Instruction Manual

Model 817/818

Cryopump Monitor

Obsolete Notice:

This manual describes an obsolete Lake Shore product. This manual is a copy from our archives and may not exactly match your instrument. Lake Shore assumes no responsibility for this manual matching your exact hardware revision or operational procedures. Lake Shore is not responsible for any repairs made to the instrument based on information from this manual.

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Lake Shore Model 817 and 818 Cryopump Monitors

SECTION I

General Information

1.1 Introduction

This section contains general information concerning the Lake Shore Cryotronics, Inc. Model 817 and Model 818 Cryopump Monitors. Included are instrument descriptions, specifications, and information concerning the instruments and accessories.

1.2 Description

The Model 817 and Model 818 are microprocessor controlled instruments which provide direct digital display of the temperature in Kelvin of a single input sensor, with 1 Kelvin resolution. The specified range of the instruments is 4 to 330 Kelvin when used with special DT-500 sensors. Accuracy of the instruments is +/- 0.05K below 30K and +/- 0.4K above 30K when utilized with DT-500-CPU sensors.

The Model 817 and Model 818 feature two alarms which can be used to safeguard or initiate and control automatic cryopump regeneration cycles. The alarms may be used as high and low alarms. The alarm set points are front panel setable with function keys and up/down keys, and may be checked without changing them. The up/down keys can be deactivated by the removal of a jumper accessed through the top of the unit. Each set point features a deadband of 0.5K to reduce chattering of the relay contacts.

The Model 817 and Model 818 feature an RS232C serial interface which allow the user to monitor the temperature, and monitor and change the alarm set point values from a host computer.

The Model 817 features power supply regulation within the instrument. The user is required to supply unregulated DC power.

The Model 818 features a built in power supply with AC filtering and line voltage selection.

The sensor input, alarm contacts, and RS232C lines are all available on a single connector on the rear panel of each instrument.

1.3 Specifications

The instrument specifications are listed in Table 1.1. These specifications are the performance standards or limits against which the instrument is tested. Any changes in the specifications due to manufacturing or design changes will be covered by revision pages, a change sheet, or both, to this manual.

1.4 Options

Curves: Special, unique, or multiple curves may be preprogrammed into the unit. Up to 10 curves can be stored in the unit and accessed by inserting a provided jumper and using the front panel up/down keys to count to the proper curve number.

Sensor Voltage Monitor: Provides a buffered input voltage signal which is available on the rear panel connector. Available for the Model 818 only.

Linear Analog Option: Provides a linearized analog voltage signal representative of the sensor temperature with a voltage signal of 1mV/k, which is available on the rear panel connector. Available for Model 818 only.

8101 RACK KIT: Provides rack mounting for up to four Model 817's or 818's in a standard 19"relay rack.

1.5 Instrument Identification

A five-digit serial number is used to identify the Model 817 or Model 818. This serial number should be used in all correspondence which the user may have with Lake Shore Cryotronics, Inc.

Table 1.1 Specifications, Models 817 and 818 Cryopump Monitors

Specifications, Models 817 and 818 Cryopump Monitors

Input Characteristics:

Temperature Range: 10 to 330K with standard DT-500DI-8B Sensor. 4 to 330K with special DT-500 sensors. See Response Curve.

Sensor (order separately): Lake Shore DT-500DI-8B. Unit can be configured for special DT-500 sensors on quantity basis.

Sensor Input: 2-terminal, single-sensor input.

Sensor Excitation: Current source. 10 microamperes.

Sensor Response Curve: Standard units require Sensor Curve DI-8B. Special curves, unique curves, multiple-curve units available on special order.

Temperature Readout:

Display: 3 digit LED display in Kelvin.

Resolution: 1 Kelvin.

Accuracy: Unit converts sensor voltage signal to temperature with an accuracy of ±0.05K below 30K and ±0.4K above 30K when utilized with DT-500DI-8B Sensor. Display rounds temperature to nearest 1K.

Response time: Less than 1 second.

Control Relays:

High and Low Setpoints: Front panel setable with function buttons and up/down buttons. Setpoints can be checked without changing them. Up/down buttons can be deactivated via internal jumper. Deadband is 0.5K at each setpoint.

Set-Point Contacts: SPDT. 28 volts dc or peak ac. 0.25 amperes. 3 watts max.

General:

Remote Interface: RS232C 3-wire output of temperature and alarm status, and input/output of setpoint values.

Dimensions, Weight: 105mm wide X 132mm high (4.125in X 5.25in) DIN quarter-rack panel. **817** depth behind panel is 64mm (2.5in). Weight is 0.9kg (2 lb). **818** depth is 117mm (4.6in). Weight is 1.3kg (2.8 lb).

Power: 817: Unregulated dc between 8.5 and 18 volts. 350 milliamps typical. **818:** 90-125 or 210-250 Vac (selected via rear-panel switch), 50 or 60 Hz, 7 watts.

Connections: 817: Board mounted post pins with mating connector supplied for sensor input, set-point contacts, RS-232C output, and power in. **818:** 14-pin D-style connector with mating connector supplied for inputs and outputs, IEC 320 connector for power cord.

Options and Accessories Available:

-MN: Adds buffered output of Sensor voltage (818 only).

-LA: Adds 1mV/K linearized analog output of temperature (818 only).

8101 Rack Kit: Provides rack mounting for up to four model 817s or 818s in standard 19" relay rack.

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SECTION II

Installation

2.1 Introduction

This section contains information and instructions necessary for the installation and shipping of the Model 817 or Model 818 Cryopump Monitor.

2.2 Initial Inspection

This instrument is electrically and mechanically inspected prior to shipment. It should be free from mechanical damages, and in perfect working order upon receipt. To confirm this, the instrument should be inspected visually for obvious damage upon receipt and tested electrically by use to detect any concealed damage. Each unit is supplied with an operating and service manual, and a mating connector for the rear panel connector. Be sure to inventory all components before discarding any shipping materials. If there is damage to the instrument in transit, be sure to file appropriate claims with the carrier, and/or insurance company. Please advise Lake Shore Cryotronics, Inc. of such filings. In case of parts shortages, please advise us also. The standard Lake Shore Cryotronics Warranty is given on the first page of this manual.

2.3 Power Requirements

The Model 817 can be operated from an unregulated DC voltage between 8.5 and 18 volts.

The Model 818 can be operated from AC line voltages of 90-125 volts or 210-250 volts at line frequencies of 50 or 60 Hz.

CAUTION

Verify that the 115/230 line voltage selection switch located on the rear panel of the Model 818 is set to the AC source voltage to be used. Also ensure that the proper fuse is installed.

2.4 Grounding

To protect operating personnel, the National Electrical Manufacturer's Association (NEMA) recommends, and some local codes require, instrument panels to be grounded.
The Model 818 is equipped with a three conductor power entry module which, when used with the proper line cord and plugged into an appropriate receptacle, grounds the instrument.

2.5 Installation

The Model 817 and Model 818 Cryopump Monitors are entirely solid state and do not generate significant heat. They are designed to be rack mounted in dead air space and should not be subjected to temperatures outside of the specified operating environment temperature range. Figure 2.1 illustrates the input and output configurations for each instrument.

2.6 Repackaging for shipment

If the Model 817 or Model 818 appears to be operating incorrectly, please discuss the problem with a factory representative before returning the instrument. He may be able to suggest several field tests which could avoid the unnecessary return of an instrument to the factory when the malfunction is elsewhere. If these tests determine that the fault is in the instrument, the representative will provide shipping and labeling instructions for returning it. In order to expedite the repair of the instrument, contact the factory for a Returned Goods Authorization (RGA) number. Include the instrument's model and serial numbers in all written correspondence.

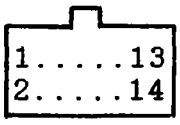
When returning an instrument, please attach a tag securely to the instrument itself (not on the shipping carton), clearly stating:

A. Owner, address and phone number
B. Instrument Model and Serial Numbers
C. Malfunction Symptoms
D. Description of External Connections and Cryostats
E. Returned Goods Authorization Number

If the original carton is available, repack the instument in a plastic bag, place it in the carton using original spacers to protect protruding controls. Seal the carton with strong paper or nylon tape. Affix shipping labels and "FRAGILE" warnings.

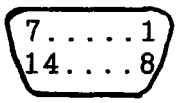
If the original carton is not available, pack the instrument similar to the above procedures, being careful to use spacers or suitable packing material on all sides of the instrument.

Figure 2.1 - Input and Output Configurations



Model 817

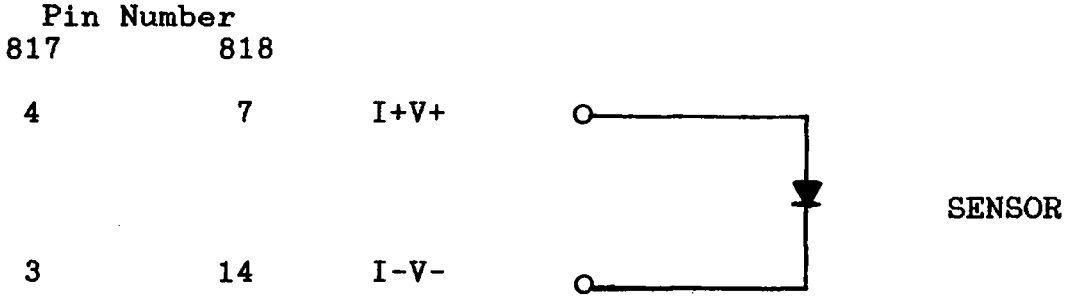
1. V+ (input supply)
2. Ground (supply,RS232C)
3. I-V- (sensor low)
4. I+V+ (sensor high)
5. No connection
6. No connection
7. Receive (RS232C)
8. Transmit (RS232C)
9. Alarm 2 normally closed
10. Alarm 2 normally open
11. Alarm 2 common
12. Alarm 1 normally open
13. Alarm 1 common
14. Alarm 1 normally closed



Model 818

1. Alarm 1 common
2. Alarm 2 common
3. Alarm 2 normally closed
4. Receive (RS232C)
5. L/A option ground
6. L/A option output
7. I+V+ (sensor high)
8. Alarm 1 normally closed
9. Alarm 1 normally open
10. Alarm 2 normally open
11. Transmit (RS232C)
12. Ground (RS232C)
13. Monitor option output
14. I-V- (sensor low, Monitor ground)

Figure 2.2 - Sensor Wiring Diagram



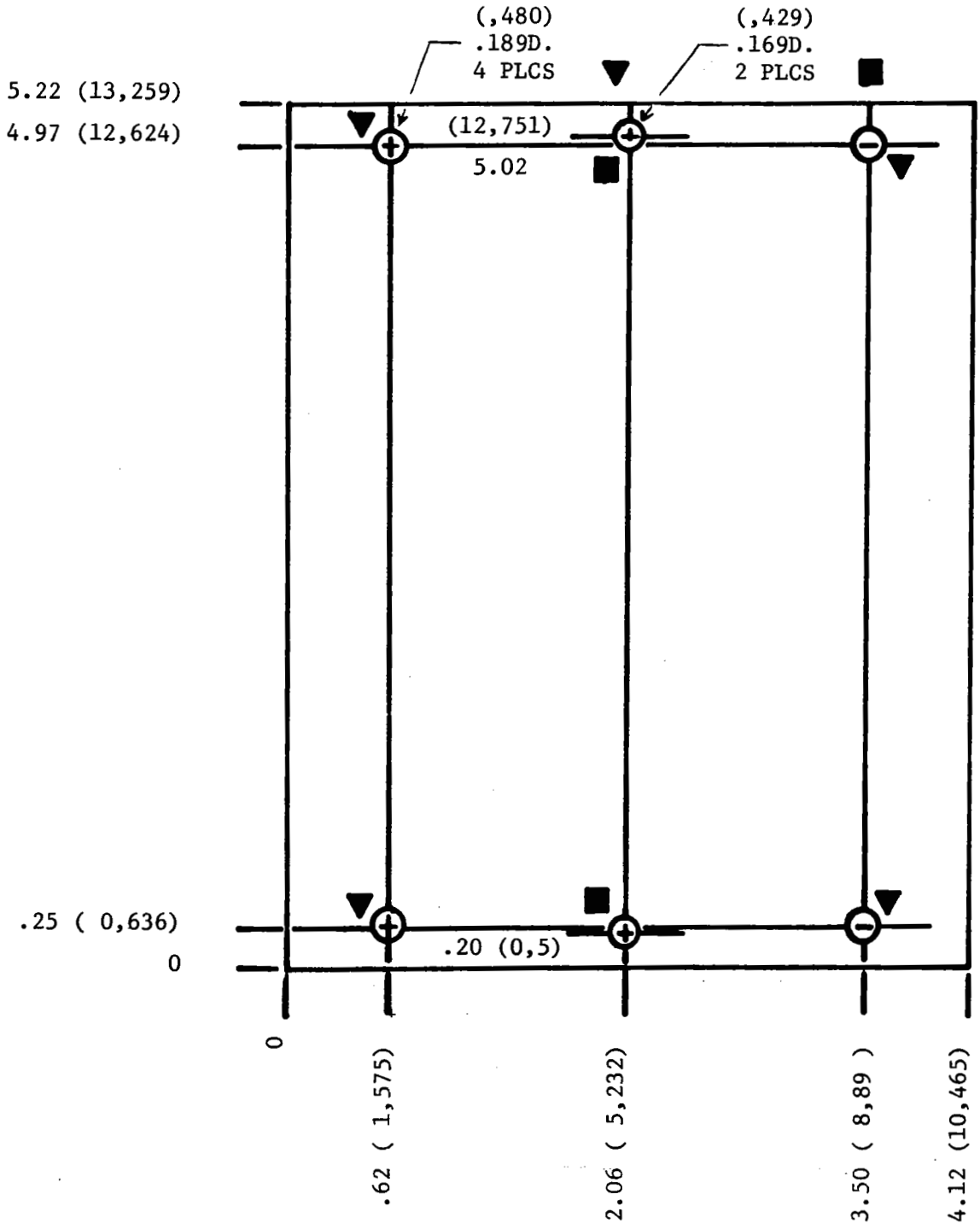


FIGURE 2.3 Front Panel Mounting Hole Detail

SECTION III

Operating Instructions

3.1 Introduction

This section contains complete operating instructions for the Model 817 and Model 818 Cryopump Monitors. Included is a description of the front and rear panel controls and indicators, programming instructions, and application examples.

3.2 Controls, Indicators

The operating controls, and indicators are shown in Figures 3.1, 3.2, 3.3, and 3.4, and are keyed in Table 3.1.

Table 3.1 - Index Key Correlation

No. Key	Function
1	Digital display for temperature and set point values
2	Function key for alarm point 1
3	Function key for alarm point 2
4	Up key used to increment alarm set points and curve number
5	Down key used to decrement alarm set points and curve numbers
6	Connector for unregulated DC power, sensor input, alarm contacts, and RS232C lines
7	Switch for 115/230 AC line voltage selection
8	Power entry module, including fuse and power (on/off) switch

9	Connector for sensor input, alarm contacts, and RS232C lines
10	Current source adjustment
11	Temperature calibration adjustment
12	Set Point Disable pins
13	Curve Select pins

3.3 Temperature Readout

The DT-500 sensor should be connected as in Figure 2.2. Turn the power on, and the digital display will indicate the proper temperature relative to the temperature where the sensor is installed.

3.4 Standard Curves

Standard curves are present in Table 3.5. Each table includes a list of PROM sensor voltages and breakpoints used in the linearization of the curve to arrive at the correct temperature to within the specified accuracy. Each unit is supplied with four standard curves: 0=DT-500DI-8B, 1=DT-500DI-8A, 2=DRC-D, 3=DRC-E1

3.5 Multiple Curves

If multiple curves where preprogrammed into the instrument, use the following proceedure to select another curve:

1. Using small pliers, remove the jump jax (jumper) from the Set Point Disable pins (Key 12) through the access hole in the top of the unit.(Refer to Figure 3.4)

2. Place the jump jax on the Curve Select pins (Key 13), and notice that the digital display now indicates the present curve number.

3. Use the up/down arrows to count to new curve number. (Refer to Figure 3.1) NOTE: The unit will only count those curves available within the unit.

4. Remove the jump jax from the Curve Select pins and place it back on the Set Point Disable pins. At this time the display will again read temperature, now calculated by the new curve. The curve number will be stored in a nonvolatile memory which is saved when power to the unit is removed.

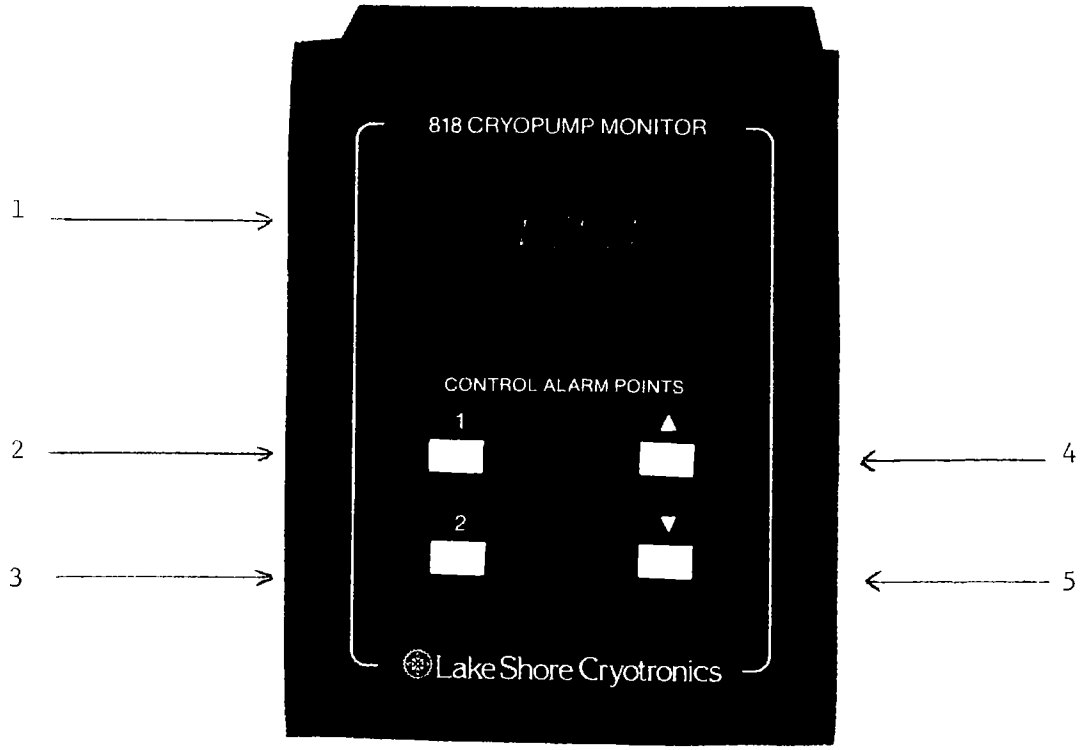


FIGURE 3.1 Typical Front Panel for Model 817 and 818

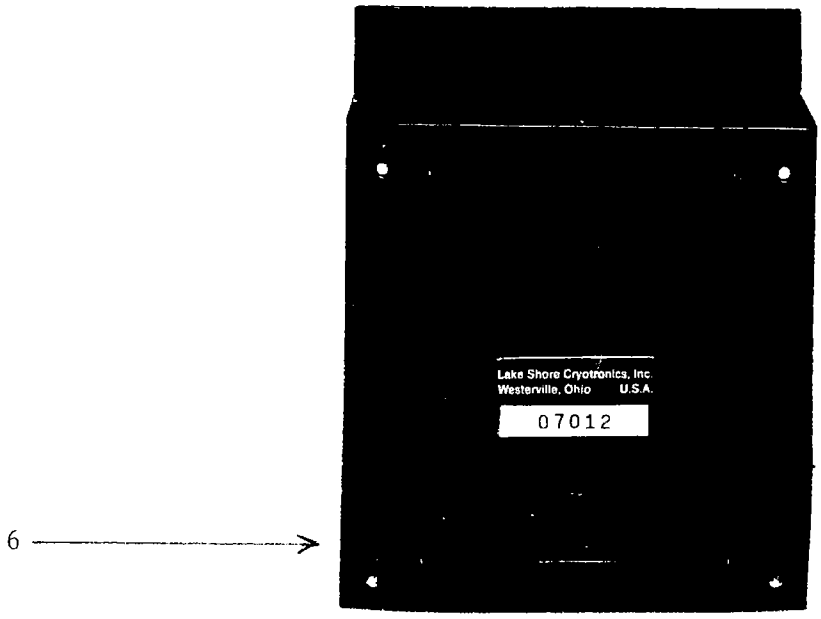


FIGURE 3.2 Model 817 Rear Panel

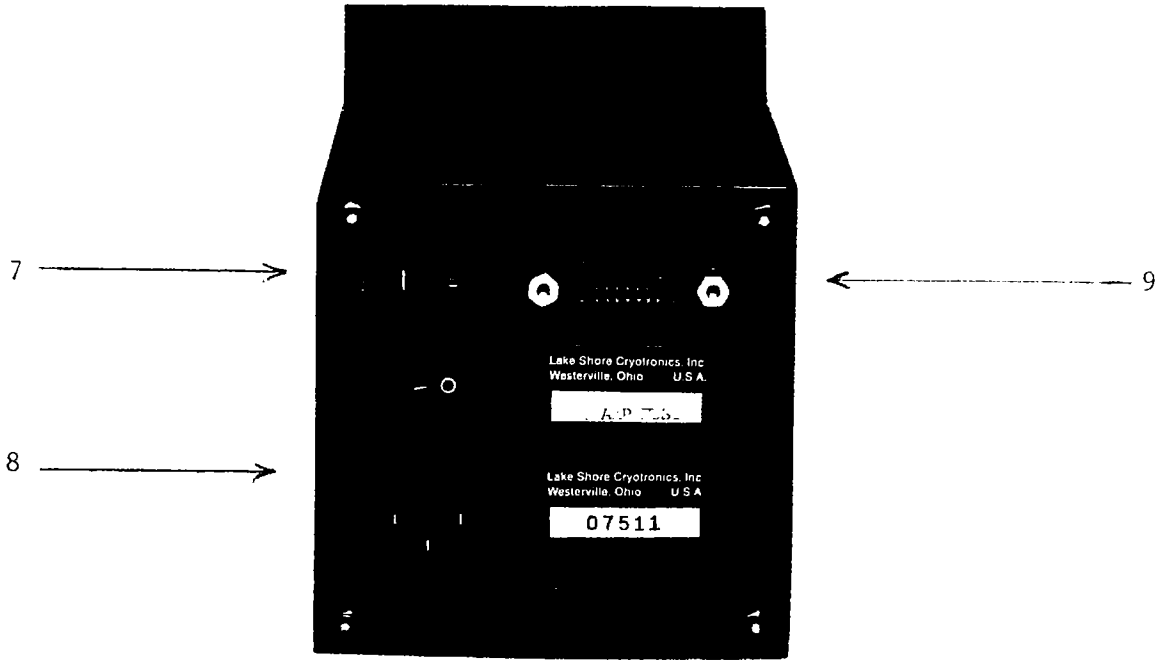


FIGURE 3.3 Model 817 Rear Panel

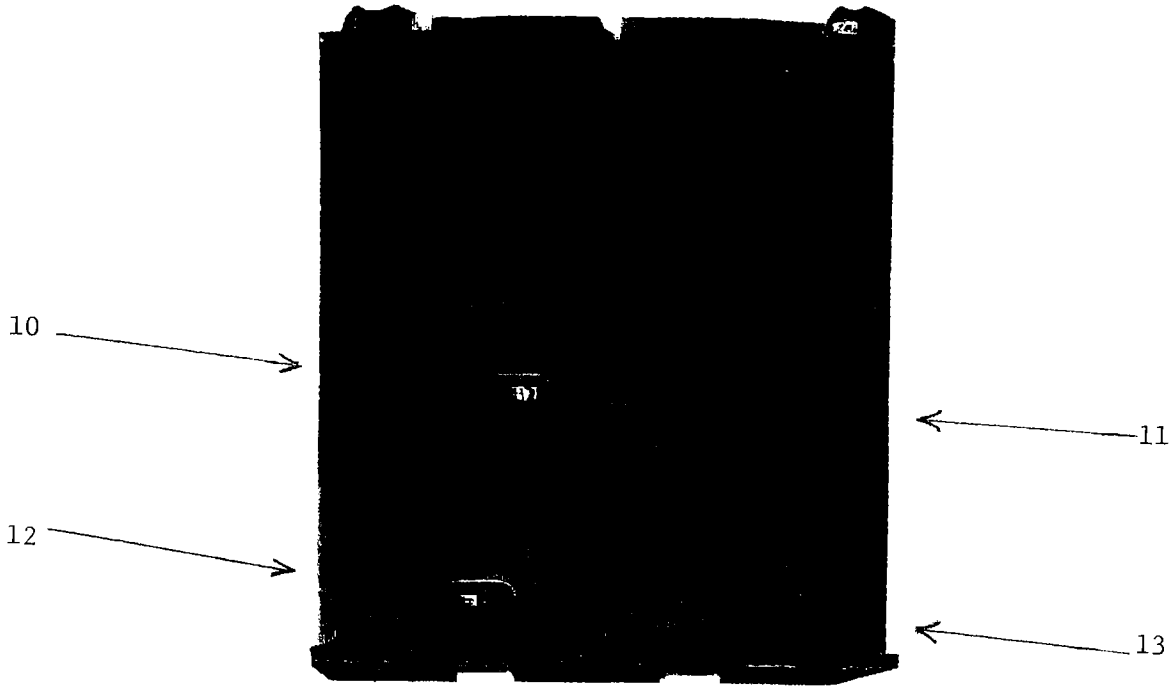


FIGURE 3.4 Top View of Model 817 and 818

3.6 Alarm Point Relays

A standard feature of the Model 817 and Model 818 is the capability to set two alarm trip points , each activating a low power single pole double throw relay.(Refer to Figure 2.1 for proper pin out, Table 1.1 for contact specifications,and Table 3.2 for relay truth table.)

Each alarm set point can be set from either the front panel keys or a remote computer.(Refer to programming instructions.)

To set the alarm set point from the front panel, use the following proceedure:

1. Make sure the Set Point Disable jumper (Key 12) is in place. (Refer to Figure 3.4)

2. Press the alarm function key for the proper alarm to be updated. (Refer to Figure 3.1) Notice that the display now indicates the alarm set point value.

3. Use the up/down arrow keys to count to the new set point value.

4. Release the alarm set point function key, and the new value will be stored in the nonvolatile memory. (The value will be saved when power to the unit is off.)

5. To disable the front panel up/down keys, remove the Set Point Disable jumper. The function keys will still operate to allow checking of the values. Be sure to keep the jumper for future use.

Table 3.2 - Relay Truth Table

Display Reading compared to:		Contact Positions Alarm 1		Alarm 2	
Alarm 1	Alarm 2	N.O.-CM.	N.C.-CM.	N.O.-CM.	N.C.-CM.
Greater	Greater	Closed	Open	Open	Closed
Greater	Lower	Closed	Open	Closed	Open
Lower	Greater	Open	Closed	Open	Closed
Lower	Lower	Open	Closed	Closed	Open
Power Off		Open	Closed	Open	Closed

3.7 SERIAL INTERFACE

The Model 817 and Model 818 instruments feature a serial interface, (RS232C), which allows the units to communicate to a host computer.

Table 3.3 - RS232C Interface Specifications

Timing Format	- Asynchoronous
Transmission Mode	- Half Duplex
Baud Rate	- 300
Bits per Character	- 7 (not including start, stop or parity bits)
Parity Type	- Odd
Number of Stop Bits	- 1
Data Interface Levels	- 0v and 5v

Table 3.4 - RS232C Commands and Format

S Status Output: Used to read the temperature, alarm set points, and relay status

Format:

TEMP,A1SP,A2SP,A1RS,A2RS,DELIMITERS

XXX,XXX,XXX,X,X(CR)(LF)

Example: If the temperature was at 330K, alarm set point 1 is 300, and alarm set point 2 is 30, then the host computer should read the following after sending the "S" command.

330,300,030,A,I

Notice that alarm 1 relay is active and alarm 2 relay is inactive.

U Alarm 1 Set Point: Used to update alarm 1 set point.

Format:

UXXX (Enter all three digits including leading zeroes)

Example: To change alarm set point 1 to 200, send the following command. The "S" command can se used to check the value.

U200

L Alarm 2 Set Point: Used to update alarm 2 set point.

Format:

LXXX (Enter all three digits including leading zeroes)

Example: To change alarm set point 2 to 50, send the following command. The "S" command can be used to check the value.

L050

The following program will input a command from the keyboard and output it to the instrument.

HP-86B

```
10 DIM A$[100],B$[100]      ! A$ IS OUTPUT TO UNIT, B$ IS
                              INPUT
20 CONTROL 10,3;6           ! 300 BAUD
30 CONTROL 10,4;10          ! 7 BITS, ODD PARITY, 1 STOP
40 INPUT A$                 ! ENTER A COMMAND
50 OUTPUT 10;A$             ! OUTPUT THE COMMAND
60 IF A$ = "S" THEN 80      ! GOTO ENTER COMMAND
70 GOTO 40                  ! RETURN FOR NEW COMMAND
80 ENTER 10;B$              ! INPUT INFORMATION FROM UNIT
90 DISP B$                  ! DISPLAY DATA ON SCREEN
100 GOTO 40                 ! RETURN FOR NEW COMMAND
```

Lake Shore Cryotronics, Inc.

Manufacturers of cryogenic thermometry and instrumentation

ADDITIONAL STANDARD TEMPERATURE RESPONSE CURVES FOR 817/818 CRYOPUMP MONITORS

The enclosed 817/818 Cryopump Monitor contains three additional standard curves to allow use with Lake Shore Cryotronics, Inc.'s DT-500DI-8C Sensors, DT-470 curve #10 sensors, and CTI's diode sensors. A voltage(V) vs. temperature (K) table is included for each of these curves.

The LSCI DI-8C curve is used when curve #5 is selected, and the CTI diode curve is used when curve #4 is selected. The LSCI DT-470 curve #10 is used when curve #6 is selected. The curve selected is the first number to appear on the display when the unit is powered up (this provision was not on the earlier units). An updated 817/818 PROM chip is available from Lake Shore Cryotronics for $50.00. When ordering an 817/818 PROM chip, please specify the instrument's serial number.

All DT-500DI-8C sensors will have a 1/4" diameter green tag attached to their anode leads and be assigned a serial number with suffix (*C).

Table 3.5 - Curve Information

Curve #0 - DT-500DI-8B
Curve #1 - DT-500DI-8A
Curve #2 - DT-500DRC-D
Curve #3 - DT-500DRC-E1

Curve #0 - DT-500DI-8B Voltage-Temperature Characteristics

BP #	Temp. (K)	PROM Voltage	BP #	Temp. (K)	PROM Voltage
29	4.0	2.41773	15	36.0	1.08547
	4.2	2.40475		38.0	1.08038
	4.4	2.39217	14	40.0	1.07549
	4.6	2.37946		45.0	1.06400
	4.8	2.36668	13	50.0	1.05273
	5.0	2.35378		55.0	1.04123
	5.5	2.32126	12	60.0	1.02954
	6.0	2.28869		65.0	1.01748
	6.5	2.25643	11	70.0	1.00528
	7.0	2.22480		75.0	0.99263
	7.5	2.19395		77.4	0.98666
28	8.0	2.16053		80.0	0.97988
	8.5	2.13552	10	85.0	0.96711
	9.0	2.10809		90.0	0.95397
	9.5	2.08197		95.0	0.94086
	10.0	2.05687		100.0	0.92767
	11.0	2.00852		105.0	0.91443
	12.0	1.96003	9	110.0	0.90124
	13.0	1.90579		115.0	0.88776
27	14.0	1.85614		120.0	0.87434
	15.0	1.80479		125.0	0.86087
26	16.0	1.74703		130.0	0.84735
	17.0	1.67479		135.0	0.83377
	18.0	1.60665	8	140.0	0.82032
	19.0	1.53675		145.0	0.80647
	20.0	1.46370		150.0	0.79274
	21.0	1.38832		155.0	0.77896
25	22.0	1.31868		160.0	0.76513
	23.0	1.26476		165.0	0.75125
24	24.0	1.21712		170.0	0.73733
23	25.0	1.17857	7	175.0	0.72353
22	26.0	1.15106		180.0	0.70936
21	27.0	1.13317		185.0	0.69532
20	28.0	1.12169		190.0	0.68125
19	29.0	1.11353		195.0	0.66713
18	30.0	1.10729		200.0	0.65302
17	32.0	1.09810		205.0	0.63889
16	34.0	1.09125		210.0	0.62475
				215.0	0.61066

Table 3.5 - Curve Information

Curve #0 - DT-500DI-8B, cont'd.

BP #	Temp. (K)	PROM Voltage	BP #	Temp. (K)	PROM Voltage
6	220.0	0.59646		275.0	0.44800
	225.0	0.58262	3	280.0	0.43451
	230.0	0.56877		285.0	0.42064
	235.0	0.55504		290.0	0.40675
5	240.0	0.54136		295.0	0.39274
	245.0	0.52801	2	300.0	0.37875
	250.0	0.51469		305.0	0.36436
4	255.0	0.50155		310.0	0.35002
	260.0	0.48815		315.0	0.33559
	265.0	0.47486		320.0	0.32109
	270.0	0.46148		325.0	0.30656
			1	330.0	0.29222

Curve #1 - DT-500DI-8A Voltage-Temperature Characteristics

BP #	Temp. (K)	PROM Voltage	BP #	Temp. (K)	PROM Voltage
30	4.0	2.46386	26	14.0	1.91202
	4.2	2.44821		15.0	1.85236
	4.4	2.43188		16.0	1.79177
	4.6	2.41500		17.0	1.73193
	4.8	2.39781	25	18.0	1.66870
29	5.0	2.37578		19.0	1.59215
	5.5	2.33823		20.0	1.51169
	6.0	2.29906		21.0	1.43234
	6.5	2.26440	24	22.0	1.34993
28	7.0	2.23248	23	23.0	1.28434
	7.5	2.20480	22	24.0	1.23212
	8.0	2.17716	21	25.0	1.18995
	8.5	2.14994	20	26.0	1.16027
27	9.0	2.12245	19	27.0	1.14015
	9.5	2.10065	18	28.0	1.12689
	10.0	2.07844	17	29.0	1.11741
	11.0	2.03712	16	30.0	1.11007
	12.0	1.99736	15	32.0	1.09942
	13.0	1.95641	14	34.0	1.09178

Table 3.5 - Curve Information

Curve #1 - DT-500DI-8A, cont'd.

BP #	Temp. (K)	PROM Voltage	BP #	Temp. (K)	PROM Voltage
13	36.0	1.08559	6	215.0	0.59901
12	38.0	1.07992		220.0	0.58502
	40.0	1.07502		225.0	0.57099
	45.0	1.06307		230.0	0.55715
	50.0	1.05136	5	235.0	0.54327
	55.0	1.03951		240.0	0.52983
11	60.0	1.02744		245.0	0.51639
	65.0	1.01475		250.0	0.50302
	70.0	1.00193		255.0	0.48965
10	75.0	0.98892		260.0	0.47625
	77.4	0.98264	4	265.0	0.46292
	80.0	0.97557		270.0	0.44925
	85.0	0.96216		275.0	0.43559
	90.0	0.94877		280.0	0.42178
9	95.0	0.93535	3	285.0	0.40797
	100.0	0.92166		290.0	0.39375
	105.0	0.90798		295.0	0.37951
	110.0	0.89426		300.0	0.36515
	115.0	0.88052	2	305.0	0.35078
	120.0	0.86676		310.0	0.33599
	125.0	0.85298		315.0	0.32121
8	130.0	0.83936		320.0	0.30643
	135.0	0.82531		325.0	0.29159
	140.0	0.81142	1	330.0	0.27665
	145.0	0.79749			
	150.0	0.78351			
	155.0	0.76950			
	160.0	0.75544			
	165.0	0.74135			
7	170.0	0.72739			
	175.0	0.71308			
	180.0	0.69891			
	185.0	0.68469			
	190.0	0.67043			
	195.0	0.65615			
	200.0	0.64185			
	205.0	0.62754			
	210.0	0.61333			

Table 3.5 - Curve Information

Curve #2 - DT-500DRC-D Voltage-Temperature Characteristics

BP #	Temp. (K)	PROM Voltage	BP #	Temp. (K)	PROM Voltage
	1.4	2.5984	25	17.0	1.6359
	1.5	2.5958		18.0	1.5646
	1.6	2.5932		19.0	1.4932
	1.7	2.5906		20.0	1.4219
	1.8	2.5880	24	21.0	1.3505
	1.9	2.5854		22.0	1.3006
30	2.0	2.5828	23	23.0	1.2507
	2.2	2.5735		24.0	1.2114
	2.4	2.5643	22	25.0	1.1720
	2.6	2.5551	21	26.0	1.1486
	2.8	2.5458	20	27.0	1.1308
29	3.0	2.5366	19	28.0	1.1190
	3.2	2.5226	18	29.0	1.1116
	3.4	2.5086	17	30.0	1.1058
	3.6	2.4946	16	32.0	1.0970
	3.8	2.4807	15	34.0	1.0902
	4.0	2.4667		36.0	1.0850
	4.2	2.4527		38.0	1.0798
	4.4	2.4387	14	40.0	1.0746
	4.6	2.4247		45.0	1.0633
	4.8	2.4108		50.0	1.0520
	5.0	2.3968	13	55.0	1.0407
	5.5	2.3618		60.0	1.0287
	6.0	2.3269		65.0	1.0166
	6.5	2.2919	12	70.0	1.0046
	7.0	2.2570		75.0	0.99172
	7.5	2.2220		80.0	0.97890
	8.0	2.1871		85.0	0.96609
	8.5	2.1521	11	90.0	0.95327
28	9.0	2.1172		95.0	0.93987
	9.5	2.0909		100.0	0.92647
	10.0	2.0646		105.0	0.91307
	11.0	2.0119		110.0	0.89966
	12.0	1.9592		115.0	0.88626
27	13.0	1.9066		120.0	0.87286
	14.0	1.8338		125.0	0.85946
26	15.0	1.7610			
	16.0	1.6984			

Table 3.5 - Curve Information

Curve #2 - DT-500DRC-D, cont'd.

BP #	Temp. (K)	PROM Voltage	BP #	Temp. (K)	PROM Voltage
10	130.0	0.84606	4	305.0	0.36397
	135.0	0.83228		310.0	0.34940
	140.0	0.81850		315.0	0.33482
	145.0	0.80472		320.0	0.32025
	150.0	0.79094		325.0	0.30568
	155.0	0.77716		330.0	0.29111
	160.0	0.76338		335.0	0.27654
	165.0	0.74961		340.0	0.26197
9	170.0	0.73582	3	345.0	0.24739
	175.0	0.72170		350.0	0.23325
	180.0	0.70757		355.0	0.21911
	185.0	0.69344		360.0	0.20497
	190.0	0.67931	2	365.0	0.19083
	195.0	0.65518		370.0	0.17774
	200.0	0.65105		375.0	0.16464
	205.0	0.63693	1	380.0	0.15155
	210.0	0.62280			
	215.0	0.60867			
8	220.0	0.59455			
	225.0	0.58080			
	230.0	0.56707			
	235.0	0.55334			
7	240.0	0.53960			
	245.0	0.52649			
	250.0	0.51337			
	255.0	0.50026			
	260.0	0.48714			
6	265.0	0.47403			
	270.0	0.46057			
	275.0	0.44711			
	280.0	0.43365			
5	285.0	0.42019			
	290.0	0.40613			
	295.0	0.39208			
	300.0	0.37802			

Table 3.5 - Curve Information

Curve #3 - DT-500DRC-E1 Voltage-Temperature Characteristics

BP #	Temp. (K)	PROM Voltage	BP #	Temp. (K)	PROM Voltage
30	1.4	2.6591	25	13.0	1.9632
	1.5	2.6567		14.0	1.9011
	1.6	2.6542		15.0	1.8390
	1.7	2.6518		16.0	1.7769
	1.8	2.6494		17.0	1.7148
	1.9	2.6470	24	18.0	1.6527
29	2.0	2.6446		19.0	1.5724
	2.2	2.6355		20.0	1.4922
	2.4	2.6265		21.0	1.4120
	2.6	2.6175	23	22.0	1.3317
	2.8	2.6084		23.0	1.2837
28	3.0	2.5994	22	24.0	1.2357
	3.2	2.5868	21	25.0	1.1877
	3.4	2.5742	20	26.0	1.1559
	3.6	2.5616	19	27.0	1.1365
	3.8	2.5490	18	28.0	1.1239
27	4.0	2.5364	17	29.0	1.1150
	4.2	2.5221	16	30.0	1.1080
	4.4	2.5077	15	32.0	1.0981
	4.6	2.4934	14	34.0	1.0909
	4.8	2.4791	13	36.0	1.0848
	5.0	2.4648		38.0	1.0797
	5.5	2.4290	12	40.0	1.0746
	6.0	2.3932		45.0	1.0630
	6.5	2.3574		50.0	1.0515
	7.0	2.3216		55.0	1.0399
	7.5	2.2858	11	60.0	1.0284
	8.0	2.2500		65.0	1.0159
	8.5	2.2142		70.0	1.0035
26	9.0	2.1784	10	75.0	0.9911
	9.5	2.1516		77.35	0.9849
	10.0	2.1247		80.0	0.9780
	11.0	2.0708		85.0	0.9649
	12.0	2.0170		90.0	0.9518
				95.0	0.9388

Table 3.5 - Curve Information

Curve #3 - DT-500DRC-E1, cont'd.

BP #	Temp. (K)	PROM Voltage	BP #	Temp. (K)	PROM Voltage
9	100.0	0.9257	6	220.0	0.5926
	105.0	0.9122		225.0	0.5789
	110.0	0.8988		230.0	0.5651
	115.0	0.8853		235.0	0.5514
	120.0	0.8718	5	240.0	0.5377
	125.0	0.8584		245.0	0.5246
8	130.0	0.8449		250.0	0.5115
	135.0	0.8311		255.0	0.4984
	140.0	0.8173		260.0	0.4853
	145.0	0.8035	4	265.0	0.4722
	150.0	0.7896		270.0	0.4588
	155.0	0.7758		275.0	0.4454
	160.0	0.7620		280.0	0.4320
	165.0	0.7482	3	285.0	0.4186
7	170.0	0.7344		290.0	0.4045
	175.0	0.7202		295.0	0.3904
	180.0	0.7060		300.0	0.3763
	185.0	0.6918	2	305.0	0.3622
	190.0	0.6777		310.0	0.3476
	195.0	0.6635		315.0	0.3330
	200.0	0.6493		320.0	0.3184
	205.0	0.6351		325.0	0.3038
	210.0	0.6210	1	330.0	0.2893
	215.0	0.6068			

Table 3.5 - Curve Information

Curve #4 CTI Diode Voltage-Temperature Characteristics

BP #	Temp. (K)	PROM Voltage	BP #	Temp. (K)	PROM Voltage
29	10.0	1.4000		120.0	0.8500
28	11.0	1.3850	12	125.0	0.8376
27	12.0	1.3656	11	130.0	0.8245
	13.0	1.3400		135.0	0.8109
26	14.0	1.3161	10	140.0	0.7971
	15.0	1.2750		145.0	0.7828
	16.0	1.2350		150.0	0.7685
	17.0	1.1910		155.0	0.7543
25	18.0	1.1500		160.0	0.7400
24	19.0	1.1290	9	165.0	0.7255
23	20.0	1.1162		170.0	0.7114
	21.0	1.1135		175.0	0.6972
	22.0	1.1109		180.0	0.6830
	23.0	1.1084		185.0	0.6690
	24.0	1.1058		190.0	0.6549
	25.0	1.1033	8	195.0	0.6408
	26.0	1.1007		200.0	0.6270
	27.0	1.0981		205.0	0.6133
	28.0	1.0955		210.0	0.5995
	29.0	1.0929		215.0	0.5858
	30.0	1.0903		220.0	0.5720
	32.0	1.0851		225.0	0.5583
	34.0	1.0799		230.0	0.5445
22	36.0	1.0747		235.0	0.5308
	38.0	1.0693		240.0	0.5170
	40.0	1.0640		245.0	0.5032
	45.0	1.0505	7	250.0	0.4896
	50.0	1.0370		255.0	0.4757
	55.0	1.0235		260.0	0.4620
21	60.0	1.0100		265.0	0.4481
20	65.0	0.9958	6	270.0	0.4341
	70.0	0.9822		275.0	0.4197
	75.0	0.9690	5	280.0	0.4050
19	77.4	0.9626	4	285.0	0.3911
	80.0	0.9560		290.0	0.3775
18	85.0	0.9440	3	295.0	0.3640
17	90.0	0.9314		300.0	0.3510
16	95.0	0.9184	2	305.0	0.3382
15	100.0	0.9049		310.0	0.3243
	105.0	0.8907		315.0	0.3106
14	110.0	0.8769	1	320.0	0.2968
13	115.0	0.8625			

Table 3.5 - Curve Information

Curve #5 - DT-500DI-8C Voltage-Temperature Characteristics

BP #	Temp. (K)	PROM Voltage	BP #	Temp. (K)	PROM Voltage
29	4.0	2.6187	23	24.0	1.2317
	4.2	2.6074	22	25.0	1.1900
	4.4	2.5956	21	26.0	1.1602
	4.6	2.5834	20	27.0	1.1402
	4.8	2.5709	19	28.0	1.1269
	5.0	2.5580	18	29.0	1.1173
28	5.2	2.5484	17	30.0	1.1100
	5.4	2.5312	16	31.0	1.1039
	5.6	2.5173		32.0	1.0991
	5.8	2.5033	15	33.0	1.0949
	6.0	2.4890		34.0	1.0913
	6.5	2.4524	14	35.0	1.0879
	7.0	2.4151		36.0	1.0850
	7.5	2.3773		37.0	1.0822
	8.0	2.3394	13	38.0	1.0795
27	8.5	2.2976		39.0	1.0770
	9.0	2.2643		40.0	1.0746
	9.5	2.2277		42.0	1.0697
	10.0	2.1919	12	44.0	1.0649
	10.5	2.1566		46.0	1.0603
	11.0	2.1221		48.0	1.0558
	11.5	2.0881		50.0	1.0512
	12.0	2.0545		52.0	1.0467
	12.5	2.0211		54.0	1.0421
	13.0	1.9875		56.0	1.0376
	13.5	1.9537		58.0	1.0330
	14.0	1.9193	11	60.0	1.0285
	14.5	1.8843		65.0	1.0168
	15.0	1.8480		70.0	1.0049
	15.5	1.8110	10	75.0	0.9930
	16.0	1.7748		77.4	0.9870
26	16.5	1.7441		80.0	0.9805
	17.0	1.7047		85.0	0.9680
	17.5	1.6702		90.0	0.9553
	18.0	1.6361	9	95.0	0.9427
	18.5	1.6022		100.0	0.9297
	19.0	1.5676		105.0	0.9168
	19.5	1.5316		110.0	0.9038
	20.0	1.4950		115.0	0.8907
	21.0	1.4218	8	120.0	0.8777
25	22.0	1.3461		125.0	0.8643
24	23.0	1.2840		130.0	0.8510

Table 3.5 - Curve Information

Curve #5 - DT-500DI-8C, cont'd.

BP #	Temp. (K)	PROM Voltage	BP #	Temp. (K)	PROM Voltage
	135.0	0.8377		235.0	0.5625
	140.0	0.8243	4	240.0	0.5490
	145.0	0.8108		245.0	0.5358
7	150.0	0.7974		250.0	0.5226
	155.0	0.7837		255.0	0.5096
	160.0	0.7701		260.0	0.4966
	165.0	0.7564		265.0	0.4836
	170.0	0.7427		270.0	0.4705
	175.0	0.7289		275.0	0.4574
6	180.0	0.7152	3	280.0	0.4442
	185.0	0.7013		285.0	0.4307
	190.0	0.6874		290.0	0.4171
	195.0	0.6734		295.0	0.4035
	200.0	0.6595	2	300.0	0.3898
	205.0	0.6455		305.0	0.3758
	210.0	0.6315		310.0	0.3618
	215.0	0.6176		315.0	0.3477
5	220.0	0.6036		320.0	0.3336
	225.0	0.5898		325.0	0.3194
	230.0	0.5761	1	330.0	0.3054

Table 3.5 - Curve Information

Curve #6 - DT-470 Voltage-Temperature Characteristics

BP #	Temp. (K)	PROM Voltage	BP #	Temp. (K)	PROM Voltage
29	1.4	1.69808		10.5	1.40615
	1.5	1.69674		11.0	1.39287
	1.6	1.69521		11.5	1.38021
	1.7	1.69355	25	12.0	1.36687
	1.8	1.69177		12.5	1.35647
	1.9	1.68987		13.0	1.34530
28	2.0	1.68912		13.5	1.33453
	2.1	1.68574		14.0	1.32412
	2.2	1.68352		14.5	1.31403
	2.3	1.68121		15.0	1.30422
	2.4	1.67880	24	15.5	1.29340
	2.5	1.67632		16.0	1.28527
	2.6	1.67376		16.5	1.27607
	2.7	1.67114		17.0	1.26702
	2.8	1.66845		17.5	1.25810
	2.9	1.66571		18.0	1.24928
	3.0	1.66292		18.5	1.24053
	3.1	1.66009		19.0	1.23184
	3.2	1.65721		19.5	1.22314
	3.3	1.65430	23	20.0	1.21555
	3.4	1.65134		21.0	1.19645
	3.5	1.64833		22.0	1.17705
	3.6	1.64529		23.0	1.15558
	3.7	1.64219	22	24.0	1.13598
27	3.8	1.64112	21	25.0	1.12463
	3.9	1.63587	20	26.0	1.11896
	4.0	1.63263	19	27.0	1.11517
	4.2	1.62602	18	28.0	1.11202
	4.4	1.61920		29.0	1.10945
	4.6	1.61220		30.0	1.10702
	4.8	1.60506	17	31.0	1.10465
	5.0	1.59782		32.0	1.10263
	5.2	1.59047		33.0	1.10060
	5.4	1.58303		34.0	1.09864
	5.6	1.57551		35.0	1.09675
	5.8	1.56792	16	36.0	1.09477
	6.0	1.56027		37.0	1.09309
	6.5	1.54097		38.0	1.09131
	7.0	1.52166		39.0	1.08955
	7.5	1.50272		40.0	1.08781
	8.0	1.48443		42.0	1.08436
	8.5	1.46700	15	44.0	1.08105
26	9.0	1.44850		46.0	1.07748
	9.5	1.43488		48.0	1.07402
	10.0	1.42013		50.0	1.07053

Table 3.5 - Curve Information

Curve #6 - DT-470, cont'd.

BP #	Temp. (K)	PROM Voltage	BP #	Temp. (K)	PROM Voltage
	52.0	1.06700		260.0	.61465
	54.0	1.06346		265.0	.60273
	56.0	1.05988		270.0	.59080
	58.0	1.05629		275.0	.57886
14	60.0	1.05277	6	280.0	.56707
	65.0	1.04353		285.0	.55492
	70.0	1.03425		290.0	.54294
	75.0	1.02482		295.0	.53093
13	77.4	1.02044		300.0	.51892
	80.0	1.01525		305.0	.50689
	85.0	1.00552		310.0	.49484
	90.0	.99565		315.0	.48278
12	95.0	.98574		320.0	.47069
	100.0	.97550		325.0	.45858
	105.0	.96524		330.0	.44647
	110.0	.95487		335.0	.43435
11	115.0	.94455	5	340.0	.42238
	120.0	.93383		345.0	.41003
	125.0	.92317		350.0	.39783
	130.0	.91243		355.0	.38561
	135.0	.90161		360.0	.37337
10	140.0	.89082		365.0	.36110
	145.0	.87976		370.0	.34881
	150.0	.86873		375.0	.33650
	155.0	.85764		380.0	.32416
	160.0	.84650		385.0	.31180
9	165.0	.83541	4	390.0	.29958
	170.0	.82404		395.0	.28700
	175.0	.81274		400.0	.27456
	180.0	.80138		405.0	.26211
	185.0	.78999		410.0	.24963
	190.0	.77855		415.0	.23714
8	195.0	.76717		420.0	.22463
	200.0	.75554		425.0	.21212
	205.0	.74398		430.0	.19961
	210.0	.73238	3	435.0	.18696
	215.0	.72075		440.0	.17464
	220.0	.70908		445.0	.16221
	225.0	.69737		450.0	.14985
7	230.0	.68580		455.0	.13759
	235.0	.67387	2	460.0	.12536
	240.0	.66208		465.0	.11356
	245.0	.65026		470.0	.10191
	250.0	.63841	1	475.0	.09032
	255.0	.62654			

SECTION IV

Maintenance

4.1 Introduction

This section contains calibration and troubleshooting information for the Model 817 and Model 818 Cryopump Monitors.

4.2 Test Equipment and Accessories

Use the following test equipment and accessories to calibrate and troubleshoot the instrument.

1) High input impedance digital voltmeter
2) Oscilloscope
3) Precision 100K resistor

4.3 Calibration

Use the following proceedure to calibrate the instrument. The unit should be allowed a half-hour warm-up time to achieve rated specs.

1) Connect the precision 100K resistor across pins I+ and I-. Connect the DVM across the 100k resistor. The voltage should read 1.0000 +/- 100 uV dc. If needed, adjust Current source adjustment trimpot. (Refer to Table 3.1 and Figure 3.4.)

2) Use the curve tables to determine the temperature for an input voltage of 1.000v and check against the display value. If needed, adjust the Temperature calibration adjustment.

4.4 Troubleshooting

A troubleshooting guide is given in Table 4.1. To properly use the guide, locate the problem in the symptom column and perform the appropriate tests. Corrective actions are given for the various possible causes. Schematics and component layouts for the various PCB assemblies are given later in this section.

Table 4.1 - Troubleshooting Guide

Symptom	Possible Cause/Corrective Action
1) No display.	1) For Model 817, check to make sure there is at least 8.5V dc present on pin 1 of the input connector with respect to pin 2. Also make sure the wires are pressed firmly into the connector and the connector is pressed firmly into the unit.
	2) For Model 818, check the line voltage selector for the proper line voltage being used. Check the fuse to see if it has blown. If so, replace with the proper fuse value indicated on the rear panel.
	3) For both units, check to see if the wiring header to the +5 voltage regulator on the rear panel has come loose.
	4) Check to see if +5V is present at pin 8 of U1 on the Analog Input Board. If not, replace the +5V regulator on the rear panel. Check to see if -5V is present at pin 5 of U1. If not, replace U1.
2) Display reads "428"	1) Check for a short between the I+V+ and the I-V- pins.
3) Display reads "OL"	1) Check that the sensor is connected up properly. (Refer to Figure 2.2.)
	2) Check for breaks in sensor cable.
	3) Make sure the wires are pressed firmly into the proper input terminals.
4) Displays incorrect temperature	1) Check to see if the proper curve is selected for the sensor being read.
	2) Check for a faulty sensor. If so replace it.

5) Unable to update alarm set points

1) Make sure the set point disable jumper is in place.

6) Relay contacts not working

1) Make sure the wires are pressed firmly into the proper pins on the input connector.

2) Check the drive line (pin 6) of the relay in question on the display board to verify that it changes from a high (+5) to a low (0v) when the temperature:
   A) is greater than the set point for alarm 1.
   B) is less than the set point for alarm 2.

Table - 4.2 A1A1 817/818 Display Board

LSCI Part Number 113-136

ITEM NO	DESCRIPTION	LSCI STOCK NO	MFR	MFR PART NO	TOT QTY
A1A1	817/818 DISPLAY P.C. BOARD ART# B-333-84-01B	111-060	LSCI	111-060	1
DS1	DIGIT,.3" LED DISPLAY	102-124	HP	hp 5082-7611	3
DS2	DIGIT,.3" LED DISPLAY	102-124	HP	hp 5082-7611	REF
DS3	DIGIT,.3" LED DISPLAY	102-124	HP	hp 5082-7611	REF
H1	JUMP JAX	106-131	SEL	026-4810-00-C-252	1
JA	12 PIN TERMINAL	110-201	SMTC	SS-132-G-9	12
JB	14 PIN TERMINAL	110-201	SMTC	SS-132-G-9	14
JMP1,2	3 PIN RA TERMINAL	110-202	SMTC	TSW-120-08-G-S-RA	3
K1	RELAY,DIP	105-330	EAC	D1C05D	2
K2	RELAY,DIP	105-330	EAC	D1C05D	REF
Q1	TRANSISTOR,PNP	102-072		2N3906	3
Q2	TRANSISTOR,PNP	102-072		2N3906	REF
Q3	TRANSISTOR,PNP	102-072		2N3906	REF
RN1	RES,NET,4.7KX9-1C	103-103	BOR	4310-101-472	1
RN2	RES,NET,5.6KX3-IND	103-156	BOR	4306-102-562	1
RN3	RES,NET,180ohmX7,DIP	103-191	BOR	4114R-001-181	1
S1	SWITCH,DOWN ARROW	105-651	ALPS	KEF10901	4
S2	SWITCH,UP ARROW	105-651	ALPS	KEF10901	REF
S3	SWITCH,SP 2	105-651	ALPS	KEF10901	REF
S4	SWITCH,SP 1	105-651	ALPS	KEF10901	REF
U1	IC,7 SEG. DEC/DRIVER	104-166	FARC	9374PC	1
U2	IC,O.C. HEX INVERTER	104-210		7406	1
U3	IC,8-BIT MULTIPLEXER	104-310	NAT	DM81LS95AN	1
XDS1	SOCKET, 14 PIN, DIP	106-580	ARI	14-511-11	3
XDS2	SOCKET, 14 PIN, DIP	106-580	ARI	14-511-11	REF
XDS3	SOCKET, 14 PIN, DIP	106-580	ARI	14-511-11	REF

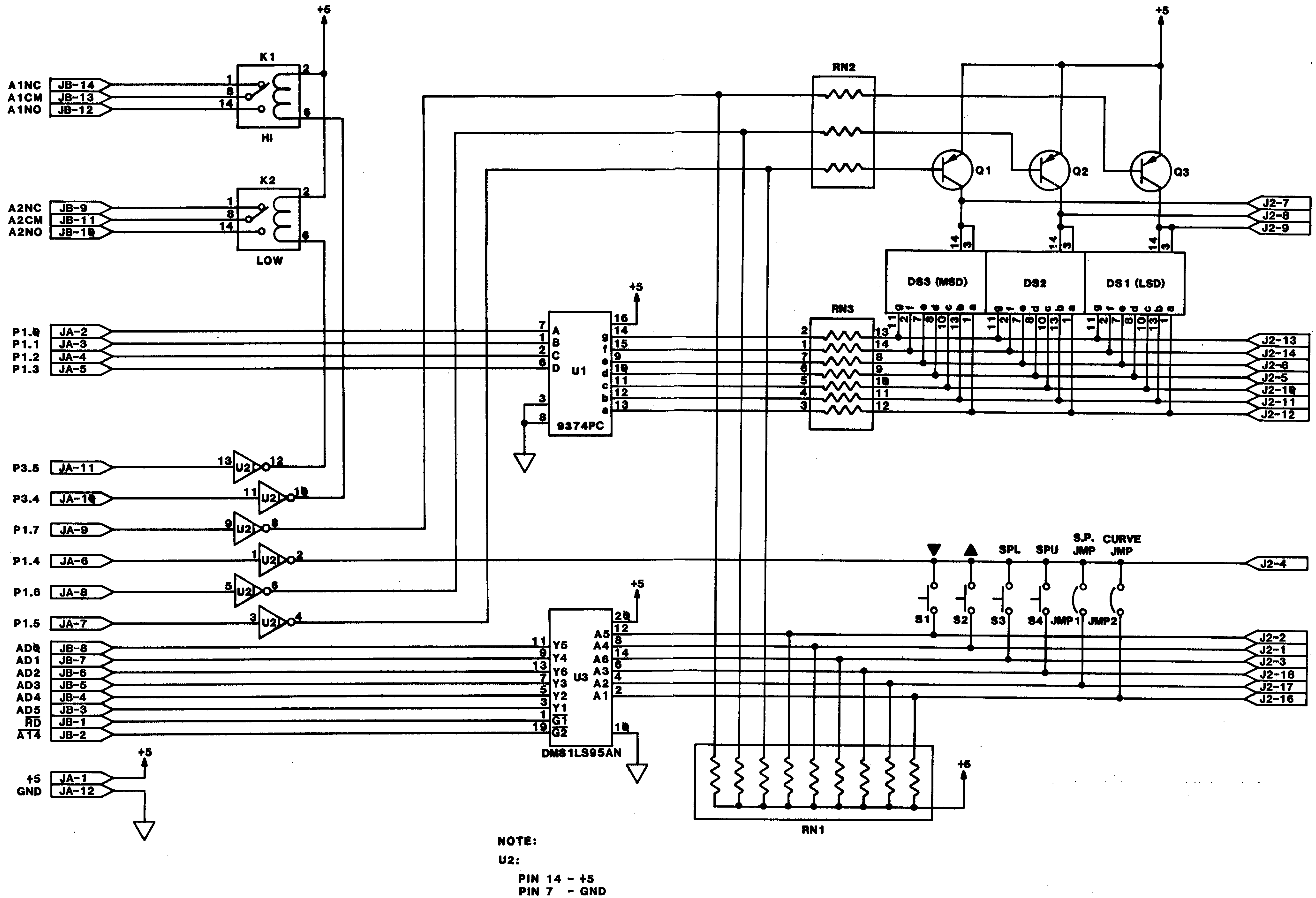


Figure 4.1 - Display Board Schematic Diagram

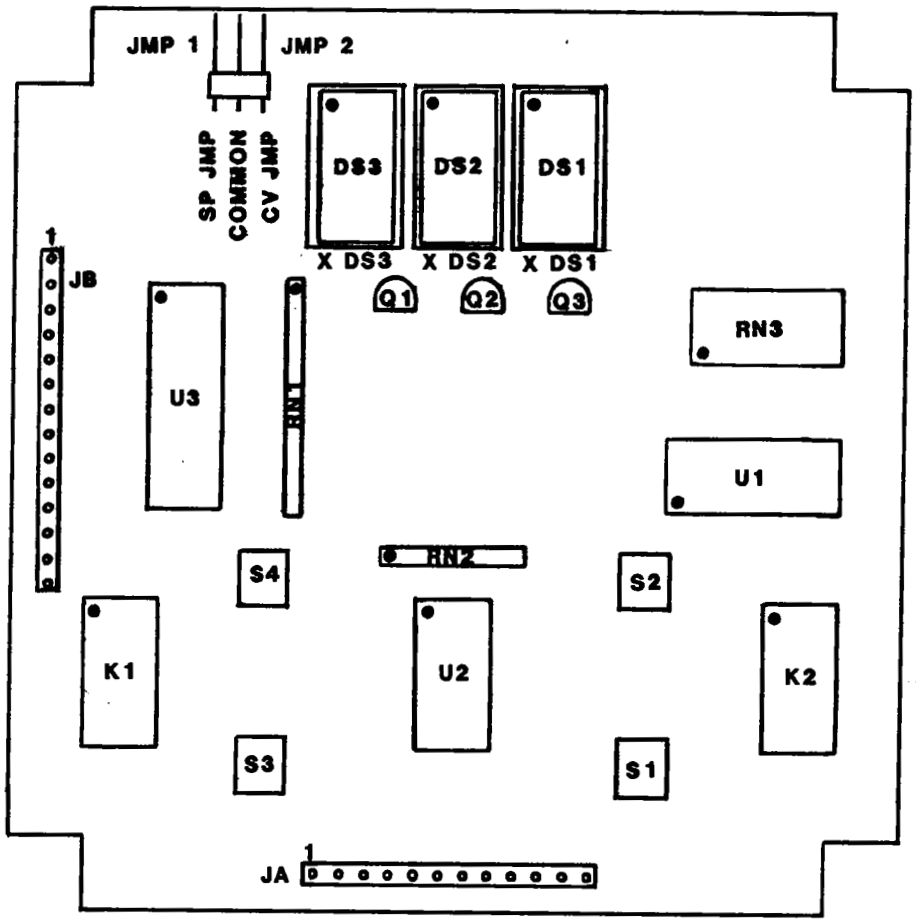


FIGURE 4.2 Model 817/818 Display Board Component Layout

Table - 4.3 A1A2 817/818 Microprocessor Board

LSCI Part Number 113-137

ITEM NO	DESCRIPTION	LSCI STOCK NO	MFR	MFR PART NO	TOT QTY
A1A2	817/818 MICROPROCESSOR P.C. BOARD ART# B-334-84-01B	111-061	LSCI	111-061	1
C1	CAP,TANT,10 MF,35V	101-137	SPRG	119D106X0035DB1	2
C2	CAP,.03 MF,QPAK-28	101-125	RGRS	UQ28.03	1
C3	CAP,.03 MF,QPAK-20	101-123	RGRS	UQ20.03	1
C4	CAP,TANT,10 MF,35V	101-137	SPRG	119D106X0035DB1	REF
C5	CAP,CER,30 PF,500V	101-067	CDE	CD15ED300J03	2
C6	CAP,CER,30 PF,500V	101-067	CDE	CD15ED300J03	REF
C7	CAP,POLY,.68 MF,100V	101-046	PLSY	160.68J100G	1
CR1	ZENER DIODE,3.9V	102-050		1N748A	1
JA	12 PIN TERMINAL	110-201	SMTC	SS-132-G-9	12
JB	18 PIN TERMINAL	110-201	SMTC	SS-132-G-9	18
JC	12 PIN TERMINAL	110-201	SMTC	SS-132-G-9	12
Q1	TRANSISTOR,PNP	102-072		2N3906	2
Q2	TRANSISTOR,PNP	102-072		2N3906	REF
R1	RES,MTF,10K,1%, W	103-358			1
R2	RES,MTF,8.25K,1%, W	103-340			1
R3	RES,MTF,1M,1%, W	103-472			1
R4	RES,MTF,4.75K,1%, W	103-306			1
R5	RES,MTF,100ohm,1%, W	103-216			1
R6	RES,MTF,30.1ohm,1%, W	103-209			1
R7	RES,MTF,1K,1%, W	103-265			1
U1	IC,MICROPROCESSOR	104-510	INT	P8031AH	1
U2	IC,OCTAL LATCH	104-528	HAR	HCP82C82	1
U3	IC,EPROM,64K	104-620	INT	2764-4	1
U4	IC,NOVRAM,64X4	104-651	XCOR	X2210P	1
U5	IC,QUAD,2-IN NAND GATE	104-200		7400	1
XU1	SOCKET,IC,40 PIN,DIP	106-507	AUG	540-AG11D	1
XU2	SOCKET,IC,20 PIN,DIP	106-504	AUG	520-AG11D	1
XU3	SOCKET,IC,28 PIN,DIP	106-506	AUG	528-AG11D	1
XU4	SOCKET,IC,18 PIN,DIP	106-509	AUG	518-AG11D	1
Y1	CRYSTAL,5.000 MHZ	103-990	MTRN		1

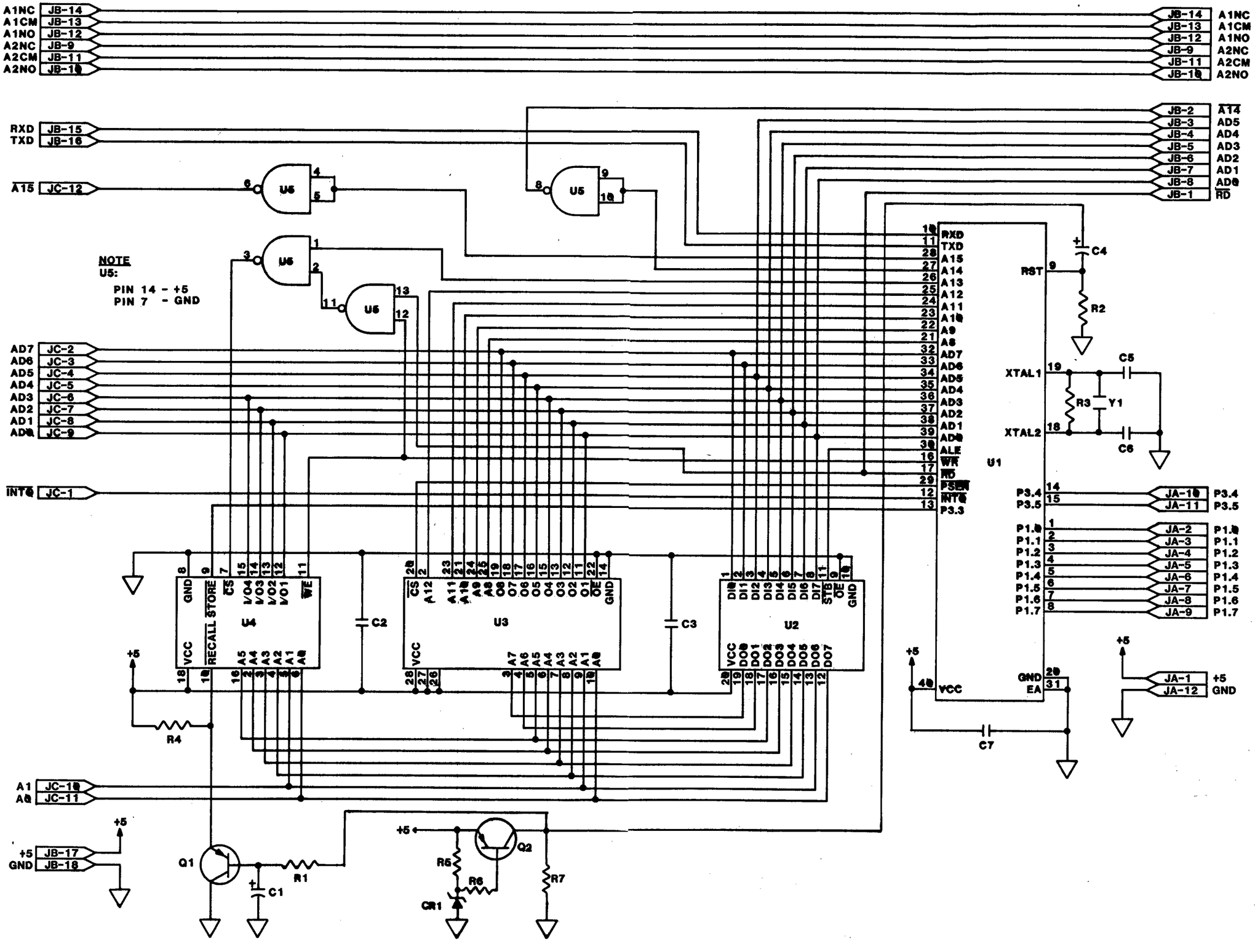


Figure 4.3 - Microprocessor Board Schematic Diagram

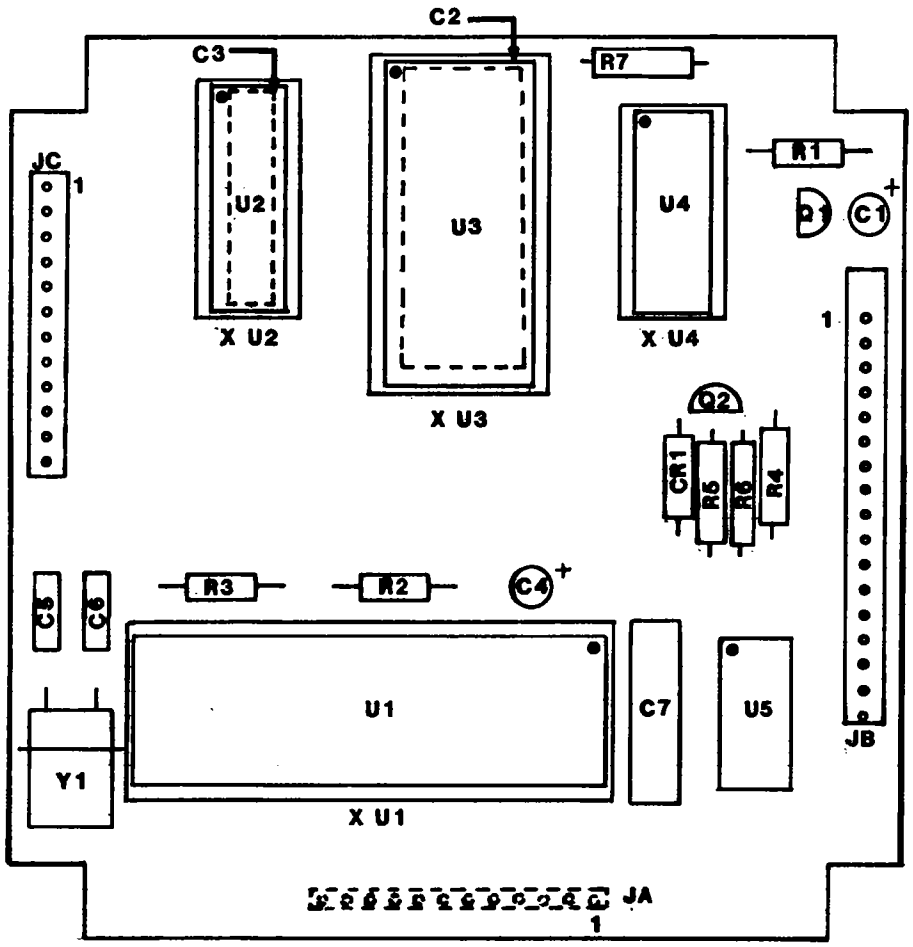


FIGURE 4.4 Model 817/818 Microprocessor Board Component Layout

Table - 4.4 A1A3 817/818 Analog Input Board

LSCI Part Number 113-138/139

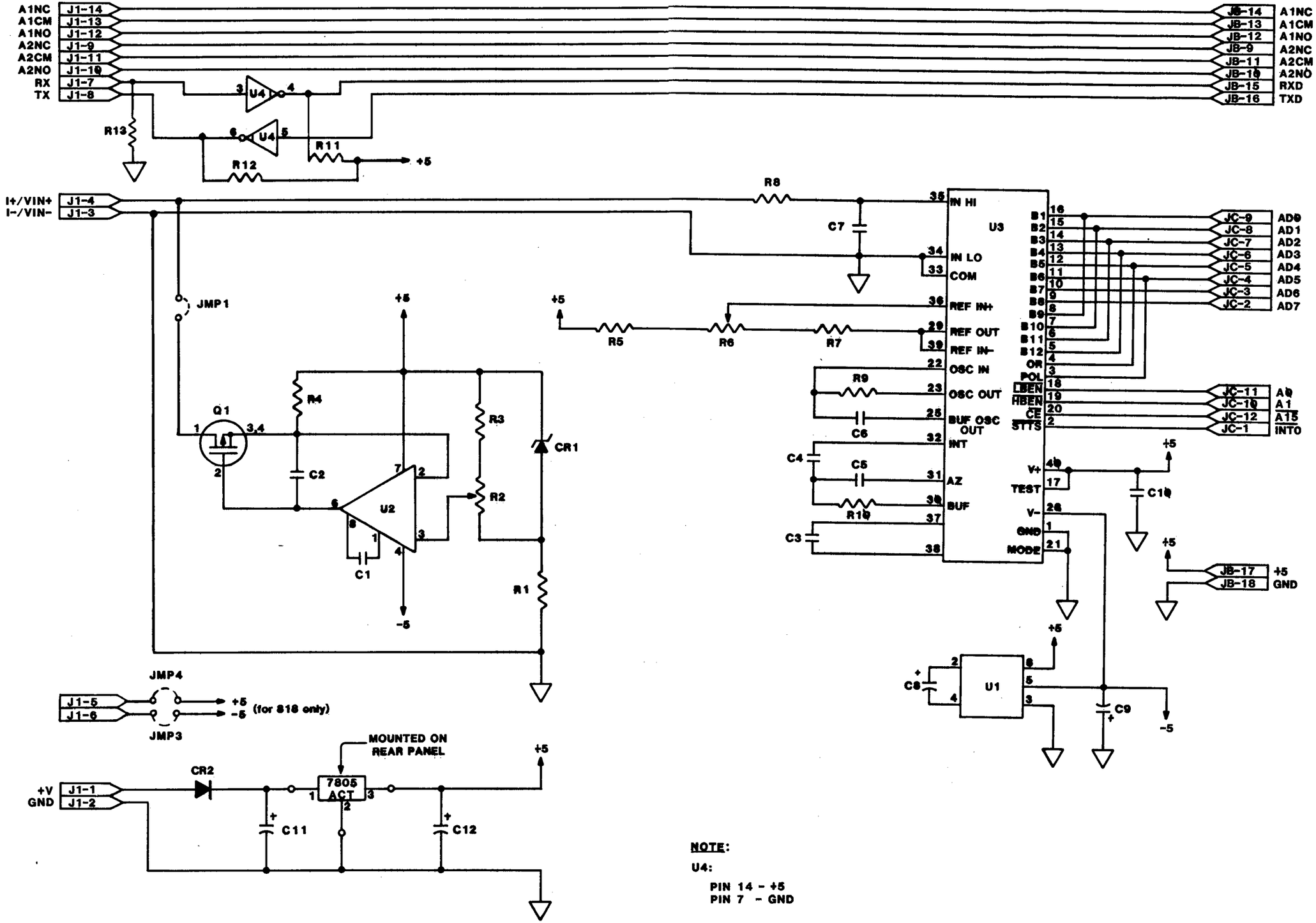
ITEM NO	DESCRIPTION	LSCI STOCK NO	MFR	MFR PART NO	TOT QTY
A1A3	817/818 ANALOG INPUT P.C. BOARD ART# B-335-84-01B	111-062	LSCI	111-062	1
C1	CAP,CER,150 PF,500V	101-085	CDE	CD15FD151J03	1
C2	CAP,PP,.0015 MF,100V	101-001	CDE	WMF1D15	1
C3	CAP,POLY,1 MF,100V	101-032	PLSY	1501K100FC	2
C4	CAP,POLY,1 MF,100V	101-032	PLSY	1501K100FC	REF
C5	CAP,PP,.33 MF,100V	101-025	FDYN	MPP-11.33uFD	1
C6	CAP,CER,390 PF,500V	101-096	CDE	CD15FD391J03	1
C7	CAP,POLY,.1 MF,100V	101-042	PLSY	160.1K100G	2
C8	CAP,TANT,10 MF,35V	101-137	SPRG	119D106X0035DB1	3
C9	CAP,TANT,10 MF,35V	101-137	SPRG	119D106X0035DB1	REF
C10	CAP,POLY,.1 MF,100V	101-042	PLSY	160.1K100G	REF
C11*	CAP,ELECT,470 MF,35V	101-226	PANS	ECEB1VV471S	1
C11**	CAP,ELECT,1000 MF,16V	101-230	PANS	ECEB1CV102S	1
C12	CAP,TANT,10 MF,35V	101-137	SPRG	119D106X0035DB1	REF
CR1	ZENER REFERENCE,1.22V	102-040	NAT	LM313H	1
CR2	DIODE,RECTIFIER	102-001		1N4006	1
H1	4 LEAD NYLON SPACER	110-131	THEM	7717-7-N	1
J1*	14 PIN PCB HEADER	106-408	MOLX	8723-15-29-6014	1
J1**	4 PIN TERMINAL	110-201	SMTC	SS-132-G-9	4
JB	10 PIN TERMINAL	110-132	SMTC	SS-132-G-9	10
JC	12 PIN TERMINAL	110-132	SMTC	SS-132-G-9	12
Q1	FET,P-CH ENH	102-074	SIL	3N163	1
R1	RES,MTF,3.74K,1%, W	103-296			1
R2	POT,5K	103-009	BOR	3006-P-502	2
R3	RES,MTF,8.66K,1%, W	103-344			1
R4	RES,MTF,100K,1%, W	103-420			3
R5	RES,MTF,4.99K,1%, W	103-308			1
R6	POT,5K	103-009	BOR	3006-P-502	REF
R7	RES,MTF,15K,1%, W	103-363			1
R8	RES,MTF,100K,1%, W	103-420			REF
R9	RES,MTF,100K,1%, W	103-420			REF
R10	RES,MTF,200K,1%, W	103-439			1
R11	RES,MTF,4.75K,1%, W	103-306			2
R12	RES,MTF,3.24K,1%, W	103-291			1
R13	RES,MTF,4.75K,1%, W	103-306			REF

Table - 4.4 817/818 Analog Input Board, cont'd.

LSCI Part Number 113-138

ITEM NO	DESCRIPTION	LSCI STOCK NO	MFR	MFR PART NO	TOT QTY
U1	IC,VOLTAGE INVERTER	104-052	ISL	ICL7660CPA	1
U2	IC,OP AMP	104-005	NAT	LM308N	1
U3	IC,12 BIT A/D CONVERTER	104-456	ISL	ICL7109CPL	1
U4	IC,O.C. HEX INVERTER	104-210		7406	1
XU1	SOCKET,IC,8 PIN,DIP	106-501	AUG	508-AG11D	2
XU2	SOCKET,IC,8 PIN,DIP	106-501	AUG	508-AG11D	REF
XU3	SOCKET,IC,40 PIN,DIP	106-507	AUG	540-AG11D	1
W1	VOLTAGE REGULATOR WIRING ASSEMBLY	112-003	LSCI	112-003	1

* PART USED IN 817
** PART USED IN 818



NOTE:

U4:

PIN 14 - +5
PIN 7 - GND

Figure 4.5 - Analog Input Board Schematic Diagram

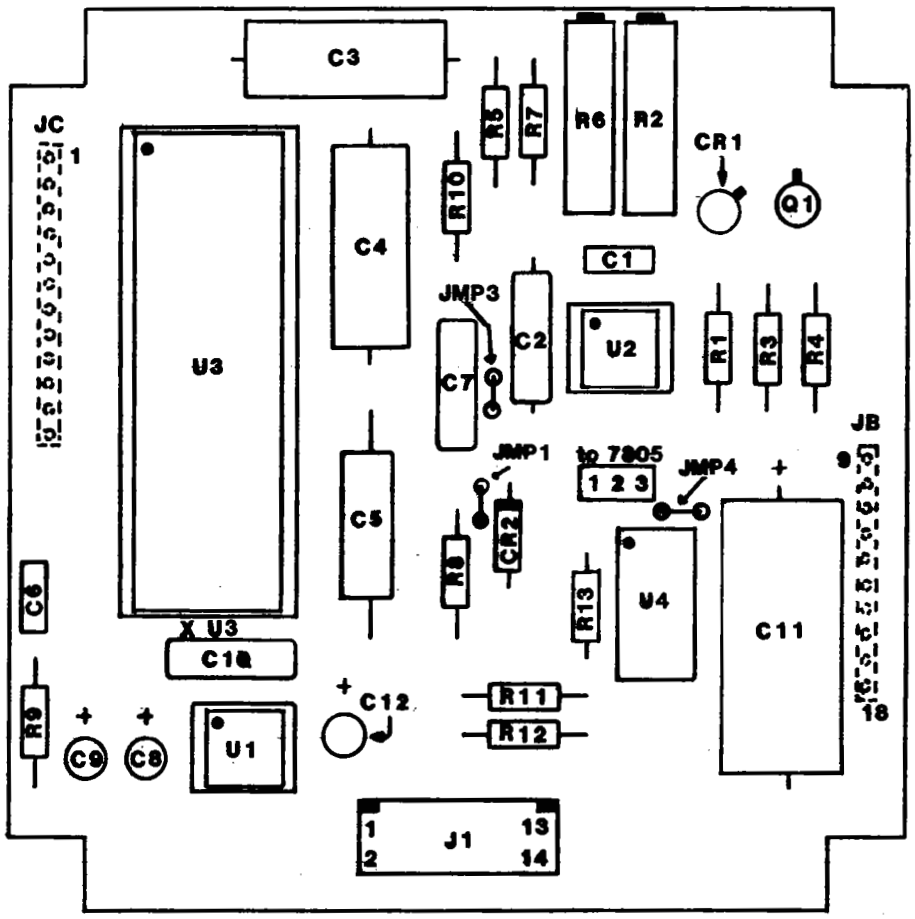
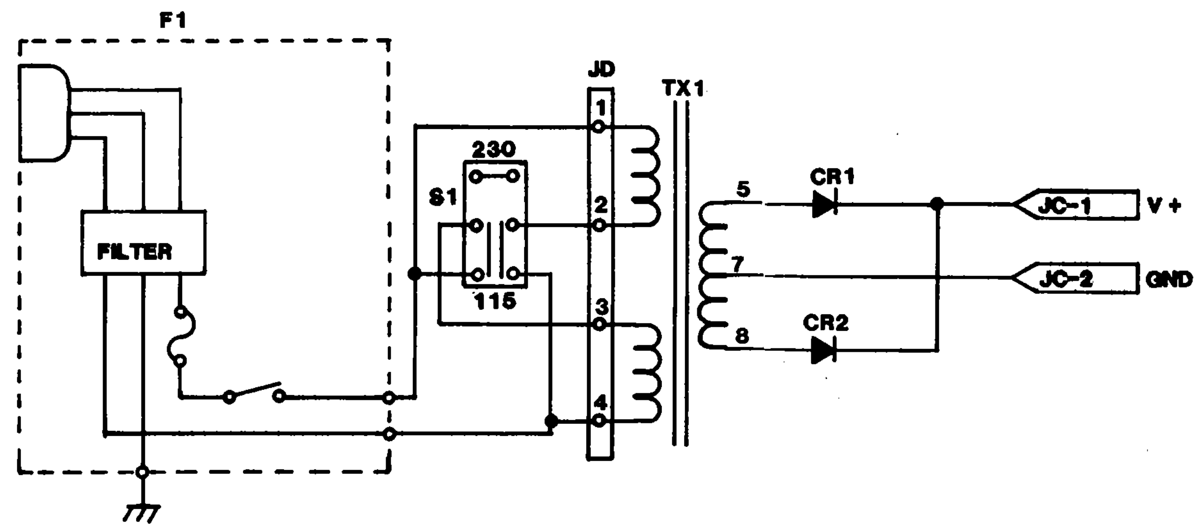


FIGURE 4.6 Model 817/818 Analog Input Board Component Layout

Table - 4.5 A1A4 818 Power Supply Board

LSCI Part Number 113-140

ITEM NO	DESCRIPTION	LSCI STOCK NO	MFR	MFR PART NO	TOT QTY
A1A4	818 POWER SUPPLY P.C. BOARD ART# B-346-84-01A	111-064	LSCI	111-064	1
CR1	DIODE,RECTIFIER	102-001		1N4006	2
CR2	DIODE,RECTIFIER	102-001		1N4006	REF
J1	4 PIN TERMINAL	110-201	SMTC	SS-132-G-9	4
TX1	TRANSFORMER	109-026	LSCI	109-026	1



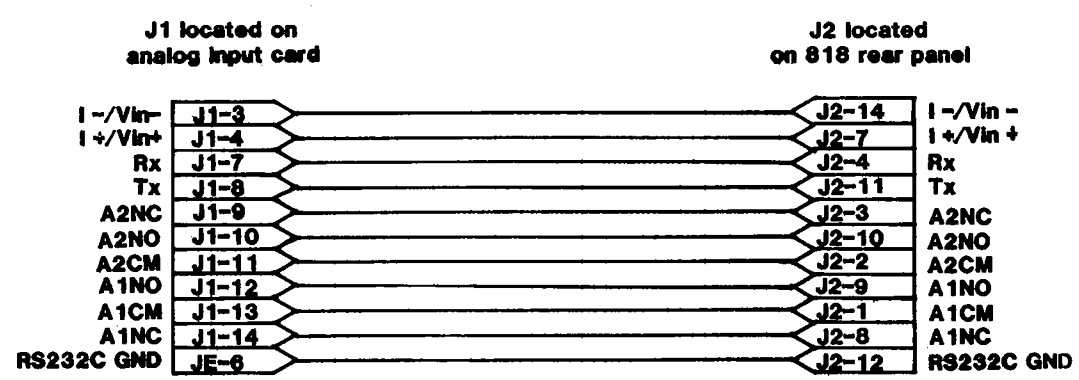


Figure 4.7 - Power Supply Schematic

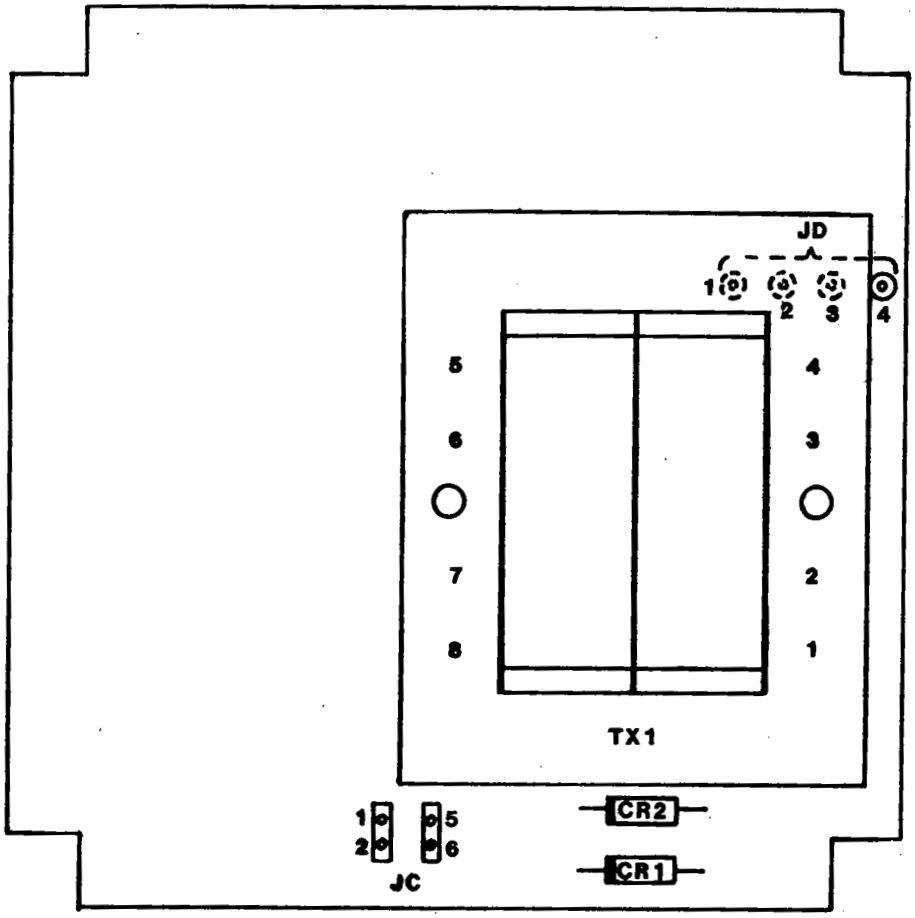


FIGURE 4.8 Model 818 Power Supply Component Layout

Table - 4.6 A2 818 Rear Panel Assembly

LSCI Part Number 108-046

ITEM NO	DESCRIPTION	LSCI STOCK NO	MFR	MFR PART NO	TOT QTY
F1	POWER ENTRY MODULE, FUSE HOLDER, POWER SWITCH	106-026	SCH	FN382-6/12	1
H1	SCREW, 4-40x3/8" FHMS BLACK OXIDE FINISH				3
H2	#4 KEP NUT				3
H3	MICA INSULATOR, TO-220	110-061			1
H4	NYLON SHOULDER WASHER	110-022	MOT	B51547F015	1
H5	HARDWARE KIT FOR J2	106-239	AMP	552568-1	1
J2	14 PIN D-STYLE RECEPT.	106-236	AMP	552308-1	1
MP1	818 REAR PANEL DWG# C-312-84-01	107-130	LSCI	107-130	1
S1	SWITCH, 115/230 LINE VOLTAGE SELECTOR	105-101	SWIT	C46206LFR	1
U1	VOLTAGE REGULATOR, +5V	102-011		7805ACT	1

Table 4.7 - Model 817 Final Assembly

LSCI Part Number 1023

ITEM NO	DESCRIPTION	LSCI STOCK NO	MFR	MFR PART NO	TOT QTY
A1A1	817 DISPLAY BOARD	113-136	LSCI	113-136	1
A1A2	817 MICROPROCESSOR BD.	113-137	LSCI	113-137	1
A1A3	817 ANALOG INPUT BD.	113-138	LSCI	113-138	1
H1	STANDOFF,6-32x " M-F		CCRD	660A-5002-19	8
H2	STANDOFF,6-32x " HEX		CCRD	635A-5007-19	4
H3	SCREW,6-32x " PHMS				4
H4	SCREW,6-32x3/8" FHMS BLACK OXIDE FINISH				4
H5	SCREW,4-40x3/8" FHMS BLACK OXIDE FINISH				1
H6	SCREW,8-32x2 " FHMS				4
H7	#4 NUT				1
H8	MICA INSULATOR,TO-220	110-061			1
H9	NYLON SHOULDER WASHER	110-022	MOT	B51547F015	1
H10	#8 SQUARE NUT				4
H11	#8 ACORN NUT,BLACK OXIDE FINISH				4
H12	KEY TOPS,GREY	105-676	LSCI		4
J1	14 PIN CABLE CONNECTOR	106-409	MOLX	8676-22-51-1514	1
	COVER PLATES	106-410	MOLX	15-05-6143	2
MP1	817 FRONT SUBPANEL DWG# C-293-84-01	107-115	LSCI	107-115	1
MP2	817 FRONT PANEL OVERLAY ART# 1019-84-01	107-113	LSCI	107-113	1
MP3	817 ENCLOSURE DWG# C-294-84-01	107-116	LSCI	107-116	1
MP4	817 REAR PANEL DWG# C-303-84-01	107-117	LSCI	107-117	1
U1	VOLTAGE REGULATOR,+5V	102-011		7805ACT	1

Table - 4.8 Model 818 Final Assembly

LSCI Part Number 1024

ITEM NO	DESCRIPTION	LSCI STOCK NO	MFR	MFR PART NO	TOT QTY
A1A1	818 DISPLAY BOARD	113-136	LSCI	113-136	1
A1A2	818 MICROPROCESSOR BD.	113-137	LSCI	113-137	1
A1A3	818 ANALOG INPUT BD.	113-139	LSCI	113-139	1
A1A4	818 POWER SUPPLY BD.	113-140	LSCI	113-140	1
A2	818 REAR PANEL ASSEMBLY	108-046	LSCI	108-046	1
F1	FUSE,.1A	110-001	LIT	102074	1
H1	STANDOFF,6-32x " M-F		CCRD	660A-5002-19	12
H2	STANDOFF,6-32x2" HEX				4
H3	SCREW,6-32x " PHMS				4
H4	SCREW,6-32x3/8" FHMS BLACK OXIDE FINISH				4
H5	SCREW,8-32x4 " FHMS				4
H6	#8 SQUARE NUT				4
H7	#8 ACORN NUT,BLACK OXIDE FINISH				4
H8	KEY TOP,GREY	105-676	LSCI	105-676	4
J2	14 PIN D-STYLE PLUG	106-237	AMP	552134-1	1
	STRAIN RELIEF	106-238	AMP	2-552079-1	2
MP1	818 FRONT SUBPANEL DWG# C-293-84-01	107-115	LSCI	107-115	1
MP2	818 FRONT PANEL OVERLAY ART#	107-128	LSCI	107-128	1
MP3	818 ENCLOSURE DWG# C-313-84-01	107-129	LSCI	107-129	1

Lake Shore Cryotronics, Inc.
64 E. Walnut St., Westerville, Ohio 43081
(614) 891-2243 • Telex: 24-5415 • Cryotron WTVL

Technical Data
Models 817 and 818
Cryopump Monitors

Monitor Cryopump Operating Temperature with Ease!

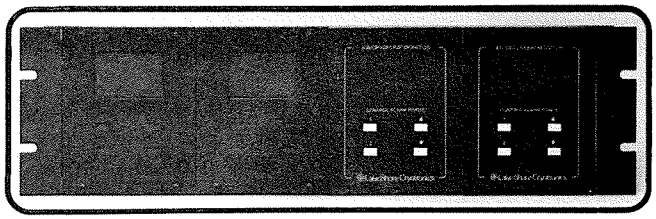
Features:

- 4 to 330K Temperature Range
- Digital Readout
- 1K Resolution over Entire Range
- Accuracy to better than ±0.5K
- Programmable Electronic Alarms
- Proven Silicon Diode Sensors
- Interchangeable Sensors
- RS 232C Digital Interface
- Analog Output Option (818 only)
- Model 817 for 9-18 Volt DC Power
- Model 818 for 110/220 AC Power

The new 817 and 818 Temperature Monitors provide an effective, economical means to monitor cryopump operating temperatues and to signal the need for regeneration. When combined with Lake Shore's proven DT-500 silicon diode Temperature Sensors, the 817 and 818 produce accurate, high-resolution temperature readings which can be observed directly on the unit or interfaced into a computer.

Both Models feature two independent electronic alarms which can be programmed to activate at any temperature within the unit's range. Alarms can be set from either the front panel or via interface and can be locked against unauthorized changes.

The primary difference in the two instruments is the power they require for operation. The 817 is designed for systems where a convenient source of dc power is available and cost-minimization is a factor. The 818 is ac-line operated and ideally suited for end-user installation or retrofitting.



Both an 817 and an 818 are shown mounted in the 8101 Rack Kit. Up to four units can be installed in the 8101 and the assembly fits in a standard 5¼" x 19" rack space.

Specifications, Models 817 and 818 Cryopump Monitors

Input Characteristics:

Temperature Range: 10 to 330K with standard DT-500DI-8B Sensor. 4 to 330K with special DT-500 sensors. See Response Curve.

Sensor (order separately): Lake Shore DT-500DI-8B. Unit can be configured for special DT-500 sensors on quantity basis.

Sensor Input: 2-terminal, single-sensor input.

Sensor Excitation: Current source. 10 microamperes.

Sensor Response Curve: Standard units require Sensor Curve DI-8B. Special curves, unique curves, multiple-curve units available on special order.

Temperature Readout:

Display: 3 digit LED display in Kelvin.

Resolution: 1 Kelvin.

Accuracy: Unit converts sensor voltage signal to temperature with an accuracy of ±0.05K below 30K and ±0.4K above 30K when utilized with DT-500DI-8B Sensor. Display rounds temperature to nearest 1K.

Response time: Less than 1 second.

Control Relays:

High and Low Setpoints: Front panel setable with function buttons and up/down buttons. Setpoints can be checked without changing them. Up/down buttons can be deactivated via internal jumper. Deadband is 0.5K at each setpoint.

Set-Point Contacts: SPDT. 28 volts dc or peak ac. 0.25 amperes. 3 watts max.

General:

Remote Interface: RS232C 3-wire output of temperature and alarm status, and input/output of setpoint values.

Dimensions, Weight: 105mm wide X 132mm high (4.125in X 5.25in) DIN quarter-rack panel. **817** depth behind panel is 64mm (2.5in). Weight is 0.9kg (2 lb). **818** depth is 117mm (4.6in). Weight is 1.3kg (2.8 lb).

Power: 817: Unregulated dc between 8.5 and 18 volts. 350 milliamps typical. **818:** 90-125 or 210-250 Vac (selected via rear-panel switch), 50 or 60 Hz, 7 watts.

Connections: 817: Board mounted post pins with mating connector supplied for sensor input, set-point contacts, RS-232C output, and power in. **818:** 14-pin D-style connector with mating connector supplied for inputs and outputs, IEC 320 connector for power cord.

Options and Accessories Available:

-MN: Adds buffered output of Sensor voltage (818 only).

-LA: Adds 1mV/K linearized analog output of temperature (818 only).

8101 Rack Kit: Provides rack mounting for up to four model 817s or 818s in standard 19" relay rack.

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