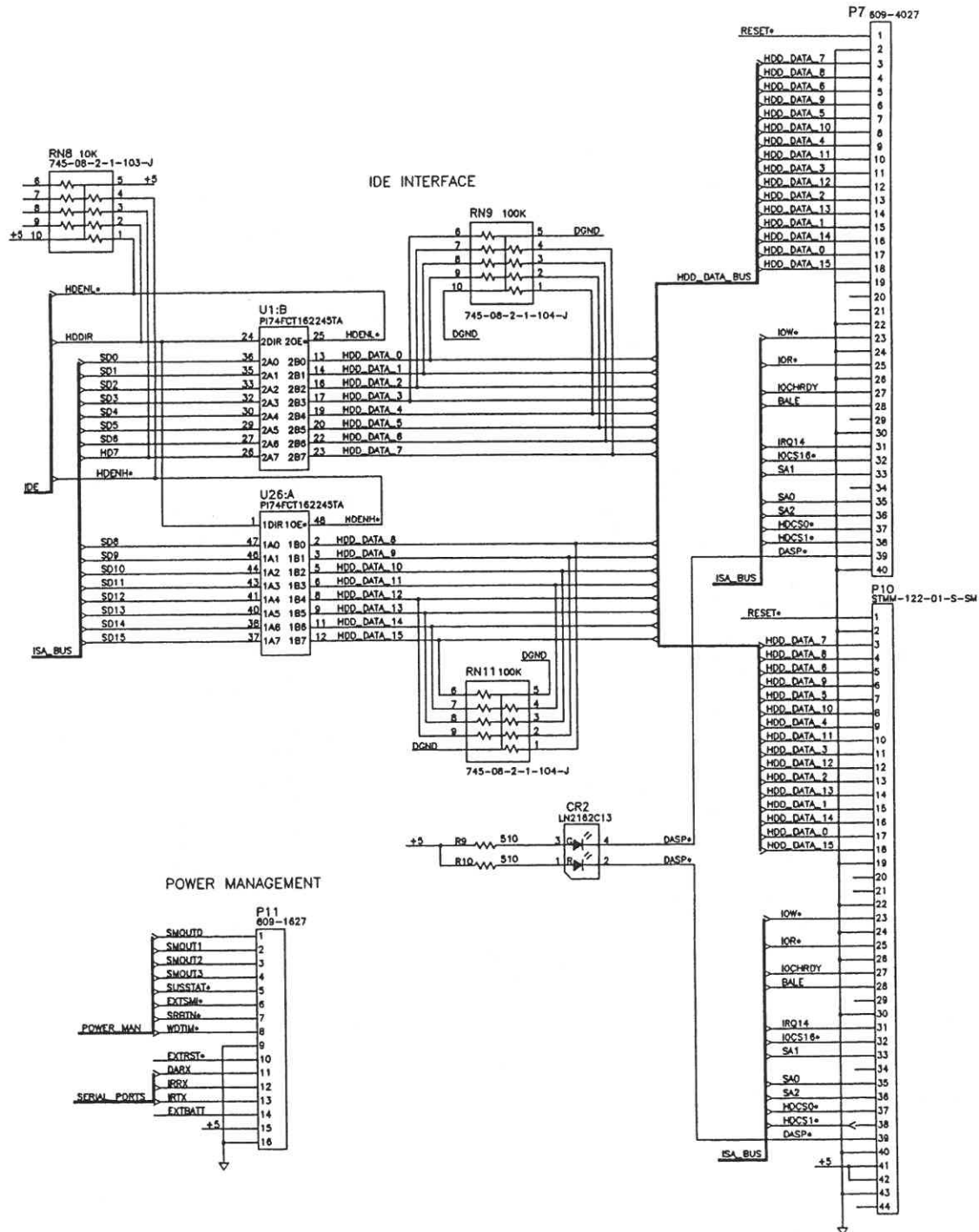


Figure 17 - DSM Processor Board - IDE Controller

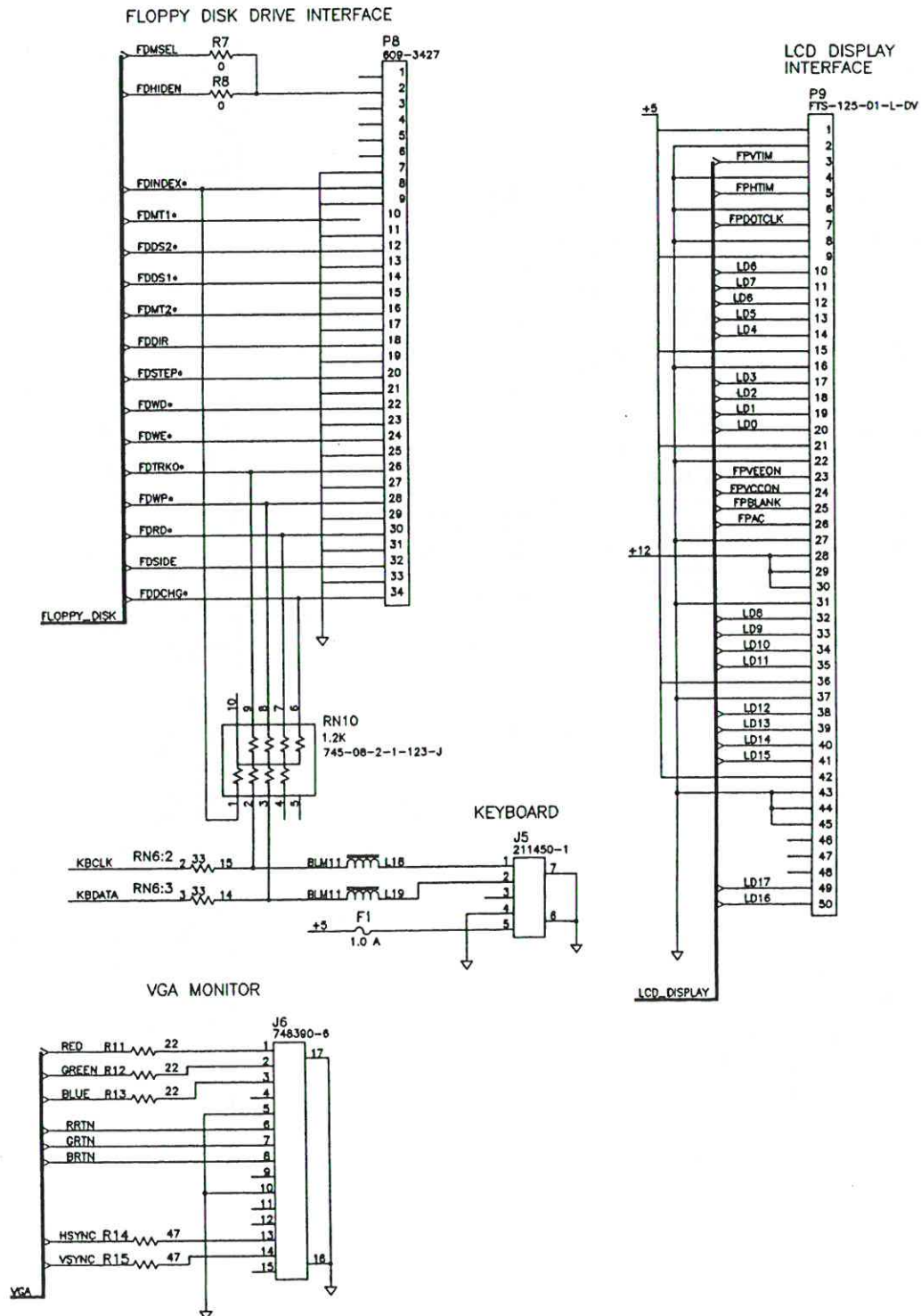


Figure 18 - DSM Processor Board - Floppy Disk IF, LCD IF, VGA Output

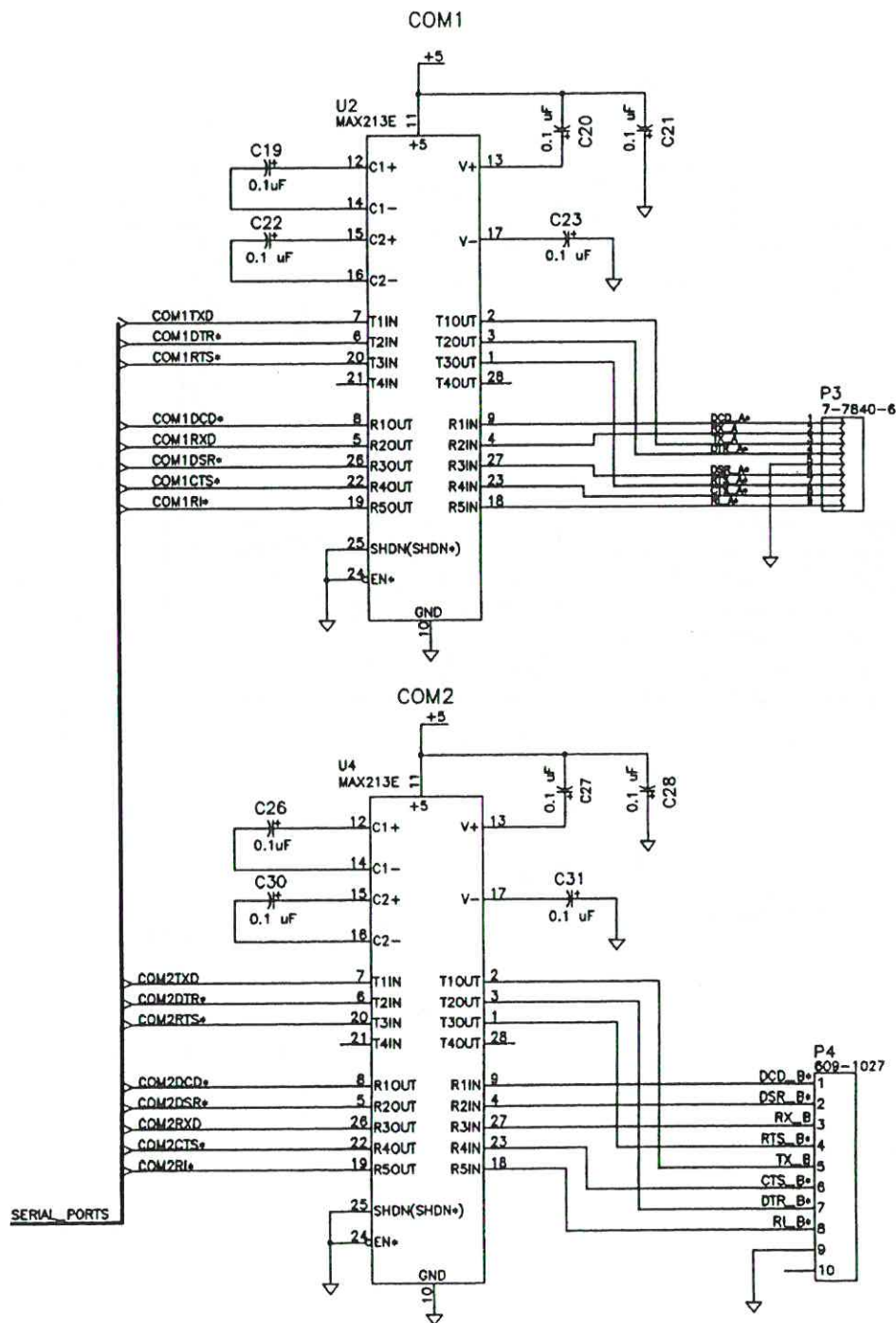


Figure 20 - DSM Processor Board - COM Ports

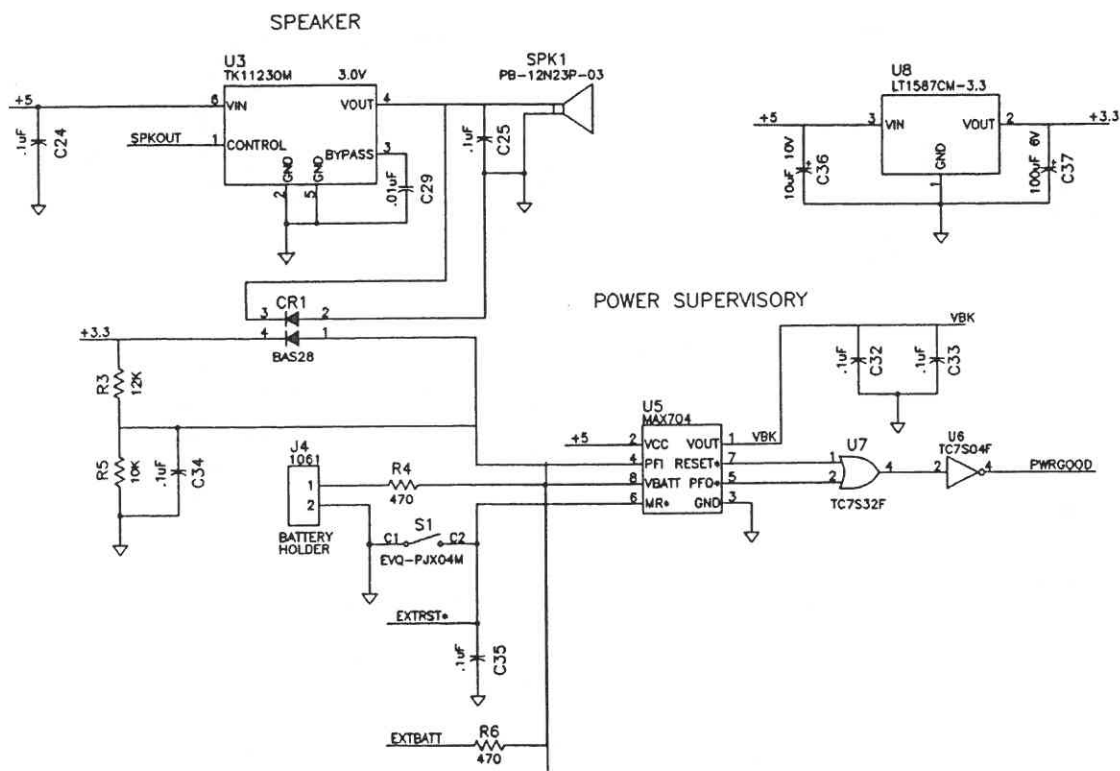


Figure 21- DSM Processor Board - Speaker, Backup Battery, and Reset Switch

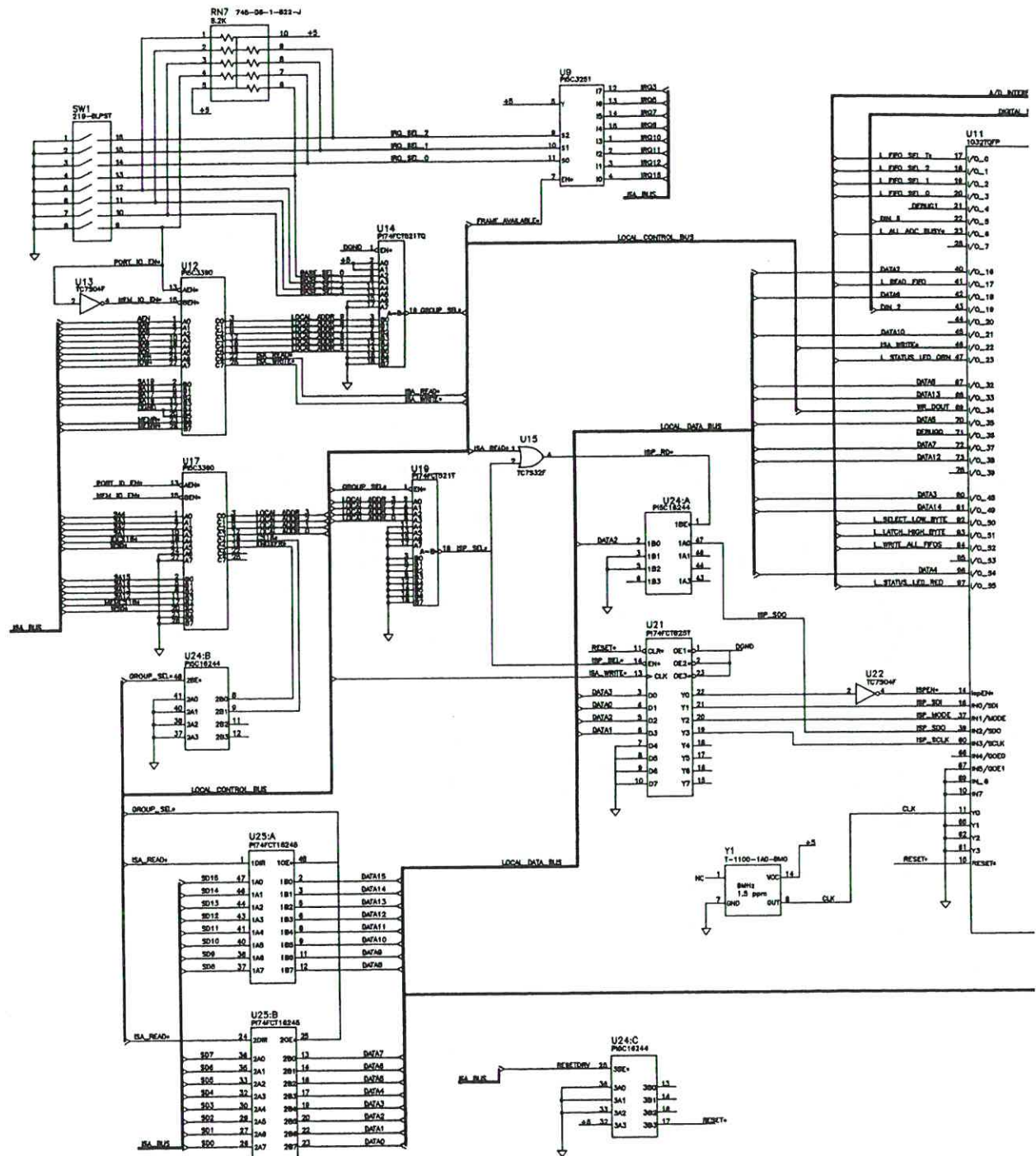


Figure 22 - DSM Processor Board - A/D Interface and Digital I/O - Part 1

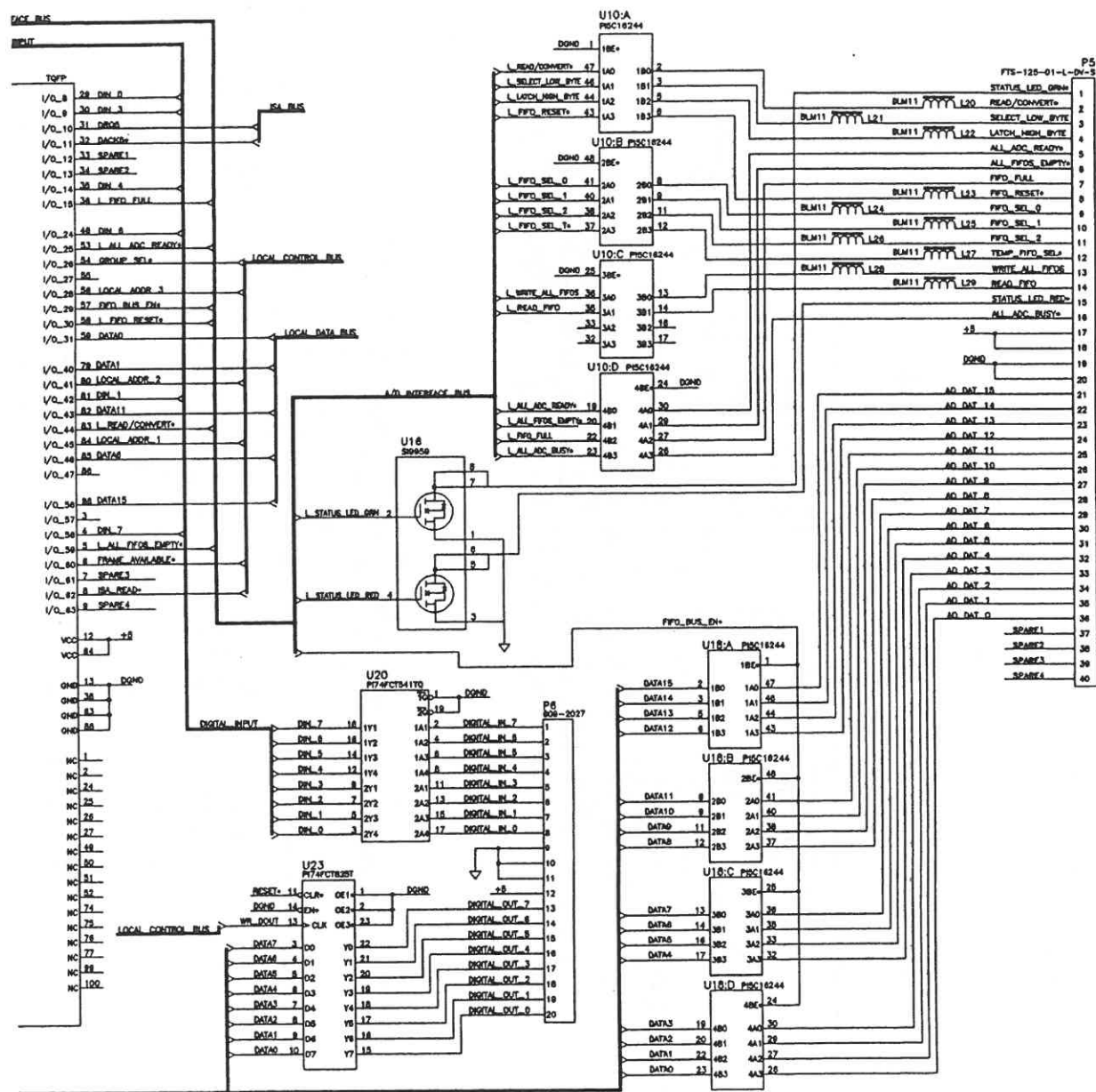


Figure 23 - DSM Processor Board - A/D Interface and Digital I/O - Part 2

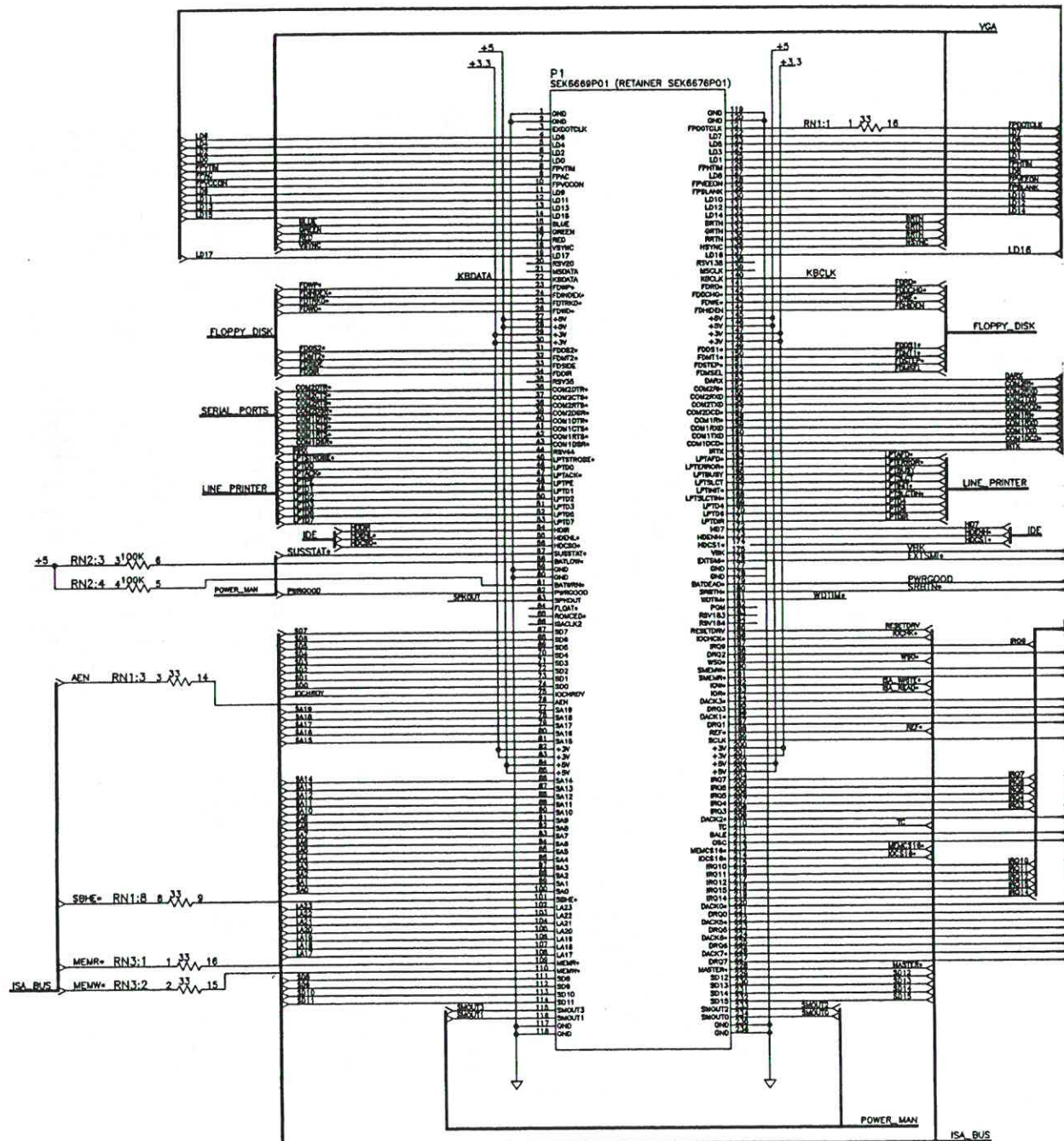


Figure 24 - DSM Processor Board - Microprocessor Section Part 1

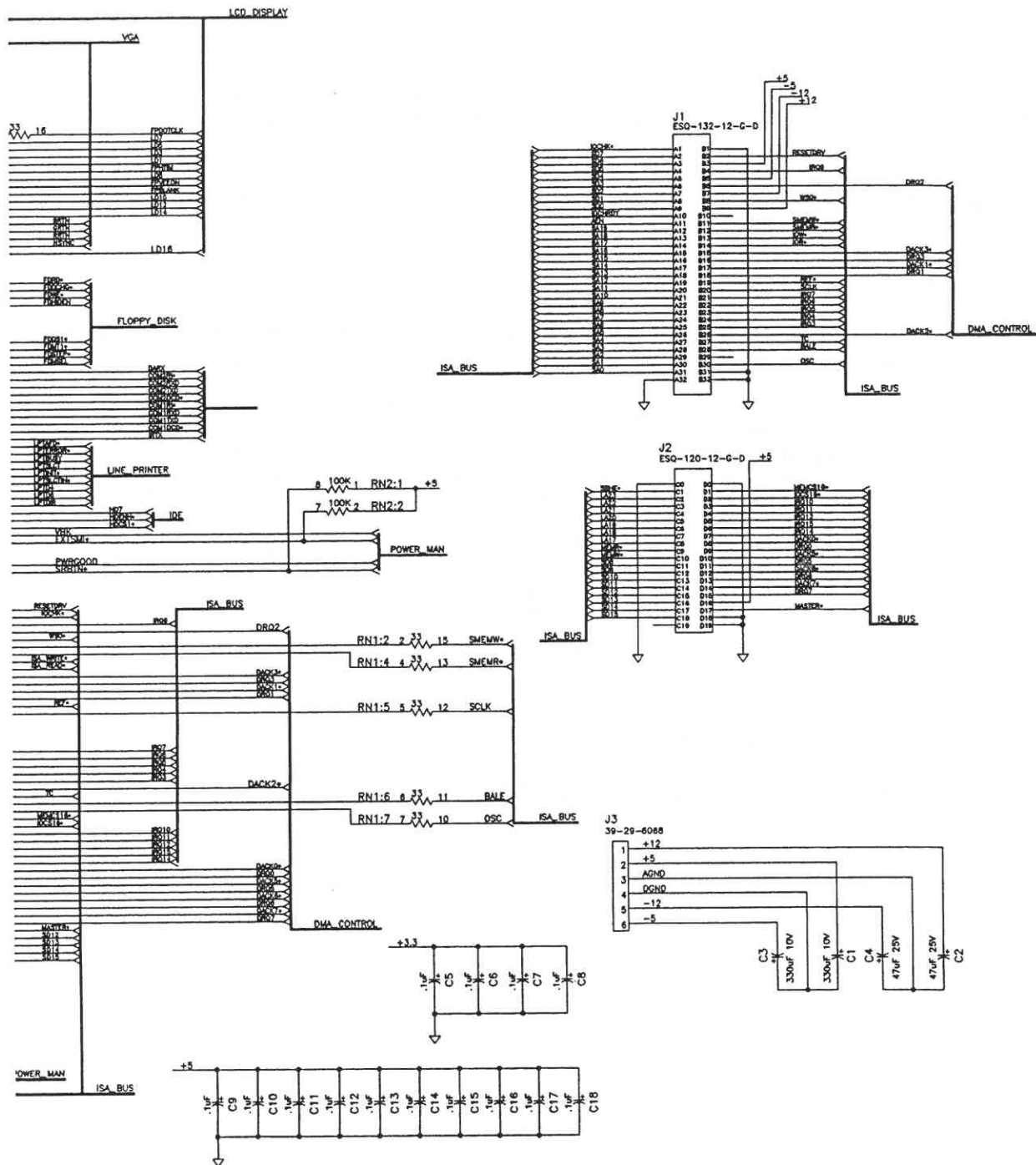


Figure 25 - DSM Processor Board - Microprocessor Section Part 2

A/D Boards

Each DSM contains 9 A/D boards. Eight are used to convert the analog pressure signals from the ZOC modules to digital signals. The ninth A/D is used to convert the analog temperature inputs to a digital signal. Only one A/D is required for the temperature measurement because the modules, and hence the sensors change temperature very slowly.

The A/D boards are installed in the A/D board enclosure. The temperature and pressure A/D's are **NOT** interchangeable.

The temperature A/D has a gain of 2.916. It is identified as Scanco PN 155781-1.

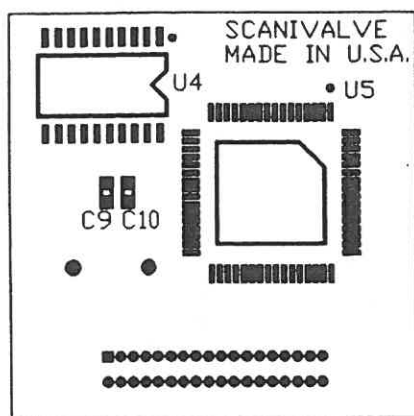
The pressure A/D could be one of three variations depending upon the output voltage of the ZOC module being scanned. Selection and use should be made by the following table:

ZOC output voltage	Gain	Scanco PN
± 2.5 Vdc	3.33	155781-2
± 5.0 Vdc	2.00	155781-3
± 10.0 Vdc	1.00	155781-4

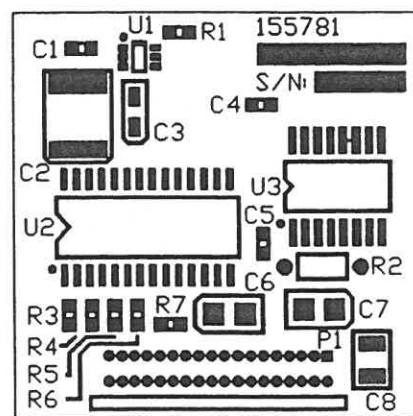
Table 4 - Pressure A/D Board Selection

Figure 26 shows the layout of the DSM A/D Boards.

Figure 27 shows the electrical schematic of the DSM A/D Boards.

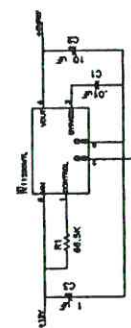


Bottom View



Top View

Figure 26 - DSM A/D Board Layout



A/D Board Replacement

It may be necessary for a user to change an A/D board. This could be caused by one of several reasons, but mainly it would be necessary because a ZOC Module with an output greater than ± 2.5 Vdc will be connected to the DSM. The procedure to change an A/D Board is very easy to follow.

NOTE: It is important that anyone changing an A/D carefully observe proper ESD practices. Failure to do this may result in damage to the A/D Boards and/or the DSM.

Procedure

Reference Figures 11, 12, 26, 27, and 28.

1. Remove power from the DSM.
2. Disconnect all ZOC module inputs.
3. Place the DSM on a solid surface with the Front Panel to the left.
4. Remove the Top Cover.
5. Remove the four screws that secure the A/D Mounting Brackets.
6. Rotate the Front Panel and A/D Enclosure so the six cover screws are accessible.
7. Remove the six cover screws.
8. Lift off the A/D Enclosure Cover.
9. Remove the A/D(s) by pulling straight up from the enclosure. The Pressure A/D's are numbered one through eight from the left side of the DSM. The Temperature A/D is installed in the slot at the far right of the enclosure.
10. Install the replacement A/D. Be very certain to insure that the edge connector is lined up correctly. There is sufficient clearance in the card guides to permit misalignment of the A/D. Misalignment will result in damage to the A/D.
11. Replace the Enclosure Cover and Cover Screws. Realign the Front Panel and replace the screws in the A/D Mounting Brackets.
12. Replace the Top Cover. Reinstall all cables.
13. Verify that all modules are connected in the proper order and that the correct coefficients are loaded in memory.

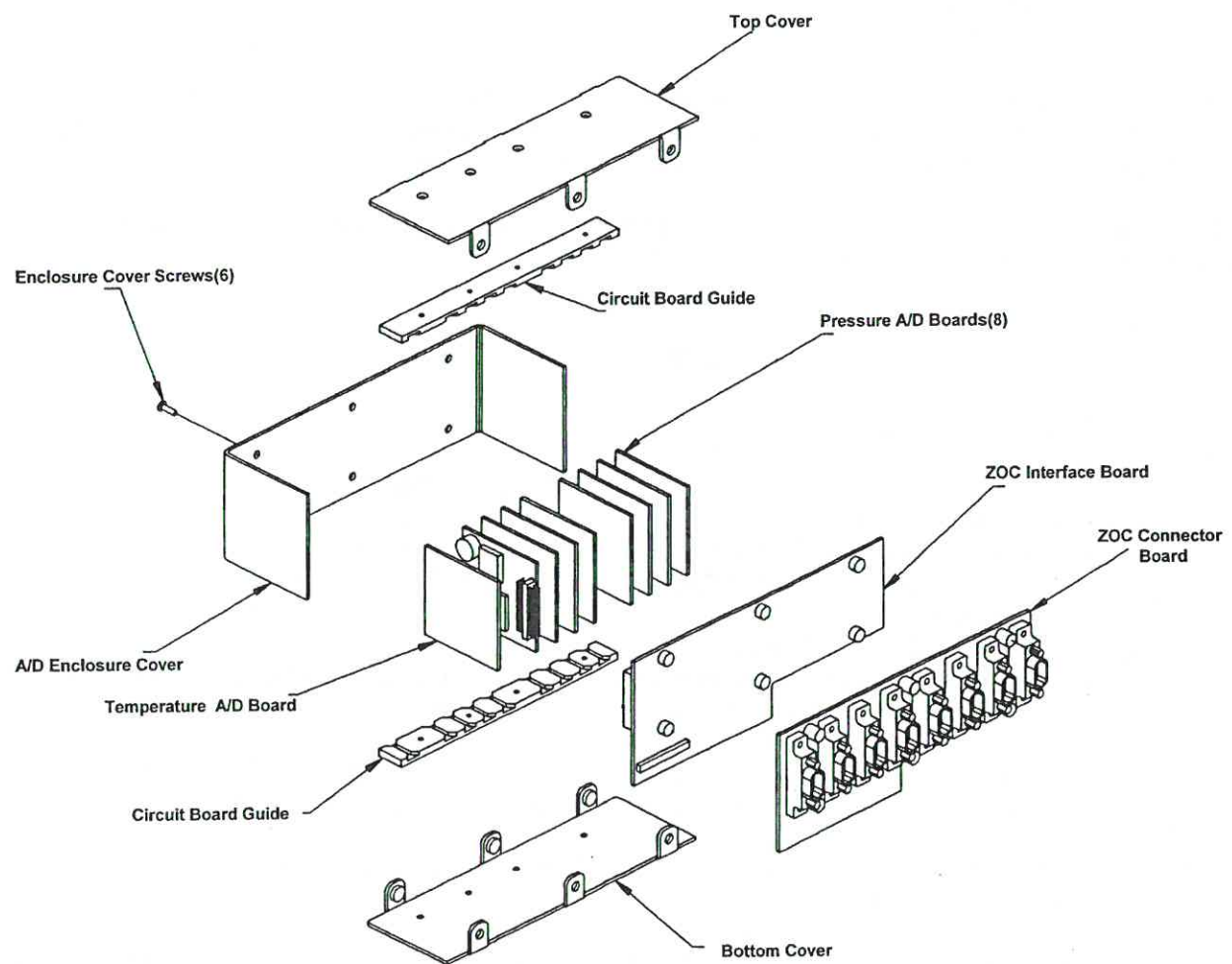


Figure 28 - A/D Enclosure Exploded Diagram

ZOC Module Interface Board

The ZOC Module Interface Board is the main interface between the ZOC modules and the DSM. It connects the A/D and Processor Boards to the ZOC Modules. This board contains the line drivers for the address outputs.

Figure 28 shows the layout of the ZOC Module Interface Board.

Figures 29, 30, and 31 contain the electrical schematic of the ZOC Module Interface Board.

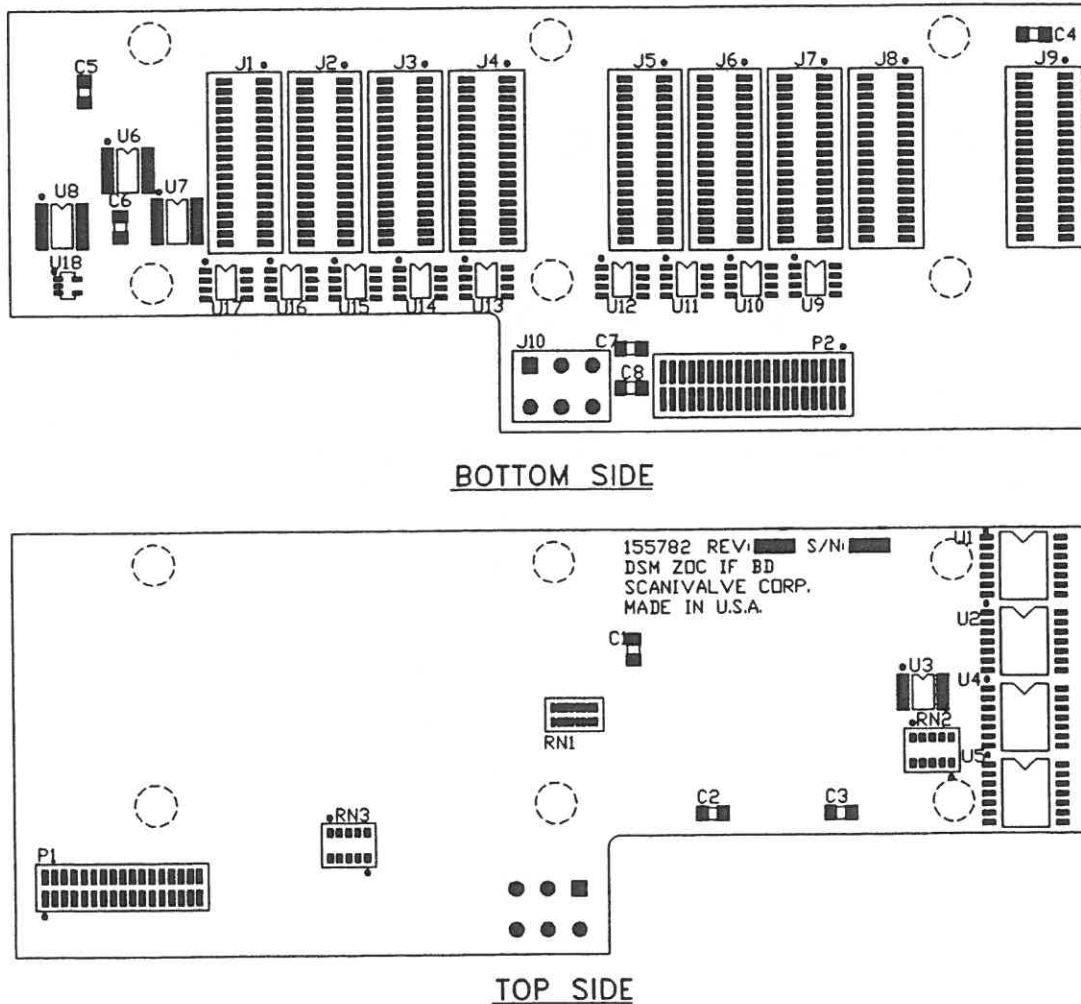


Figure 29 - ZOC Module Interface Board Layout

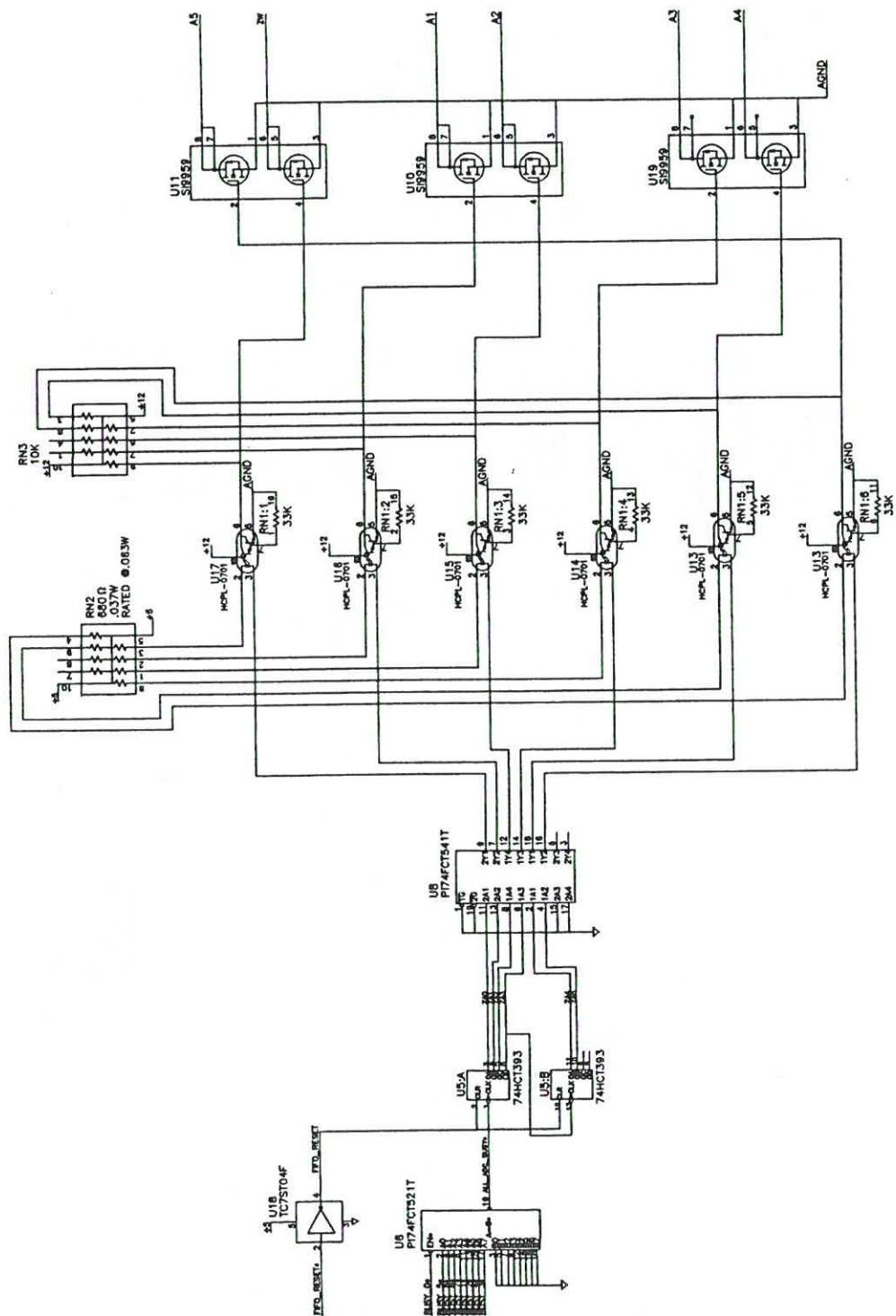
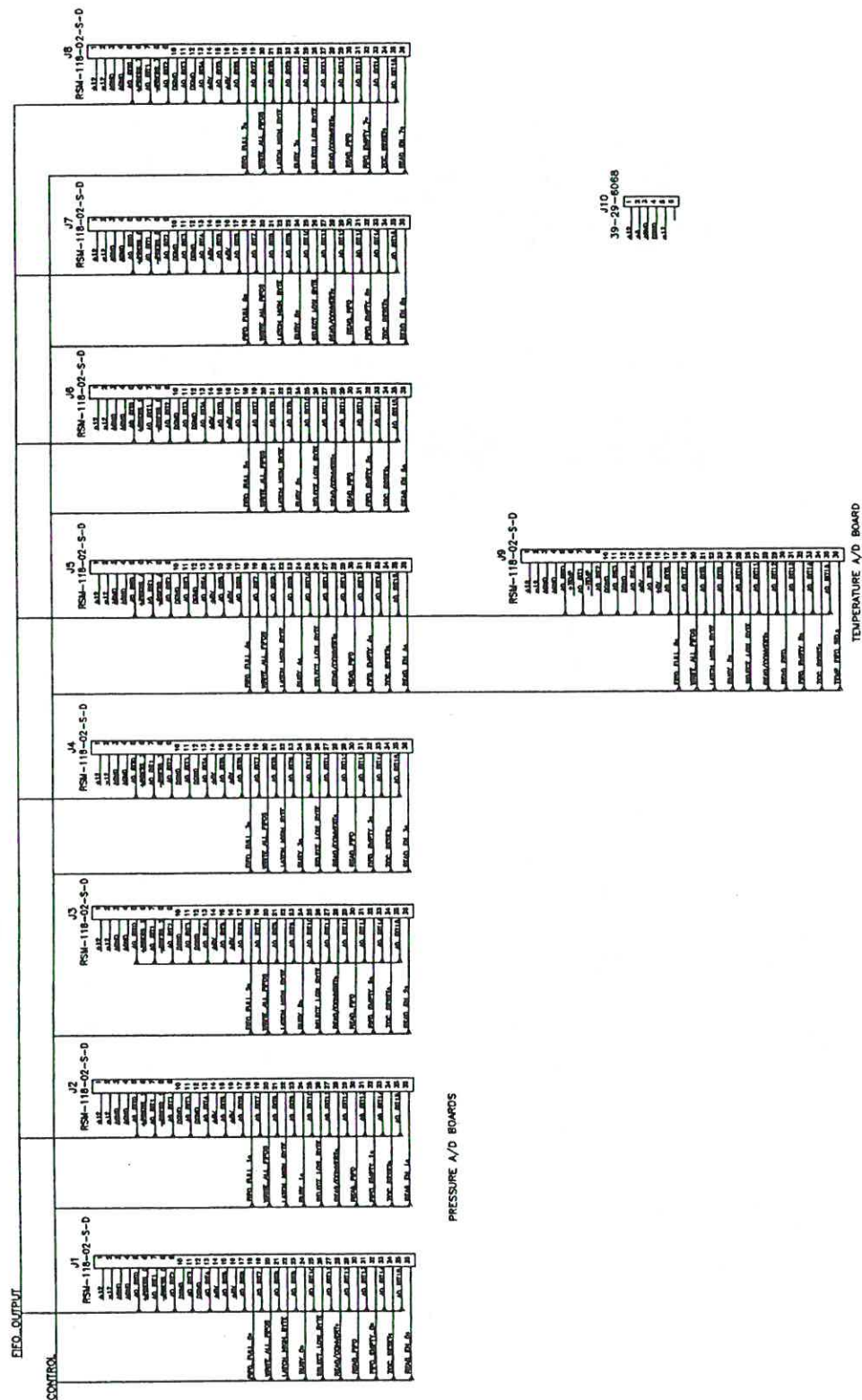


Figure 30 - ZOC Module Interface Board Electrical Schematic - Address Outputs



DSM ZOC Connector Board

This board is the direct connection between the DSM and the ZOC Modules. It contains the interface connectors and the RTD conditioning circuits. The ZOC Module RTD's are scanned from this board and the outputs routed to the Temperature A/D Board.

Figure 33 shows the layout of the DSM ZOC Connector Board

Figures 34 and 35 contains the electrical schematic

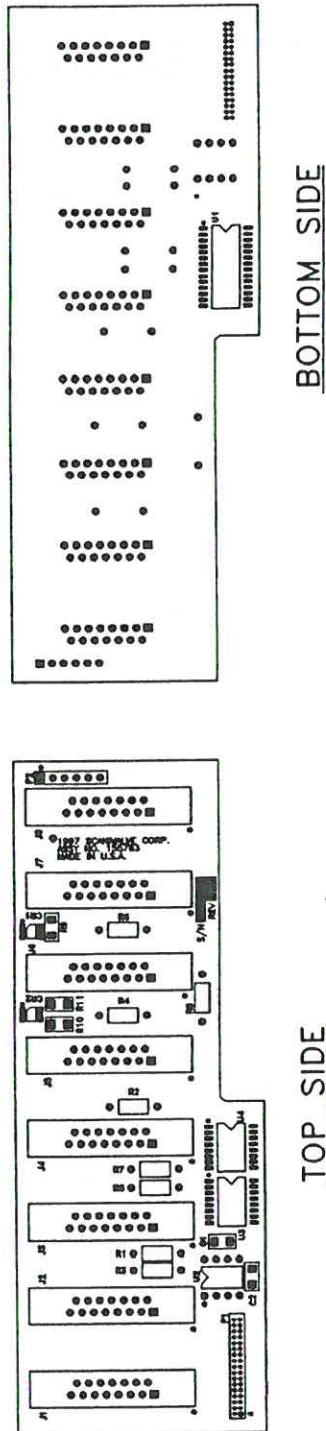


Figure 33 - DSM ZOC Connector Board Layout

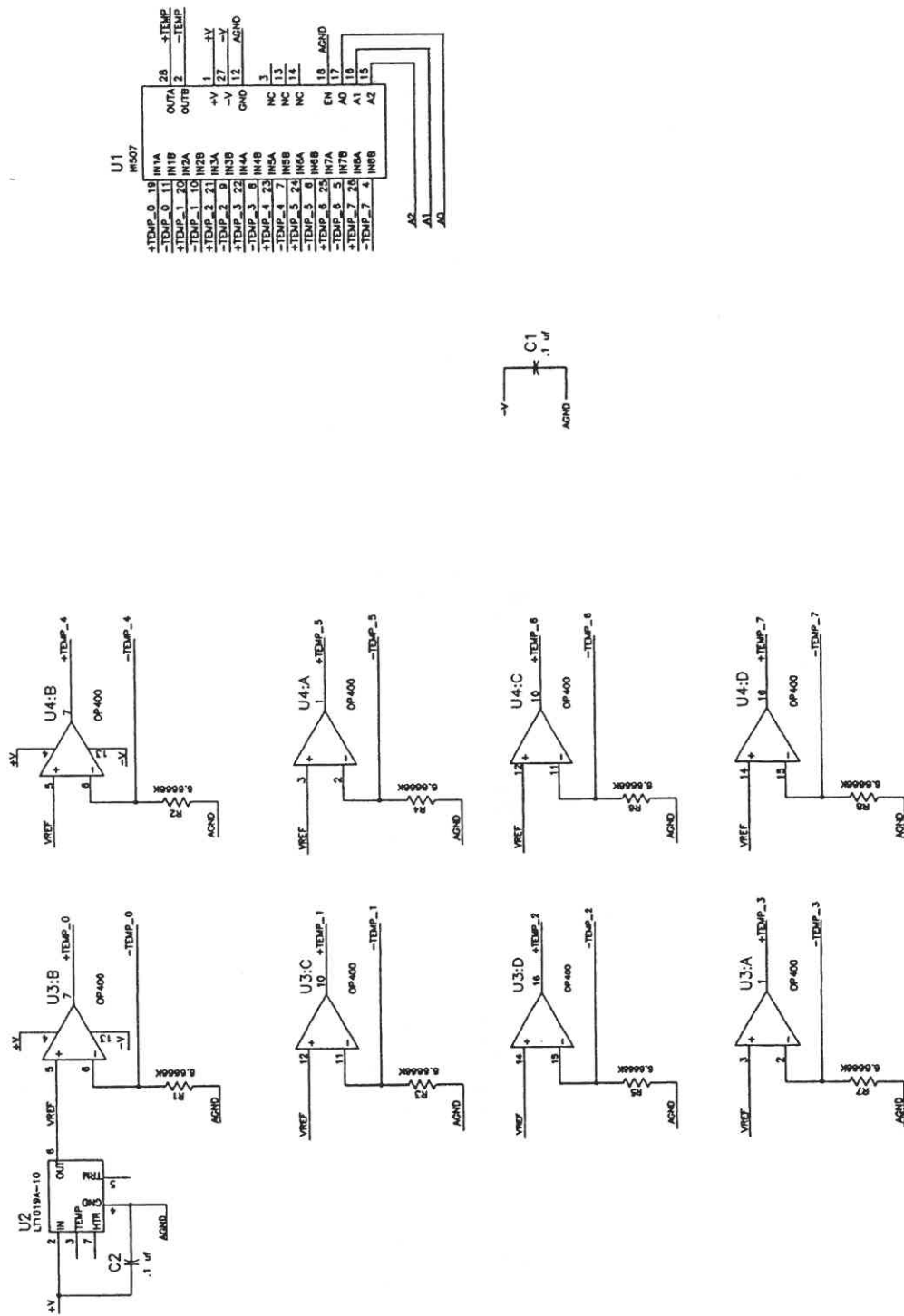


Figure 34 - DSM ZOC Connector Board Electrical Schematic Part 1

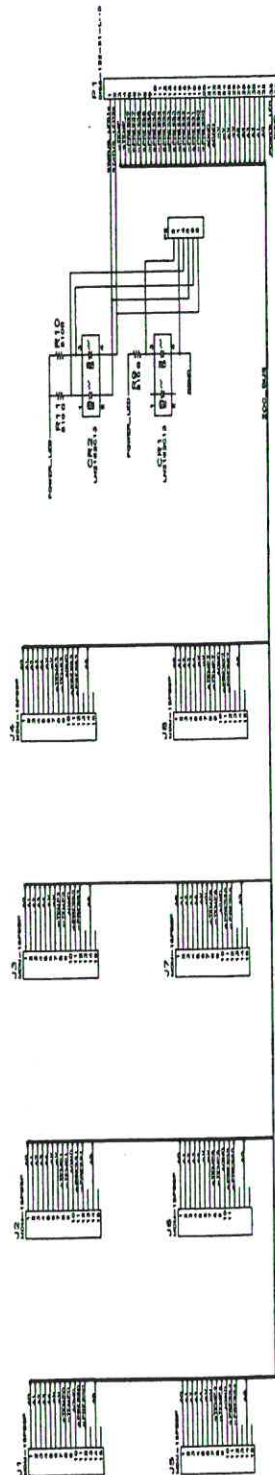


Figure 35 - DSM ZOC Connector Board Electrical Schematic Part 2

ARINC 429 Interface Board

The ARINC 429 Interface Board is a Model CEI-400 manufactured by Condor Engineering.

The CEI-400 is set up in a two receiver, two transmitter configuration. However, in the DSM3005, the CEI-400 will only transmit data. There is no receive capability built into the DSM. All configurations are set by hardware jumpers. The jumper programming is explained in this section. The user must be aware that modification of the factory jumper settings could have a deleterious effect on the operation of the DSM3005. Data rates are set for 100 kbits/sec which is the fastest rate available.

Receiver circuitry is double buffered. When a data word is received by the hardware, it is placed in the buffer where the user may read the data word. The data word must be read before the next word is received. The incoming data word will overwrite any data left in the buffer.

CEI-400 Setup

Refer to Figure 34 for more details on the jumper programming of the CEI-400 ARINC 429 Interface Board.

Base I/O Address

The Base I/O address is set by jumpers on Jumper Block JP1. The following table shows the jumper programming.

Base I/O Address (Hex)	Jumper settings
380 (default)	3-4, 7-8
390	1-2, 7-8
3A0	3-4, 5-6
3B0	1-2, 5-6

Slew Rate

The slew rate refers to the rise and fall times for the ARINC signals. The jumpers connect the proper capacitance so the waveforms meet ARINC specifications. Jumper Blocks JP2, JP3, JP4, and JP5 are used to set the slew rates. No jumpers are required for the high bit rate.

Interrupts

Jumper Block JP6 is used to enable interrupt control. In the DSM3005, no interrupts are enabled.

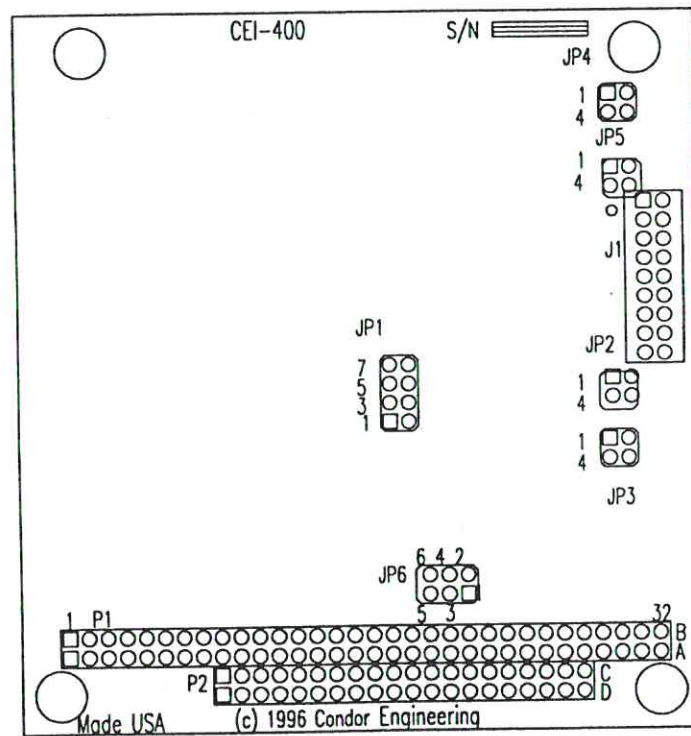


Figure 36 - ARINC 429 Interface Board(CEI-400) Layout

Digital I/O Board

The Digital I/O Board provides the necessary interfacing between the DSM and a Digital Input or Output. The DSM may be configured for as many as 5 Digital Inputs and/or 5 Digital Outputs.

Digital Inputs are edge triggered. A minimum signal of 5 Vdc is required. The maximum input is 15 Vdc.

Digital Outputs are 28 Vdc @ 500 mA maximum. They are supplied by the unfused 28 Vdc power input.

Figure 36 shows the layout of the Digital I/O Board. Figures 37 and 38 show the schematic.

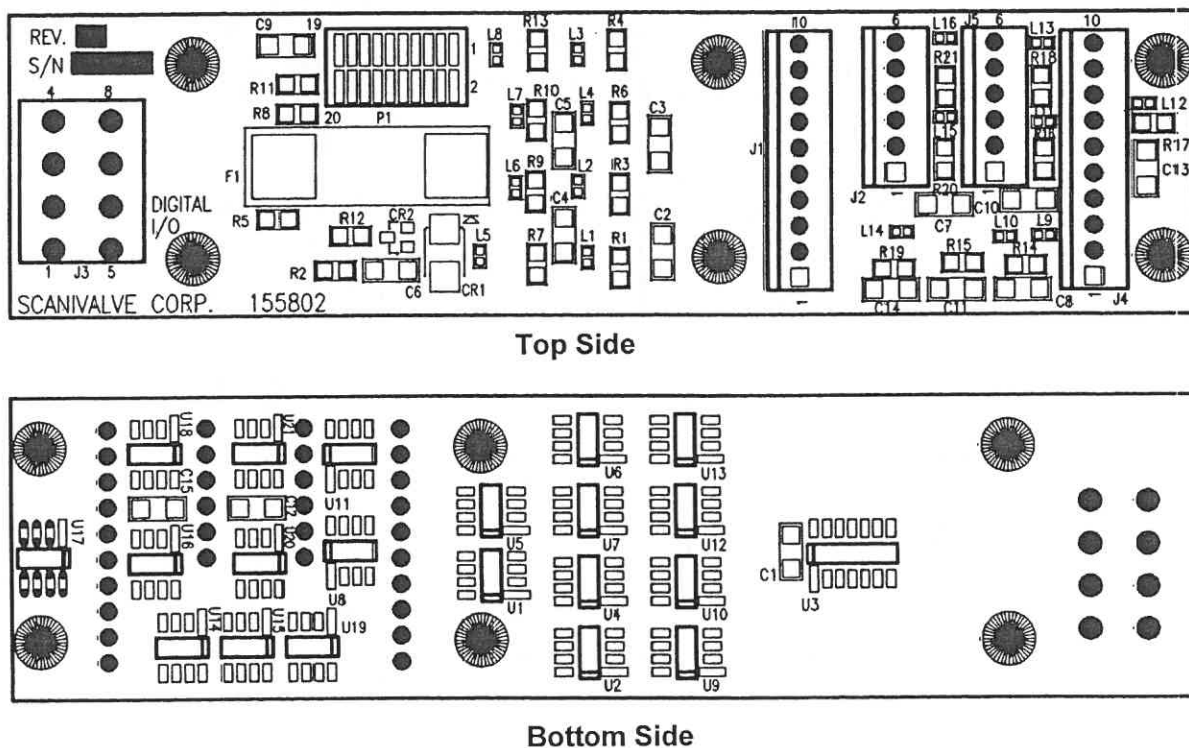


Figure 37 - Digital I/O Board Layout

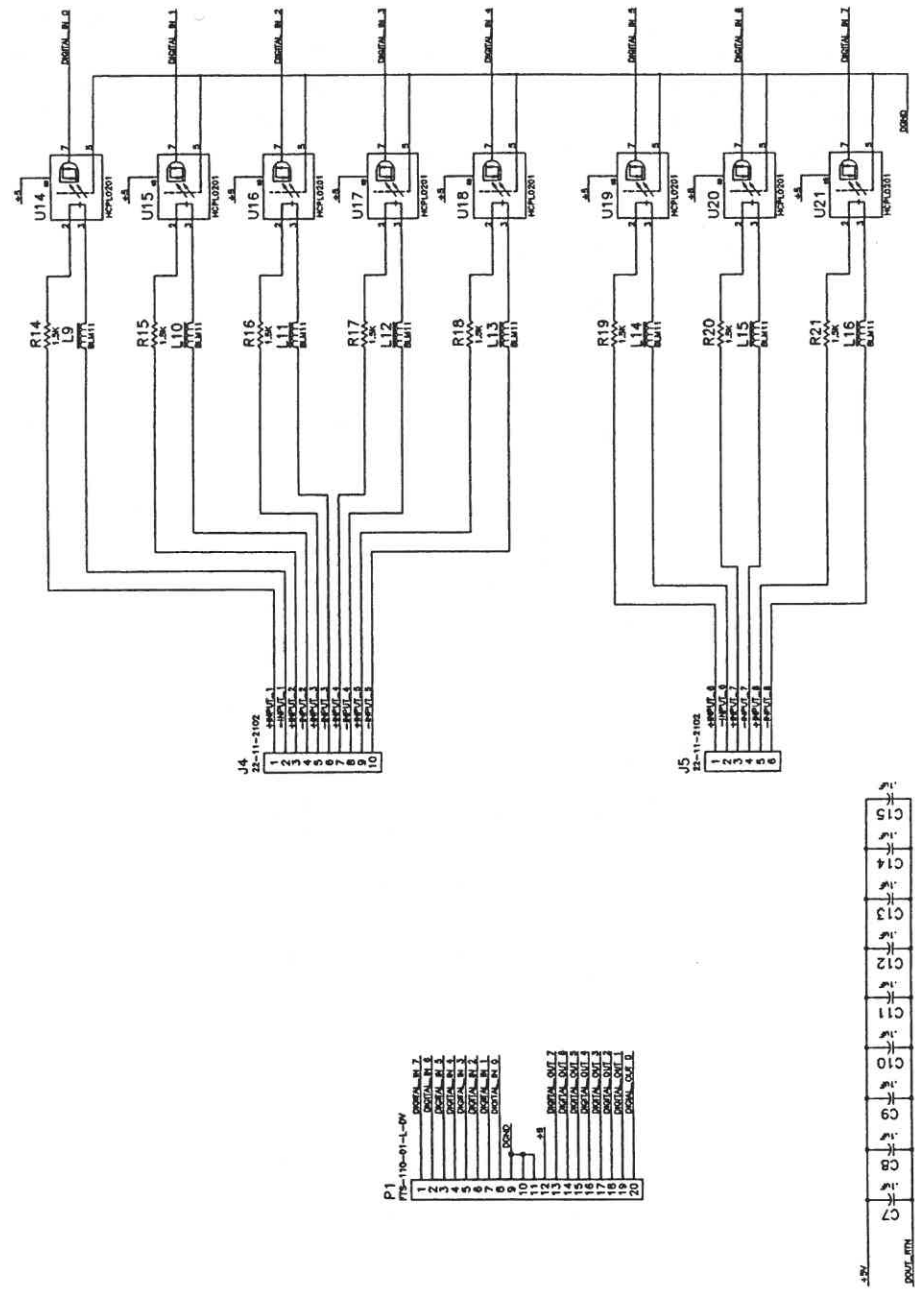


Figure 39 - Digital I/O Board Schematic - Part 2

Power Supply

The Power Supply Board converts the nominal 28 Vdc power input to four regulated DC voltages: +12, -12, +5, and -5 Vdc, which are used to power the DSM. In addition, the power supply board contains a temperature comparator circuit which controls power to the cooling fans. Power to the fans is disabled at 1°C and enabled at 12°C. This circuit also provides protection for the DC-DC Converters. Power to the DC-DC Converters will be disabled at 80°C to prevent damage to the circuitry. At 60°C, the power circuit will recover and enable the DC-DC Converters.

The DC input to the power supply may be 18 to 36 Vdc. The input is fused at 4 Amps.

Figure 40 shows the layout of the Power Supply Board. Figure 41 contains the schematic.

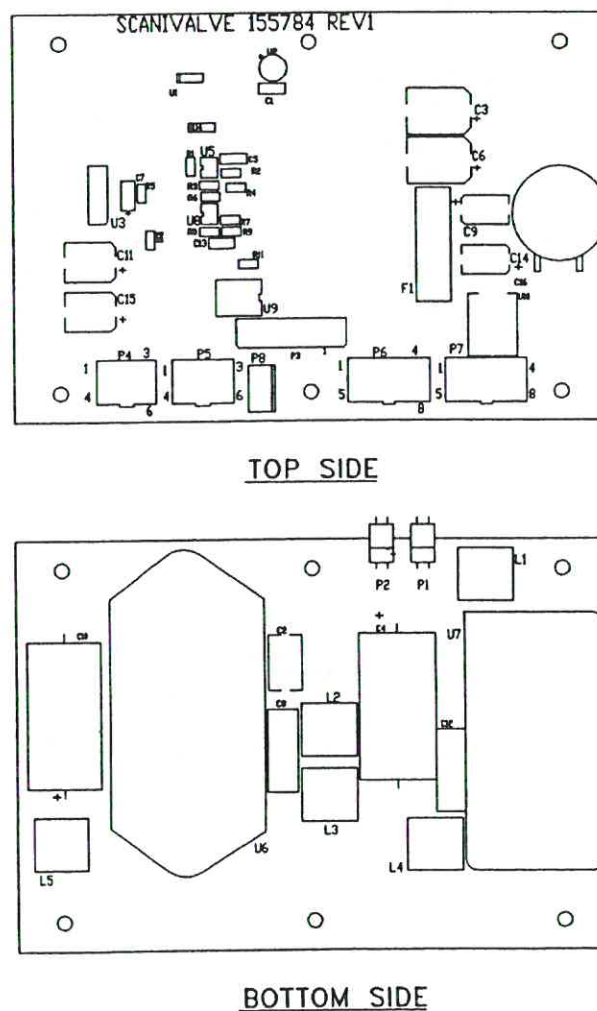


Figure 40 - Power Supply Board Layout

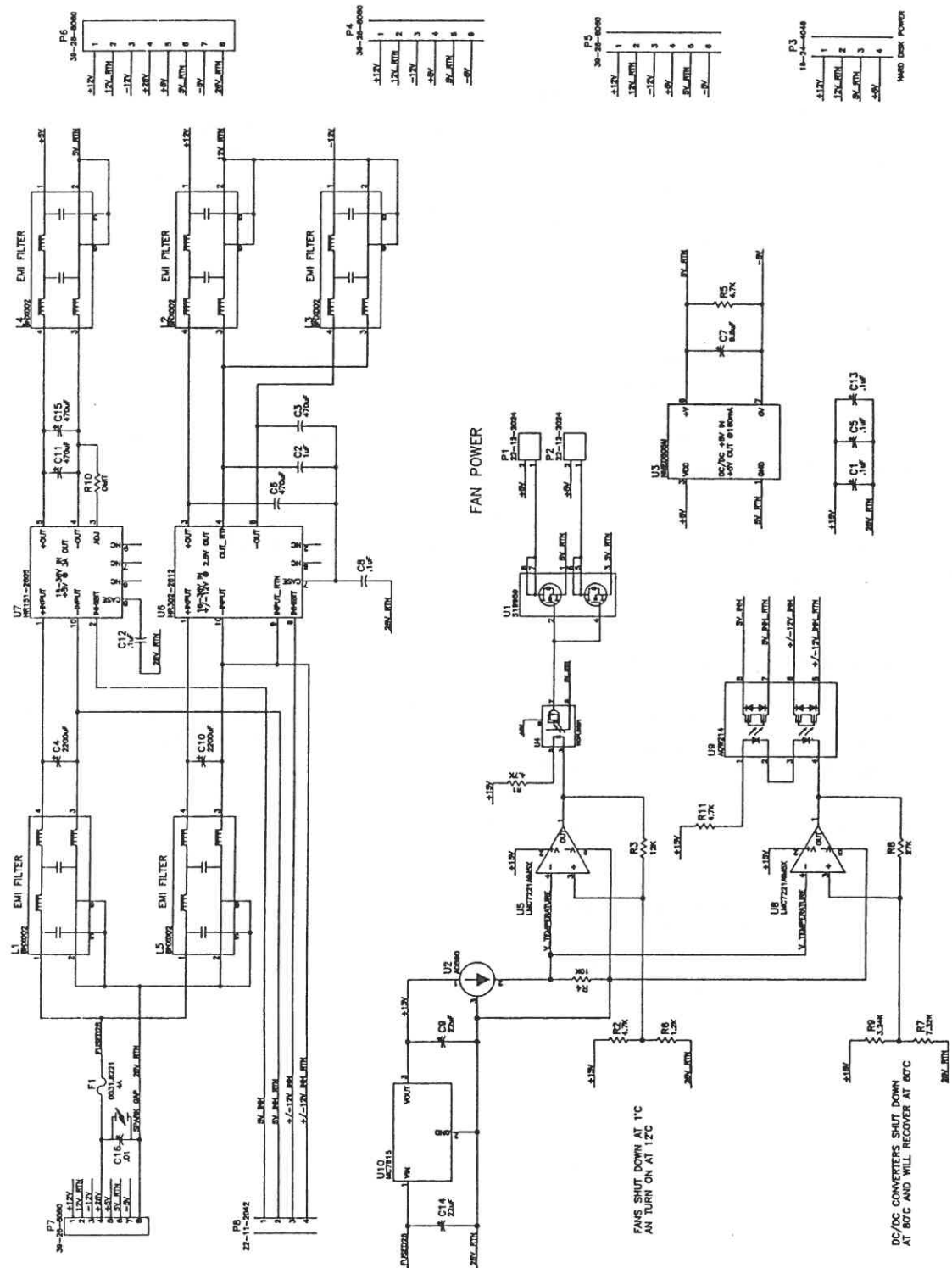


Figure 41 - Power Supply Schematic

Special Hardware

Hard Disk Drive

The Hard Disk Drive used in the DSM 3005 is a solid state hard disk. The installed disk may be manufactured by SanDisk Corporation or M-Systems. Solid state disk drives are completely compatible with all IDE controllers. A host computer is not able to detect that a non-magnetic device is installed. The drives will have a formatted capacity of 140 Mb or higher. It is rated to 15 g's of vibration and 1000g's of shock while operating. The drives are rated for 300,000 read/write cycles per 512 byte sector. They have an average MTBF greater than 1,000,000 hours.

Cooling Fan

The cooling fan is a Mechatronics F4010H05. The power requirements are 5 Vdc @ 100ma. It rotates at 4200 rpm and provides an air flow of 4.6 scfm.

The fan must not be obstructed. The EMI mesh should be cleaned occasionally in order to keep the cooling air flow at a maximum.

NOTE: The DSM **MUST** be shut down as soon as possible if the cooling fan is not operating. Continued operation of the DSM without sufficient cooling air will result in damage to the microprocessor.

Interconnecting Cables

This section contains drawings and schematics of the various interconnecting cables. All of these cables are internal. It is not expected that a user would have to service these cables unless a problem is induced during a normal maintenance of the DSM.

The following cables are shown in this section:

- Power Input Cable
- Power Jumper Cable
- ARINC 429 Cable
- Digital Input Cable
- Digital Output Cable

Power Input Cable

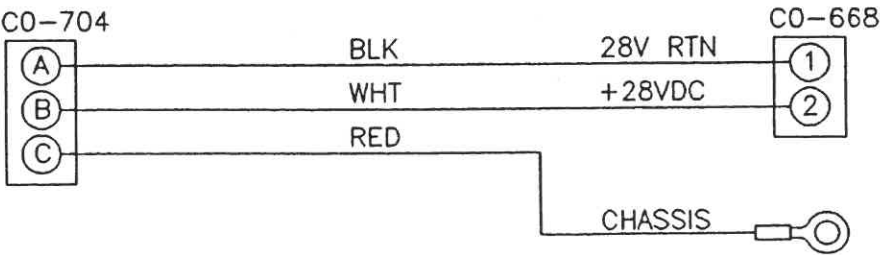
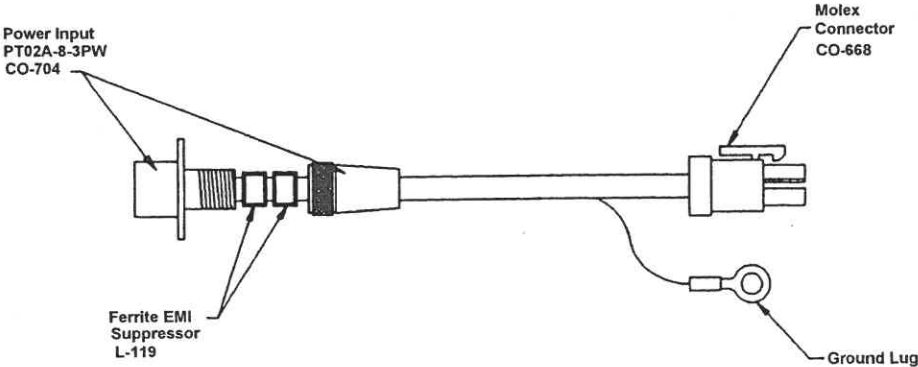


Figure 42 - Power Input Cable(Internal

Power Jumper

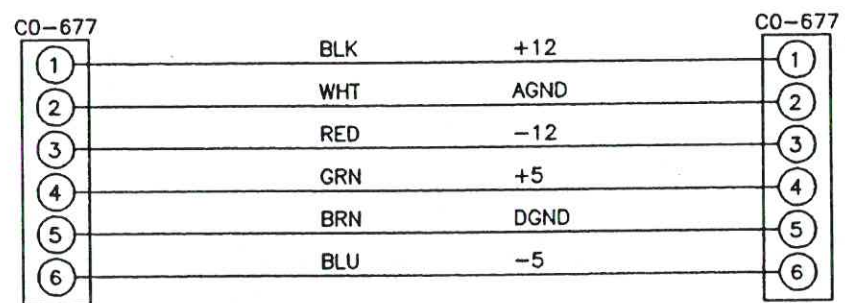
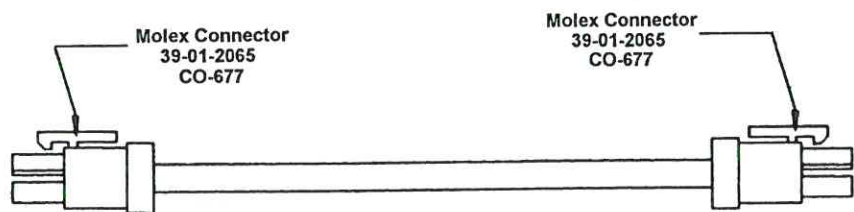


Figure 43 - Power Jumper Cable(Internal)

ARINC 429 Cable

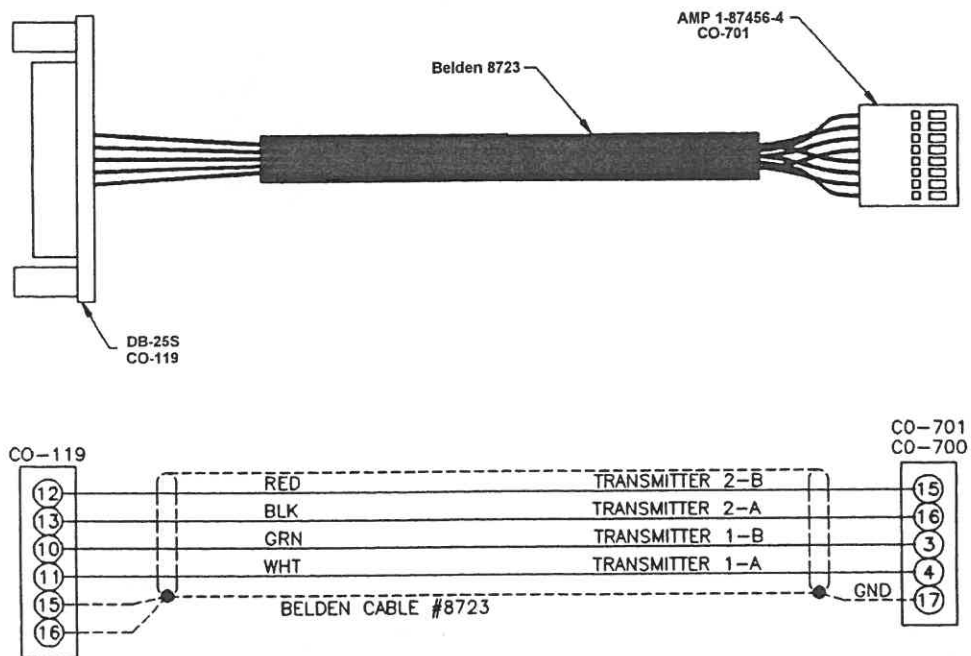


Figure 44 - 2-channel ARINC 429 Cable(Internal)

Digital Input Cable

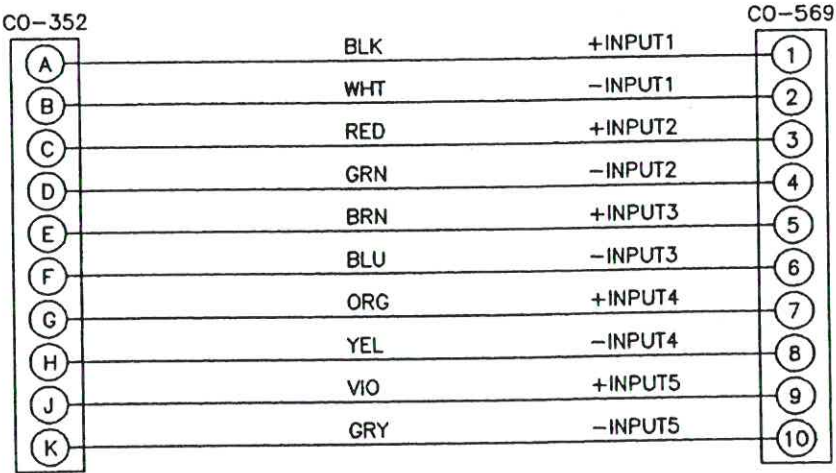
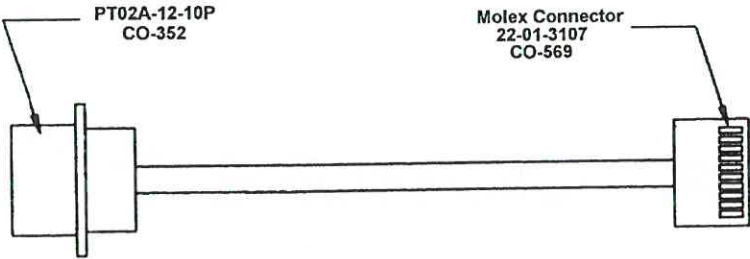


Figure 45 - Digital Input Cable(Internal)

Digital Output Cable

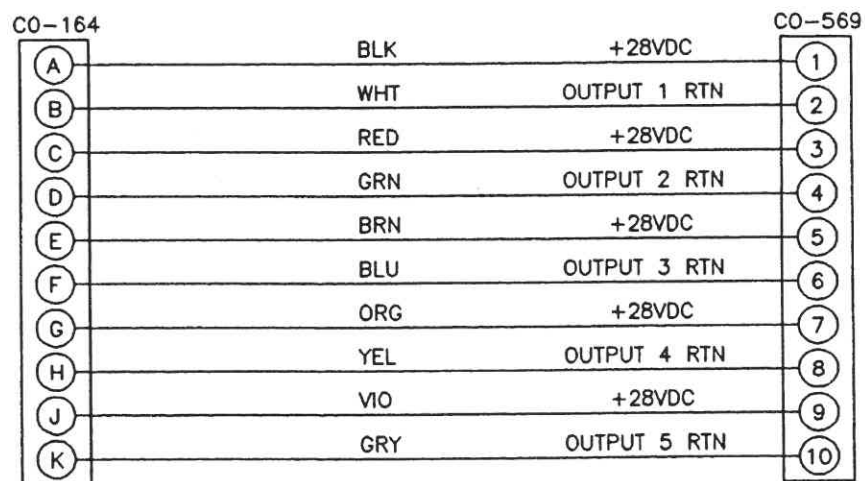
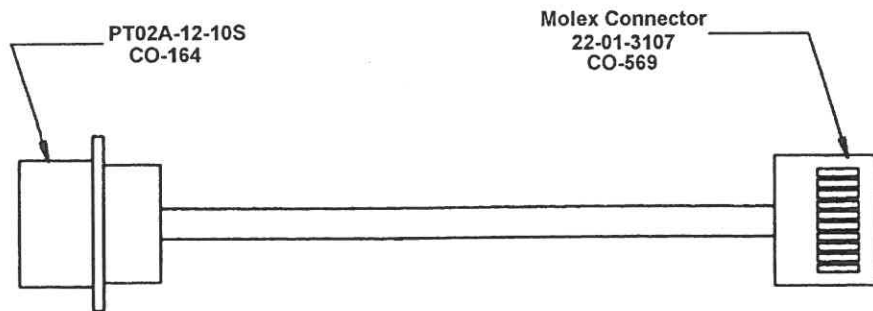


Figure 46 - Digital Output Cable(Internal)

