DZERO Rack Monitor Interface Chassis

Specification

Note: This is the "as built" specification. Check the date in the page headers.

Note: This includes fail-safe external fault changes made in January 1991.

Please refer all questions, comments or observations to Rick Hance by phone at (312) 840-3898 or by VAX mail at FNAL::HANCE

Rack Monitor Interface Drawings

27-Jul-95

Drawing Number	Description	Location
3740 530 EB 330053	D0 Rack Monitor Interface Schematic - 8 Pages	D0 Flat Files
3740 530 EC 330054	D0 Rack Monitor Interface Top Cover Silk Drawing	D0 Flat Files
3740 530 EC 330055	D0 Rack Monitor Interface Back Panel Silk Drawing	D0 Flat Files
3740 530 EC 330056	D0 Rack Monitor Interface Powe Supply Drill Drawing	D0 Flat Files
3740 530 EC 330057	D0 Rack Monitor Interface Power Supply Assembly Draw	D0 Flat Files
3740 530 EC 330058	D0 Rack Monitor Interface Power Supply Schematic	D0 Flat Files
3740 530 ED 330059	D0 Rack Monitor Interface Printed Circuit Board Assembl	D0 Flat Files
3740 530 ED 330060	D0 Rack Monitor Interface Printed Circuit Board Drill	D0 Flat Files
3740 530 ED 330061	D0 Rack Monitor Interface Side Panel Machine	D0 Flat Files
3740 530 ED 330062	D0 Rack Monitor Interface Front Panel Machine	D0 Flat Files
3740 530 ED 330063	D0 Rack Monitor Interface Top & Bottom Cover Machin	D0 Flat Files
3740 530 ED 330064	D0 Rack Monitor Interface Back Panel Machine	D0 Flat Files
3740 530 PM 330065	D0 Rack Monitor Interface PC Photography EC205-240	D0 Flat Files
3740 530 PM 330066	D0 Rack Monitor Interface Power Supply PC Photography	D0 Flat Files

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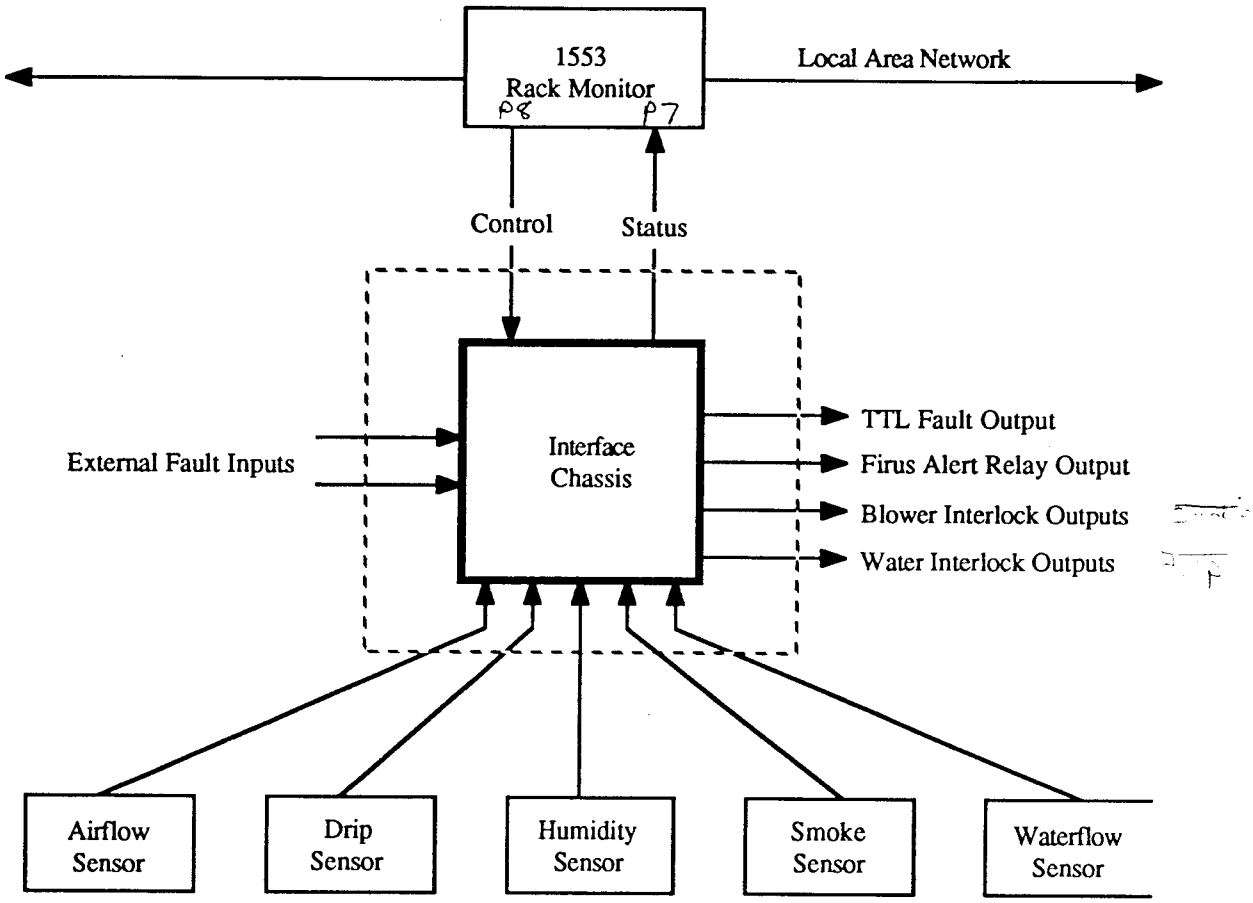
Introduction

This document describes a rack monitor interface chassis which will be mounted in each of the various DZERO equipment racks and which will supply the interface logic required to connect the individual equipment rack sensors to the DZERO rack monitoring system. Within each rack, the sensor inputs are processed and combined into a digital status word which is cabled to a networked 1553 control box. This enables operators and computer alarms and limits programs to monitor the status of each equipment rack. In addition to providing status signals to the 1553 control box, the interface chassis will use the sensor inputs to generate signals which can warn FIRUS of a fault or locally disable power supplies, water solenoids and blowers.

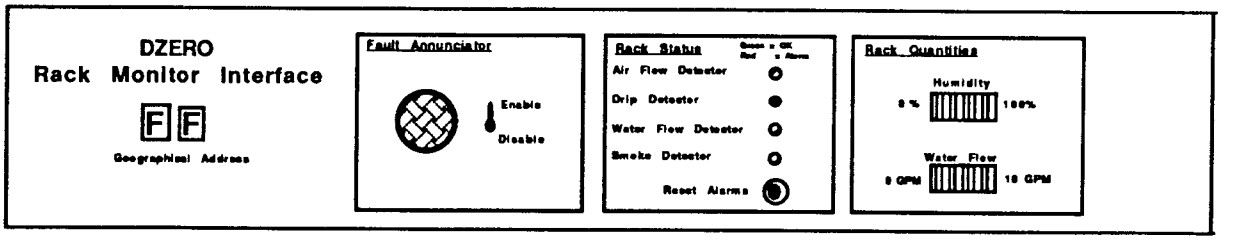
Two external fault inputs are provided at the rear of the chassis via BNC connectors. These inputs are provided for the situation where an adjacent chassis may need to force a fault. An example is the SHAPER electronics installation where all power supplies are in the same rack and one or more supplies must be interlocked to neighboring rack environments.

System Configuration



Front Panel Discussion

Front Panel



Geographical Address

An 8-bit DIP switch, accessable from the top of the unit, allows for setting of a geographical address which will be read back thru the 1553 rack monitor. This geographical address serves no purpose other than to provide postive identifcation of the rack being monitored.

Fault Annunciator

This device emits a loud audio alert tone whenever triggerred by the occurrance of a fault from an enabled air flow sensor, drip detector, water flow detector or smoke detector. A fault will remain once triggerred and the annunciator will sound until a computer generated RESET occurs or until the RESET button is pressed. The annunciator may be silenced by the enable/disable switch if necessary to maintain sanity.

Rack Status

Each LED in this section is green if conditions are normal and red if a fault has been triggerred. A fault will remain once triggerred and the associated LED will remain red until a computer generated reset occurs or until the RESET button is pressed. To accommadate different installations, each of the sensor inputs may be enabled or disabled by a switch on the chassis' PC board accessable from the top without disassembly. For example: If the user did not have drip detectors installed, the drip detector should be disabled to prevent the "cable off" condition from triggerring a fault which would indicate on the LED and sound the annunciator. The following LEDs and push button are located in this section:

Air Flow Detector: If enabled this indicator turns red if the rack fan has stopped turning or if the cable to the detector has become disconnected.

Drip Detector: If enabled this indicator turns red if one of the several parallel drip detectors in each rack has been shorted by the dripping of a conductive liquid such as water or if the cable to the assembly has become disconnected.

Water Flow Detector: If enabled this indicator turns red if the combined flow of water thru the rack's heat exchangers drops below a threshold or if the cable to the detector becomes disconnected. The threshold is settable by a switch on the chassis' PC board accessable from the top without disassembly.

Smoke Detector: If enabled this indicator turns red if smoke is detected in the rack or if the cable to the detector becomes disconnected.

Reset Alarms: This push button is used to manually reset any alarm condition being indicated by LEDs and the annunciator. If the fault condition remains after it has been reset, then the LEDs and annunciator will not reset but will continue to indicate.

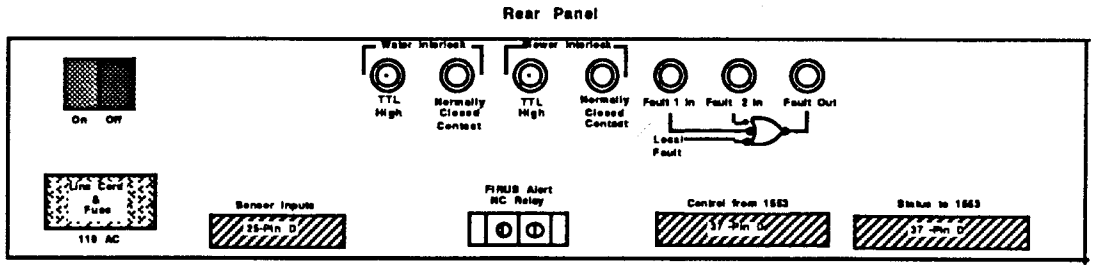
Rack Quantities

This section contains light bars which are used to indicate measurable quantities of interest in the rack The two light bars in this section are as follows:

Humidity: Humidity in the rack is measured and displayed as a quantity between 0% and 100% humidity resolved to increments of 10%.

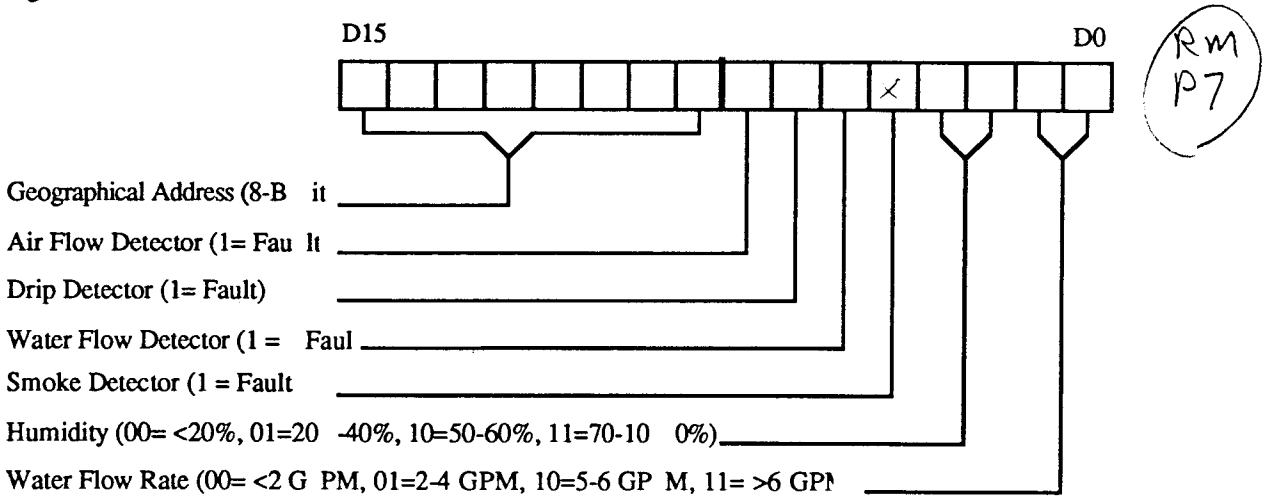
Water Flow: Water flow in the rack is measured and displayed as a quantity between 0 and 10 gallons per minute resolved to increments of 1 gallon per minute.

Rear Panel Discussion



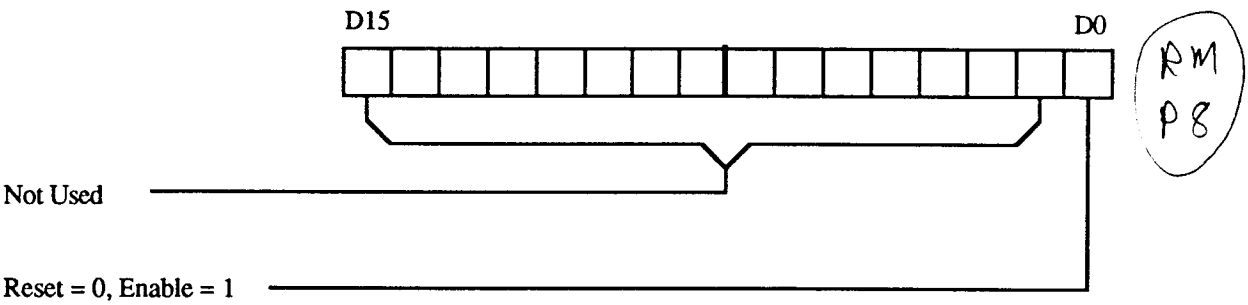
Connector - Status to 1553

The status of the rack monitor interface is routed to the 1553 by a cable connected to this 37-pin "D" connector (sockets). The pinnout of this connector is given in the appendix. The 16-bit word delivered to the 1553 is organized as follows:



Connector - Control From 1553

The control of the rack monitor interface chassis is via a cable from the 1553 Rack Monitor to this 37-pin "D" connector (sockets). The only control function available is "RESET". When a fault condition is detected by the interface chassis, it is latched and remains latched even if the sensor returns to normal. To clear the fault condition which will be indicated on the front panel and in the status word, a manual or programmed RESET must occur, The RESET must be cleared and set. Normal condition is TTL "Hi". A TTL "Low" condition attempts to reset all fault conditions. If the fault condition still exists during RESET or after RESET is returned to TTL "Hi", then the chassis will continue to report a fault and provide the appropriate interlocks. The pinnout of this connector is given in the appendix. The 16-bit word delivered by the 1553 to the interface chassis is organized as follows:



Connector - Sensor Inputs

The sensors are connected into a wire harness which enters the rear of the chassis via this 25-pin "D" connector (sockets). The sensor inputs are listed below along with a general description of their processing and function. See the appendix for the exact pin numbers for each signal. Clearly labeled, circuit board mounted DIP switches alows the user to select which sensors are connected which sensors participate in the "fault out" signal.

Air Flow Sensor: +5v and ground is routed to the sensor. When air is flowing, the sensor produces pulses which are routed back to the monitor. A retriggerable one-shot circuit stays quasi-stable as long as the pulses are received. A fault is sensed if the cable is disconnected or airflow ceases. If a fault occurs, the front panel AIR FLOW LED is lit, the annunciator is activated and the FLOW/NO FLOW bit supplied to the 1553 changes to indicate no air flow. As an option a switch may be set which will produce the FAULT OUT signal which can be used to disable a remote power supply.

Drip Detector: +5v and ground are routed to a continuity type drip detector thru 120k ohms and the circuit is completed back to a biased comparator in the rack monitor thru the connected cable. A fault is sensed if the cable is not connected or if a water drop in the detector shorts the current limited +5v to ground. If a fault occurs, the front panel DRIP DETECTOR LED is lit, the annunciator is activated, the DRY/WET bit supplied to the 1553 changes to indicate a drip. As an option a switch may be set which will produce the FAULT OUT signal which can be used to disable a remote power supply.

Humidity Sensor: +20v and ground is routed to a humidity sensor via a cable. The sensor returns 0-1 volt which corresponds to 0-100% humidity. The 0-1 volt signal is fed thru a gain of 5 amplifier to a bar display driver which then displays the humidity level on a 10 LED front panel bar display. The most significant 8-bits of the bar code are encoded into 2-bits and sent to the 1553. The humidity sensor circuit does not participate in the FAULT OUT signal or front panel alarms.

Smoke Detector: +20v and ground are supplied to the smoke detector. The +20v is interrupted when a RESET occurs to clear the detector condition. The RESET is supplied by a front panel push button or by an output bit from the 1553. A fault occurs if the detector smells smoke or if the cable is disconnected. If a fault occurs, the front panel SMOKE DETECTOR LED is lit, the annunciator is activated and the OK/SMOKE bit supplied to the 1553 changes to indicate smoke. As an option a switch may be set which will produce the FAULT OUT signal which can be used to disable a remote power supply.

Water Flow Detector: The signal from a magnetic pickup on a water flow detector is received and fed to a frequency to voltage converter. The resulting 0-3.5v is fed to a bar display driver which then drives a 10 LED front panel bar display. The most significant 8-bits of the bar display inputs are encoded into 2-bits and supplied to the 1553 for computer monitoring of water flow. A switch is provided for the user to select the minimum flow acceptable before a fault is declared.

Connectors - Fault In/Out

In some applications, a rack monitor interface's "fault out" signal controls a power supply which provides current to devices in one or more adjacent racks. A means is provided here to shutdown that power supply if the interface chassis in an adjacent rack senses a fault. For example, if a power supply provides current to an adjacent rack, and the drip sensor in that adjacent rack detects a water leak, the interface chassis in that rack will provide a fault signal to the interface chassis controlling the power supply and will shut it down. The "Local Fault" signal shown on the back panel is internal to the chassis and indicates a fault is detected from one of the sensor signals. The other signals are "Isolated LEMO" type connectors and described as follows:

Fault 1: Single ended TTL input for combining adjacent rack faults for local interlocking. This signal must be held to a TTL "high" either by an adjacent chassis Fault out signal, or by another means. The water or blower TTL out signals may be used. If this signal is driven to a TTL "low" condition, it will force the FAULT OUT output signal to a TTL "low". Specs: Vil 0-.8V, Vih 2-5V, Input Resistance 4.7K.

Fault 2: Single ended TTL input for combining adjacent rack faults for local interlocking. This signal must be held to a TTL "high" either by an adjacent chassis Fault out signal, or by another means. The water or blower TTL out signals may be used. If this signal is driven to a TTL "low" condition, it will force the FAULT OUT output signal to a TTL "low". Specs: Vil 0-.8V, Vih 2-5V, Input Resistance 4.7K.

Fault out: Single ended TTL output signal to be used as a power supply disable signal . This signal is a combination of LOCAL FAULT, FAULT 1 and FAULT 2. It is normally high but goes low on detection of a water drip, low water flow (optional), air flow interruption (optional), smoke, or low going signals at the FAULT 1 or FAULT 2 input. Specs: Vol .44 max @ 24 ma, Voh 4.3 min @ -24 ma.

Connector - FIRUS Alert

This 2-wire screw type terminal strip is connected to an isolated, normally open contact which closes on detection of a water drip, smoke or power failure. This output is intended to be connected via a pair of wires to a FIRUS interface point which uses the same type of connector. Specs: Switching volts 100Vdc max, switching current .5A max, carry current 1.5A max, series protection resistor 36 ohms.

Connectors - Water Solenoid Interlock

This output is provided in two formats:

1-) A BNC connector attached to an isolated, ~~normally~~ closed relay contact which opens on detection of a water drip, cable failure or power failure. Specs: Switching volts 100Vdc max, switching current .5A max, carry current 1.5A max, series protection resistor 10 ohms.

2-) A BNC connector attached to a normally high TTL signal for driving a solid state relay. This signal goes low on detection of a water drip. Specs: Vol .44V @ Iol = 24ma, Voh 4.2V @ Ioh = -24ma .

Connectors - Blower Interlock

This output is provided in two formats:

1-) A BNC connector attached to an isolated, normally closed relay contact which opens on detection of smoke, cable failure or power failure. Specs: Switching volts 100Vdc max, switching current .5A max, carry current 1.5A max, series protection resistor 10 ohms.

2-) A BNC connector attached to a normally high TTL signal for driving a solid state relay. This signal goes low on detection of smoke. Specs: Vol .44V @ Iol = 24ma, Voh 4.2V @ Ioh = -24ma .

Appendix A - Connector Pin out For Status to 1553

Status to 1553 Unit

Ribbon Cond #	37 "D" Pin #	Signal Name
1	1	D0 WATER FLOW
2	20	GND
3	2	D1 WATER FLOW
4	21	GND
5	3	D2 HUMIDITY
6	22	GND
7	4	D3 HUMIDITY
8	23	GND
9	5	D4 SMOKE FAULT
10	24	GND
11	6	D5 WATER FAULT
12	25	GND
13	7	D6 DRIP FAULT
14	26	GND
15	8	D7 AIR FAULT
16	27	GND
17	9	D8 MSB GEO ADDRESS
18	28	GND
19	10	D9 GEO ADDRESS
20	29	GND
21	11	D10 GEO ADDRESS
22	30	GND
23	12	D11 GEO ADDRESS
24	31	GND
25	13	D12 GEO ADDRESS
26	32	GND
27	14	D13 GEO ADDRESS
28	33	GND
29	15	D14 GEO ADDRESS
30	34	GND
31	16	D15 LSB GEO ADDRESS
32	35	GND
33	17	
34	36	
35	18	
36	37	
37	19	

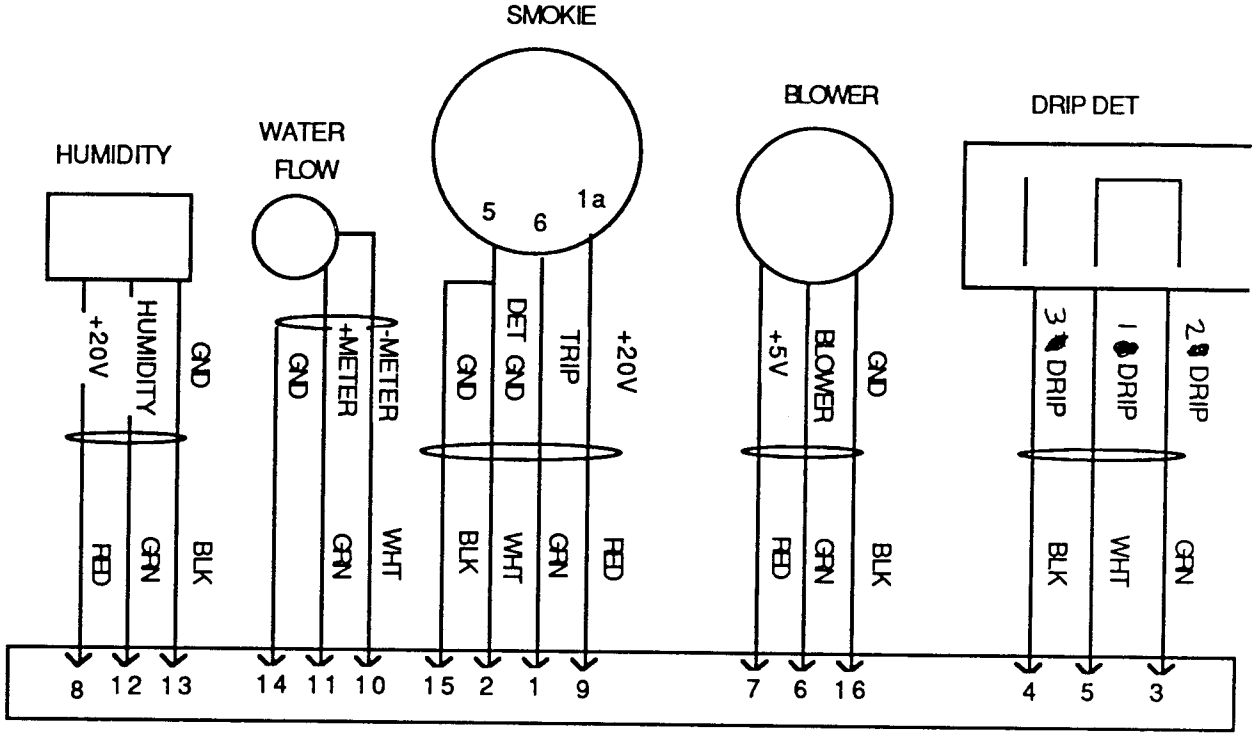
Appendix B - Connector Pin out For Control from 1553

Control from 1553 Unit

Ribbon Cond #	37 "D" Pin #	Signal Name
1	1	RESET
2	20	GND
3	2	
4	21	
5	3	
6	22	
7	4	
8	23	
9	5	
10	24	
11	6	
12	25	
13	7	
14	26	
15	8	
16	27	
17	9	
18	28	
19	10	
20	29	
21	11	
22	30	
23	12	
24	31	
25	13	
26	32	
27	14	
28	33	
29	15	
30	34	
31	16	
32	35	
33	17	
34	36	
35	18	
36	37	
37	19	

Appendix C - Connector Pin out and Cabling to Sensors

Rack Monitor Interface
Sensor/Cable/Connector Wiring



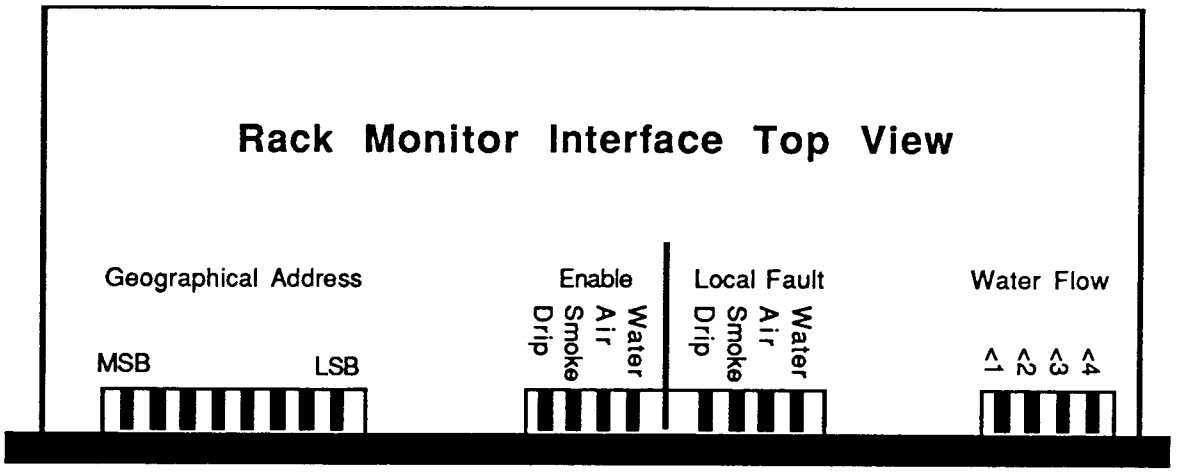
J6 (Male AMP "D" Connector)

Parts List:

(5 pieces) Cable, 6' long, 2 twisted pair, Fermi stock #1170-0050
(1) connector, 25 Pin "D", Amphenol P/N 117-DB-25P, Fermi stock # 1430-4300
(1) Connector Hood, Amphenol P/N 117-51226-1A, Fermi stock # 1430-4320

Appendix D - Option Switches

All option switches are clearly labeled and accessable at the front of the unit from the top as shown below:



Geographical Address - These switches are used to set a HEX number which will be displayed on the front panel and which may be read back thru the control system. They serve no purpose other than as a means to identify the location of the rack being monitored. OFF = 1 and ON = 0 for each bit. For example, HEX address 3A would be setup left to right as ON ON OFF OFF OFF ON OFF ON.

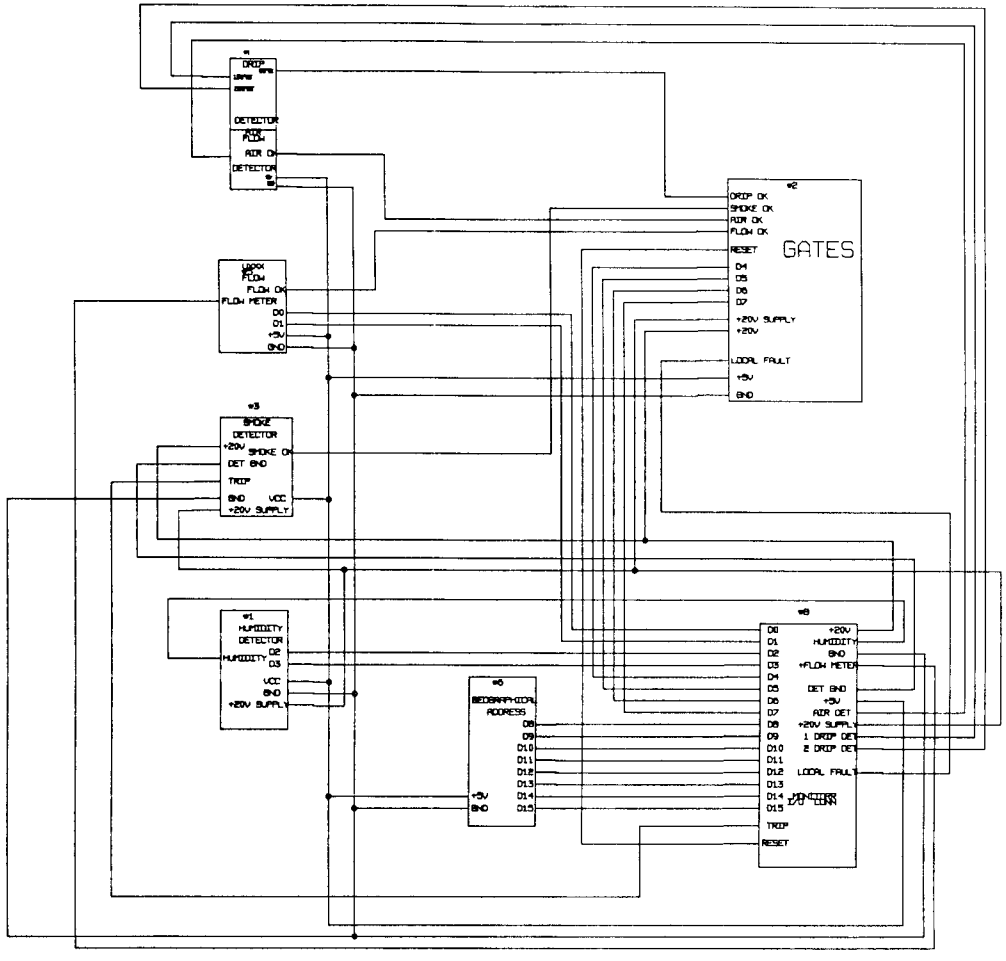
Enable - These switches are used to enable those sensors which are to be "internally monitored". For example, if the rack has a drip detector, a smoke detector and an air flow detector; but no water flow detector, then the drip, smoke and air switches should be set to ON and the water switch should be set to OFF to prevent false alarms. The unit will indicate an alarm if a fault is detected or if a cable detaches while the corresponding switch is set to on. When the unit is indicating an alarm, it may also produce a "local fault" depending on the Local fault switches described next.

Local Fault - These switches are used to identify those "internally monitored" circuits which are to be involved in the "local fault" signal which is used to shut down power supplies. For example, it may be desireable to shut down a power supply only if an alarm occurs due to diminished water flow. In this case, all switches would be OFF except for the water switch which would be ON. Note that these switches are all qualified internally with the previously explained "Enable" switch i.e Drip must be enabled before Drip can contribute to local faults regardless of the "Local Fault" switches. In addition, the "Water" switch is further qualified with the "Water flow" switch explained next.

Water Flow - These switches are used to set the point at which an alarm will occur due to dimished water flow. Only one of these switches must be set to ON. For example, if it is desired to have an alarm if the water flow diminishes to less than 2 gallons per minute, set the <2 switch ON and all others OFF.

```
MODULE RMON

TITLE 'Humidity sensor encoder for the DZERO rack monitor box'
"... 12/90

HUMIDITY DEVICE 'P16V8C';

"This PAL encodes the light bar output of the humidity sensor for the
"DZERO rack monitor interface into a 2-bit binary number representing
"humidity level. This 2-bit number is then delivered to the 1553 rack
"monitor for use by the controls computers.

"Inputs

H1              Pin 1;  "Humidity level = 10% (Low true)
H2              Pin 2;  "Humidity level = 20% (Low true)
H3              Pin 3;  "Humidity level = 30% (Low true)
H4              Pin 4;  "Humidity level = 40% (Low true)
H5              Pin 5;  "Humidity level = 50% (Low true)
H6              Pin 6;  "Humidity level = 60% (Low true)
H7              Pin 7;  "Humidity level = 70% (Low true)
H8              Pin 8;  "Humidity level = 80% (Low true)
H9              Pin 9;  "Humidity level = 90% (Low true)
H10             Pin 11; "Humidity level = 100% (Low true)

"Outputs

D2              Pin 18; "Data bit 2 to 1553 Humidity LSB (Hi true)
D3              Pin 17; "Data bit 3 to 1553 Humidity MSB (Hi true)

TRUTH_TABLE     ([H1,H2,H3,H4,H5,H6,H7,H8,H9,H10] -> [D3,D2 ])
                [ 1, 1, 1, 1, 1, 1, 1, 1, 1, 1 ] -> [ 0, 0 ]; "0%
                [ 0, 1, 1, 1, 1, 1, 1, 1, 1, 1 ] -> [ 0, 0 ]; "10%
                [ 0, 0, 1, 1, 1, 1, 1, 1, 1, 1 ] -> [ 0, 1 ]; "20%
                [ 0, 0, 0, 1, 1, 1, 1, 1, 1, 1 ] -> [ 0, 1 ]; "30%
                [ 0, 0, 0, 0, 1, 1, 1, 1, 1, 1 ] -> [ 0, 1 ]; "40%
                [ 0, 0, 0, 0, 0, 1, 1, 1, 1, 1 ] -> [ 1, 0 ]; "50%
                [ 0, 0, 0, 0, 0, 0, 1, 1, 1, 1 ] -> [ 1, 0 ]; "60%
                [ 0, 0, 0, 0, 0, 0, 0, 1, 1, 1 ] -> [ 1, 1 ]; "70%
                [ 0, 0, 0, 0, 0, 0, 0, 0, 1, 1 ] -> [ 1, 1 ]; "80%
                [ 0, 0, 0, 0, 0, 0, 0, 0, 0, 1 ] -> [ 1, 1 ]; "90%
                [ 0, 0, 0, 0, 0, 0, 0, 0, 0, 0 ] -> [ 1, 1 ]; "100%
END RMON
```

```
MODULE RMON

TITLE 'Water flow encoder for the DZERO rack monitor box'
"12/90

WATERFLO DEVICE 'P16V8C';

"This PAL encodes the light bar output of the Water flow sensor for the
"DZERO rack monitor interface into a 2-bit binary number representing
"water flow. This 2-bit number is then delivered to the 1553 rack
"monitor for use by the controls computers.

"Inputs

F1              Pin 1;  "Water flow = 1 GPM (low true)
F2              Pin 2;  "Water flow = 2 GPM (low true)
F3              Pin 3;  "Water flow = 3 GPM (low true)
F4              Pin 4;  "Water flow = 4 GPM (low true)
F5              Pin 5;  "Water flow = 5 GPM (low true)
F6              Pin 6;  "Water flow = 6 GPM (low true)
F7              Pin 7;  "Water flow = 7 GPM (low true)
F8              Pin 8;  "Water flow = 8 GPM (low true)
F9              Pin 9;  "Water flow = 9 GPM (low true)
F10             Pin 11; "Water flow = 10 GPM (low true)
S1              Pin 16; "Trip if < 1 GPM switch (low true)
S2              Pin 15; "Trip if < 2 GPM switch (low true)
S3              Pin 14; "Trip if < 3 GPM switch (low true)
S4              Pin 13; "Trip if < 4 GPM switch (low true)

"Outputs

D0              Pin 17; "Data bit 1 to 1553 flow LSB (Hi true)
D1              Pin 18; "Data bit 1 to 1553 flow MSB (Hi true)
FLOWOK          PIN 19; "Bit indicating flow level is ok (Hi true)

TRUTH_TABLE     ([F1,F2,F3,F4,F5,F6,F7,F8,F9,F10] -> [D1,D0 ])
                [ 1, 1, 1, 1, 1, 1, 1, 1, 1, 1 ] -> [ 0, 0 ]; "0 GPM
                [ 0, 1, 1, 1, 1, 1, 1, 1, 1, 1 ] -> [ 0, 0 ]; "1 GPM
                [ 0, 0, 1, 1, 1, 1, 1, 1, 1, 1 ] -> [ 0, 1 ]; "2 GPM
                [ 0, 0, 0, 1, 1, 1, 1, 1, 1, 1 ] -> [ 0, 1 ]; "3 GPM
                [ 0, 0, 0, 0, 1, 1, 1, 1, 1, 1 ] -> [ 0, 1 ]; "4 GPM
                [ 0, 0, 0, 0, 0, 1, 1, 1, 1, 1 ] -> [ 1, 0 ]; "5 GPM
                [ 0, 0, 0, 0, 0, 0, 1, 1, 1, 1 ] -> [ 1, 0 ]; "6 GPM
                [ 0, 0, 0, 0, 0, 0, 0, 1, 1, 1 ] -> [ 1, 1 ]; "7 GPM
                [ 0, 0, 0, 0, 0, 0, 0, 0, 1, 1 ] -> [ 1, 1 ]; "8 GPM
                [ 0, 0, 0, 0, 0, 0, 0, 0, 0, 1 ] -> [ 1, 1 ]; "9 GPM
                [ 0, 0, 0, 0, 0, 0, 0, 0, 0, 0 ] -> [ 1, 1 ]; "10GPM

EQUATIONS

!FLOWOK         = !S1 & F1      "Trip if flow < 1 GPM and switch 1 on
                # !S2 & F2      "Trip if flow < 2 GPM and switch 2 on
                # !S3 & F3      "Trip if flow < 3 GPM and switch 3 on
                # !S4 & F4;     "Trip if flow < 4 GPM and switch 4 on

END RMON
```



REPEAT=4

Revised January 1991
1) GATES
2) MONITORR I/O CONN

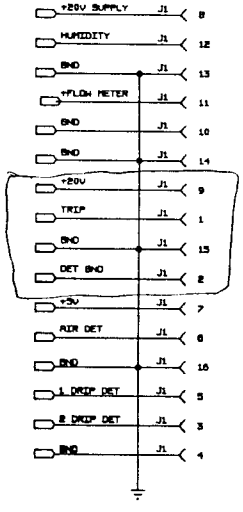
3740-530-EC-311053

FERMI NATIONAL LABORATORY

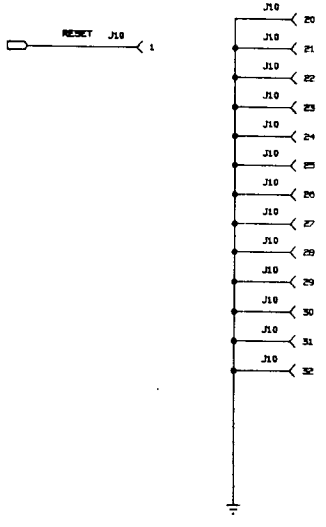
D0
RACK SENSOR INTERFACE
BLOCK DIAGRAM

D	11/2/89	A.D.COOK	
REV C	[redacted]		1 OF 8

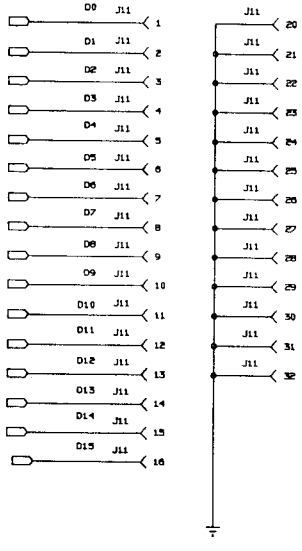
INPUT FROM SENSORS

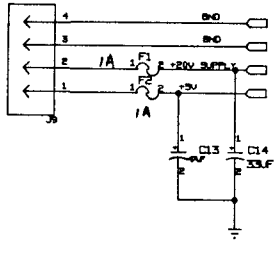


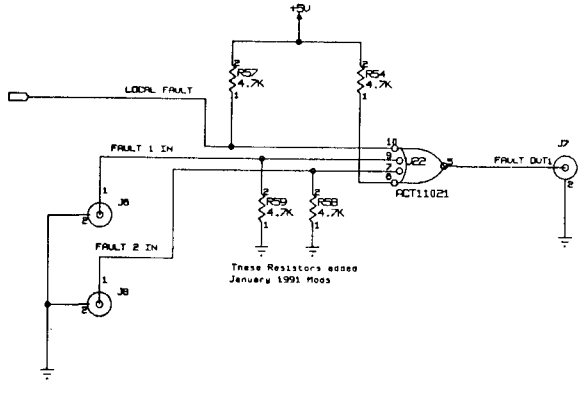
DIGITAL INPUT FROM 1553 (P3)



DIGITAL OUTPUT TO 1553 (P2)







Revised Jan 91
1)Removed Pullups from Fault #1 &2
2)Added Pulldowns to Fault #1 & 2

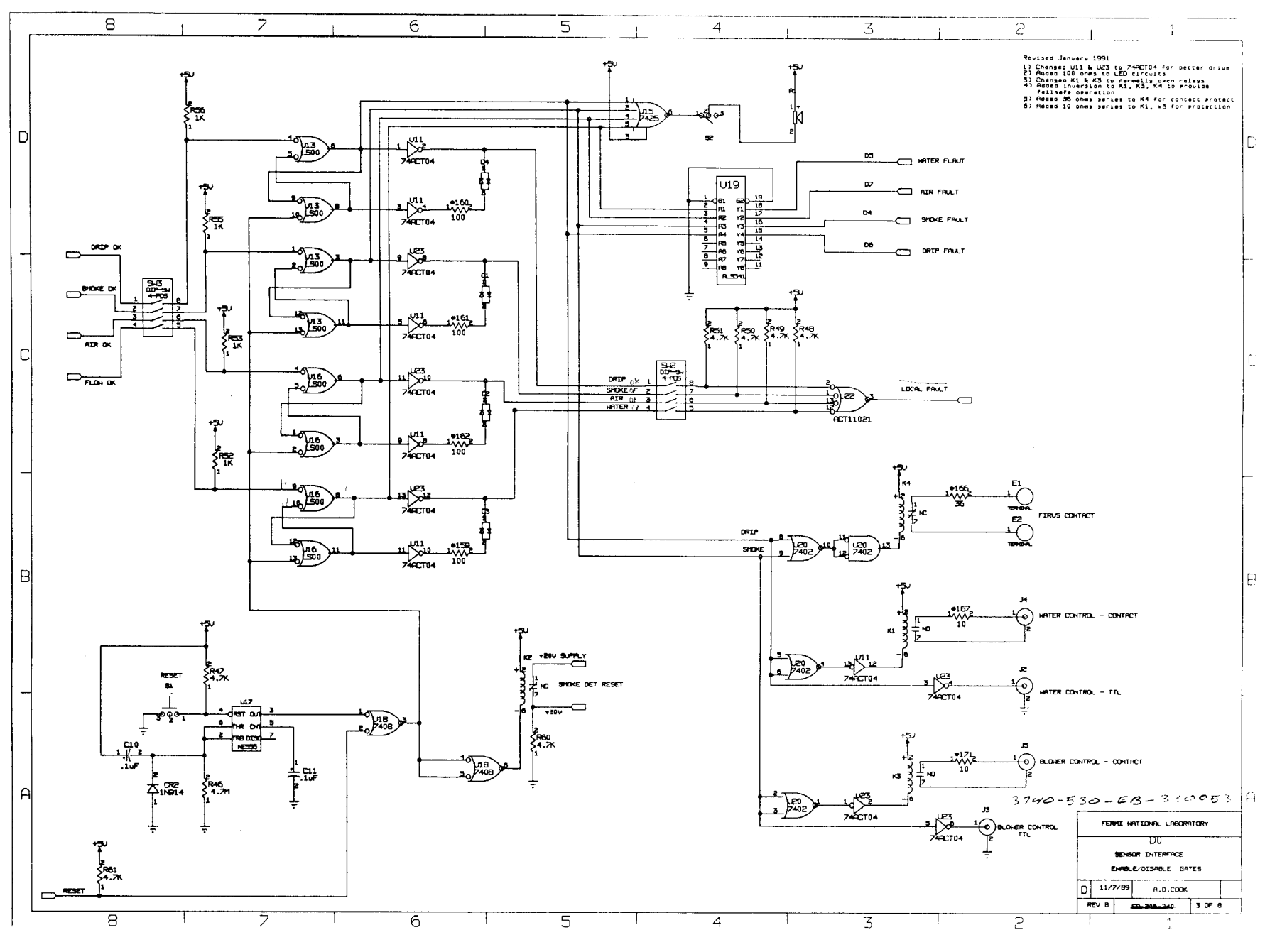
3740-530-EB-3.0053

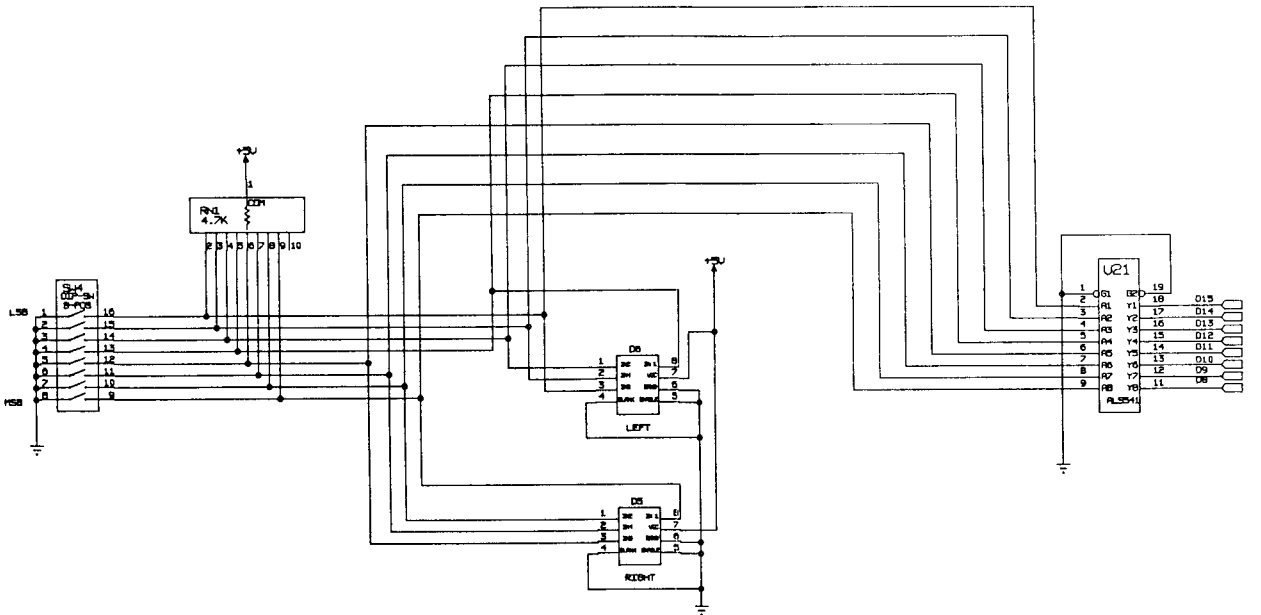
FERMI NATIONAL LABORATORY

SENSOR INTERFACE
MONITOR I/O CONNECTIONS

D	11/7/89	A.D.COOK	
REV B	[redacted]		2 OF 8

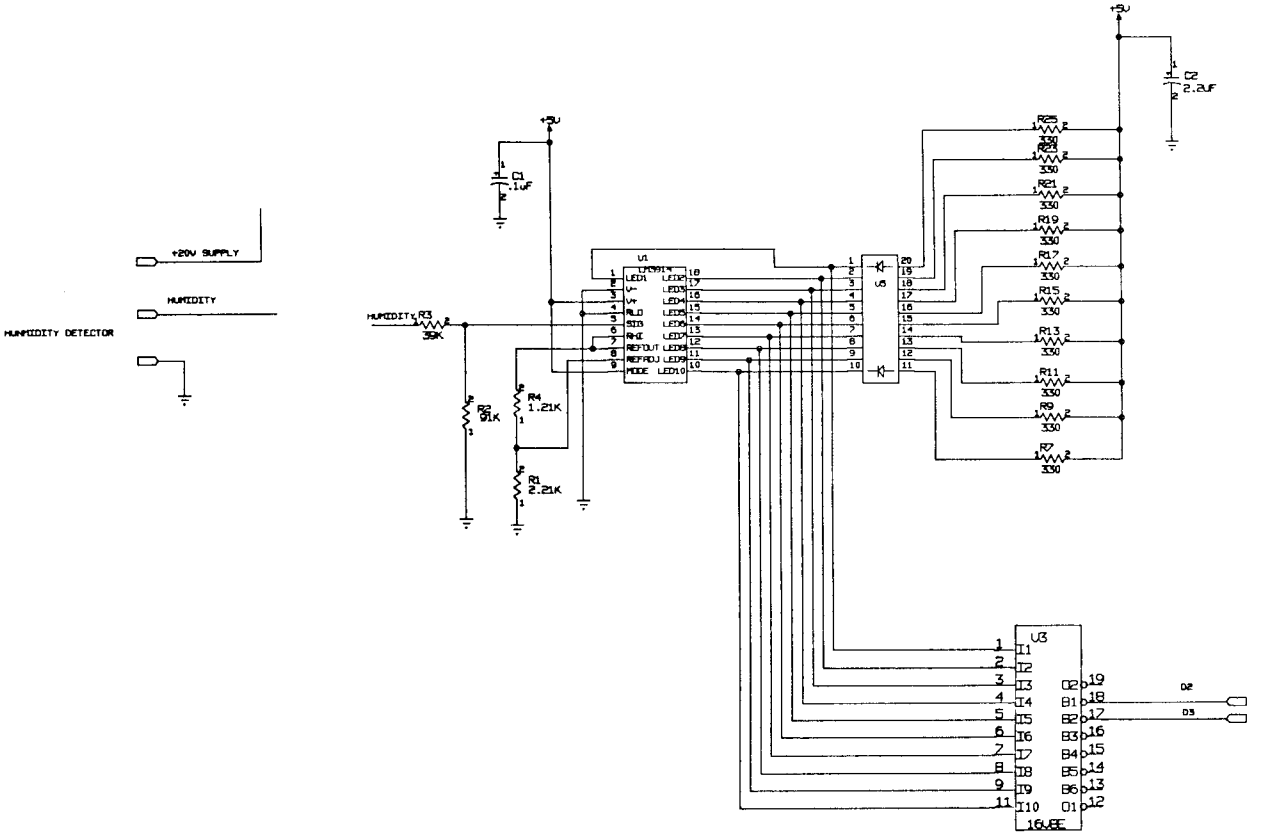
REPEAT=14


Revised January 1991
1) Changed U11 & U23 to 74ACT04 for better drive
2) Added 100 ohms to LED circuits
3) Changed K1 & K3 to normally open relays
4) Added inversion to K1, K3, K4 to provide failsafe operation
5) Added 36 ohms series to K4 for contact protect
6) Added 10 ohms series to K1, K3 for protection
+5V
R56 1K
R55 1K
R53 1K
R52 1K
R51 4.7K
R50 4.7K
R49 4.7K
R48 4.7K
DRIP OK
SMOKE OK
AIR OK
FLOW OK
SW3 DIP-4W 4-POS
SW2 DIP-4W 4-POS
U13 LS00
U16 LS00
U11 74ACT04
U23 74ACT04
U19 74LS541
D5 WATER FLAUT
D7 AIR FAULT
D4 SMOKE FAULT
D6 DRIP FAULT
LOCAL FAULT
U22 ACT11021
U13 74LS25
SW
L+
#160 100
#161 100
#162 100
#159 100
#166 36
#162 10
#171 10
K4
K1
K3
K2
NC
NO
E1
E2
TERMINAL
FIRUS CONTACT
J4
WATER CONTROL - CONTACT
J2
WATER CONTROL - TTL
J5
BLOWER CONTROL - CONTACT
J3
BLOWER CONTROL TTL
U20 7402
U18 7408
U17 NE555
RESET
R47 4.7K
R46 4.7M
R60 4.7K
R61 4.7K
C10 .1uF
C11 .1uF
CR2 1N914
+20V SUPPLY
+20V
SMOKE DET RESET
DRIP
SMOKE
3740-530-EB-3[illegible]
FERMI NATIONAL LABORATORY
D0
SENSOR INTERFACE
ENABLE/DISABLE GATES
D 11/7/89 A.D.COOK
REV B
3 OF 8



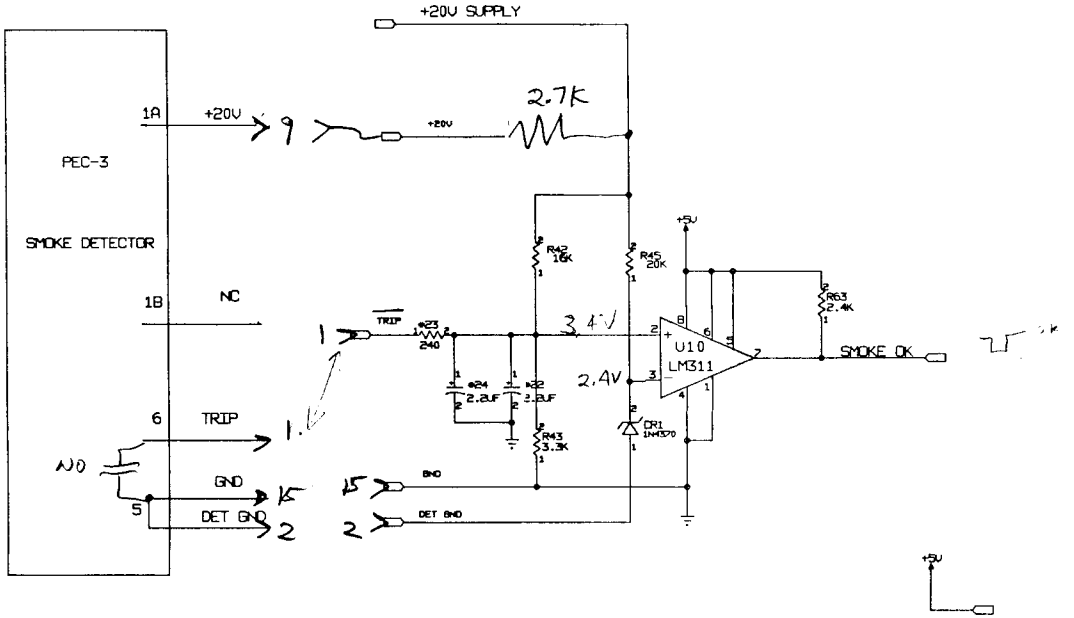
3740-530-EB-3:10033

FERMI NATIONAL LABORATORY			
D0 SENSOR INTERFACE GEOGRAPHICAL ADDRESS			
D	11/7/89	A.D.COOK	
REV A	[redacted]		4 OF 8



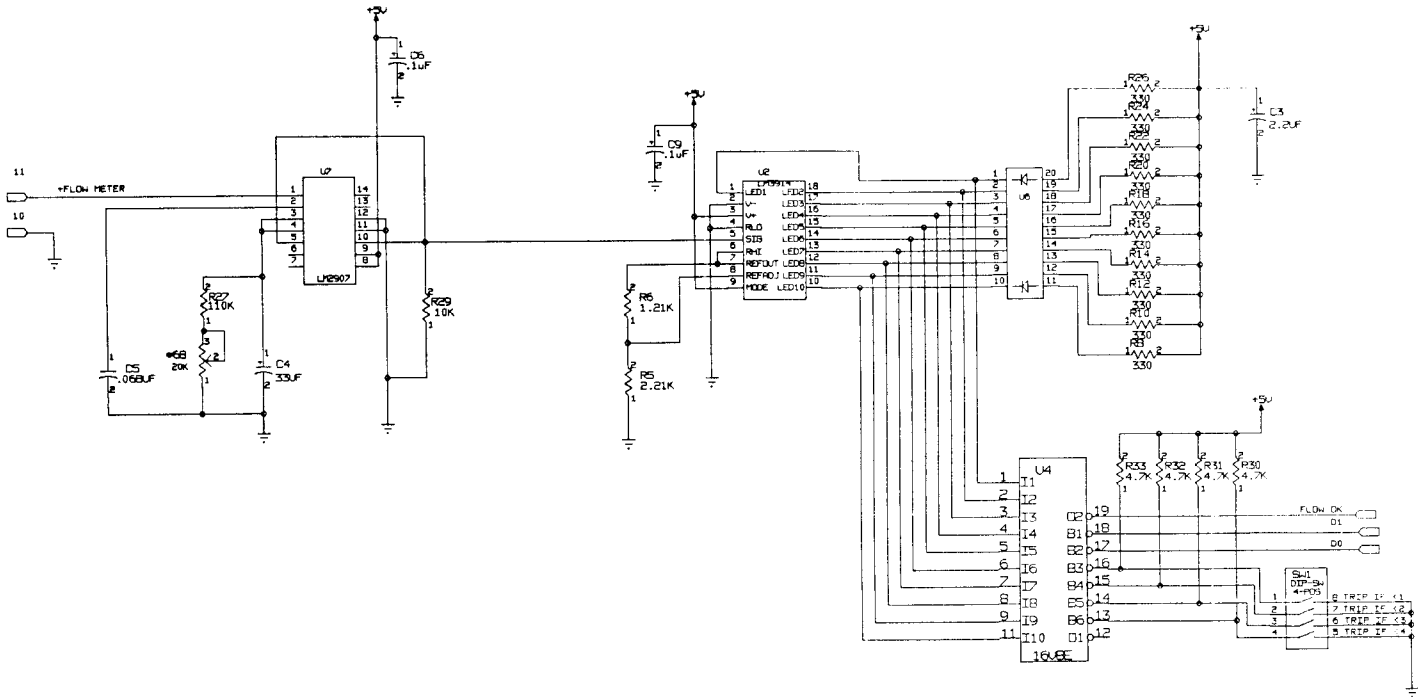
3740-530-EB-3[illegible]

FERMI NATIONAL LABORATORY		
D0 SENSOR INTERFACE HUMIDITY INTERFACE		
D	11/7/89	A.D.COOK
REV A	[illegible]	5 OF 8



3740-530-EB-3[illegible]

FERMI NATIONAL LABORATORY			
D0 ENSOR INTERFACE SMOKE DETECTOR			
D	11/7/89	A.D.COOK	
REV A	[illegible]		6 OF 8



3740-530-
613-330053

FERMI NATIONAL LABORATORY

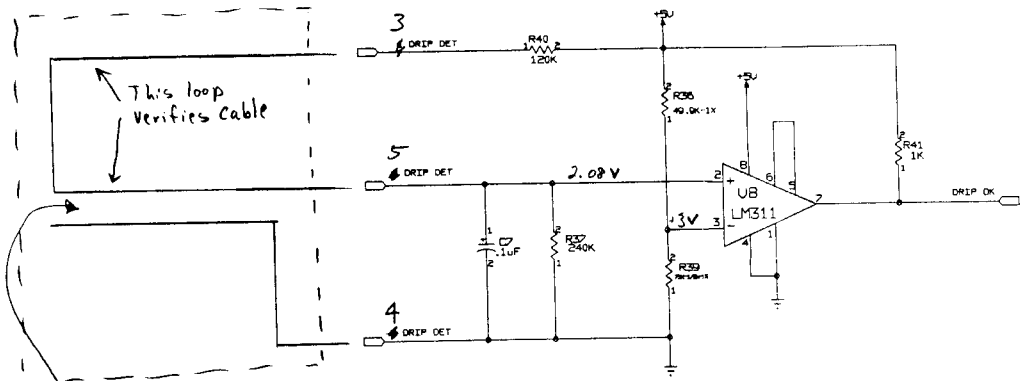
D0

SENSOR INTERFACE CHASSIS
WATER FLOW INTERFACE

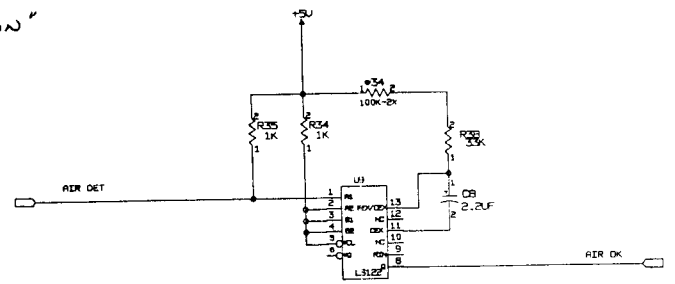
D | 11/7/89

REV # ~~E0-3[illegible]~~

Drip Detector
PC Board



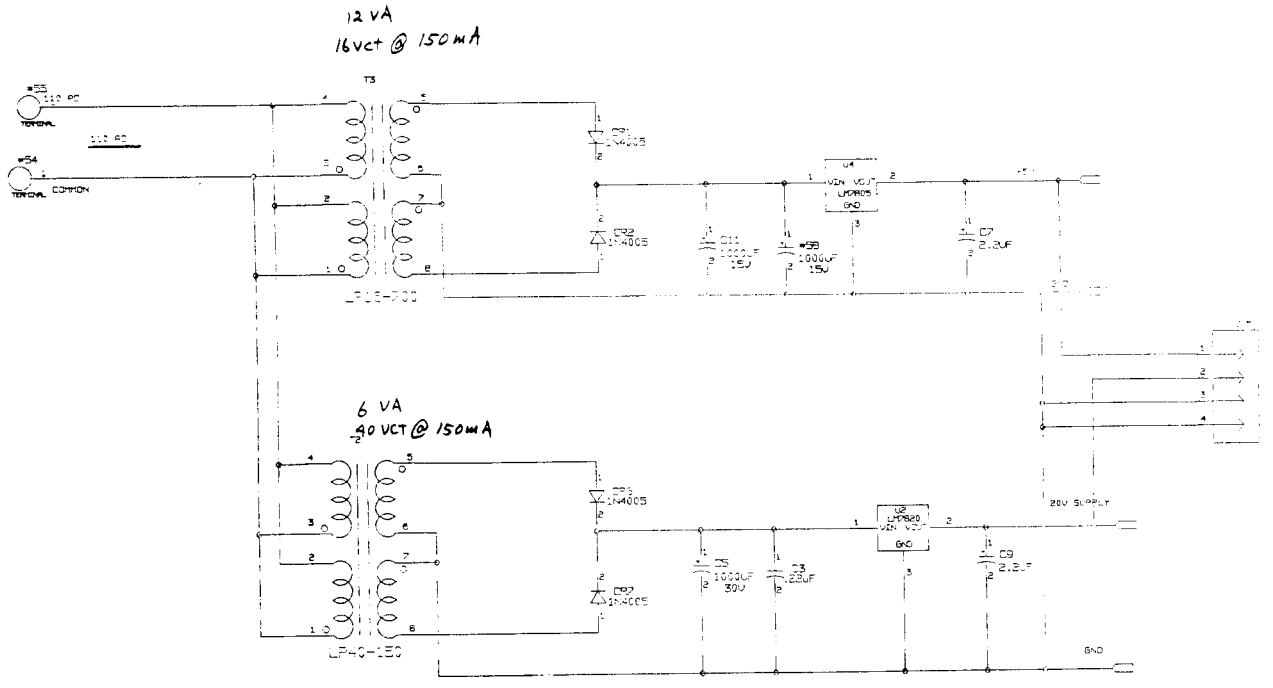
NORMAL CONDITIONS = LOGICAL 0

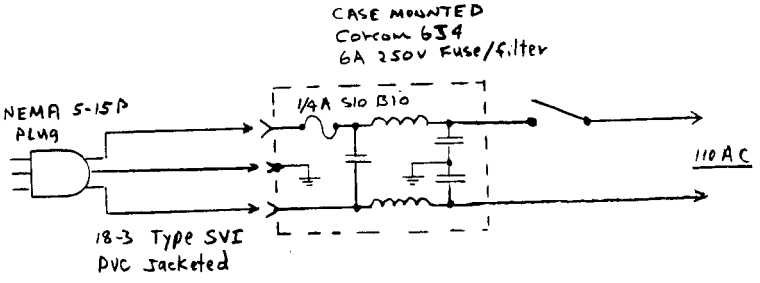


LS122
ONE SHOT

3740-530-EB-330053

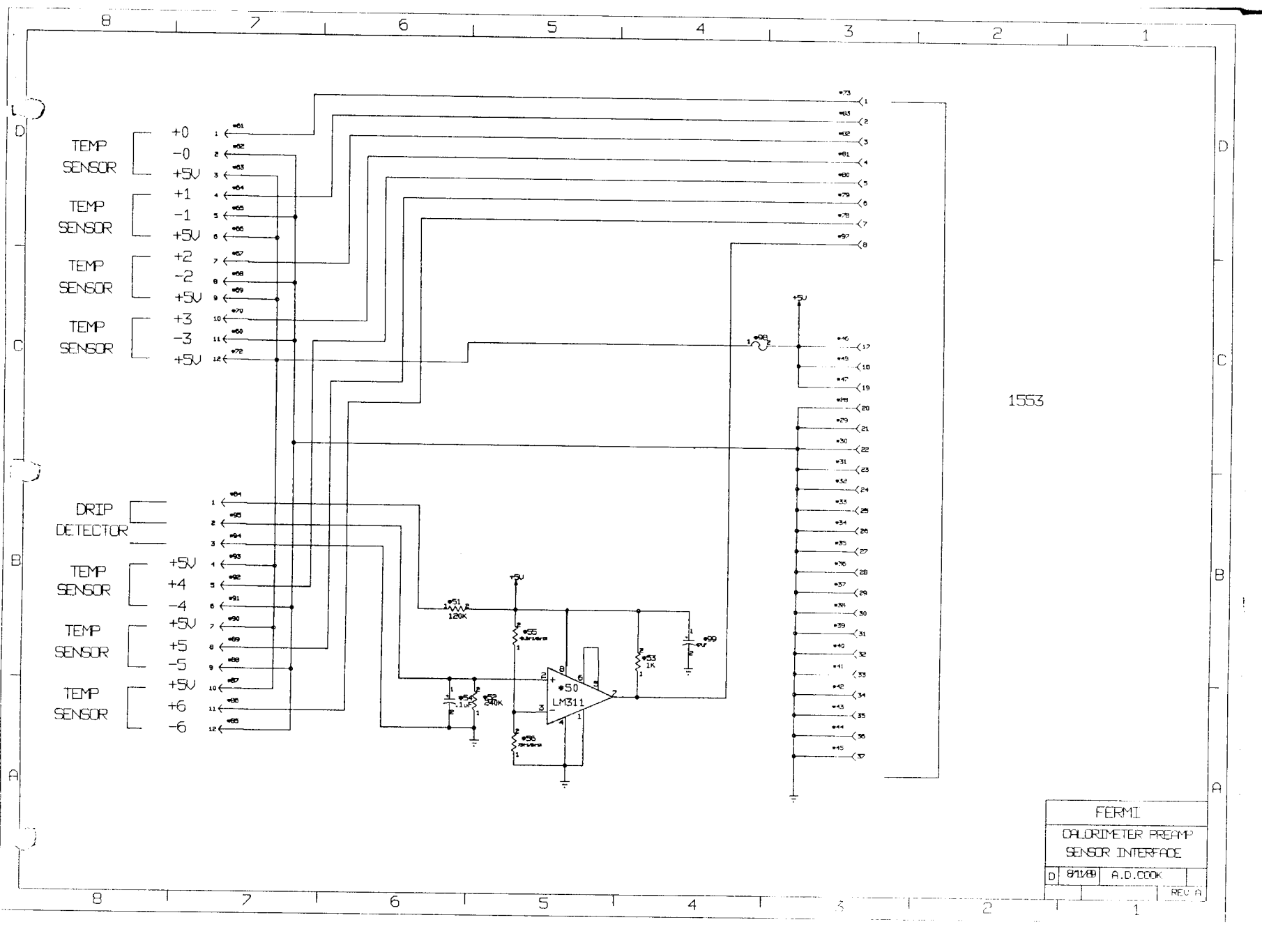
FERMI NATIONAL LABORATORY		
DO		
SENSOR INTERFACE CHASSIS		
DRIP & AIR DETECTOR		
D	11/7/89	A.D.COOK
REV A	[redacted]	6 OF 8





3740-530-E3-330053

REPEATED	REPEATED
FERMI NATIONAL LABORATORY	
DO	
POWER SUPPLY	
A.D. 7735	


TEMP SENSOR +0 -0 +5V
TEMP SENSOR +1 -1 +5V
TEMP SENSOR +2 -2 +5V
TEMP SENSOR +3 -3 +5V
DRIP DETECTOR
TEMP SENSOR +5V +4 -4
TEMP SENSOR +5V +5 -5
TEMP SENSOR +5V +6 -6
*50 LM311
120K
1K
240K
.1uF
+5V
1553
FERMI
CALORIMETER PREAMP SENSOR INTERFACE
D 91100 A.D.COOK
REV A