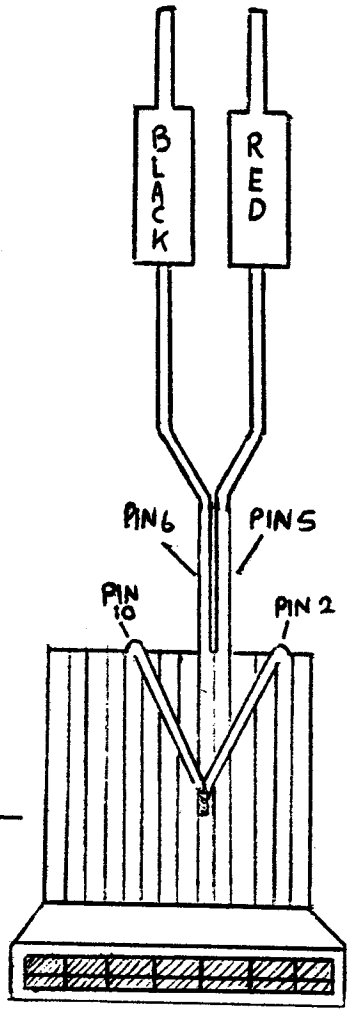
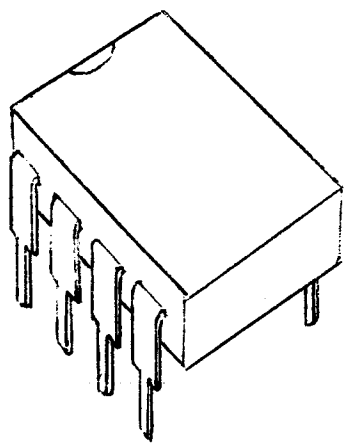
TED 200
TEST CABLE

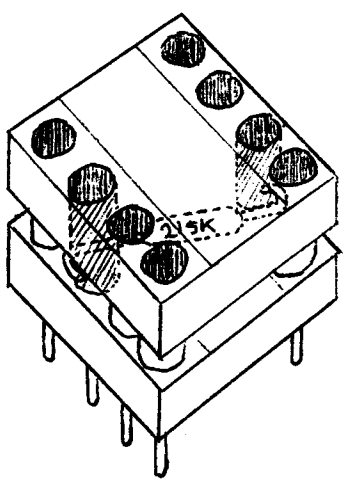


14 WAY RIBBON CONNECTOR

Fig. 1

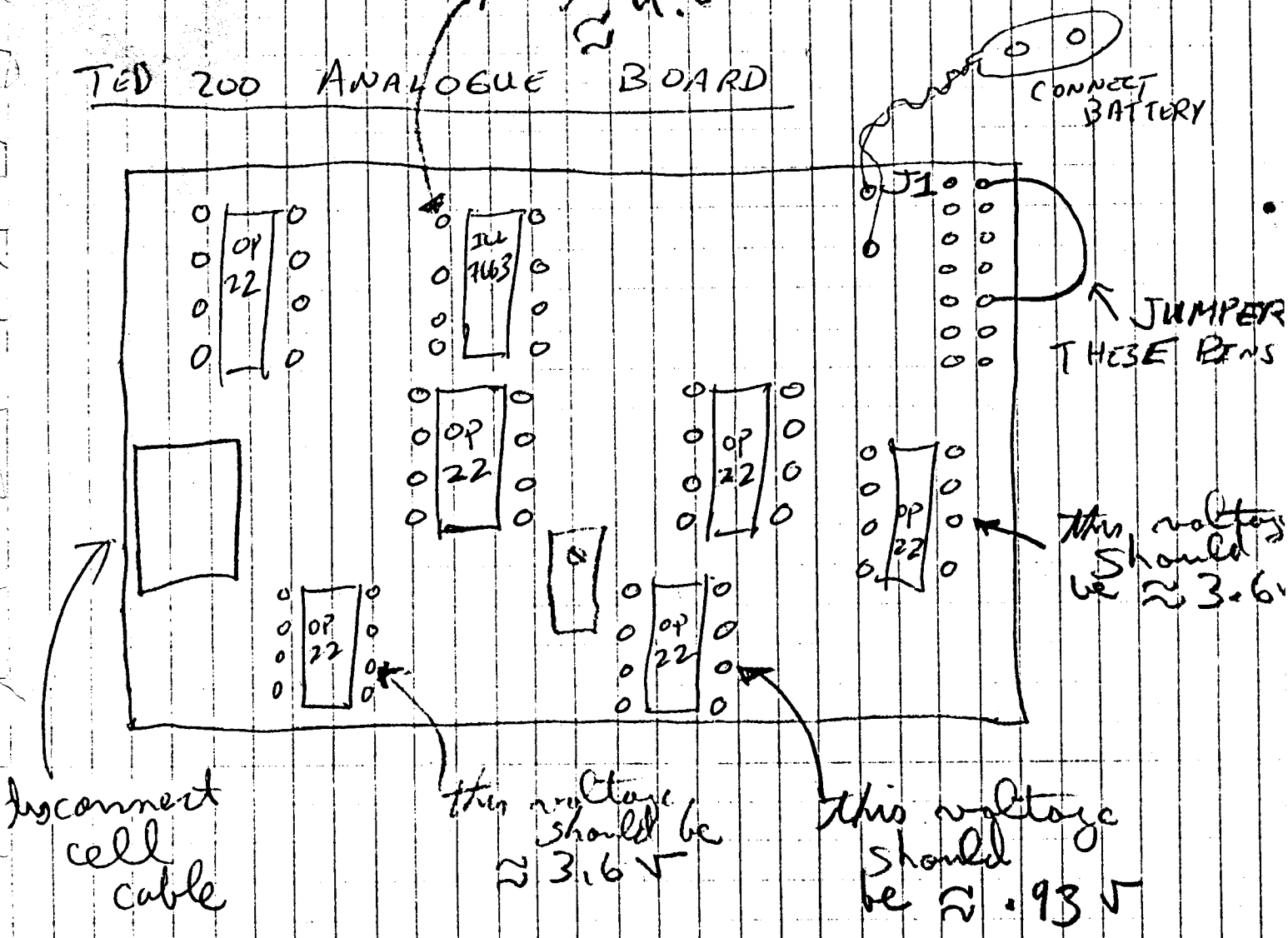
Fig. 2





August 4, 1987

TED 200 ANALOGUE BOARD



S. Bray
TED

TELEDYNE BROWN ENGINEERING Analytical Instruments	**TEST PROCEDURE**	TEST & CALIBRATION DEPARTMENT
MODEL NUMBER: TED 200-T	**PROCEDURE NUMBER:** TP-TED200T	**PAGE:** 1 **OF** 7 **REVISION:** 0 **REVISION DATE:** 03/10/94

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TELEDYNE BROWN ENGINEERING
Analytical Instruments
MAY 10 1994
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FUNCTIONAL TEST PROCEDURE

WARNING

TESTING OF THIS INSTRUMENT MAY INVOLVE ELECTROSTATIC SENSITIVE DEVICES (ESD), HIGH VOLTAGE, HAZARDOUS GASES, AND/OR CHEMICALS. PERSONNEL WHO ARE NOT FAMILIAR WITH PROCEDURES FOR THE ABOVE MUST CHECK WITH THEIR SUPERVISOR PRIOR TO BEGINNING THE TEST

CONCURRENCE	DATE	CONCURRENCE	DATE
ORIGINATOR T.R. LANDS	3/17/94	SENSOR DEPARTMENT	
PRODUCTION ENGINEERING		QUALITY ASSURANCE BE Rhone	3/29/94
TEST DEPARTMENT Diane L. Scott	3/18/94	OTHER	

TED 200-T FUNCTIONAL TEST PROCEDURE

1.0 INTRODUCTION

This functional test is performed as the final check of the TED 200-T portable oxygen monitor prior to shipment.

2.0 APPLICABLE DOCUMENTS

(a) Schematic C-41913, Controller PC Board
(b) Schematic B-41912, Analog PC Board
(c) Schematic B-41914, Display PC Board
(d) Instruction Manual, TED 200-T Portable Oxygen Monitor

3.0 TEST OBJECTIVE

The objective of this test is to exercise all the functions of the monitor to ensure it performs to the specifications as outlined in the above referenced documents.

4.0 TEST DESCRIPTION

The running sheet will list all options that this unit has installed. Preliminary alignment, sub-assembly, and system gas test procedures for all these options must have been performed prior to the start of this test. The test will consist of a comprehensive check of the electrical components to specified tolerances. The steps in this test shall be performed in sequence.

5.0 TEST EQUIPMENT

5.1 Power Requirements - As stated per the running sheet; otherwise, power shall be 6.3 Vdc.

5.2 Equipment Requirements - As follows:

(a) AA Battery, 1.5 Vdc (4ea.)
(b) Keithley Current Source, Model 236
(c) "Dummy" (sensor) cell

6.0 TEST SETUP

Set up the unit to be tested per Figure 1. Verify that all options and jumpers have been installed and all special instructions accomplished per the running sheet and applicable drawings.

Circuit oscillations may be generated when using the Keithley. If this happens, place a 10k or 20k ohm resistor in series with the input connector.

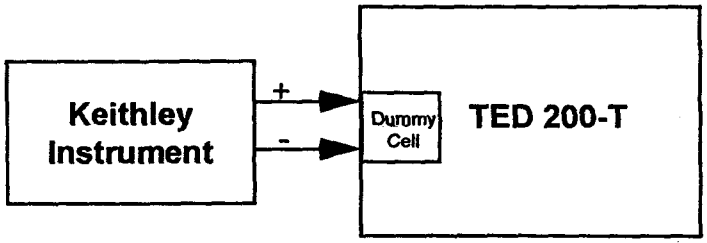

Figure 1. TED 200-T Test Setup

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PROCEDURE NUMBER TP-TED200T
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TED 200-T FUNCTIONAL TEST PROCEDURE

STEP #	OPERATOR ACTION	EXP RESULT	TOLERANCE
1	Install the four AA 1.5 Vdc batteries.	N/A	
2	Press the **ON/OFF** key once.	Unit LCD displays "High Alarm 100", "LowAlarm 17" and flashing message **"AIR CAL"**	Exact
3	Install the dummy sensor cell, then connect the Keithley instrument to the dummy cell.	N/A	
4	Adjust the Keithley to 112 micro amps.	N/A	
5	Press the **CAL** key once.	LCD display counts down from 10 to 0, then displays 21.	+/- 1
		LCD displays message "CAL IN 100%."	Exact
6	Adjust the Keithley for 535.885 micro amps.	LCD displays 100.	+/- 5%
		message "CAL IN 100%" and counts down from 15 to 0, then displays 100.	
		Alarm buzzer sounds and red LED flashes.	Exact
8	Adjust the Keithley output to 267.9 micro amps.	LCD displays 50	Exact

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TED 200-T FUNCTIONAL TEST PROCEDURE

STEP #	OPERATOR ACTION	EXP RESULT	TOLERANCE
9	Press the **SET HI ALARM** key, then press the UP arrow key.	LCD displays "OFF" for HI ALARM setting and flashing message "ALARM DEFEATED."	Exact
10	Using the DOWN arrow key, adjust the **HI ALARM** setting to a value less than 100, e.g., "88."	LCD displays value set.	Exact
11	Press the **SET LO ALARM** key, then press the UP arrow key until the LO ALARM setting reads "21."	LCD displays 21.	Exact
12	Adjust the Keithley to 112 micro amps.	Alarm buzzer sounds. Red LED flashes.	Exact
13	Press the **ALARM SILENCE** key once.	After 5 seconds, the LCD display counts down from "30" in the lower right hand corner. Alarm buzzer stops. Red LED continues flashing.	Exact
14	Press the **SET LO ALARM** key.	N/A	
15	Using the DOWN arrow key, set the LO ALARM to "19.".	Red LED goes off.	Exact
16	Press the **ALARM SILENCE** key.	"30" is displayed in lower right hand corner of LCD display.	Exact
17	Press the **ALARM SILENCE** key a second time.	"90" is displayed in lower right hand corner of LCD display.	Exact
18	Press the **ALARM SILENCE** key a third time.	"180" is displayed in lower right hand corner of LCD display.	Exact

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TED 200-T FUNCTIONAL TEST PROCEDURE

STEP #	OPERATOR ACTION	EXP RESULT	TOLERANCE
19	Press the **ALARM SILENCE** key a fourth time.	"00" is displayed in lower right hand corner of LCD display.	Exact
20	Press the **ALARM TEST** key twice.	HI ALARM setting counts up from 19 to the value set in Step 9, e.g.,"88."	Exact
		Alarm buzzer sounds twice.	Exact
		Red LED flashes twice. Then the setting counts back down to the LO ALARM setting of 19.	Exact
		The buzzer sounds twice again and the red LED flashes twice.	Exact
		[illegible] again and the red [illegible] displays 521."	
21	Press the **BATT TEST** key.	LCD displays "BATTERY HOURS LEFT 999"	Exact
22	Adjust the Keithley output to 0.000 micro amps.	N/A	
23	Adjust the Keithley output to 535.885 micro amps.	LCD display increases toward 100.	LCD display reads 90 in less than 10 seconds.
24	Press the **ON/OFF** key twice.	The unit shuts off.	Exact
25	Press the **ON/OFF** key once.	LCD Displays 21.	Exact

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TED 200-T FUNCTIONAL TEST PROCEDURE

STEP #	OPERATOR ACTION	EXP RESULT	TOLERANCE
26	Adjust Keithley output to 0.000 micro amps. Allow meter to stablize.	LCD displays 0.	+/- .5
27	Slowly adjust the keithley output to obtain a meter reading of 1.	Keithley output current required is less than 5.358 micro amps.	Exact
28	Adjust Keithley output to 0.000 micro amps.	LCD displays 0.	+/- .5
29	Adjust Keithley output to 112 micro amps.	LCD displays 21.	+/- 1
30	Adjust Keithley output to 535.885 micro amps.	LCD displays 100.	+/- 1
31	Verify the unit is in normal operating mode (e.g., displaying an O2 concentration). Then move the shorting block from E1-1/E1-2 to E1-2/E1-3.	After 5 to 15 seconds, the unit's LCD goes blank, the alarm buzzer sounds continuously, and the red LED stays on.	Exact
32	Return the shorting block from E1-2/E1-3 to E1-1/E1-2.	... continuously,	
33	Turn the unit under test **POWER** switch **OFF**. Disconnect all test leads and test equipment.	N/A	

TEST IS NOW COMPLETE.

WARNING: THE FOLLOWING PROCEDURE SHOULD BE PERFORMED BY A QUALIFIED ELECTRONIC TECHNICIAN OR A BIOMEDICAL ENGINEER ONLY.

5.5 Resetting Circuit Breaker (TED 200)

The TED 200 incorporates a circuit breaker mounted on the printed circuit board which is installed nearest the battery holder. This circuit breaker protects the circuitry of the TED 200 from high current fault conditions which can occur from the incorrect installation of batteries. In the event the TED 200 fails to turn on, first check batteries for proper polarity installation. If the unit still fails to turn on, it is recommended that the user remove the batteries and disassemble the unit by unscrewing the four (4) screws located on the bottom of the unit. Slowly pull the top half of the unit off. To reset the circuit breaker, depress the black button which sits on the circuit breaker (denoted by the silkscreened designator - CB1). Replace the batteries and check the operation of the unit. Reinstall cover after operation check.

5.6 Offset Adjustment (TED 200)

In the event that the TED 200 fails to accept more than one new cell, or suffers an unacceptable loss in accuracy, it is possible for the user to recalibrate the unit fairly rapidly. To accomplish this, remove the batteries and disassemble the unit by unscrewing the four (4) screws located on the bottom of the unit. Slowly pull the top half of the unit off. Disconnect the ribbon cable and remove the Printed Circuit Board nearest the battery holder. Reconnect the printed circuit board (outside the unit) to the batteries. Procede with the following steps:

1. Apply power to the board by making sure the battery pack is still installed and connected to the board.

2. Connect a 215K ohm (1%) resistor between pins 2 and 6 of the amplifier U5.

3. Jumper pin 10 to pin 2 on the connector J1.

4. With a voltage meter accurate to within ±1mV, measure the voltage between pins 5 and 6 of J1.

5. Adjust the trim pot (P1) slowly until the voltage at pin 5 is 4mV greater than that at pin 6. (If this is not possible, return unit to TAI).

6. Remove the 215K resistor and jumpered connection and put the unit back together.

NOTE: In the event these steps do not produce the desired results, return the unit to TAI.

WARNING: TAMPERING WITH INTERNAL ADJUSTMENTS OR COMPONENTS, WITH THE EXCEPTIONS OF THE OFFSET ADJUST AND RESETTING THE CIRCUIT BREAKER, MAY VOID THE INSTRUMENT WARRANTY.