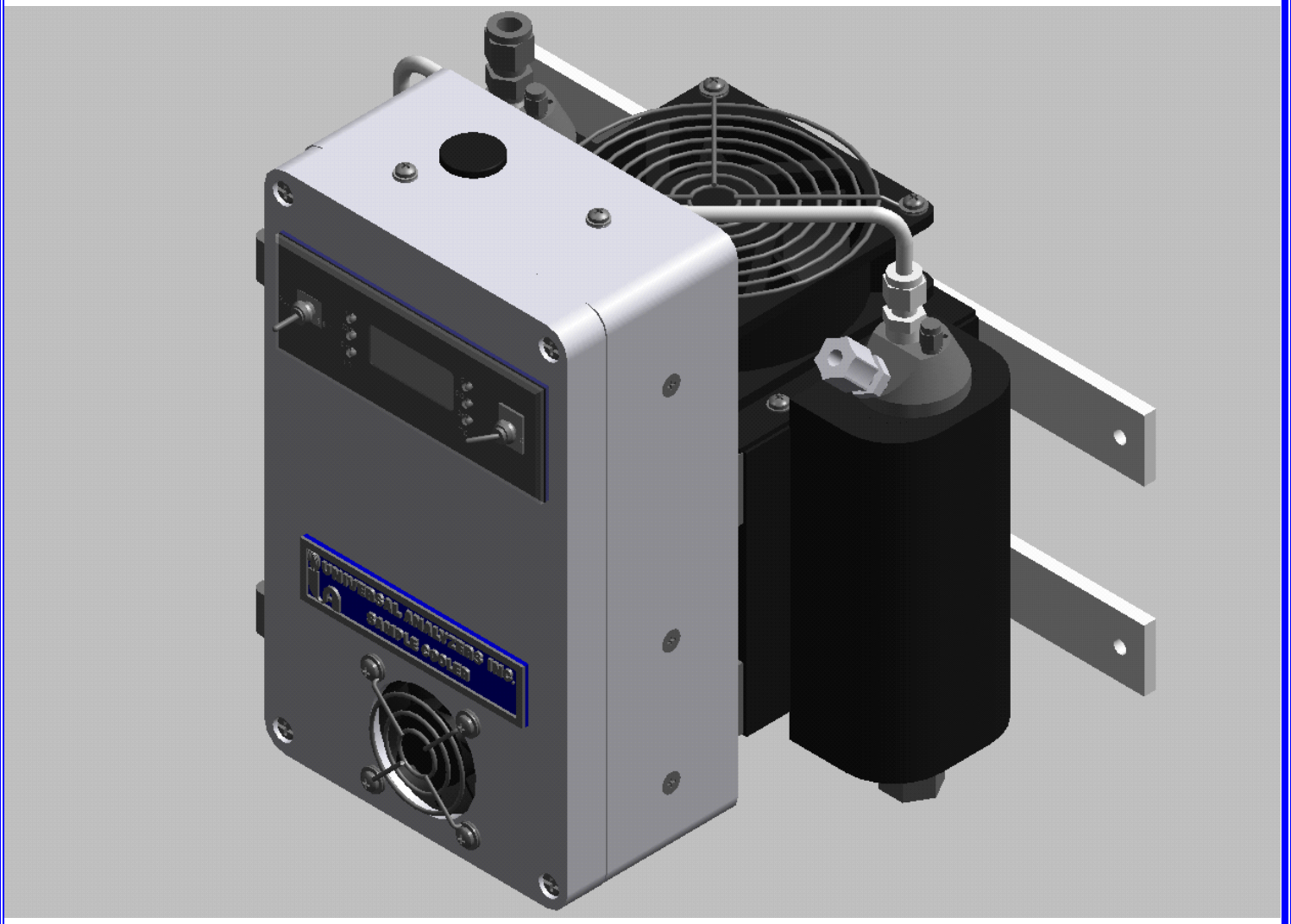
UNIVERSAL ANALYZERS INC.

MODEL 530

SINGLE CHANNEL SAMPLE COOLER



LIMITED WARRANTY

ALL PRODUCTS MANUFACTURED BY UNIVERSAL ANALYZERS INC. ARE WARRANTED TO BE FREE OF MANUFACTURING DEFECTS FOR A PERIOD OF ONE YEAR FROM THE DATE OF RECEIPT AT THE CUSTOMER'S RECEIVING AREA AND FOR AN ADDITIONAL PERIOD OF UP TO 90 DAYS IF THE PRODUCT IS PLACED IN SERVICE AFTER BEING IN STORAGE. THIS WARRANTY COVERS MATERIALS AND LABOR TO RESTORE ANY PRODUCTS TO ORIGINAL FACTORY SPECIFICATIONS IF A DEFECT IS FOUND WITHIN THE WARRANTY PERIOD.

THE DEFECTIVE PRODUCT SHOULD BE SENT, FREIGHT PREPAID, TO THE FACTORY IN CARSON CITY, NEVADA. REPAIRS WILL BE PERFORMED AT THE FACTORY AND RETURNED, PREPAID, BY THE SAME SHIPPING METHOD USED TO SEND THE PRODUCT TO THE FACTORY.

THIS WARRANTY DOES NOT APPLY WHERE THE EQUIPMENT HAS SUSTAINED DAMAGE DUE TO NEGLECT, MODIFICATION, CORROSION, OR OTHER REASON BEYOND THE SCOPE OF THE NORMAL DEFINITION OF "MANUFACTURING DEFECT".

FURTHER, THIS WARRANTY IS LIMITED TO REPLACING THE DEFECTIVE COMPONENTS AND RETURNING THE EQUIPMENT MANUFACTURED BY UNIVERSAL ANALYZERS INC. TO THE CUSTOMER IN WORKING CONDITION. ANY OTHER CLAIMS ARE OUTSIDE THE SCOPE OF THIS WARRANTY. NO WARRANTIES ARE MADE AS TO THE SUITABILITY OF THE USE OF THE EQUIPMENT IN ANY PARTICULAR APPLICATION OR LOCATION. THE SUITABILITY OF THE USE OF THE EQUIPMENT IS THE RESPONSIBILITY OF THE CUSTOMER AND THE INSTALLING CONTRACTOR.

Universal Analyzers Inc.

August 18, 1996

UNIVERSAL ANALYZERS MODEL 530 SAMPLE COOLER

SPECIFICATIONS

SAMPLE FLOW RATE:	0 to 5 L/M (at STP)
MAXIMUM INLET TEMPERATURE:	
STAINLESS STEEL HEAT EXCHANGER:	700º F. (371º C.)
KYNAR/GLASS HEAT EXCHANGER:	280º F. (138º C.)
MAXIMUM INLET GAS DEW POINT:	180º F. (82º C.)
MAX. GAS SAMPLE WATER VAPOR CONTENT:	50%*
MAXIMUM COOLING POWER (SECOND STAGE):	63 BTU'S/Hr. (60 kJ/Hr.)
DEW POINT LEAVING FIRST STAGE:	AMBIENT +10º F. (6º C.)
OUTLET SAMPLE DEW POINT:	41º F. (5º C.), adjustable
GAS SAMPLE INLET AND OUTLET FITTINGS:	3/8" & 1/4" TUBING FITTINGS
BOTTOM CONDENSATE DRAIN FITTING:	3/8" FNPT FITTING
MAXIMUM INPUT POWER:	175 WATTS
INPUT VOLTAGE:	95-125 VAC, 50/60 Hz or 190-250 VAC, 50/60 Hz
ELECTRICAL CLASSIFICATION:	GENERAL PURPOSE, NEMA 1
DIMENSIONS:	11" x 10" x 9", HWD
WEIGHT:	20 LB's, (9 KG)
SOLUBLE GAS REMOVAL RATES:	NO 0% LOSS NO_2 <10% LOSS SO_2 < 2% LOSS CO 0% LOSS CO_2 < 2% LOSS

* at reduced flow rates

MODEL 530 SAMPLE COOLER
OPERATING INSTRUCTIONS

APPLICATION

In order to analyze combustion products or incinerator effluents utilizing a direct extractive sampling technique, it is important to remove the water vapor without removing the water soluble fraction(s) from the gas sample. The heat exchangers (impingers) used in the Universal Analyzers gas sample coolers are designed to minimize the gas/condensate area **and** time of contact to reduce to a minimum, the amount of mass transfer of those water soluble components from the gas phase into the liquid phase. The result is a dry gas sample which has the same composition on a dry basis before and after passing through the chiller.

A gas sample is usually taken from a stack with a probe extending into the center of the stack mounted onto or adjacent to a heated filter. The heated filter is maintained at a temperature above the dew point of the stack gas, usually 300^{o} to 400^{o} F. in order to avoid cementing the filtered particulates to the filter medium with condensate. A means is usually provided to automatically blow the particulates trapped by the filter, back into the stack on a periodic basis.

The stack gas sample is clean but "wet" after passing through the filter assembly. The moisture in the gas sample comes from the fuel as a product of combustion, from the humidity in the air which supports the combustion and from the water content which was trapped in the fuel. This latter source of water in the sample can be from burning moist coal, wet garbage, or from water injected into the fire box. Water from all of these sources will remove the water soluble gasses from the sample stream if allowed to condense in the sample line prior to the controlled separation within the Universal Analyzers' heat exchangers in the sample cooler.

In order to maintain the temperature of the gas sample above the dew point as it is transported to the gas sample cooler, a heat traced sample line is usually employed. The heat traced sample line can be very short if the gas sample cooler is located close to the heated stack filter or it could be several hundred feet long if the gas sample cooler is located in the analyzer shack some distance from the stack.

The Universal Analyzers gas sample cooler contains the special impinger type heat exchanger(s). These are mounted within heat transfer blocks which are cooled by thermoelectric elements utilizing the "Peltier Effect" discovered in France over half a century ago. Where high water contents are encountered, it is efficient to remove the condensate in two stages, one at the temperature of the air in the vicinity of the "Precooler" and then by passing the sample into a heat exchanger cooled by the thermoelectric elements. The precooler can remove water which will condense at the temperature of the environment. In high water content samples, this could be as much as 80% of the water in the sample.

The thermoelectrically cooled stage is temperature controlled at a factory setting of 5º C. This temperature can be adjusted with a set point potentiometer easily as described below.

The gas sample conditioning system should contain additional components to insure that a clean, dry sample is presented to the analyzer panel for minimum analyzer maintenance. A sensor should be provided to sense the presence of condensate, should any exist in the tubing following the chiller. This is the optional WCO (Water Carry-Over) sensor which can be provided with a Universal Analyzers chiller. A visible coalescing filter which collects particulates on the outside of the cylindrical filter, surrounded by a transparent bowl will allow the operator to inspect the condition of the heated stack filter. The WCO sensor can be provided with the sensing elements in the bottom of the filter bowl to provide an early warning if the coalescing filter removes liquid from the sample stream. This combination filter/moisture sensor is called the "WCOF".

The location of the sample pump (usually an oil-less diaphragm pump) within the sampling system is the subject of much debate. If the pump is located upstream from the chiller, it should have a heated head to avoid the presence of a two phase mixture which shortens the life of a diaphragm and causes maintenance problems. It can be shown that passing the gas sample through the chiller under a slight positive pressure will result in a lower gas dew point than if the gas were at a slight vacuum. A common location for the sample pump is in the sample line after the chiller. This allows the sample pump to handle a cool, dry sample with much reduce maintenance problems. Some design engineers have taken the approach to use a sample cooler having two chilled heat exchangers. The pump is placed in the sample line between the two heat exchangers. The first chilled heat exchanger takes enough of the water vapor from the sample to protect the pump. The second heat exchanger is under a slight pressure and the dew point is at it's minimum because it is on the discharge side of the pump. The sample pump location within the sample system is a matter of choice and good engineering.

The condensate must be removed from the heat exchanger(s) using one of the following methods:

1. A continuously running peristaltic tubing pump can be used with the heat exchanger either under pressure or vacuum. This is an easy solution which lends itself to leak testing because of the positive displacement nature of the peristaltic pump. It is, however, a device which requires periodic maintenance to replace the tubing.

2. Condensate can be removed from the heat exchanger using an eductor with a flow limiter to draw some of the hot, wet sample through the heat exchanger along with the condensate. This method utilizes the heat exchanger as a bypass condenser and serves the purpose of reducing the time lag in the sample line without loading the chiller with the water vapor in the bypassed sample.

3. A float drain trap can be used to collect the condensate running out of the bottom of the heat exchanger(s) if the heat exchangers are at a slight **positive pressure** with respect to the atmosphere. The float drain trap functions like a steam trap. The float rises to discharge the condensate when there is enough to lift the float.

4. A small drain tank can be provided with a dual level, conductivity type level control to collect the condensate. When the tank if full, the level controller will start a pump to remove the condensate until it reaches to the lower electrode. When contact is lost, the pump stops and the condensate is again allowed to fill the tank. Typically, a peristaltic pump is used to remove the condensate. The advantage is that the pump only runs occasionally and bypasses no gas sample. The peristaltic pump requires less maintenance because it does not run continuously.

Finally, a means of controlling the flow of the sample to the analyzers must be considered. This can be as simple as providing a flow meter with a flow control needle valve to pinch off the sample flow causing the sample pump to pump higher on the pump curve. One option which is used is to provide an adjustable back-pressure regulator between the inlet and outlet of the sample pump to allow a portion of the gas pumped to be recirculated back to the inlet if discharge pressure exceeds the back-pressure control point. Some analyzers have their own sample pump which may be sufficient to supply the analyzer but insufficient to pull the sample through the chiller, sample line, and heated stack filter. These can be supplied by piping the sample from the external sample pump into the run of a tee with a flow meter which registers the flow of excess sample from the branch of the tee to atmosphere. The internal analyzer sample pump can then withdraw sample from the opposite run of the tee which is essentially at atmospheric pressure and unaffected by pressure changes within the sample line due to changes in filter pressure drop or sample pump efficiency.

DESCRIPTION

The key to the success of the Universal Analyzers Sample Cooler being able to condense the water from a wet gas sample with a minimal loss of the water soluble gas fraction, is due to the design of the heat exchanger. Please refer to Drawings P0147, and P0149; both having sheets 1 & 2. The separation occurs in an impinger which has a highly polished cylindrical surface cooled to the desired dew point temperature. The hot wet sample is brought to the bottom of the cylinder through an insulated tube and allowed to rise through a narrow annular area to insure the entire sample is influenced by the cold surface. The condensate falls down the cold polished surface in the form of a sheet (as opposed to droplets or the bubbling of the gas sample through the condensate) which minimizes the gas/liquid contact surface area.

The temperature of the cylindrical condensation surface of the heat exchanger is maintained through intimate contact with an aluminum heat transfer blocks. In the Model 530 Sample Cooler, the first of the heat transfer blocks is cooled by direct contact with the air cooled heat sink. The dew point of the exit sample from the first of the two heat exchangers will be about 10º F. above the ambient temperature. (The dew point depends on the amount of heat that is being extracted which is a function of the flow rate and the water content of the sample.)

The second of the heat exchangers through which the sample passes is cooled by the use of a Thermoelectric Element at a controlled temperature. The factory temperature setting is 5º C. The temperature sensor is a type K thermocouple. The controller is a proportional controller with a proportional band of about 1º C. The set point is field adjustable as described below. The heat which is removed from the gas sample (and that which is created by the Thermoelectric Elements) is discharged by the air cooled heat sink.

The digital display as a front panel indication of the of the operating temperature in degrees Celsius. Two internal jumpers at the top of the control circuit card within the enclosure can be moved to change the indicated temperature to read out in degrees Fahrenheit.

In addition, there are three LED lamps to indicate the status of the cooler. The "COOL" lamp is a green LED which lights when the operating temperature is below the alarm temperature set point, factory set at 10º C. An "Over-temperature" relay is powered when the "COOL" lamp is on. The relay board within the enclosure has a terminal strip to allow all six of the two Form "C" relay contacts to be accessible. The sample pump can be interlocked with this relay.

The "DRY" lamp indicates that there is no water in contact with the moisture sensor listed as the "WCO" or "WCOF" options. If the "DRY" lamp is out, the alarm relay will be in the alarm position. If a moisture sensor is not used, the lamp should be turned off by installing a jumper on the moisture sensor input terminals on the relay board. Without moisture sensors installed, the "DRY" lamps have no meaning. The moisture sensor relay which is energized in the "DRY" condition can be used to provide contacts to activate an annunciator panel and/or turn off the sample pump in the "wet" condition.

The "TC" lamp is a red LED which will come on if the thermocouple opens. The "over-temperature" relay will also transfer to the high temperature condition if the red "TC" lamp comes on.

INSTALLATION INSTRUCTIONS

The Model 530 sample cooler has a bracket on the top and bottom to allow it to be wall mounted or mounted to rails in an instrument rack. Mount it vertically so that the condensate will drain to the bottom of the heat exchangers.

Connect the sample line to the 3/8" stainless steel tubing fitting on top of the left hand heat exchanger. The outlet from the sample cooler is the 1/4" tubing fitting extending at an angle out of the top of the right hand, chilled, heat exchanger.

A sample pump is normally required to pull the sample through the sample cooler and to force it through the visible filter. The moisture sensor, if not a part of the visible filter, it should be located ahead of the visible filter.

A 3/8" FNPT fitting is provided as the condensate drain connection at the bottom of the each heat exchanger. When making the connection to this fitting, a wrench must be used to keep the coupling from turning **to avoid breaking internal components.**

A method for condensate removal must be provided. Several methods are discussed above. An eductor or aspirator with a small bore tube connecting it to the condensate drain; or a peristaltic pump running continuously are two common methods. A drain must be run to sewer, a container, or to the ground outside the instrument enclosure.

If an eductor is utilized to remove the condensate, the outlet tube length should be no longer than two feet in order to keep too much back pressure from the outlet of the eductor. The outlet tube can be placed in a larger pipe to channel the condensate to a drain.

The electrical power, about 2 amps at 115 VAC or 1 amp at 230 VAC 50/60 HZ should be supplied. Each alarm relay has two sets of "Form C" contacts brought out to terminal strips on the relay board. One set on each relay are totally dry contacts. The other set are MOV protected and designed to interrupt power to the sample pump when in the alarm condition.

The moisture sensor, WCO or WCOF should be connected to the top terminal strip on the relay circuit board.

START UP PROCEDURE

Apply power to the sample cooler. The indicated temperature will start to drop immediately. It should be below the over-temperature alarm point in approximately four minutes and the "COOL" green LED lamp should light. When the temperature reaches the control set point, the rate at which the temperature drops will be reduced. The temperature will stabilize within 1º C. of the control set point.

Start the sample gas flow by turning on the sample pump and adjusting the flow control valve to the desired flow rate. Water should be observed to be removed from the bottom of each heat exchanger when steady state conditions are established.

If an eductor is utilized to remove the condensate, a strong flow of air should be felt to be flowing from the eductor outlet tube. The outlet tube length should be no longer than two feet. The outlet tube can be placed in a larger pipe to channel the condensate to a drain.

The green "DRY" LED light will be on. If an optional moisture sensor is installed, the light will go out and the alarm relay de-energized if the sensor detects condensate. A test can be

performed by putting water on the moisture sensor. If the sample pump is powered through the alarm relay contacts, it will cease running. When the moisture sensor is wiped dry, the sample pump will start.

Turn on the analyzer(s) and initiate the calibration cycle.

TROUBLE SHOOTING

The presence of water in liquid form after the sample cooler is an indication of a fault in the system. Reasons for the presence of condensate in the system after the sample cooler could be one or more of the following:

1. Overloading of the cooling capacity of the cooler due to too much water vapor in the sample or due to too great a sample flow rate.

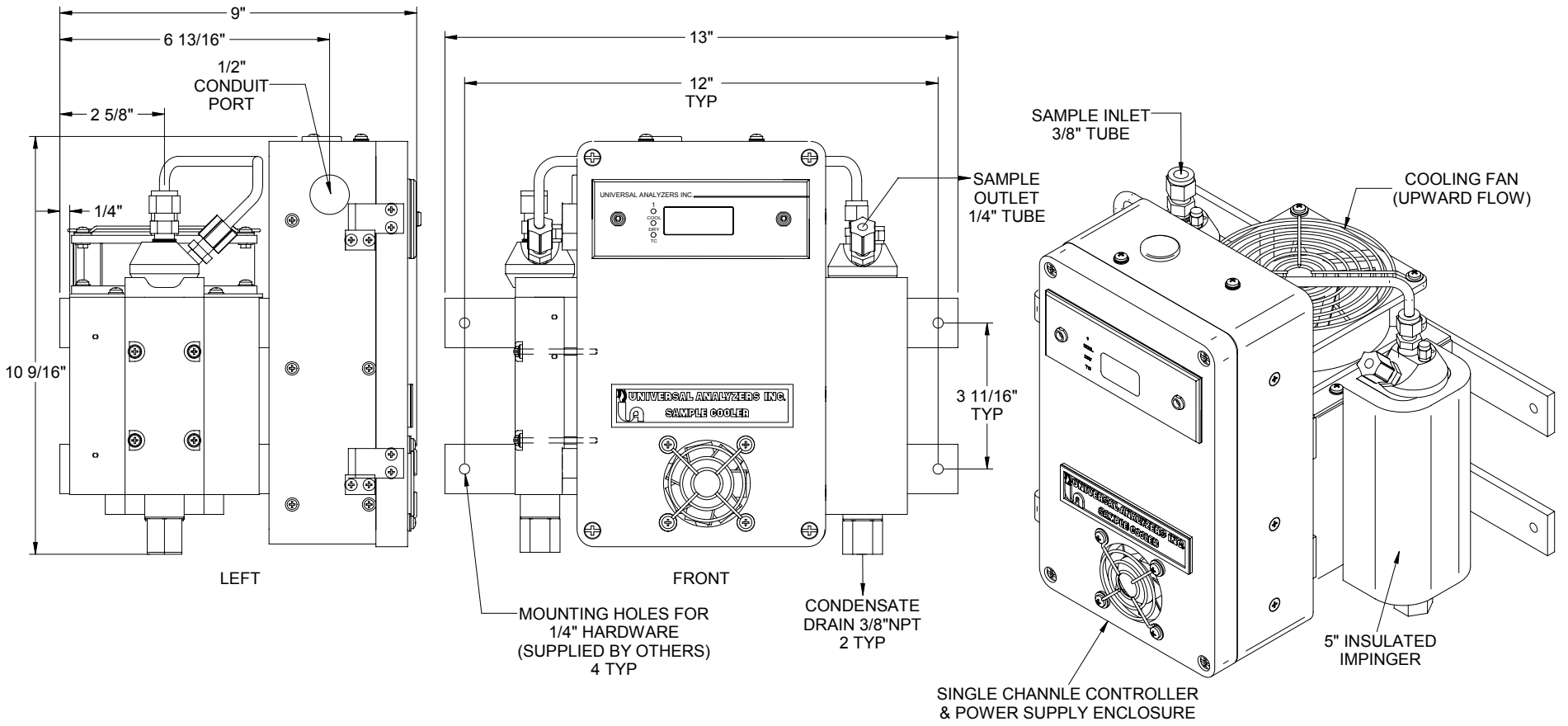
2. The condensate removal equipment (peristaltic pump, eductor, or drain pot) may be faulty. The heat exchanger(s) may be full of condensate.

3. An air leak may be in the condensate removal system allowing air to enter and blow the condensate back into the heat exchanger. (This assumes the heat exchanger is under a slight vacuum.)

4. The flow of cooling water to the heat sink may have been interrupted. The heat sink has become too hot to cool the thermoelectric elements.

5. The sample cooler could have failed.

If additional information is required, telephone assistance can be obtained by calling (775) 883-2500 or FAX request to (775) 883-6388.



REV	DATE	DESCRIPTION	DWN	APVD
D	01/18/00	MOVE ENCLOSURE TO THE FRONT FOR ACCESS	EAM	TB

REVISIONS

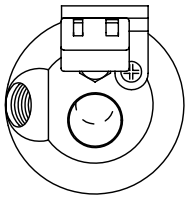
MODEL 530M SAMPLE COOLER OUTLINE & MOUNTING DIMENSIONS

PART NO.	FOR
NOT ISSUED	INSTRUMENT

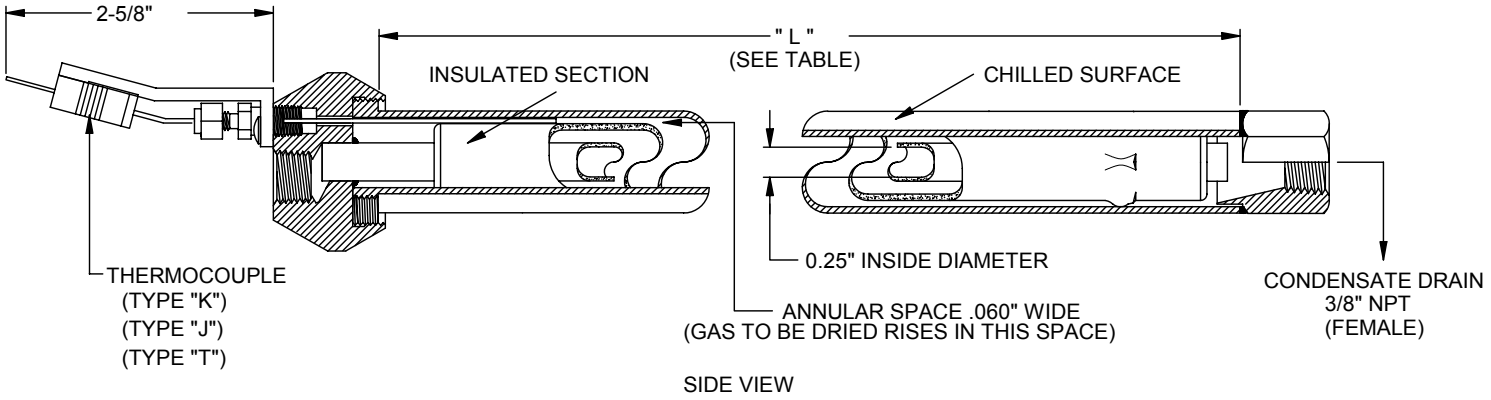
UNIVERSAL ANALYZERS INC.
1701 South Sutɒ Terrace
Carson City, Nevada 89706 USA

DRAWN BY EV MUSSELMAN	DRAWING NO P0011
APVD BY T. BARBEN II	

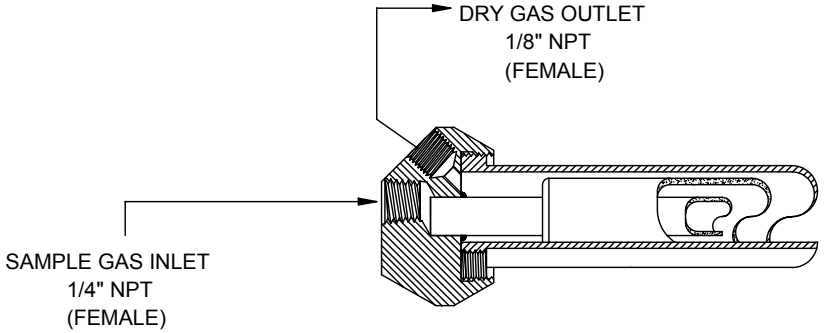
DATE	SCALE	SIZE	SHEET
02/03/1992	1 : 1	E	1 OF 1



TOP VIEW



SIDE VIEW



1). SEE SHEET 2 FOR ASSEMBLY INSTRUCTIONS.

APPROX LENGTH " L "	316 S.S. EXCHANGER P/N	HASTELLOY C276 EXCHANGER P/N	ALLOY 20 EXCHANGER P/N	TITANIUM EXCHANGER P/N	UNIVERSAL ANALYZERS SERIES
5"	5200-SK50 5200-SJ50 5200-ST50	5200-CK50 5200-CJ50 5200-CT50	5200-AK50 5200-AJ50 5200-AT50	5200-TK50 5200-TJ50 5200-TT50	400 500
10"	5200-SK10 5200-SJ10 5200-ST10	5200-CK10 5200-CJ10 5200-CT10	5200-AK10 5200-AJ10 5200-AT10	5200-TK10 5200-TJ10 5200-TT10	800 1000 1100 3000

REV	DATE	DESCRIPTION	DWN	APVD
B	01/23/97	SHOW NEW DESIGN WITHERMOCOUPLE BRACKET	EAM	HWM

REVISIONS

METALLIC TEMPERATURE SENSING
HEAT EXCHANGER OUTLINE

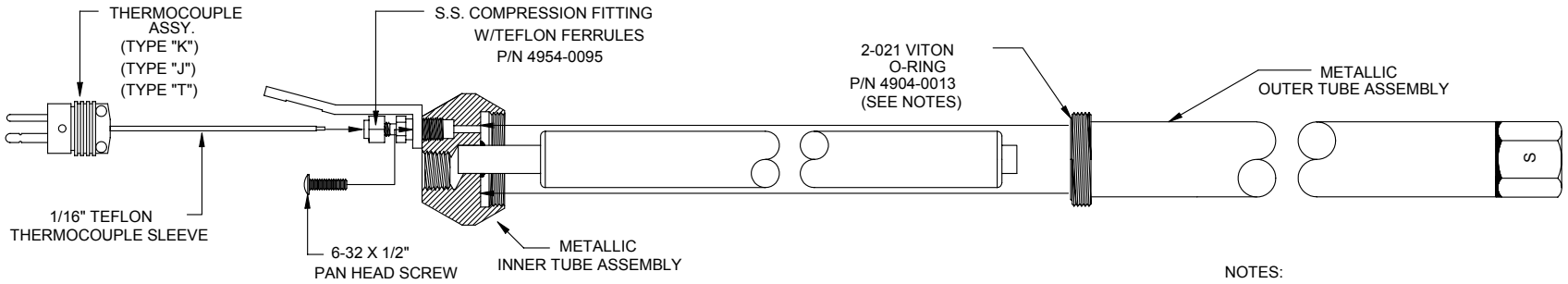
PART NO.	FOR
SEE TABLE	SEE TABLE

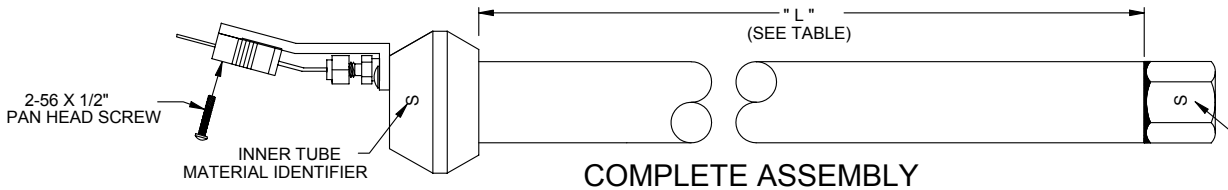
UNIVERSAL ANALYZERS INC.
1701 South Sutro Terrace
Carson City, Nevada 89706 USA

DRAWN BY	EV MUSSELMAN	DRAWING NO
APVD BY	HARVEY MITCHELL	P0146

DATE	SCALE	SIZE	SHEET
12/11/95	1 : 1	C	1 OF 2

EXPLODED METALLIC HEAT EXCHANGER





COMPLETE ASSEMBLY

NOTES:

1). O-RING IS FACTORY INSTALLED IN METALLIC OUTER TUBE ASSY.

2). LIGHTLY LUBRICATE O-RING WITH SILICONE GREASE BEFORE ASSEMBLY.

SPARE PARTS LIST

" L " LENGTH	MATERIAL DESC.	COMPLETE ASSY P/N	OUTER TUBE ASSY P/N	INNER TUBE ASSY P/N	TYPE "K" THERMOCOUPLE ASSEMBLY P/N	TYPE "J" THERMOCOUPLE ASSEMBLY P/N	TYPE "T" THERMOCOUPLE ASSEMBLY P/N
5"	316 S.S.	5200-SK50	5201-0012	5201-0015	1150-0011	X	X
5"	"	5200-SJ50	"	"	X	1150-0012	X
5"	"	5200-ST50	"	"	X	X	1150-0013
5"	ALLOY 20	5200-AK50	5201-0022	"	"	X	X
5"	"	5200-AJ50	"	"	X	"	X
5"	"	5200-AT50	"	"	X	X	"
5"	HASTELLOY C276	5200-CK50	5201-0020	"	"	X	X
5"	"	5200-CJ50	"	"	X	"	X
5"	"	5200-CT50	"	"	X	X	"
5"	TITANIUM	5200-TK50	5201-0024	5201-0028	1150-0018	X	X
5"		5200-TJ50	"	"	X	1150-0019	X
5"		5200-TT50	"	"	X	X	1150-0014
10"	316 S.S.	5200-SK10	5201-0013	5201-0016	1150-0011	X	X
10"	"	5200-SJ10	"	"	X	1150-0012	X
10"	"	5200-ST10	"	"	X	X	1150-0013
10"	ALLOY 20	5200-AK10	5201-0023	"	"	X	X
10"	"	5200-AJ10	"	"	X	"	X
10"	"	5200-AT10	"	"	X	X	"
10"	HASTELLOY C276	5200-CK10	5201-0021	"	"	X	X
10"	"	5200-CJ10	"	"	X	"	X
10"	"	5200-CT10	"	"	X	X	"
10"	TITANIUM	5200-TK10	5201-0025	5201-0029	1150-0018	X	X
10"	"	5200-TJ10	"	"	X	1150-0019	X
10"	"	5200-TT10	"	"	X	X	1150-0014

REV	DATE	DESCRIPTION	DWN	APVD
B	01/23/97	SHOW NEW DESIGN W/THERMOCOUPLE BRACKET	EAM	HWM

REVISIONS

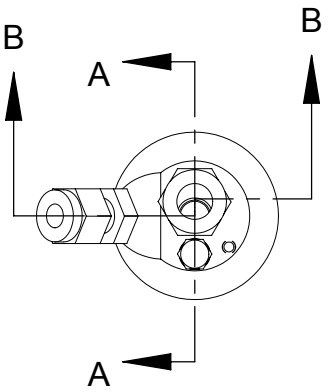
METALLIC TEMPERATURE SENSING HEAT EXCHANGER ASSEMBLY

PART NO.	FOR
SEE TABLE	400 500 800 1000 1100 3000 SERIES

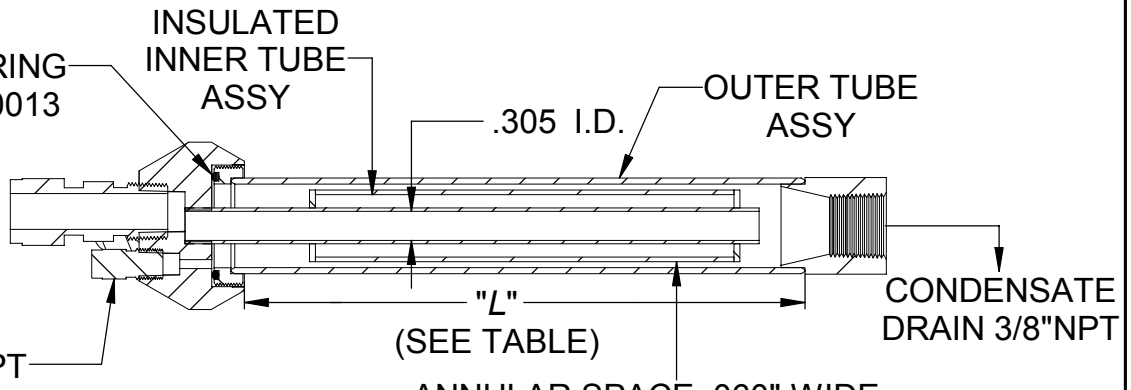
UNIVERSAL ANALYZERS INC.
1701 South Sutro Terrace
Carson City, Nevada 89706 USA

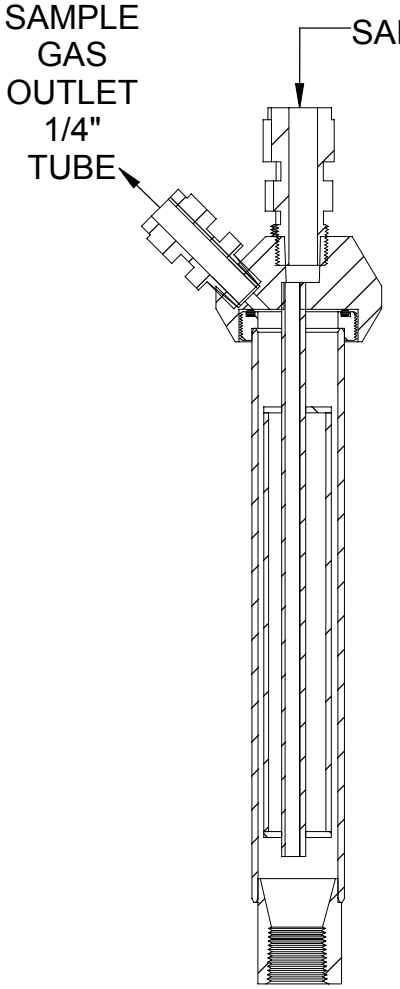
DRAWN BY	EV MUSSELMAN	DRAWING NO
APVD BY	HARVEY MITCHELL	P0146

DATE	SCALE	SIZE	SHEET
12/11/95	1 : 1	B	2 OF 2



TOP VIEW





SECTION B-B

SECTION A-A

APPROX LENGTH "L"	HEAT EXCHANGER P/N	OUTER TUBE MATERIAL	UNIVERSAL ANALYZERS SERIES
5"	5200-S050	316 S.S.	400/500
5"	5200-T050	TITANIUM	400/500
5"	5200-A050	ALLOY 20	400/500
5"	5200-C050	HASTELLOY C-276	400/500
5"	5200-S05T	TEFLON COATED 316 S.S.	400/500
10"	5200-S010	316 S.S.	800/1000/1100/3000
10"	5200-T010	TITANIUM	800/1000/1100/3000
10"	5200-A010	ALLOY 20	800/1000/1100/3000
10"	5200-C010	HASTELLOY C-276	800/1000/1100/3000
10"	5200-S01T	TEFLON COATED 316 S.S.	800/1000/1100/3000

1). SEE SHEET 2 FOR ASSEMBLY INSTRUCTIONS.

REV	DATE	DESCRIPTION	DWN	APVD
A	02/09/99	REVISE P/N TABLE FOR TEFLON COATED	EAM	RD

REVISIONS

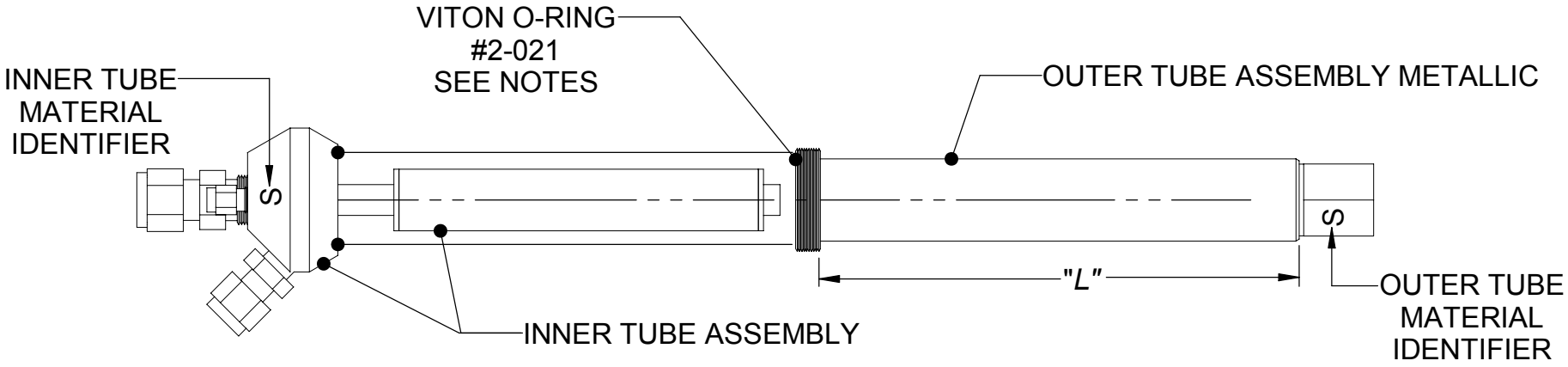
HEAT EXCHANGER METALLIC
NON-TEMPERATURE SENSING
OUTLINE

PART NO.	FOR
SEE TABLE	SEE TABLE

UNIVERSAL ANALYZERS INC.
1701 South SutroTerrace
Carson City, Nevada 89706 USA

DRAWN BY	EV MUSSELMAN	DRAWING NO
APVD BY	H. MITCHELL	P0147

DATE	SCALE	SIZE	SHEET
12/11/95	NONE	C	1 OF 2



HEAT EXCHANGER SEPERABLE		SPARE PARTS LIST			
APPROX "L" LENGTH	P/N	INNER TUBE ASSY P/N	OUTER TUBE ASSY P/N	VITON O-RING #2-021 P/N	PLUG 1/16"NPT P/N
5"	5200-S050	5201-0015	5201-0012	4904-0013	4951-0058
5"	5200-T050	"	5201-0024	"	"
5"	5200-A050	"	5201-0022	"	"
5"	5200-C050	"	5201-0020	"	"
5"	5200-S05T	5201-0041	5201-0043	"	"
10"	5200-S010	5201-0016	5201-0013	4904-0013	4951-0058
10"	5200-T010	"	5201-0025	"	"
10"	5200-A010	"	5201-0023	"	"
10"	5200-C010	"	5201-0021	"	"
10"	5200-S01T	5201-0042	5201-0044	"	"

NOTES:
1). O-RING IS FACTORY INSTALLED IN METALLIC OUTER TUBE.
2). LIGHTLY LUBRICATE O-RING WITH SILICONE GREASE BEFORE ASSEMBLY.

REV	DATE	DESCRIPTION	DWN	APVD
A	02/09/99	REVISE TABLE TO INCLUDE TEFLON PARTS	EAM	RD

REVISIONS

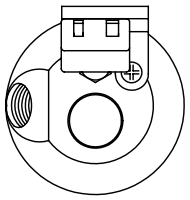
HEAT EXCHANGER ASSEMBLY
NON-TEMPERATURE SENSING
METALLIC

PART NO.	FOR
SEE TABLE	INSTRUMENT

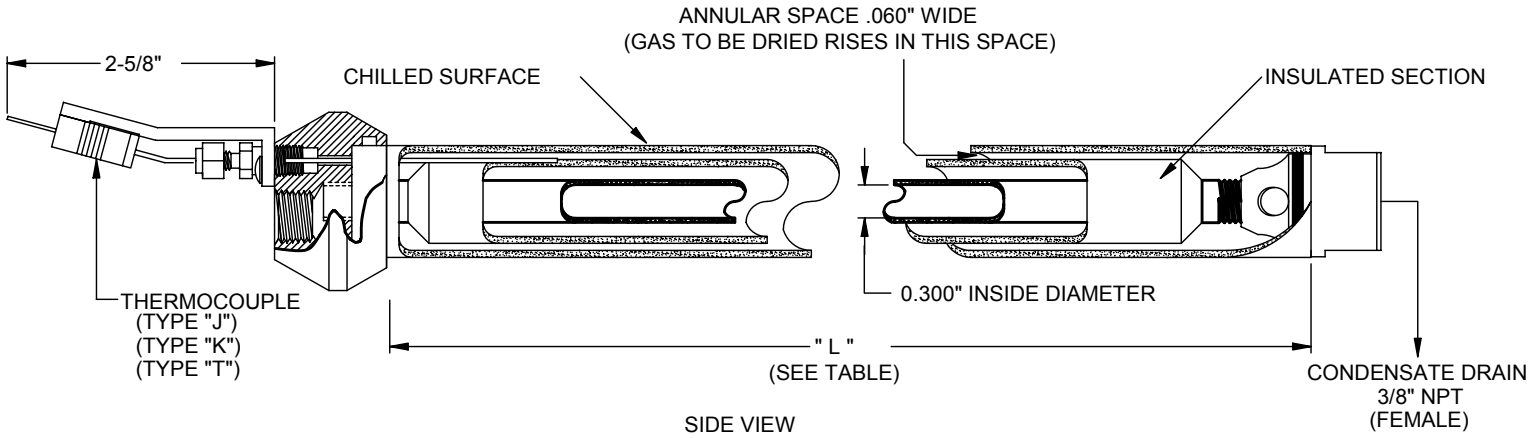
UNIVERSAL ANALYZERS INC.
1701 South SutroTerrace
Carson City, Nevada 89706 USA

DRAWN BY	EV MUSSELMAN	DRAWING NO
APVD BY	H. MITCHELL	P0147

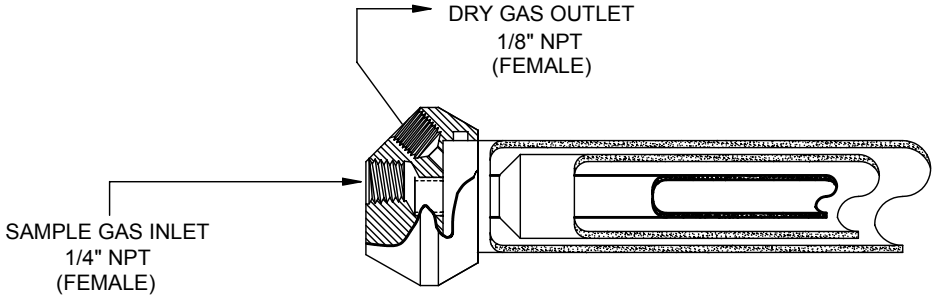
DATE	SCALE	SIZE	SHEET
12/11/95	NONE	C	2 OF 2



TOP VIEW



SIDE VIEW



1). SEE SHEET 2 FOR ASSEMBLY INSTRUCTIONS.

LENGTH "L"	GLASS KYNAR HEAT EXCHANGER ASSEMBLY P/N	UNIVERSAL ANALYZERS SAMPLE COOLER MODELS
5"	5200-KK50 5200-KJ50 5200-KT50	520
		530
		540
		570
10"	5200-KK10 5200-KJ10 5200-KT10	1040
		1050
		1060
		1080
		1090
15"	5200-KK15 5200-KJ15 5200-KT15	FGA2

REV	DATE	DESCRIPTION	DWN	APVD
C	10/02/01	Add 15" Heat Exchanger Data To Table	EM	JK

REVISIONS

Glass Kynar Temperature Sensing Heat Exchanger Outline

PART NO. SEE TABLE | FOR SEE TABLE

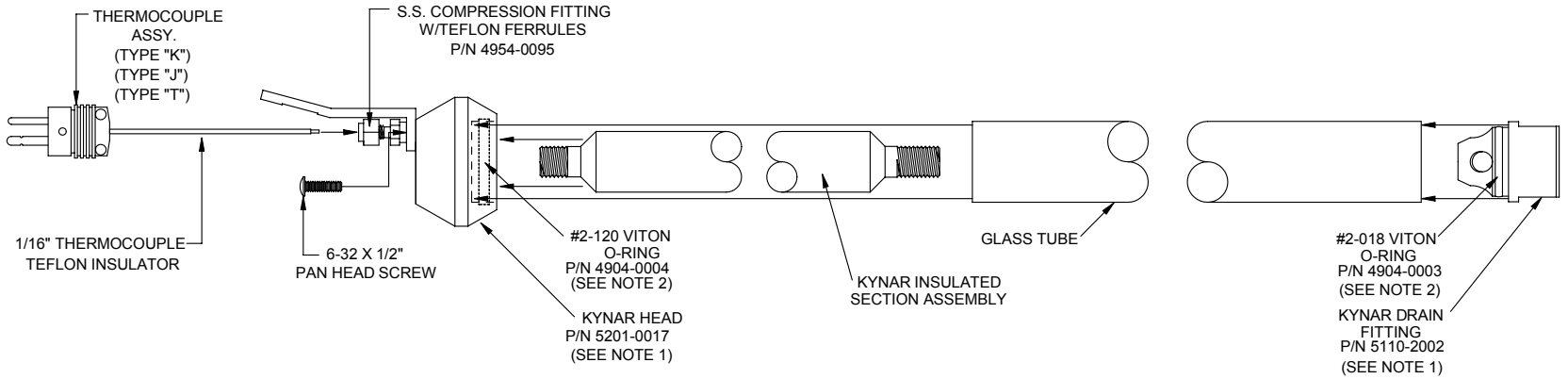
UNIVERSAL ANALYZERS INC.
1701 South Sutro Terrace
Carson City, Nevada 89706 USA

DRAWN BY E. Mussleman | DRAWING NO P0148

APVD BY H. Mitchell

DATE	SCALE	SIZE	SHEET
12/11/95	1 : 1	C	1 OF 2

EXPLODED GLASS KYNAR HEAT EXCHANGER

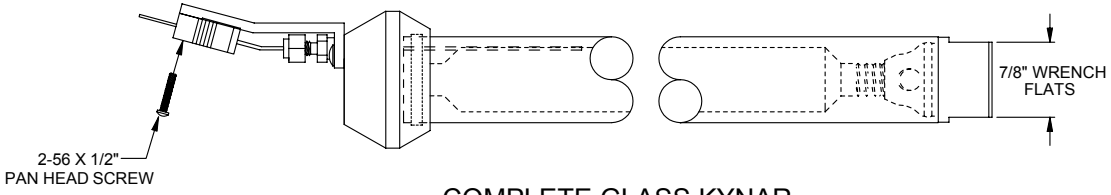


SPARE PARTS LIST						
GLASS KYNAR HEAT EXCHANGER ASSEMBLY		KYNAR INSULATED SECTION ASSEMBLY	GLASS TUBE	TYPE "K" THERMOCOUPLE	TYPE "J" THERMOCOUPLE	TYPE "T" THERMOCOUPLE
LENGTH "L"	P/N	P/N	P/N	P/N	P/N	P/N
5"	5200-KK50	5110-2003	5201-0002	1150-0011	1150-0012	1150-0013
5"	5200-KJ50	"	"	"	"	"
5"	5200-KT50	"	"	"	"	"
10"	5200-KK10	5110-2004	5201-0001	"	"	"
10"	5200-KJ10	"	"	"	"	"
10"	5200-KT10	"	"	"	"	"
15"	5200-KK15	5110-2006	5201-0078	"	"	"
15"	5200-KJ15	"	"	"	"	"
15"	5200-KT15	"	"	"	"	"

NOTES:

1). O-RINGS ARE FACTORY INSTALLED IN KYNAR HEAD AND KYNAR DRAIN FITTING.

2). LIGHTLY LUBRICATE O-RINGS WITH SILICONE GREASE BEFORE ASSEMBLY.



COMPLETE GLASS KYNAR HEAT EXCHANGER ASSEMBLY

REV	DATE	DESCRIPTION	DWN	APVD
C	10/02/01	Add 15" Data To Parts List Table	EM	JK

REVISIONS

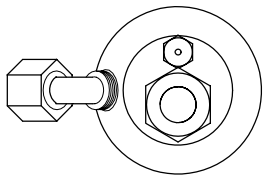
Glass Kynar Temperature Sensing Heat Exchanger
Spare Parts List Exploded Assembly

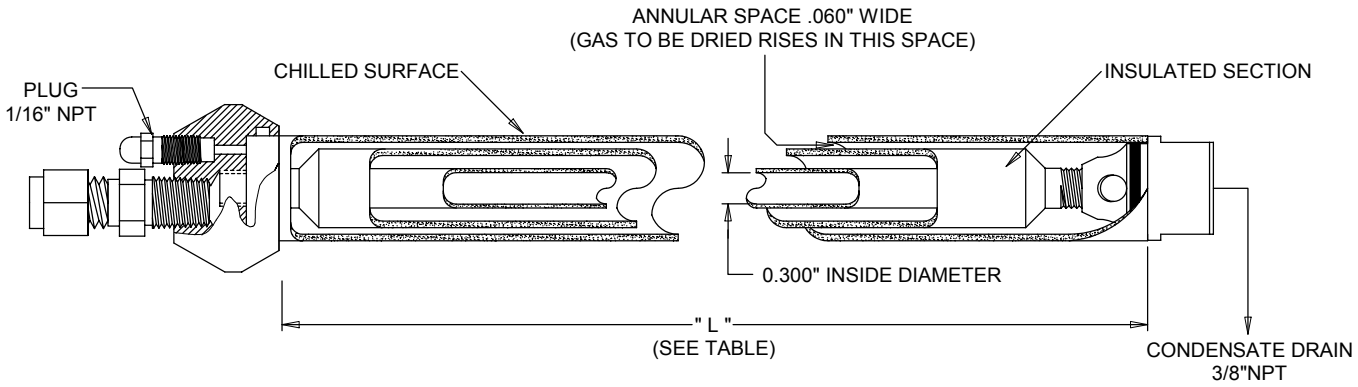
PART NO.	FOR
SEE TABLE	SAMPLE COOLERS

UNIVERSAL ANALYZERS INC.
1701 South Sutro Terrace
Carson City, Nevada 89706 USA

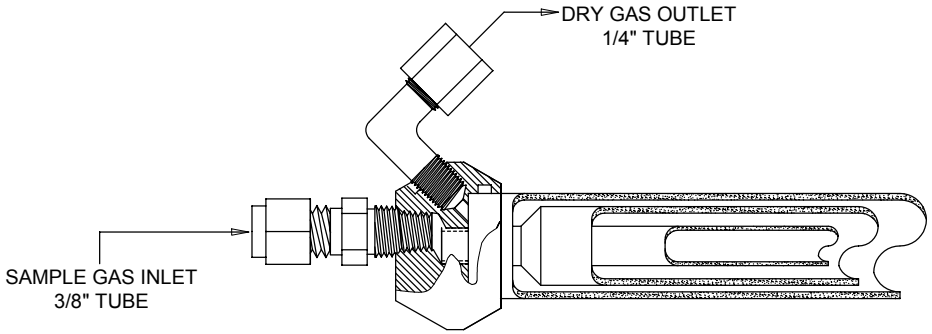
DRAWN BY	E. Musselman	DRAWING NO
APVD BY	H. Mitchell	P0148

DATE	SCALE	SIZE	SHEET
12/11/95	1 : 1	B	2 OF 2





SIDE VIEW



1). SEE SHEET 2 FOR ASSEMBLY INSTRUCTIONS.

LENGTH "L"	GLASS KYNAR HEAT EXCHANGER ASSEMBLY P/N	UNIVERSAL ANALYZERS SAMPLE COOLER MODELS	QTY OF EXCHANGERS PER SAMPLE COOLER
5"	5200-K050	520	1
		530	2
		540	2
		570	4
10"	5200-K010	1040	1
		1050	2
		1060	2
		1080	2
		1090	4
15"	5200-K015	FGA2	1

REV	DATE	DESCRIPTION	DWN	APVD
B	10/02/01	Add 15" Data To Table	EM	RD

REVISIONS

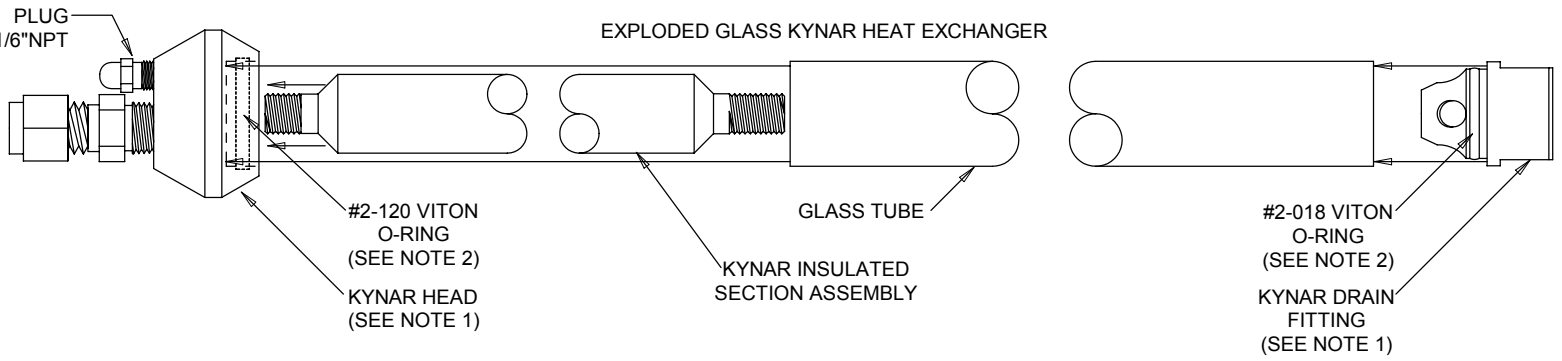
HEAT EXCHANGER GLASS / KYNAR NON-TEMPERATURE SENSING OUTLINE

PART NO.	FOR
SEE TABLE	INSTRUMENT

UNIVERSAL ANALYZERS INC.
1701 South Sutro Terrace
Carson City, Nevada 89706 USA

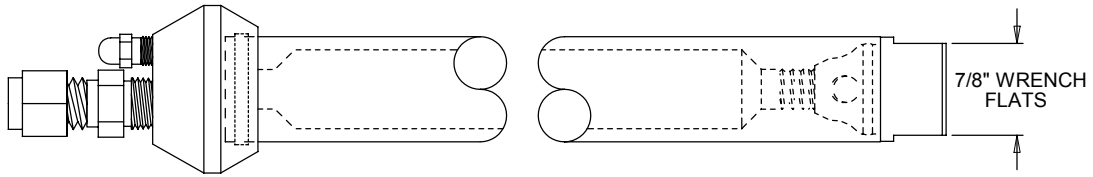
DRAWN BY	EV MUSSELMAN	DRAWING NO
APVD BY	H. MITCHELL	P0149

DATE	SCALE	SIZE	SHEET
12/11/95	1 : 1	C	1 OF 2



SPARE PARTS LIST

GLASS KYNAR HEAT EXCHANGER ASSEMBLY		KYNAR INSULATED SECTION ASSY	GLASS TUBE	KYNAR DRAIN FITTING	#2-120 VITON O-RING	#2-018 VITON O-RING	KYNAR HEAD	1/16" NPT PLUG
LENGTH "L"	P/N	P/N	P/N	P/N	P/N	P/N	P/N	P/N
5"	5200-K050	5110-2003	5201-0002	5110-2002	4904-0004	4904-0003	5201-0017	4951-0066
10"	5200-K010	5110-2004	5201-0001	"	"	"	"	"
15"	5200-K015	5110-2006	5201-0078	"	"	"	"	"



COMPLETE GLASS KYNAR
HEAT EXCHANGER ASSEMBLY

NOTES:

1). O-RINGS ARE FACTORY INSTALLED IN KYNAR HEAD AND KYNAR DRAIN FITTINGS

2). LIGHTLY LUBRICATE O-RINGS WITH SILICONE GREASE BEFORE ASSEMBLY.

REV	DATE	DESCRIPTION	DWN	APVD
B	10/02/01	Add 15" Data to Table	EAM	RD

REVISIONS

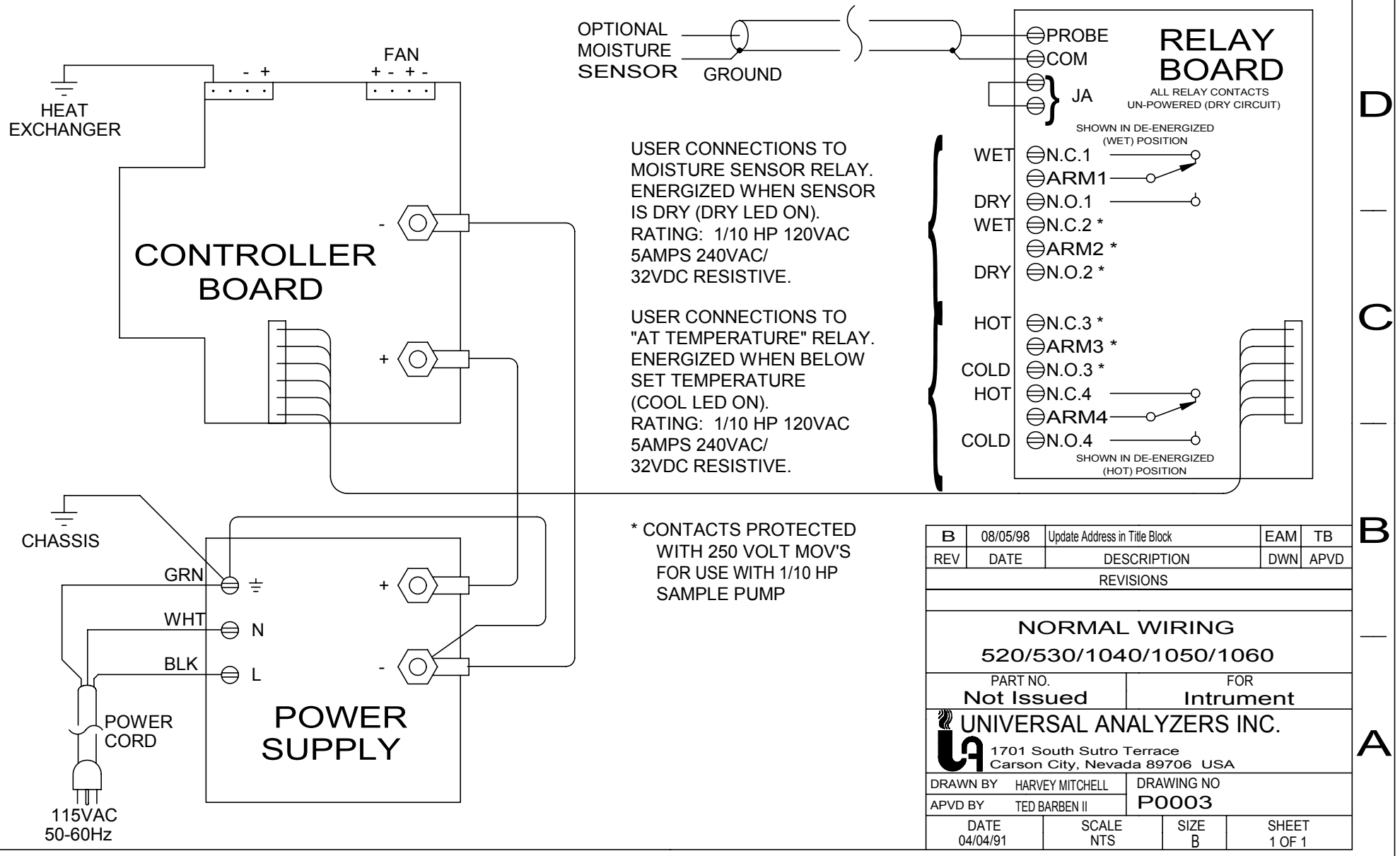
HEAT EXCHANGER GLASS / KYNAR NON-TEMPERATURE SENSING SPARE PART INSTALLATION

PART NO. SEE TABLE | FOR INSTRUMENT

UNIVERSAL ANALYZERS INC.
1701 South Sutro Terrace
Carson City, Nevada 89706 USA

DRAWN BY EV MUSSELMAN | DRAWING NO P0149
APVD BY H. MITCHELL

DATE	SCALE	SIZE	SHEET
12/11/95	1 : 1	C	2 OF 2



REV	DATE	DESCRIPTION	DWN	APVD
B	08/05/98	Update Address in Title Block	EAM	TB

REVISIONS

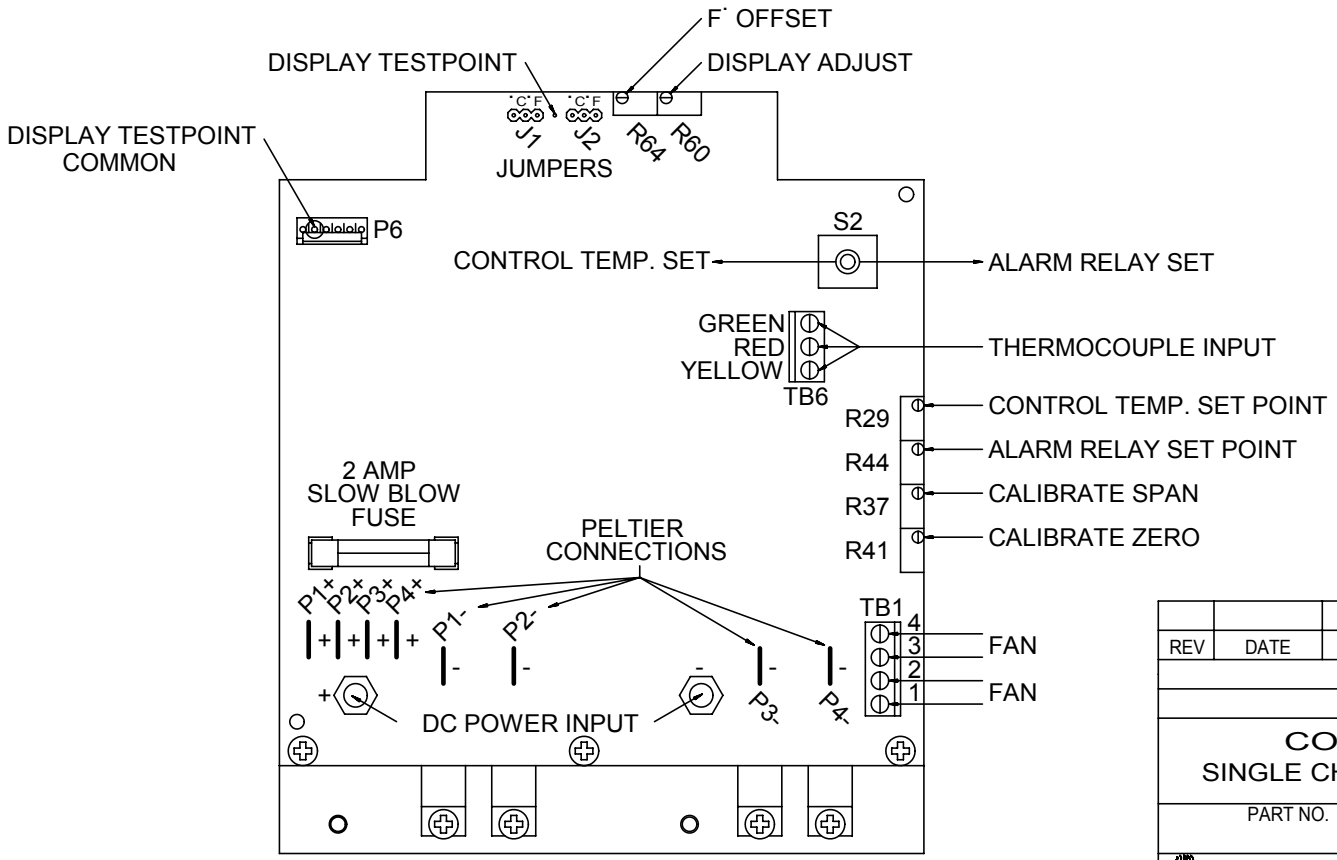
NORMAL WIRING
520/530/1040/1050/1060

PART NO.	FOR
Not Issued	Intrument

UNIVERSAL ANALYZERS INC.
1701 South Sutro Terrace
Carson City, Nevada 89706 USA

DRAWN BY HARVEY MITCHELL	DRAWING NO P0003
APVD BY TED BARBEN II	

DATE	SCALE	SIZE	SHEET
04/04/91	NTS	B	1 OF 1



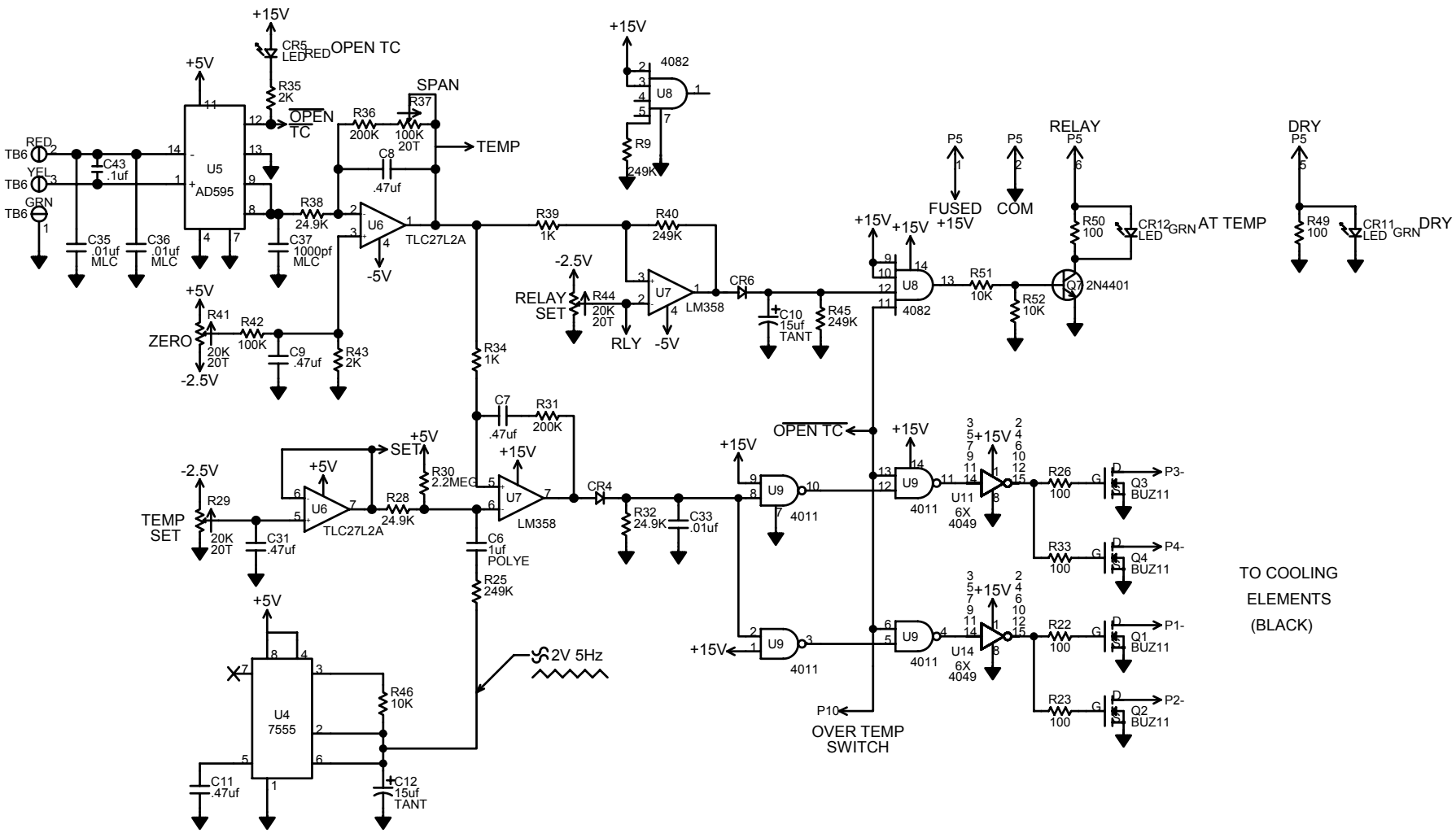
REV	DATE	DESCRIPTION	DWN	APVD
REVISIONS				

CONTROL BOARD
SINGLE CHANNEL SAMPLE COOLERS

PART NO.	FOR

UNIVERSAL ANALYZERS INC.
1701 S. Sutro Terrace
Carson City, Nevada 89706 USA

DRAWN BY	HARVEY MITCHELL	DRAWING NO	
APVD BY		P0023	
DATE	SCALE	SIZE	SHEET
7/28/92	1 : 1	B	1 OF 1



5). +15 VOLTS INPUT: INSTALL "WIRE A"
+24 VOLTS INPUT: INSTALL U17 AND C41.

4). 520 USES Q4 ONLY.
1040 USES Q2 AND Q4 ONLY.
1060 USES Q1, Q2, Q3, AND Q4.

3). ALL DIODES ARE 1N4148.

2). ALL CAPACTORS ARE MLC.

1). ALL RESISTORS ARE 1/4W, 1%, 50ppm/ C°.

NOTES: UNLESS OTHERWISE SPECIFIED.

REV	DATE	CHANGE
E	3/22 00	ADD C43/CHANGE C31 TO C41
D	6/14 95	REMOVED CR17, C29, AND C19
C	9/30 93	SAWP 8 & 9 U9
B	4/22 93	ADDED U17 & C31
A	4/17 93	OVER TEMP SWITCH

SCHEMATIC FOR NAME: SINGLE CHANNEL SAMPLE COOLER CONTROLLER BOARD SCHEMATIC
PART NO. 3600-0001 / 3600-0003 / 3600-0004

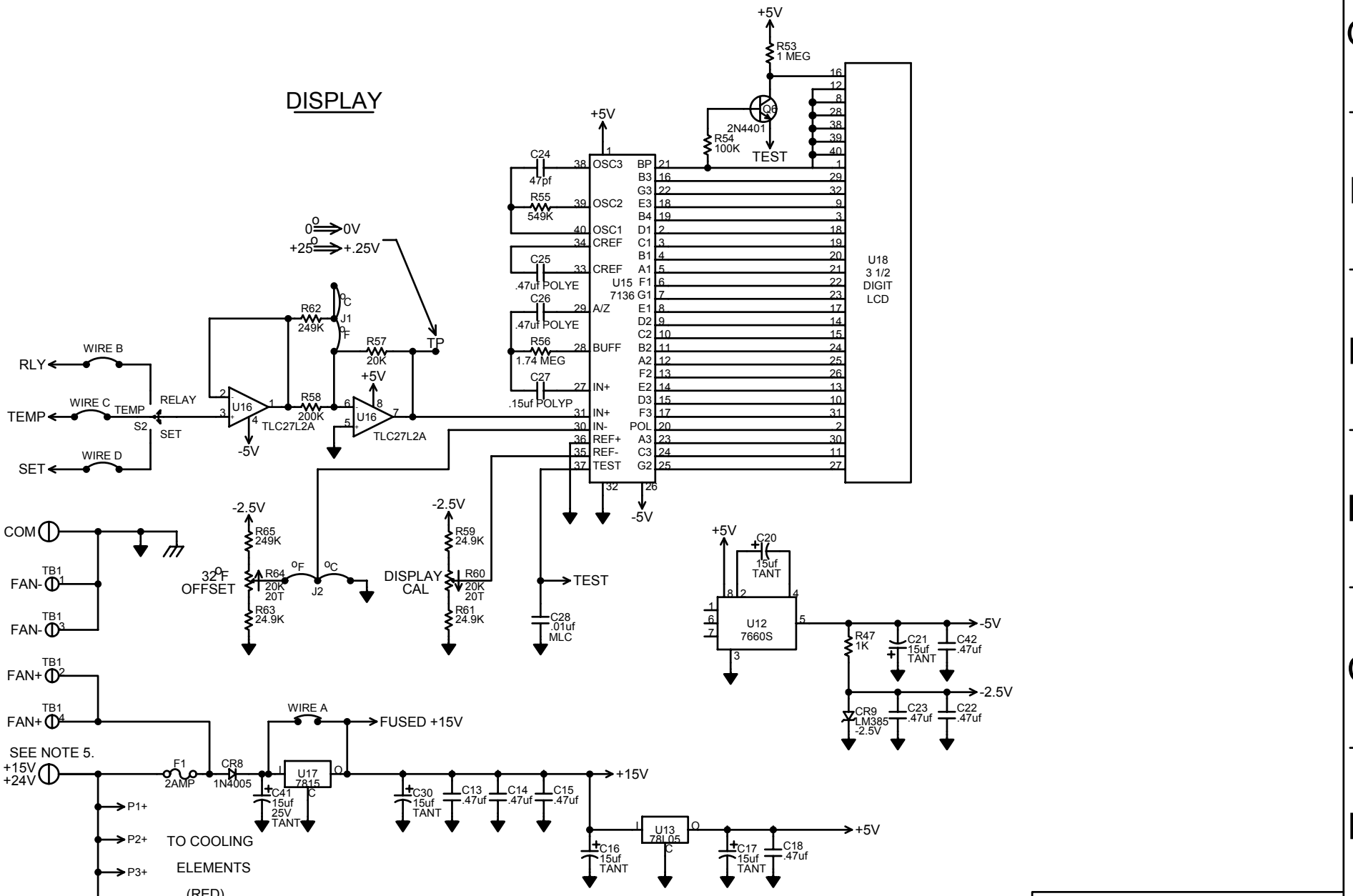
UNIVERSAL ANALYZERS INC.

DATE: 12/23/91

C E0001

SHEET 1 OF 2

DWN MRM
CHK TB
APV TB
ENG TB



REV	DATE	CHANGE	REV	DATE	CHANGE
			C	9/30 93	SWAP 8 & 9 U9
E	3/22 00	ADD WIRE B, C, D	B	4/22 93	ADDED U17 & C31
D	6/14 95	REMOVED CR17, C19, AND C29	A	4/17 93	OVER TEMP SWITCH

SCHEMATIC FOR NAME SINGLE CHANNEL SAMPLE COOLER CONTROLLER BOARD SCHEMATIC
PART NO3600-0001 / 3600-0003 / 3600-0004

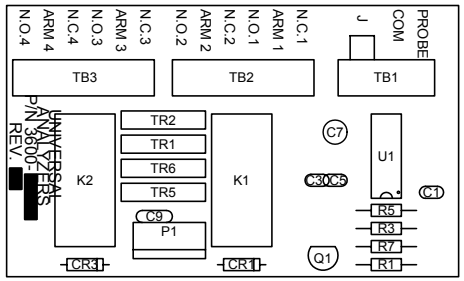
UNIVERSAL ANALYZERS INC.

DATE: 12/23/91

C E0001

DWN MRM
CHK TB
APV TB
ENG TB

SHEET 2 OF 2



DIMENSIONS IN INCHES.

NOTES: UNLESS OTHERWISE SPECIFIED.

Package To Prevent Handling And Stocking Damage

FINISH _____
PER SPEC. _____

THIRD ANGLE PROJECTIONS

SUPERSCEDES DWG.

UNLESS OTHERWISE INDICATED:
ANGLES = ± 2
MACHINED FINISH 300/OR BETTER
CHAMFER ANGLE = ± 3
CHAMFER LENGTH = ± .015"
DIMENSIONS ENCLOSED IN A ☐ ARE MORE CRITICAL THAN APPLICABLE INDUSTRY STANDARDS.
ALL DIMENSIONS ±.005" UNLESS OTHERWISE SPECIFIED.

ASSY OR B/M

ITEM	REQ'D	DWG NO.	DWG SIZE	PART NO.	NAME
				SCHEMATIC E0003 E0059	
				3600-0006 / 0029	PARTS LOCATION
				FOR SINGLE CHANNEL RELAY	

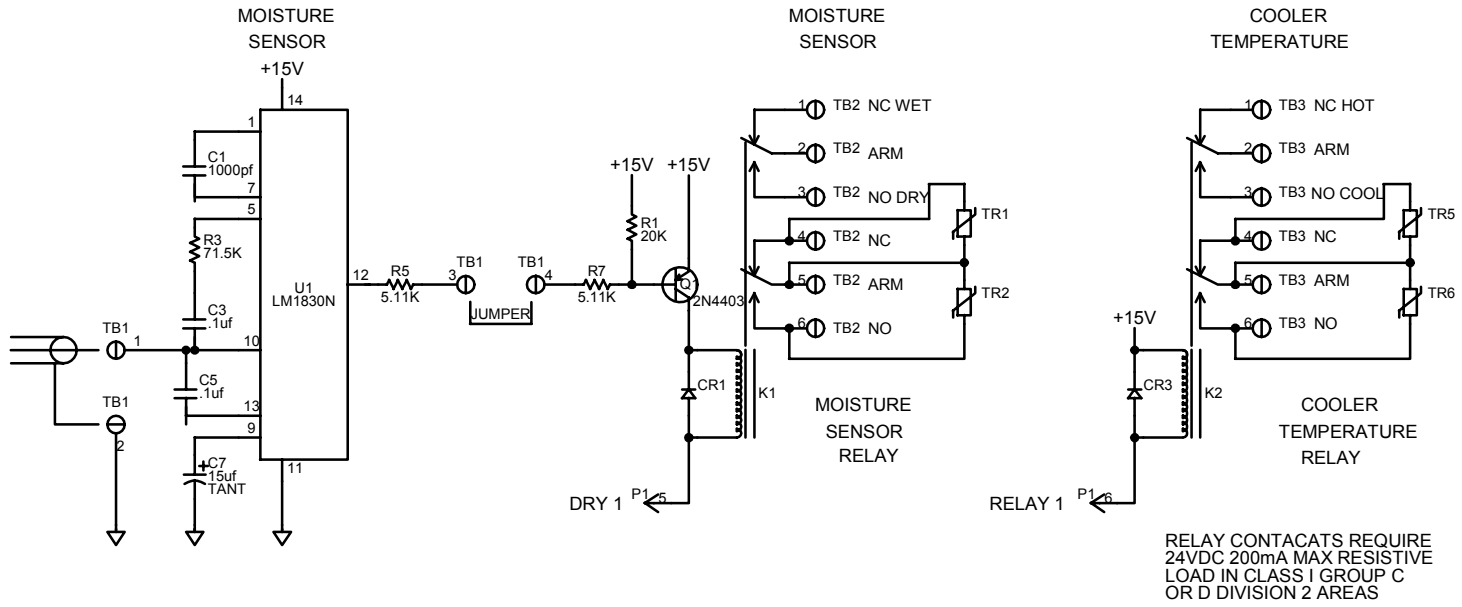
APV SYM	DATE	REVISIONS
TB	8/17/95	A CHANGE JA TO J ADD 00 E0059 3600-0029
	3/23/00	B

SCALE FULL | DATE 8/17/95 | INTERNATIONAL

UNIVERSAL ANALYZERS INC.

SIZE	DRAWING NO.	REV.	DWN.	CHKD	APVD.	ENGR.
B	E0005	B	MRM	TB	TB	TB

SHEET CONT. ON.

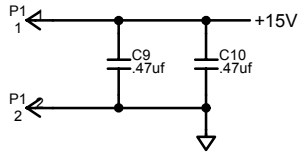


RELAY CONTACATS REQUIRE
24VDC 200mA MAX RESISTIVE
LOAD IN CLASS I GROUP C
OR D DIVISION 2 AREAS

FM
APPROVED

CSA

NOTICE
REVISION OF THIS DOCUMENT
MUST BE AUTHORIZED BY
APPROPRIATE APPROVAL AGENCIES



6). ALL MOV'S ARE 250V.
5). ALL DIODE VALUES ARE 1N4148.
4). ALL CAPACITORS ARE CERAMIC.
3). ALL CAPACITOR VALUES IN MFD.
2). ALL RESISTORS 1/4W 1%.
1). ALL RESISTOR VALUES IN OHMS.
NOTES: UNLESS OTHERWISE SPECIFIED.

REV	DATE	CHANGE
C	03/14 05	R3 TO 71.5
B	10/10 94	R3 TO 34K
A	5/16 94	RELAY RATINGS

SCHEMATIC FOR NAME: SINGLE CHANNEL SAMPLE COOLER RELAY BOARD
PART NO 3600-0006

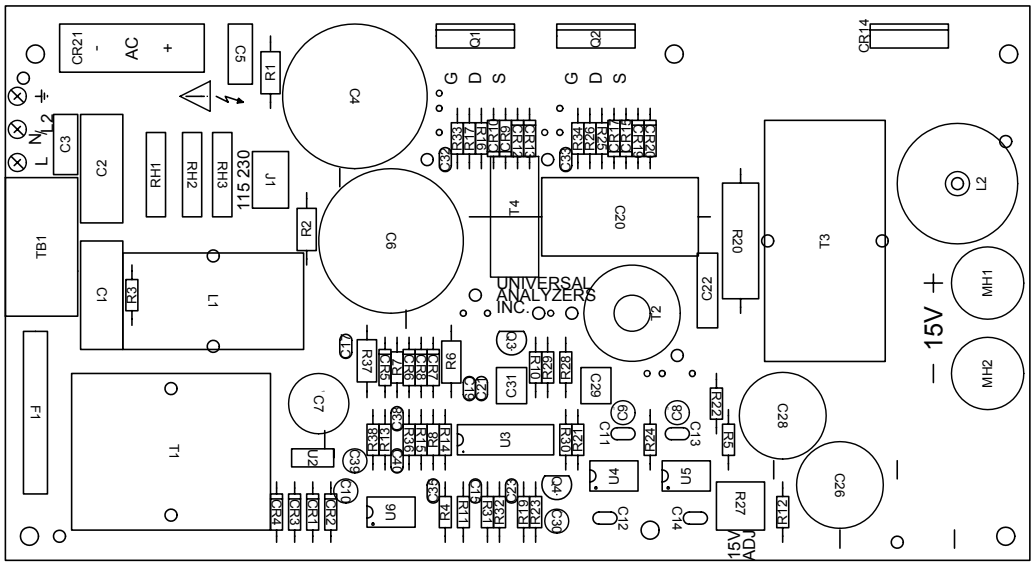
UNIVERSAL ANALYZERS INC.

DATE: 11/26/91

C E0003

SHEET 1 OF 1

DWN MRM
CHK TB
APV TB
ENG TB



250 WATT

DIMENSIONS IN INCHES.

Package To Prevent Handling And Stocking Damage

FINISH
PER SPEC.

THIRD ANGLE PROJECTIONS

SUPERSCEDES DWG.

UNLESS OTHERWISE INDICATED:
ANGLES = ± 2
MACHINED FINISH 300/OR BETTER
CHAMFER ANGLE = ± 3
CHAMFER LENGTH = ± .015"
DIMENSIONS ENCLOSED IN A ☐ ARE MORE CRITICAL THAN APPLICABLE INDUSTRY STANDARDS.
ALL DIMENSIONS ± .005" UNLESS OTHERWISE SPECIFIED.

ASSY OR B/M

ITEM	REQ'D	DWG NO.	DWG SIZE	PART NO.	NAME

REVISIONS

APV	SYM	DATE	CHANGE
TB	A	7/28/93	
	B	9/30/93	

SCHEMATIC
E0020

PART NO. | NAME: PARTS LOCATION

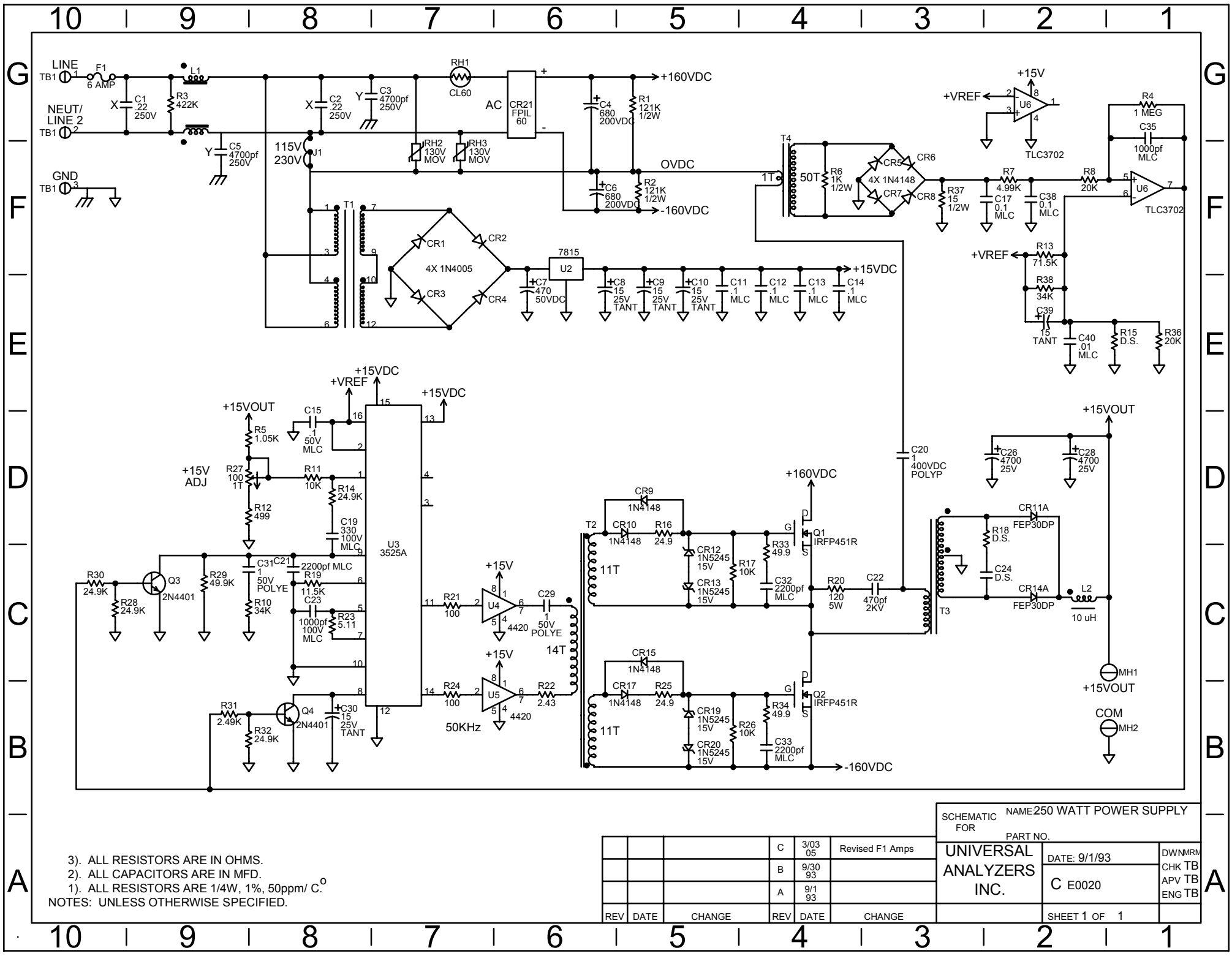
FOR: 250 WATT POWER SUPPLY

SCALE: FULL | DATE: 7/28/93 | INTERNATIONAL

UNIVERSAL ANALYZERS INC.

SIZE	DRAWING NO.	REV.	DWN.	CHKD.	APVD.	ENGR.
C	E0021	A	MRM	TB	TB	TB

SHEET CONT. ON.



3). ALL RESISTORS ARE IN OHMS.
2). ALL CAPACITORS ARE IN MFD.
1). ALL RESISTORS ARE 1/4W, 1%, 50ppm/ C.°
NOTES: UNLESS OTHERWISE SPECIFIED.

REV	DATE	CHANGE
C	3/03 05	Revised F1 Amps
B	9/30 93	
A	9/1 93	

SCHEMATIC FOR NAME 250 WATT POWER SUPPLY
PART NO.

UNIVERSAL ANALYZERS INC.

DATE: 9/1/93

C E0020

SHEET 1 OF 1

DWN MRM
CHK TB
APV TB
ENG TB

Universal Analyzers Inc.

SPARE PARTS RECOMMENDATIONS FOR MODEL 530

Level A, Consumable Parts (*All Models*):		**2 Yr Req.**
3010-0003	Fuse, Control Board – 2 Amp Slow Blow	2
3010-0005	Fuse, Power Supply Board – 6 Amp Slow Blow	2
Level B, Basic Parts (*Model 530SS*):		
5200-S050	Heat Exchanger/Impinger – 316S.S. 5 Inch	
4904-0013	O-Ring, 316S.S. Heat Exchanger – Viton 2-021	2
8010-0001	Paste, Heat Sinking - 0.1 Ounce Container	2
Level B, Basic Parts (*Model 530PV*):		
5200-K050	Heat Exchanger/Impinger – Glass/Kynar 5 Inch	
5201-0002	Glass Tube, Outer – Heat Exchanger Replacement 5 Inch	1
4904-0003	O-Ring, Glass/Kynar Heat Exchanger – Viton 2-018	2
4904-0004	O-Ring, Glass/Kynar Heat Exchanger – Viton 2-120	2
8010-0001	Paste, Heat Sinking - 0.1 Ounce Container	2
Level C, Critical Parts (*All Models*):		
3016-0001	Peltier Element - 15Vdc 8.5 Amp 40mm Sq.	
9515-0001	Insulation Kit - Heat Transfer Block	
1150-0016	Thermocouple, Type “K” - Peltier Control	1
4800-0002	Fan, Heat Sink Cooling	
4800-0004	Fan, Power Supply Cooling	
Level D, In-Depth Parts (*All Models*):		
3600-0001	Controller Circuit Board - Single Channel	
3600-0006	Alarm Relay Circuit Board - Single Channel	
3600-0038	Power Supply Board - 15Vdc 250 Watt	
Optional Parts:		
4958-0003	Motor, Peristaltic Pump - 120Vac 6RPM	1
4958-0006	Head, Peristaltic Pump - For #15 Tubing	
4958-0025	Sample Pump - 120Vac Mini Dia-Vac Alum/Teflon Single Head	
4980-0005	WCOF Assembly - Visible Moisture Sensor/2µm Teflon Filter	
5205-0006	Bowl, WCOF Filter - Replacement with Cable	
4980-0006*	Filter Element - 2µm Teflon (WCOF)	6
9216-0002	Tube, Peristaltic Pump - 5 Feet Length #15	2
9515-0018	Sample Pump Rebuild Kit - Mini Dia-Vac	3
9515-0046	Thermocouple Kit, Heat Exchanger - “New Jersey” Type “K”	

* Commissioning Spare Part

UNIVERSAL ANALYZERS INC.

MOISTURE CONVERSION TABLE

DEW POINT, DEGREES C.	% WATER BY VOLUME AT SATURATION	% WATER BY WEIGHT AT SATURATION	WATER VAPOR PRESSURE, mm. Hg
-100	0.00000139	0.00000081	0.0000099
-50	0.00388	0.00241	0.0295
-20	0.102	0.0633	0.776
-10	0.256	0.1596	1.950
-5	0.396	0.229	3.014
-4	0.432	0.268	3.280
-3	0.469	0.291	3.569
-2	0.510	0.317	3.880
1	0.555	0.345	4.223
0	0.602	0.364	4.579
1	0.649	0.404	4.937
2	0.696	0.433	5.294
3	0.750	0.466	5.70
4	0.803	0.499	6.10
5	0.861	0.535	6.54
6	0.922	0.573	7.01
7	0.988	0.614	7.51
8	1.06	0.658	8.05
9	1.13	0.702	8.58
10	1.21	0.753	9.15
11	1.29	0.802	9.8
12	1.38	0.860	10.5
13	1.48	0.920	11.2
14	1.58	0.980	12.0
15	1.68	1.044	12.8
20	2.31	1.433	17.5
25	3.13	2.004	23.8
30	4.19	2.64	
35	5.55	3.54	
40	7.28	4.67	
45	9.46	6.12	
50	12.2	8.0	
55	15.5	10.3	
60	19.7	13.3	
65	24.4	16.8	
70	30.7	21.7	
75	38.0	27.8	
80	46.7	35.6	
85	57.2	45.7	
90	69.2	58.4	