- add a video card
- turn on VGA keyboard] advanced BIOS
- reboot

Applied Technologies, Inc.

login - root
pwd - adam

OPERATOR'S MANUAL

COLORADO UNIVERSITY/NCAR CUFF SYSTEM
200-211

To shut down the DOCK

adam# shutdown -h now
^
halt

turn off after it says system halted

Prepared by:

Applied Technologies, Inc.
6395 Gunpark Dr. Unit E
Boulder, CO 80301

49267 35
BPO

530-4977

2

OPERATOR'S MANUAL

COLORADO UNIVERSITY/NCAR CUFF SYSTEM

200-211

Prepared by:

Applied Technologies Inc.
6395 Gunpark Dr. Unit E
Boulder, CO 80301

COLORADO UNIVERSITY/NCAR CUFF SYSTEM DOCUMENTATION
23 MAY, 1996

1. INTRODUCTION

The Colorado University / NCAR system is a PC architecture data collection system running the Linux operating system. It is capable of monitoring 16 digital serial inputs and 16 analog inputs. Communications with CUFF are via an ethernet connection which can also be connected to the internet. CUFF sends all collected data to the network connection and does not store any data internally.

2. HARDWARE

2.1 PC COMPUTER

The CUFF computer system is a standard PC architecture. It consists of a 486 motherboard with a 486DX/2 microprocessor, a minitower case and power supply, and a 1.2 Gigabyte hard drive.

2.2 ROCKETPORT MULTIPLE SERIAL CARDS

CUFF provides connection to 16 digital serial ports through two Comtrol RocketPort multiple serial port cards. Drivers for these cards were obtained from the Linux archive at MIT.

2.3 KEITHLY/METRABYTE ANALOG CARD

CUFF provides 16 analog inputs through a Keithly/Metrabyte 16 bit Analog to Digital converter. Register level programming information had to be special ordered from Keithly, and the low level interaction with this card is included in the analog process software. DAS PC 9092 Rev 4

2.4 ETHERNET INTERFACE

CUFF communicates with the network via a 3Com EtherLink III network interface adapter. This card provides all three of the common ethernet connections: RJ45, BNC, and AUI.

2.5 ANALOG BREAKOUT BOX

The analog breakout box was designed by Applied Technologies Inc. It contains the same connectors used in the NCAR Adam systems and provide the connections between the analog instruments and the Data Collection Unit. This box provides hardware gain and offset controls, and signal conditioning modules. This box also provides transient protection for all inputs. For drawings of this box and the internal printed circuit boards, see Appendix A. For operational details of the analog input board (102-118), see Appendix B.

2.6 DIGITAL BREAKOUT BOX

The digital breakout box was designed by Applied Technologies Inc. It contains the same connectors used in the NCAR Adam systems and provide the connections between the serial instruments and the Data Collection Unit. This box also provides transient protection for all inputs. For drawings of this box and the internal printed circuit boards, see Appendix A.

3. OPERATING SYSTEM

CUFF uses the Linux operating system. Linux is a UNIX derivative that is designed for the PC architecture, provides many of the features of UNIX, and contains some POSIX compliance. The CUFF software was written for the Linux OS, but should be easily ported to other platforms.

4. SOFTWARE

The CUFF software is named Adam. CUFF is similar in functionality to the NCAR Adam/Aster systems and is able to communicate with the existing Adam Server software at NCAR. The software consists of two separate parent processes and multiple child processes. Source code for the Adam software can be found in the /usr/src/adam subdirectory.

4.1 ADAM

Adam is a parent process. On initialization it starts SIO, Analog, Heart, and Rserial which are all child processes. After the children are started, it then performs RPC calls to the Adam Server for configuration data and forwards the appropriate configuration data to the child process that needs the setup information. After the initialization phase of Adam, it goes into its synchronization loop (Sync). Sync monitors the data pipe which is filled by SIO, Analog, and Heart. When data are present at the pipe, Sync places the data into a linked list that is time tag sorted. It then checks the head of the list to see if the time delay requirements have been met. If so, it sends the data to the Adam Server, removes the sample from the list, and checks the new head of the list to see if it needs to be also sent. This continues until the time delay is not met or until the list is empty. Once Adam is stared, it goes into a infinite loop and can only be exited with a TERM signal.

in /home/cuff/src/adam

Adam syntax:

adam -v -h AdamServer

adam -h urgrell &

-v = verbose mode

-h AdamServer = the name of the Adam Server with which it communicates.

4.1.1 SIO

urgrell

SIO is a child process of Adam. It is started during Adam's initialization. SIO initializes itself and then waits for configuration commands to come from Adam. As configuration information is received, the serial ports are configured, and SIO starts waiting for data on the configured ports. The first character SIO receives from the serial port is placed in the buffer and the current time tag is placed in the sample. Each successive character is placed in the buffer, and when the end-of-message character is received, the sample is sent to Adam for delivery to Adam Server.

SIO also responds to commands from RSerial. When RSerial requests that a port be copied, SIO will send a copy of the data received to RSerial. RSerial will receive data on a character by character basis rather then the entire message string at once. When RSerial sends data that needs to be sent to the instrument, SIO will pass the data unaltered to the instrument. RSerial echoing is turned off when RSerial sends a message to request echoing a channel that is not valid (i.e. -1).

4.1.2 Analog

Analog is a child process of Adam. It is started during Adam's initialization. Analog initializes itself and the analog card, and then waits for configuration commands to come from Adam. As configuration information is received, Analog sets up the respective analog input and sleeps for 50 milliseconds. After 50 milliseconds, Analog sets the time tag in the sample and reads all 16 inputs of analog data. The configuration list is checked to see which channels are in use and what frequency the data are to be

recorded. A messages is then generated and sent to Adam. Analog then sleeps until the next sample is required.

4.1.3 Heart

Heart is a child process of Adam. It is started during Adam's initialization. Heart provides the one second heartbeat requirement for the Adam software. It sleeps for one second, then places the time tag into a message for Adam. The message is sent to Adam and heart sleeps for another second.

4.1.4 RSerial

RSerial is a child process of Adam. It is started during Adam's initialization. RSerial provides an interface between a network socket and SIO. When a connection to RSerial occurs the first message sent is the requested port number for communication. This number is sent to SIO which starts to echo the data received on that port. RSerial relays the data in both directions between the network socket and SIO.

4.2 TIMEUPDATE

Timeupdate is a independent processes that periodically request time information from the Adam Server. After the time is received the CUFF system time and CMOS clock are updated.

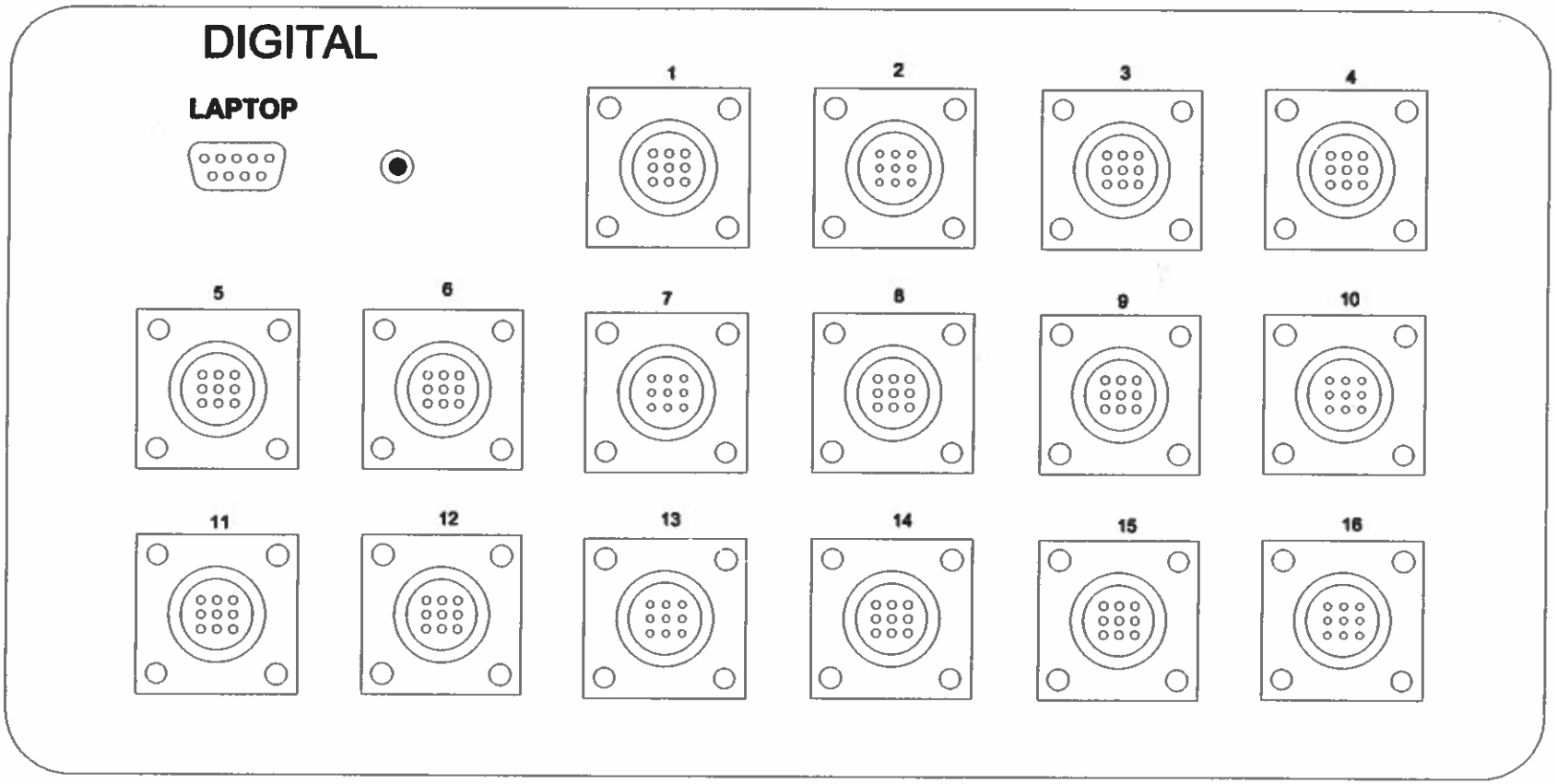
Timeupdate syntax:

timeupdate -v -h AdamServer -t UpdateTime
-v = vererbose
-h AdamServer = the name of the Adam Server with which it communicates.
-t UpdateTime = time in seconds to delay between calls to Adam Server

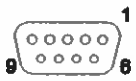
APPENDIX A

BREAKOUT BOX DRAWINGS

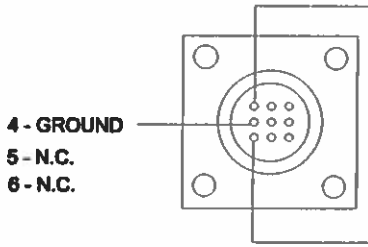
Front Panel



LAPTOP



2 - XMIT DATA
3 - RECEIVE DATA
5 - GROUND

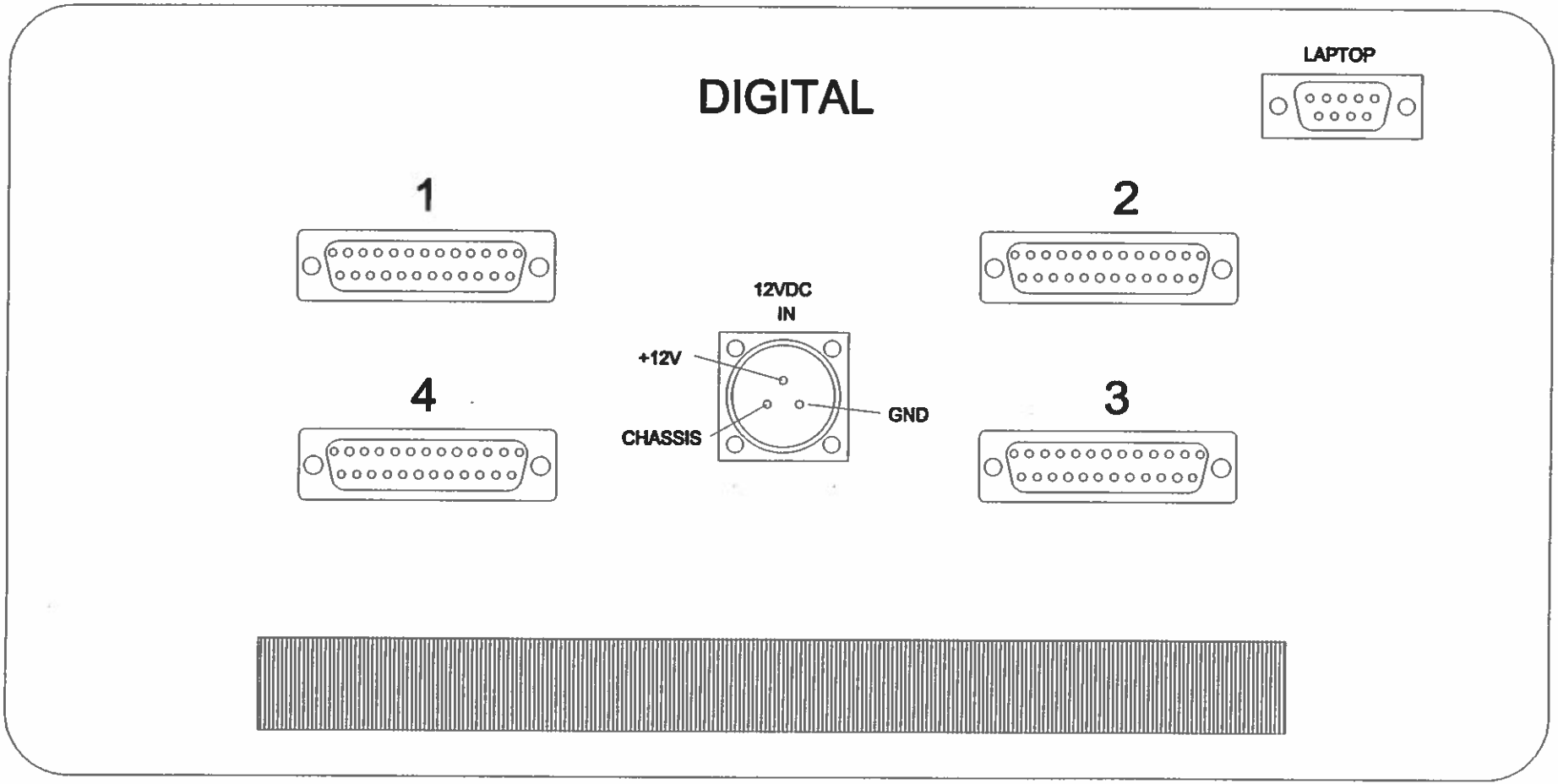


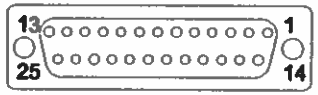
1 - RS-232 OUT
2 - RS-232 IN
3 - CHASSIS

4 - GROUND
5 - N.C.
6 - N.C.

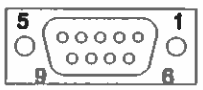
7 - 12V GROUND
8 - +12V
9 - N.C.

Rear Panel



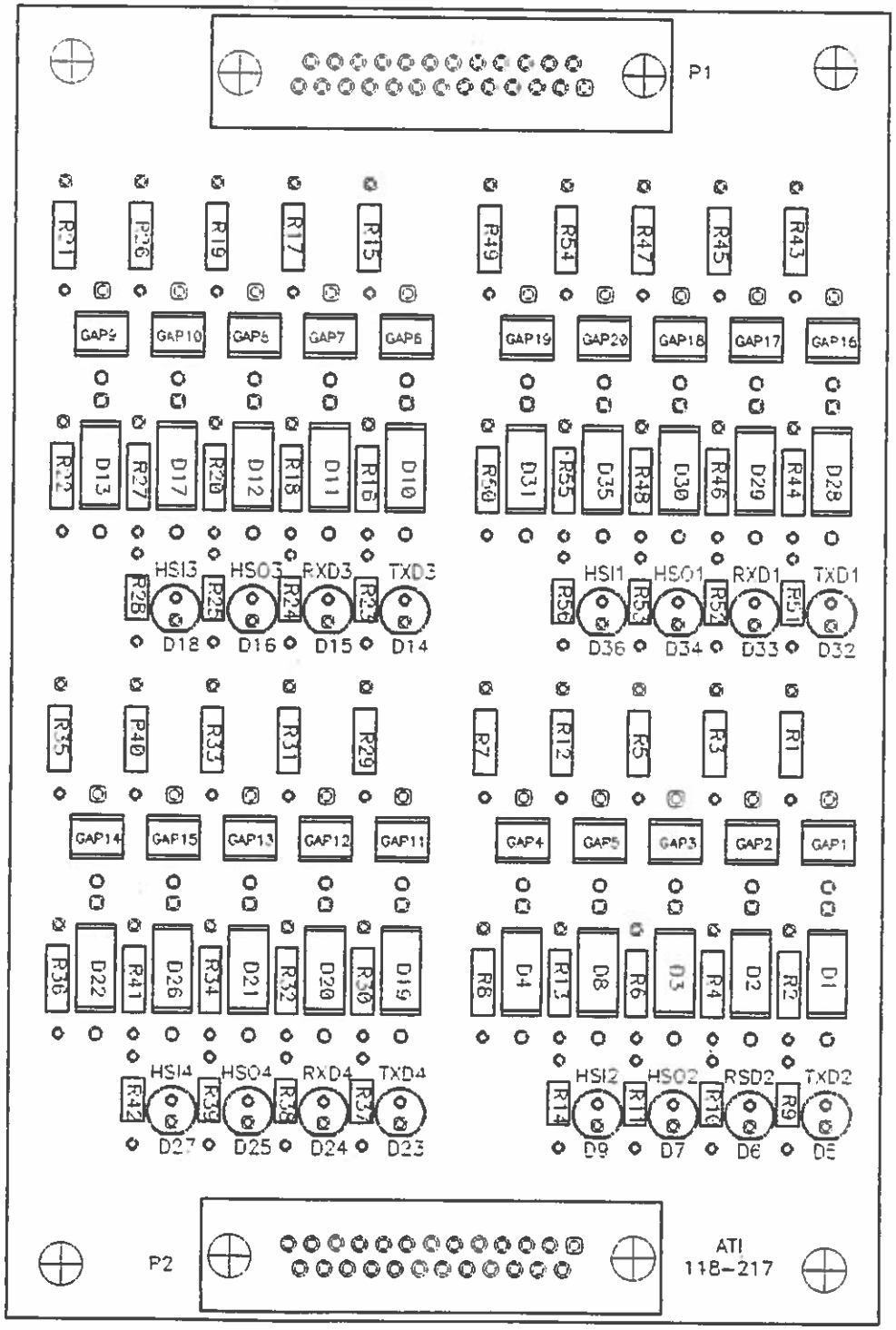


Refer to Wiring Diagram for pin-out.

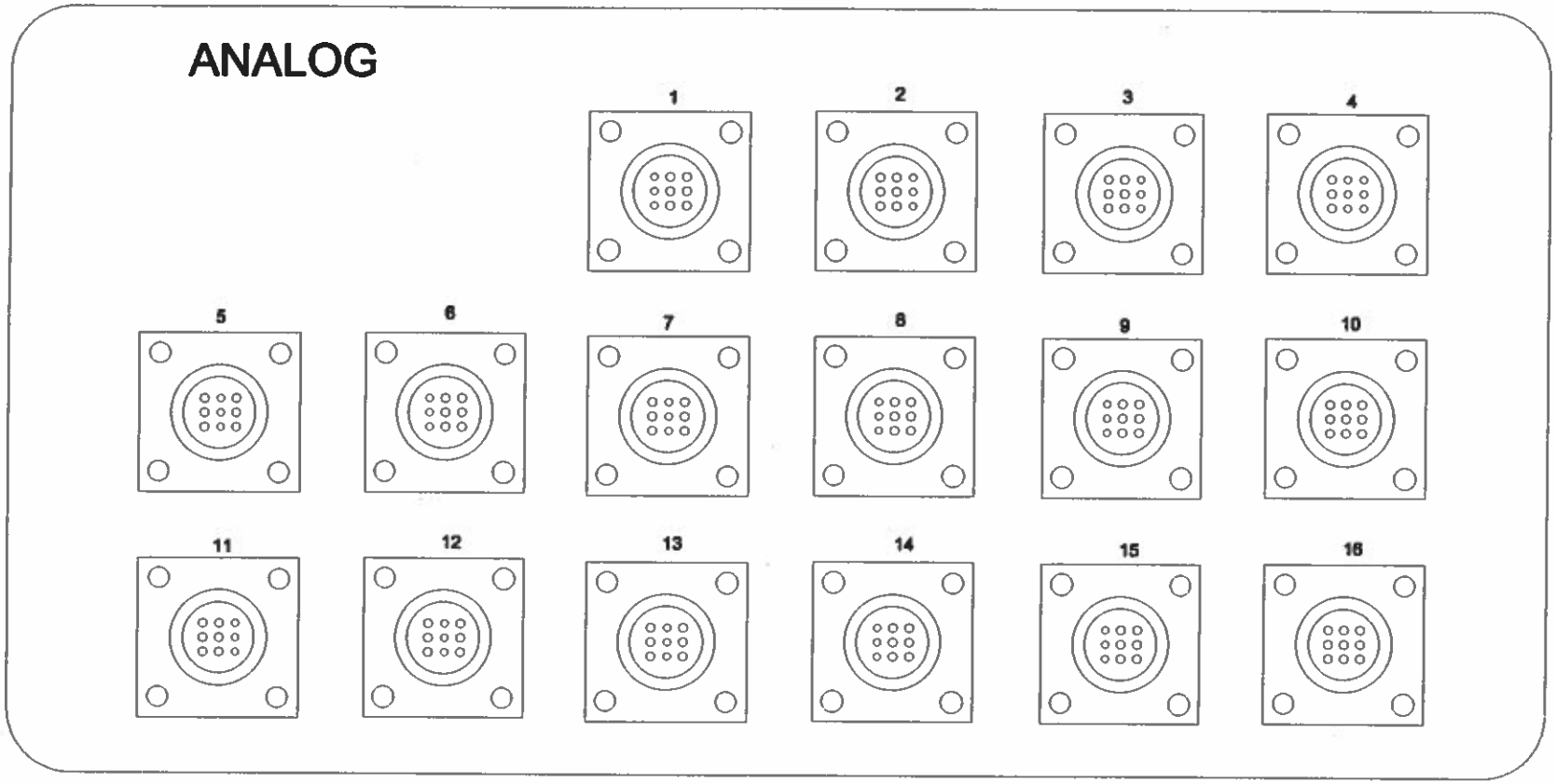


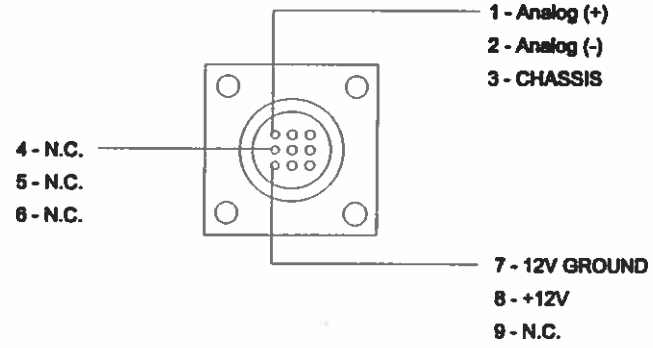
2 - XMIT DATA
3 - RECV. DATA
5 - GROUND

TRANSIENT SUPPRESSION BOARD
(DIGITAL INPUTS)
102-117



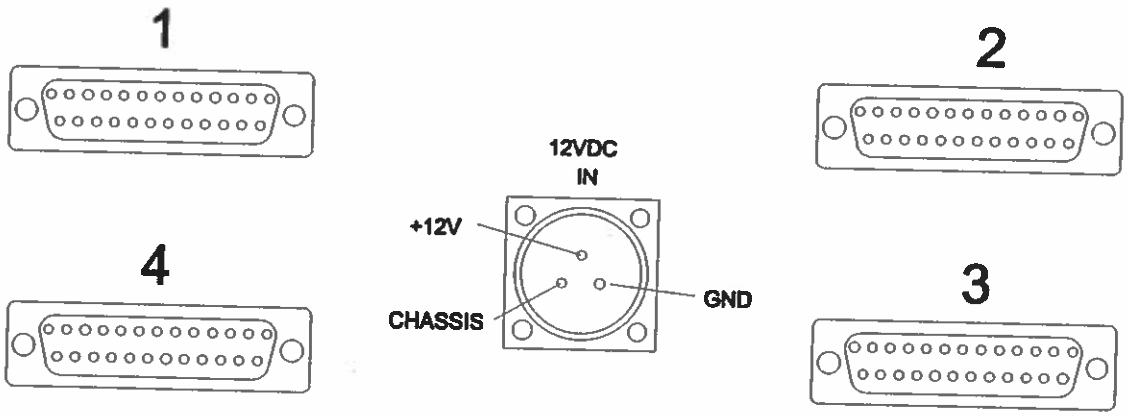
Front Panel

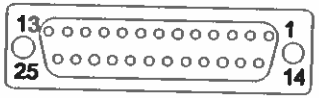

ANALOG
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16


1 - Analog (+)
2 - Analog (-)
3 - CHASSIS
4 - N.C.
5 - N.C.
6 - N.C.
7 - 12V GROUND
8 - +12V
9 - N.C.

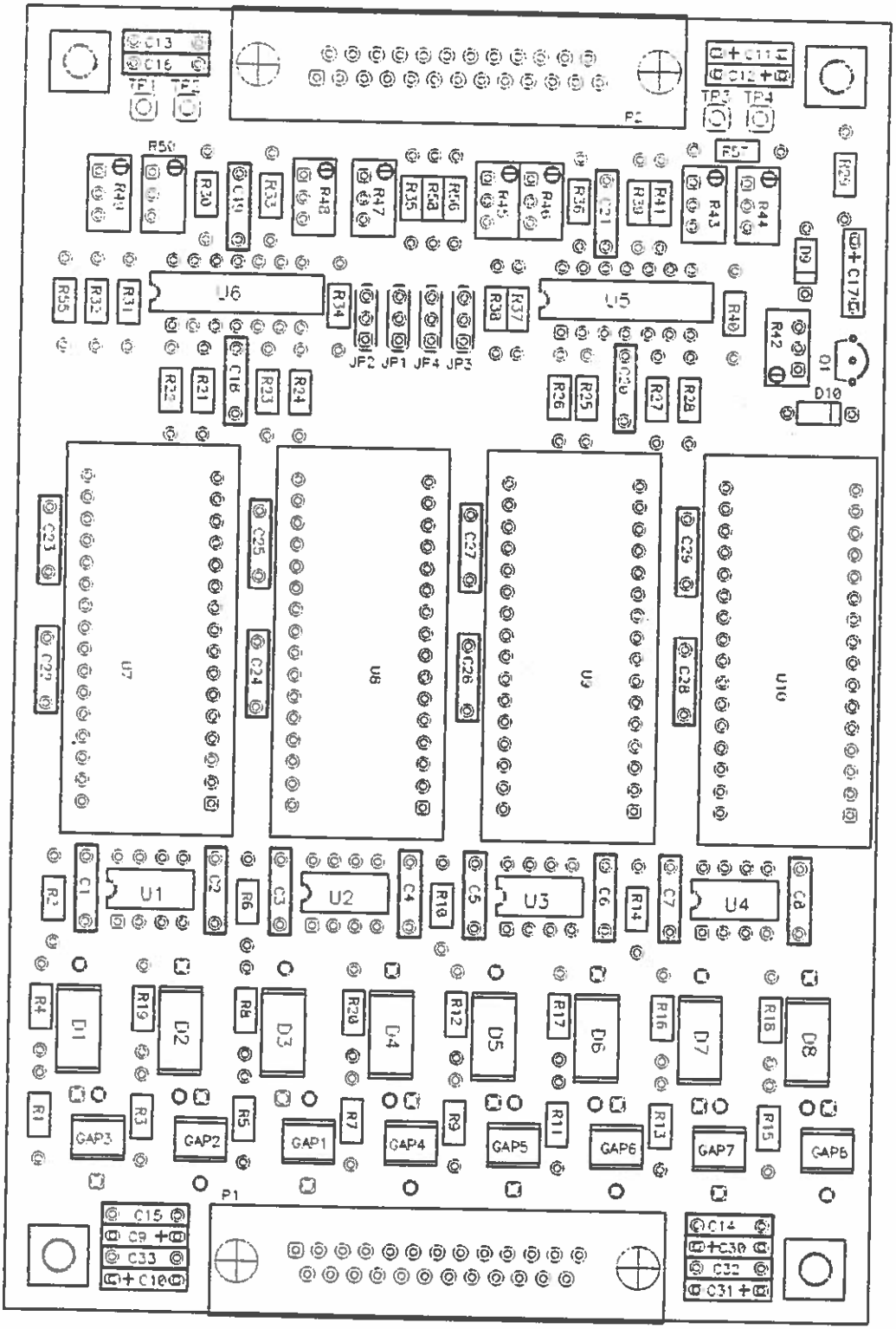
Rear Panel

ANALOG





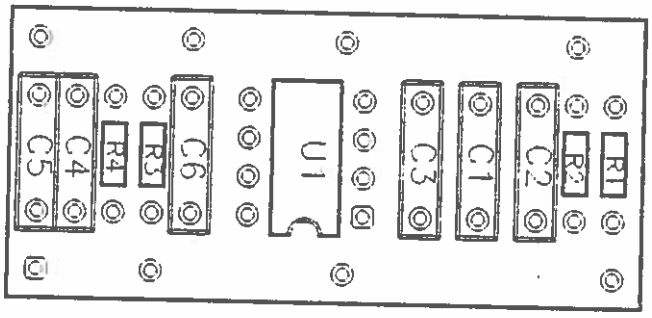
Refer to Wiring Diagram for pin-out.

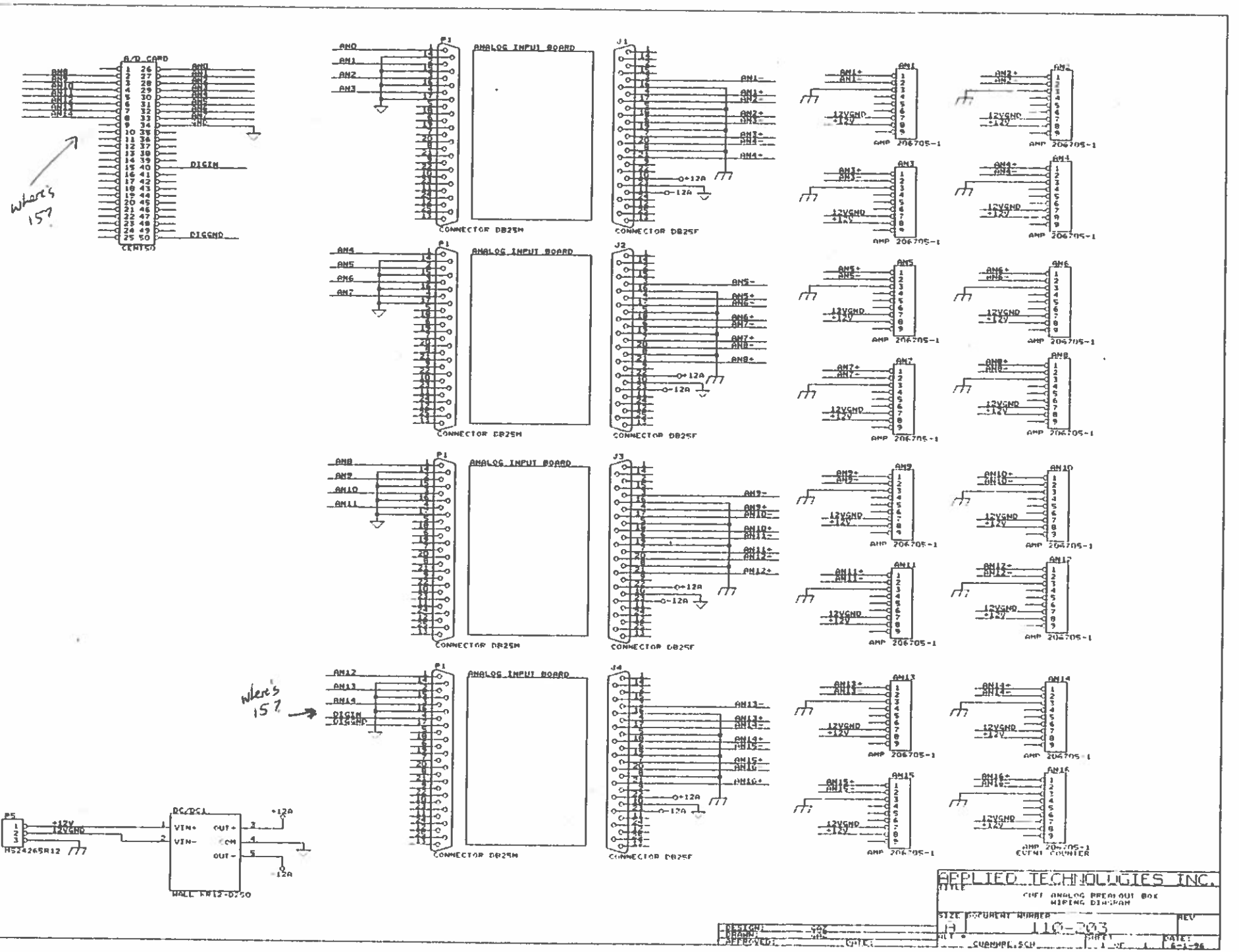


ANALOG INPUT FRONT END

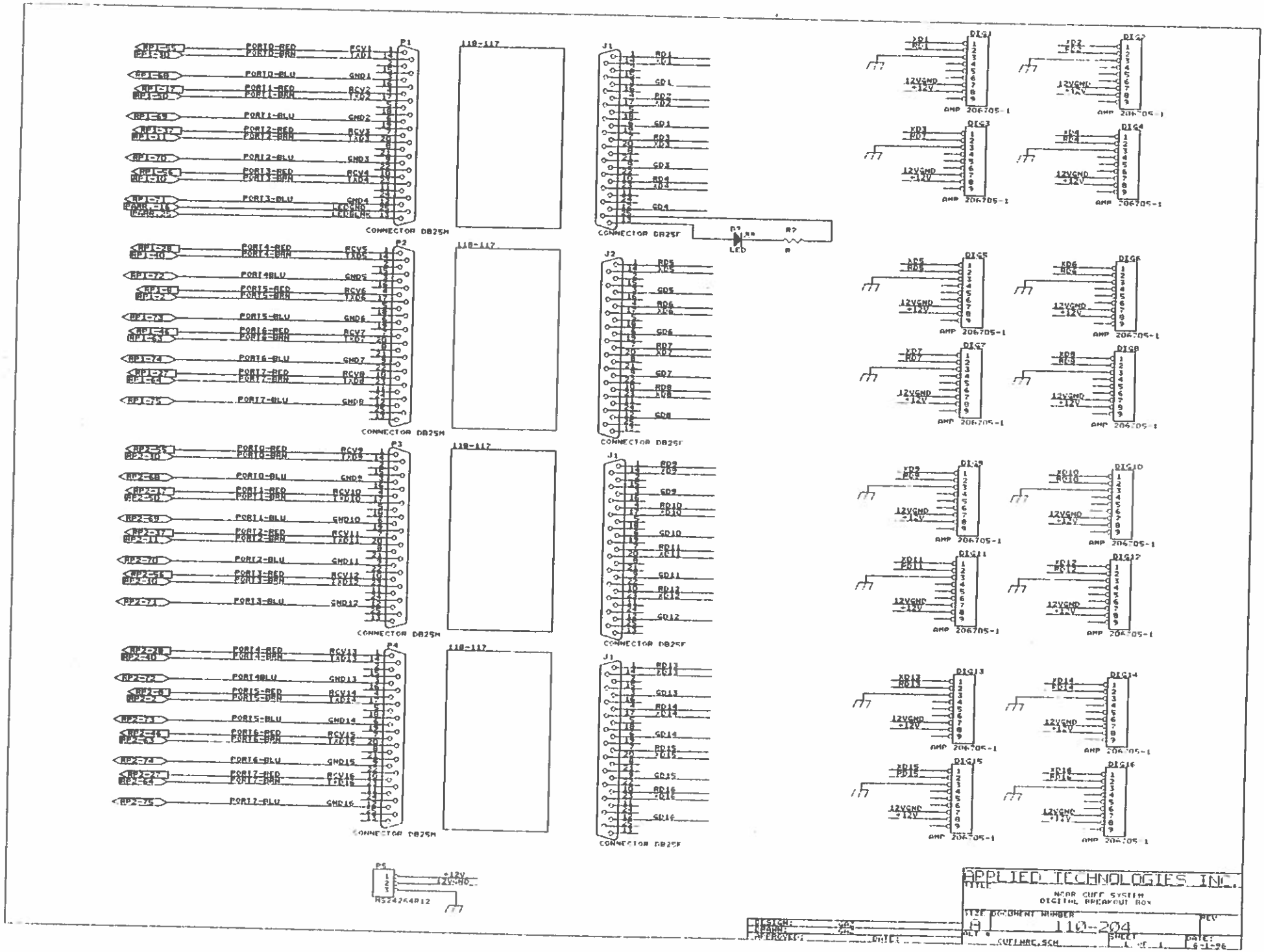
102-118

FILTER MODULE
102-119





APPLIED TECHNOLOGIES INC.	
TITLE: CUST ANALOG BREAKOUT BOX WIRING DIAGRAM	
SIZE: A	DOCUMENT NUMBER: 110-203
SCALE: NOT *	SUBNMPL.SCH
DESIGN:	DATE:
DRAWN:	
APPROVED:	DATE:
REV	
SHEET 1 OF 1	DATE: 6-1-96


P1
P2
P3
P4
P5
J1
J2
CONNECTOR DB25M
CONNECTOR DB25F
LED
DIG1
DIG2
DIG3
DIG4
DIG5
DIG6
DIG7
DIG8
DIG9
DIG10
DIG11
DIG12
DIG13
DIG14
DIG15
DIG16
AMP 206705-1
APPLIED TECHNOLOGIES INC.
NCAR CUFF SYSTEM
DIGITAL BREAKOUT BOX
110-204
CUFFNRC.SCH

APPENDIX B

OPERATIONAL DETAILS FOR ANALOG INPUT BOARD (102-118)

1. ANALOG INPUT BOARD 102-118

1.1 GENERAL DESCRIPTION

Each analog input board provides four differential inputs. The board allows the user to set and trim gain, trim offset, select unipolar or bipolar operation and select an anti-aliasing filter for each channel. The output of this board is +/- 5 volts single ended (referenced to ground). Lightning protection is also provided by this board. There are four analog input boards, providing sixteen channels in the analog breakout box.

1.2 GAIN

Each input is lightning protected and applied to an instrumentation amplifier (AD620 U1-U4). The gain of that amplifier can be changed by changing the resistor value between pins 1 and 8. For channel 1 through channel 4, change R2, R6, R10 and R14. The formula for the gain is:

$$G = 1 + (49.4K / R_g)$$

The gain for each channel has been set at unity by leaving Rg open. The gain can be trimmed by adjusting the gain potentiometer, for channels 1, 2, 3 and 4, adjust R50, R48, R46 and R44. The gain pots have been calibrated at the factory but must be re-adjusted if the gain of the instrumentation amplifier is changed. (Not necessarily true if you could find the exact values of resistor you need).

1.3 OFFSET

The offset for channels 1, 2, 3 and 4 can be adjusted with potentiometers R49, R47, R45 and R43. The offsets have been trimmed at the factory for zero offset. Offset may need to be re-adjusted if the gain, filter or unipolar-bipolar jumper is changed. Offsets of instruments may be nulled out with these pots (within reason).

1.4 FILTERS

changed 1/12/98
see Duck log

Each channel is equipped with an anti-alias filter. ~~The factory configuration is 1Hz. filters on the odd channels and 10Hz. filters on the even channels.~~ Filter modules are socket mounted and can be changed as needed. The filter module pin out was designed such that a commercially available filter could be inserted. Low power linear active filters that fit this footprint are available in various configurations and frequencies from:

Frequency Devices

25 Locust Street

Haverhill, MA 01830 (508) 374-0761

DP68 series

1.5 UNIPOLAR - BIPOLAR JUMPER

Each channel can be configured as a unipolar or bipolar channel JP1-JP4 sets the mode for channels 1-4. With unity gain on the instrumentation amplifier, the A/D will respond full scale for 0-10 volts unipolar and +/- 5 volts bipolar. The jumpers are all set for bipolar at the factory. Gain and offset calibration may be needed if this jumper is changed.

1/7/98 Channels 1-8 seem to be -32k to +32k for -10 to +10 v

Channels 8-16 of course don't work at all

Duck serial port names

CHRIS

/dev/tty R0
1
2
3
4
5
6
7
tty S1
tty R33
34
35
36
37
38
39