ACCUTORR NON-INVASIVE BLOOD PRESSURE MONITOR AND PULSE OXIMETER SERVICE MANUAL

ACCUTORR 3/ACCUTORR 3SAT
ACCUTORR 4/ACCUTORR 4SAT

Contents

Forward

This Service Manual Is intended as a guide for technically qualified personnel during repair and calibration procedures. The information has been divided into the four main sections listed above. A detailed table of contents is provided on the first page of each section.

This publication may have been updated to reflect product design chnages and/or manual improvements. Any such changes to this manual would be accomplished by supplying replacement pages and instructions for inserting of affixing them into the manual.

NOTE: In order to ensure the proper performance of your monitoring equipment and to prevent the voiding of the warranty, it is recommended that only parts and accessories provided by Datascope be used with your monitor.

WARNINGS

The ACCUTORR 3/4 operates on line voltages. Therefore, an electric shock hazard may exist when the instrument covers are removed. Repair and calibration procedures should only be performed by qualified personnel who proceed with care and follow proper servicing techniques. Warnings are given in Sections 2.2 and 4.2.2, as well as in other appropriate locations.

NOTE

Unauthorized servicing may void the remainder of the warranty. Check with the factory or with a local authorized Datascope representative to determine the warranty status of a particular instrument.

RS232 DISCLAIMER

Connection of non-isolated devices to the RS232 Connector on this unit may cause chassis leakage to exceed the specification standards.

1. INSTRUMENT DESCRIPTION

1.1 Introduction

This section of the Service Manual provides general information about the instrument.

Sections 1.2 and 1.3 are included as a review of the instrument functions and operation, although the reader is encouraged to refer to the Operating Instructions, P/N 0070-00-0220, for more complete information.

Section 1.4 provides a description of operating principles for reference during repairs.

Section 1.5 provides overall product specifications.

1.2 CONTROLS AND INDICATORS

This section of the Service Manual identifies and describes each control and display of the Datascope ACCUTORR 3/4.

Refer to the paragraph numbers listed below for the location of specific controls and displays.

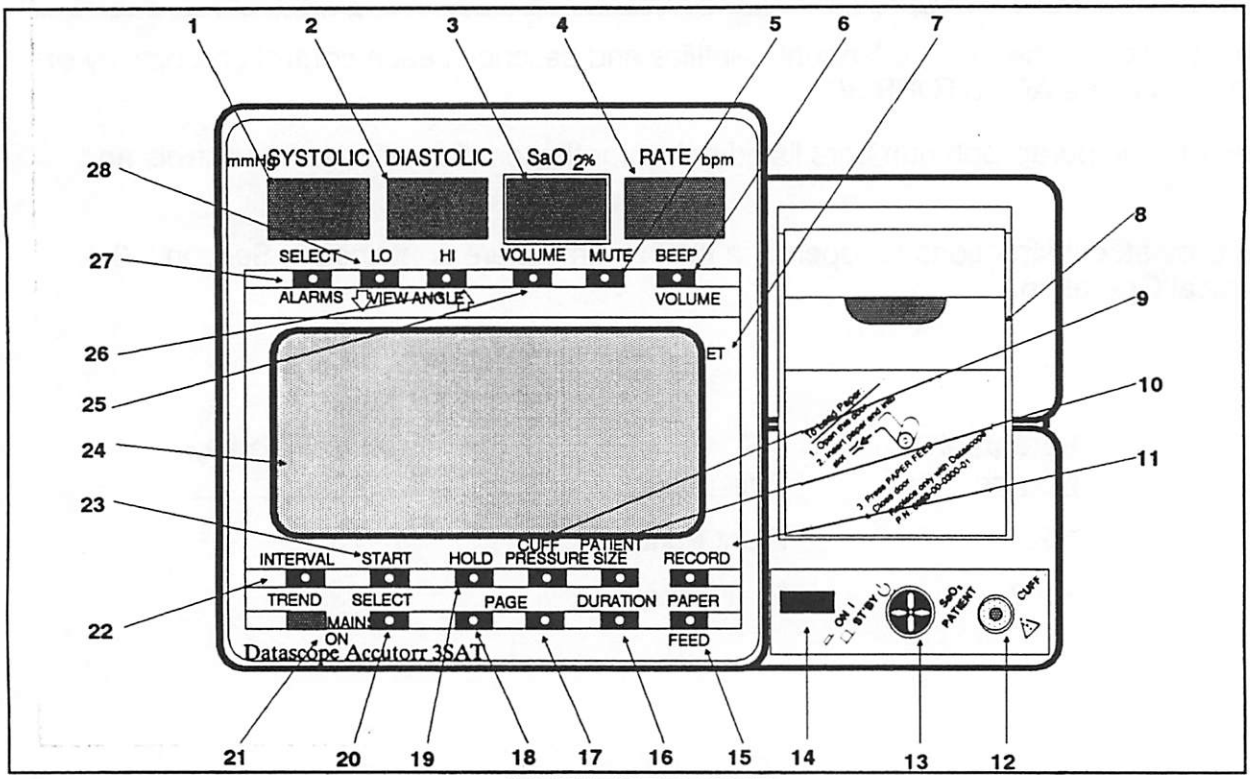
Step-by-step instructions for operating the instrument are contained in Section 1.3.4, Typical Operation.

Paragraph Number	Description	Control/Display Number
1.2.1	Front Panels -	1 - 29
1.2.2	Rear Panel -	30 - 39

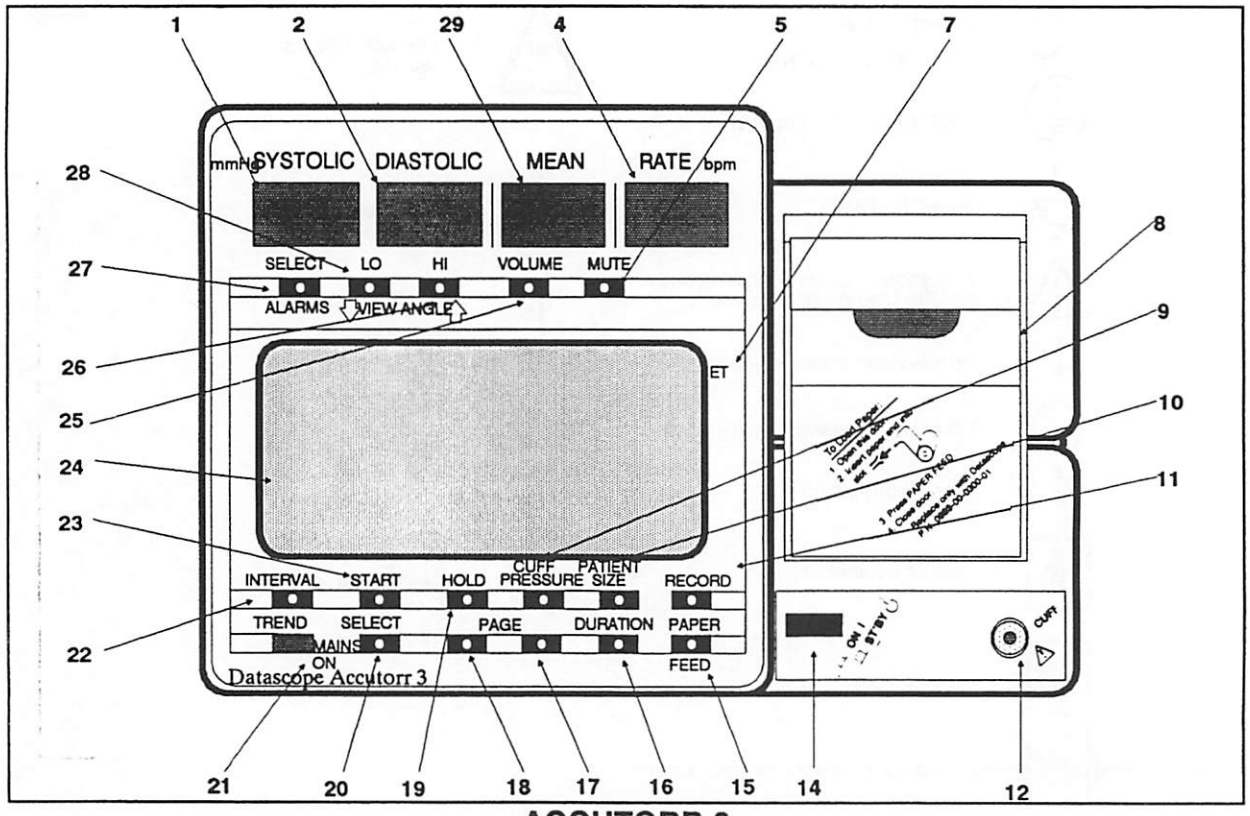
SYMBOL	DESCRIPTION
	DIRECT CURRENT (DC)
	ALTERNATING CURRENT (AC)
	PROTECTIVE EARTH (Ground)
	EQUIPOTENTIALITY
	ATTENTION, CONSULT ACCOMPANYING DOCUMENTS / REFER TO MANUAL
	ON (power connection to the mains)
	OFF (power disconnection from the mains)
	TYPE B EQUIPMENT
	TYPE BF EQUIPMENT
	TYPE CF EQUIPMENT
	DEFIBRILLATOR PROOF CF EQUIPMENT

SYMBOL	DESCRIPTION
T063 / 220V	REPLACE FUSE AS MARKED
	ON / STANDBY SWITCH
	EARTH (Ground)
	LAMP
	DANGEROUS VOLTAGE

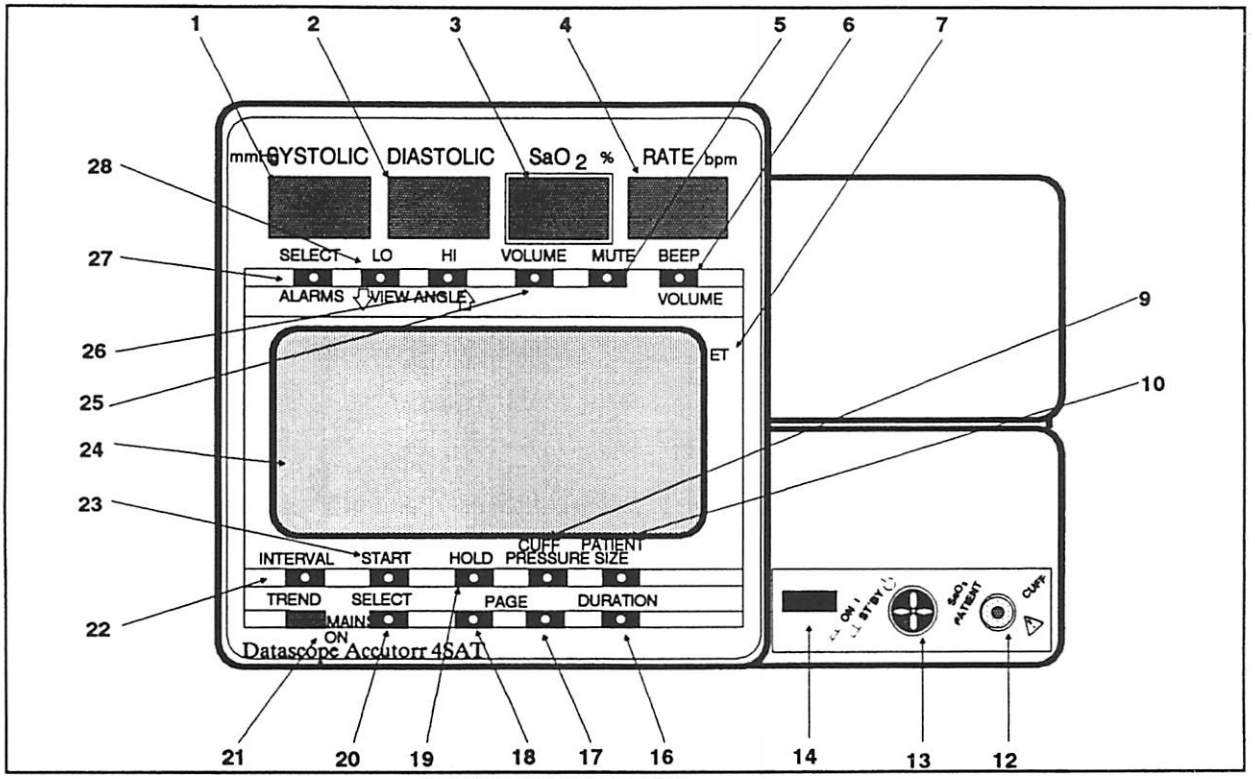
1.2.1 Front Panels



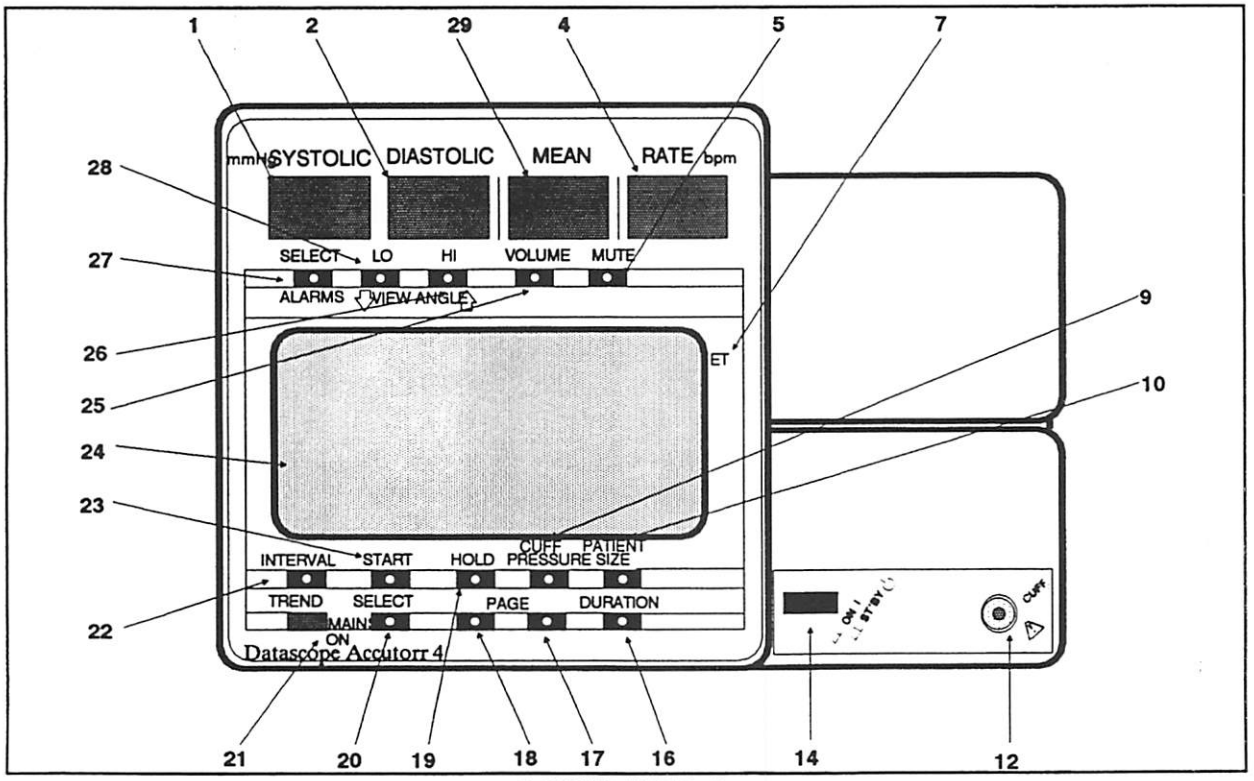
ACCUTORR 3SAT



ACCUTORR 3



ACCUTORR 4SAT



ACCUTORR 4

1. - **Systolic**
2. - **Diastolic**
3. - **SaO_2%**
4. - **Rate bpm**
5. - **Mute (Alarm)**
6. - **Beep Volume (SaO_2)**
7. - **ET Elapsed Time**
8. - **Printer Module**
9. - **Cuff Pressure**
10. - **Patient Size**
11. - **Record**
12. - **Cuff**
13. - **SaO_2 Patient**
14. - **ON/ST'BY**
15. - **Paper Feed**
16. - **Duration (Trend)**
17. - **Page Down**
18. - **Page Up**
19. - **Hold**
20. - **Select (Trend)**
21. - **Mains On**
22. - **Interval**
23. - **Start**
24. - **LCD Display**
25. - **Volume (Alarm)**
26. - **Hi (Alarm Limit)**
27. - **Select (Alarm)**
28. - **Lo (Alarm Limit)**
29. - **Mean**

1. Systolic - A 3-digit, amber LED display indicating systolic pressure in mmHg.

2. **Diastolic** - A 3-digit, amber LED display indicating diastolic pressure in mmHg.

3. **SaO2** - A 3-digit, amber LED display indicating saturated oxygen in %.

4. **Heart Rate** - A 3-digit, amber LED display indicating heart rate in beats per minute (bpm).

5. **Mute (Alarm)** - Cancels the volume of the NIBP audible alarm until the end of the next measurement cycle. Cancels the volume of the $Sa0_2$ audible alarm for two minutes. MUTE does not affect the flashing digits or messages. If MUTE is pressed twice within 3 seconds all alarms will be muted for 2 minutes.

6. **SaO_2 Beep Volume** - (ACCUTORR 3SAT and ACCUTORR 4SAT only) Used to select the volume of the continuous SaO_2 beep.

7. **ET (Elapsed Time)** - Displays the amount of time since the last measurement.

8. **Printer Module** - Used to produce a "hard copy" of the data obtained by the monitor.

9. **Cuff Pressure** - Selects the initial NIBP cuff inflation values.

10. **Patient Size** - Selects the desired operating mode, ADULT/CHILD or NEONATE. The selection is displayed on the LCD Window.

11. **Record** - (ACCUTORR 3 and ACCUTORR 3 SAT only) Used to begin the printing of selected or designated interval timed data.

12. **NIBP Connector** - A connector used to attach the NIBP cuff assembly to the monitor.

13. **SaO_2 Patient Connector** - A connector used to attach the SaO_2 Sensor assembly to the monitor

14. **ON/ST'BY Switch** - A push-button switch used to turn the monitor ON or to place it into a ST'BY mode.

15. **Paper Feed** - (ACCUTORR 3 and ACCUTORR 3 SAT only) Used to feed paper into the recorder.

16. **Duration (Trend)** - Selects the time scales for graphically trended data. Available time scales are 1-, 2-, 4-, 8-, 12-, or 24-hours. Hold this key down for three seconds to clear the trended memory.

17. **Page Down** - Used to scroll through the tabular or graphic displays.

18. **Page Up** - Used to scroll through the tabular or graphic displays.

19. **Hold** - A touch switch used to place the measurement cycle into a "hold mode." (The "hold mode" suspends a series of timed measurements or terminates a measurement cycle already in progress (deflates cuff)).

20. **Select (Trend)** - Selects the desired trend and waveform display in the following order (LIST TREND, NIBP GRAPHIC TREND, SaO_2 GRAPHIC TREND, SaO_2 Waveform).

21. **Mains On** - A green LED used to notify the operator of the monitor's mains on/off state.

22. **Interval** - A touch switch used to select the automatic timer intervals for NIBP measurements.

    INTERVALS ARE: Off (only applies to the Interval feature), Continuous (one measurement immediately after the other for a maximum period of five minutes), 1-, 2.5-, 5-, 10-, 15-, 20-, 30-, 45-, 60 and 120-minutes.

    At power up the timer interval will be as last set, but will not be activated until START is pressed.

    CONTINUOUS is one measurement immediately after the other for a maximum period of five minutes. At the end of the five minutes a measurement will be taken once every five minutes.

23. **Start** - Used to begin an NIBP measurement sequence or to begin the interval timer sequence.

24. **LCD Display** - A liquid crystal display used to exhibit NIBP, heart rate, and when available $Sa0_2$, measurements in a tabular form; trended NIBP/heart rate data in graphic form; trended $Sa0_2$/heart rate data in graphic form; and when available, an $Sa0_2$ waveform.

25. **Volume (Alarm)** - Sets the volume of the audible alarm to one of four settings (OFF, LO, MED, HI). The OFF selection may be disabled in the User Configuration Mode. See Section 1.3.4.12. If the alarm OFF selection is activated, a rectangular marker will appear in the upper left corner of the VOLUME window. If the alarm OFF is disabled, then no marker will appear.

26. **HI Limit (Alarm)** - When in the Alarm Set Mode, sets the high alarm limit for the selected parameter. The high alarm limit can only be set for the alarm parameter that is highlighted in the window superimposed in the trend display area on the LCD display. When in the normal mode, changes the view angle (contrast).

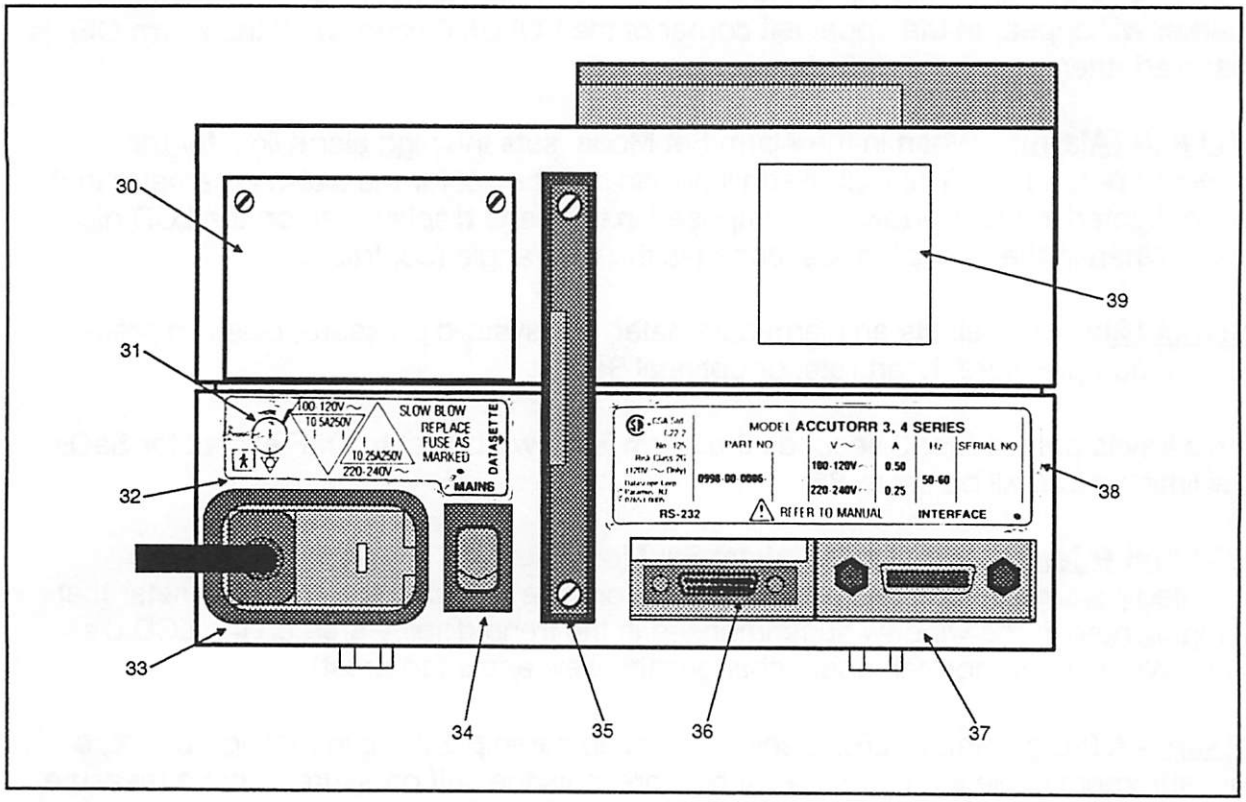
27. **Select (Alarm)** - Selects an alarm parameter, i.e., systolic pressure, diastolic pressure, mean pressure, heart rate, or optional SaO_2.

    If this key is pressed for 3 seconds the alarm limits will be set to OFF except for SaO_2 low limit, which will be set to 85.

28. **LO Limit (Alarm)** - When in the Alarm Set Mode, sets the low alarm limit for the selected parameter. The low alarm limit can only be set for the alarm parameter that is highlighted in the window superimposed in the trend display area on the LCD display. When in the normal mode, changes the view angle (contrast).

29. **Mean** - A 3-digit, amber LED display indicating mean pressure in mmHg. During a measurement cycle the mean pressure represents the cuff pressure. After a measurement cycle the mean pressure represents mean arterial pressure.

1.2.2 Rear Panel



ALL UNITS

30. **Battery Compartment** - Contains the optional rechargeable battery.

31. **Potential Equalization Lug - (Equipotential Post)** - A connector used to equalize the ground potential between other hospital equipment and the Datascope ACCUTORR 3/4.

32. **Power Input Label** - Identifies the power input.

33. **Power Input Module** - (Line Cord Receptacle, Fuse Holder, Voltage Selector) - A line cord receptacle, fuse holder, and voltage selector for mating with a detachable line cord.

34. **Mains Power Switch** - A switch used to act as the line power (mains) disconnect.

35. **Datasette Module Port** - An input slot used to connect the software module to the unit.

35. **Datasette Module Port** - An input slot used to connect the software module to the unit.

36. **RS232 Connector** *(Data Out) - A 25-pin D-type connector used to provide additional high speed channels for Datascope peripheral communications. **Note:** Connection of non-isolated devices to the RS232 Connector on this unit may cause chassis leakage to exceed the specifications.

37. **Interface Connector** *- A 24-pin IEEE #488-1978 type receptacle used to interface with only Datascope equipment.

38. **Serial Number Label** - Identifies model number, serial number, fuse type, and AC rating of the unit.

39. **Leakage Label** (for 220V only) - A label used to identify leakage information pertaining only to 220V units.

* Before using the communication connectors, contact authoirzed service personnel for assistance.

1.3. OPERATION

This section of the Operating Instructions provides general guidelines and step-by-step instructions for the proper operation of the monitor. Numbers in parentheses ( ) identify the displays and the controls described in Section 2.0, CONTROLS AND INDICATORS.

Abbrievated Operating Instructions

CAUTION: Only use Abbrievated Operating Instructions if you are already familiar with this product. If not please continue with the Detailed Operating Instructions in the remainder of this chapter.

A. Setting-Up

1. Set rear panel Mains Power Switch to OFF.
2. If desired, interface any peripheral equipment.
3. Attach power cord.
4. Set Mains Power Switch to ON.
5. Press ON/ST'BY Switch to ON.
6. Set (when appropriate) the following:

   -Patient Size (Adult/Child or Neonatal)
   -Alarm Limits
   -Alarm Volume
   -SaO_2 Beep Volume
   -View Angle (Contrast)

B. Initiating NIBP Measurement

1. Select cuff.
2. Attach cuff hose to NIBP connector and place cuff on patient.
3. Select timer interval, if desired.
4. Select cuff pressure, if necessary.
5. Press Start to begin NIBP measurement.
6. Press Hold to suspend measurement.

C. Establishing SaO_2 (ACCUTORR 3/4 SAT only)

1. Select appropriate sensor.
2. Attach sensor to the SaO_2 connector and apply to the patient.
3. Press Trend Select to obtain SaO_2 waveform, if necessary.

D. Recording Information

1. Select desired trend screen or SaO_2 waveform to record.
2. Press Record to start recording function.
3. Press Record again to stop recording function.

Detailed Operating Instructions

3.1 Setting-Up

1. Set the rear panel MAINS POWER SWITCH (34) OFF.

2. Check the serial number label (38) and voltage indicated. Confirm proper voltage configuration. If the monitor is not wired correctly, contact a Datascope Service Representative or qualified hospital personnel.

3. If interfacing with other compatible Datascope instruments, attach the interface cable (P/N 0012-00-0271) between the rear panel INTERFACE CONNECTOR* (37) and the corresponding interface connector on the peripheral instrument(s).

4. If additional communications capabilities are required, attach the RS232 Interface Cable to the rear panel RS232 Connector,* Data Out (36) and the corresponding interface connector on the peripheral instrument(s).

5. Attach the AC power cord into the Datascope ACCUTORR's rear panel INPUT MODULE (33) and into a grounded (3-prong) Hospital Grade AC receptacle. Do not use an adaptor to defeat the U-ground.

WARNING

When attached to other products insure that the total chassis leakage currents of all units (total) do not exceed 100 ua.

3.2 Turning Power On

1. Place the rear panel MAINS POWER SWITCH (34) to ON. A green LED, MAINS ON (21), should illuminate on the front panel.

2. Press the front panel ON/ST'BY switch (14) to ON.

The message **"INTERNAL TEST IN PROGRESS"** displays on the LCD advisory panel.

The following items are checked during the first 10 seconds of monitor operation (initial power up):

- Internal Self-Check
- All Front Panel LEDs
- The LCD Advisory Panel
- The Alarm Tones

NOTE: To insure proper function, watch for all front panel LEDs and the LCD Advisory Panel to light up.

The monitor is ready for use when the message is erased from the LCD.

* Before using the communication connectors, contact authorized service personnel for assistance. Detailed Operating Instructions

If the self-test is not successful, one of the following messages will be displayed on the LCD:

RAM TEST FAILED	**ROM TEST FAILED**
RS232 PORT FAILURE	**D.S. BUS FAILURE**

If any of these messages are displayed, the monitor will not operate. See Section 1.3.4.8, LCD Messages, for further instructions.

1.3.3 Initial Control Settings

The following initial settings are automatically selected at power on.

FUNCTION	INITIAL SETTING ON POWER UP	DEFAULT SETTINGS
Timer Interval	As last set	OFF
Hold	OFF	OFF
Patient Size	As last set	Adult
Trend Display	Tabular List	Tabular List
Systolic Alarm Limits	As last set	OFF
Diastolic Alarm Limits	As last set	OFF
Mean Alarm Limits	As last set	OFF
Rate Alarm Limits	As last set	OFF
Alarm Volume	As last set	MED
SaO_2 Beep Volume	As last set	LO
Record	OFF	OFF
Initial Cuff Inflation	Adult/Child: 180mmHg Neonate: 120mmHg	Adult/Child: 180mmHg Neonate: 120mmHg
View Angle	As last set	12 o'clock view nominal

1.3.3.1 View Angle (Contrast)

The view angle is changed by pressing the HI (26) and LO (28) keys at any time during normal operation (except when in the Alarm Set Mode). A beep is heard each time one of these keys is pressed. A double beep is heard when the last setting has been reached for that key.

NOTE: The HI and LO keys have a dual function. When in the Alarm Set Mode the keys are used to set the alarm limits. Therefore, pressing these keys in the Alarm Set Mode will not alter the view angle.

1.3.4 Operation

All ACCUTORR models can be initiated to obtain NIBP measurements manually or by automatically timed intervals. The ACCUTORR 3 SAT and ACCUTORR 4 SAT can also obtain SaO_2 measurements.

1.3.4.1 Manual Initiation of NIBP Measurements

1. Select a pressure cuff that is approximately 20% wider than the diameter of the limb on which it is to be used.

A cuff that is too narrow for the limb will result in erroneously high readings. The correct size of the pressure cuff for a given patient has, among other considerations, a direct bearing on the accuracy of the obtained NIBP measurements. Base your selection of the cuff size on the limb circumference of the patient. The following table indicates the available Datascope cuffs for use with the Datascope ACCUTORR. The design dimensions of the cuffs and their intended uses are based on recommendations of the American Heart Association.

Limb Circumference (cm)	Description / Cuff Name	Datascope Part Number	
		Reusable	Disposable
45 - 65	Thigh *	0998-00-0003-05	
30 - 45	Large Adult	0998-00-0003-02	0683-07-0001-01
24 - 36	Adult	0998-00-0003-01	0683-07-0001-02
18 - 27	Child	0998-00-0003-03	0683-07-0001-03
16 - 25	Small Child	0998-00-0003-04	0683-07-0001-04
11 - 19	Infant	0998-00-0003-06	
6 - 11	Newborn	0998-00-0003-07	
11 - 17	Neonatal, Size 3		0683-03-0003-02
9 - 13	Neonatal, Size 2		0683-03-0002-02
7 - 10	Neonatal, Size 1		0683-03-0001-02
6 - 8	Neonatal, Size 0		0683-03-0004-02
Color Coded Cuffs**			
45 - 66	Thigh - Brown	0998-00-0003-26	
30 - 47	Large Adult - Grey	0998-00-0003-25	
24 - 36	Adult - Tan	0998-00-0003-24	
18 - 27	Chile - Red	0998-00-0003-23	
10 - 19	Infant - Green	0998-00-0003-22	
6 - 11	New Born - Blue	0998-00-0003-21	

NOTE: Disposable cuffs may be sterilized. Refer to Chapter 4 for sterilization instructions.

NOTE: Cuffs become more supple as they age and sometimes develop permanent folds that can leave temporary marks on the limb. Any cuffs that exhibit this effect should be replaced.

The pressure on the limb may not fall to zero between measurements if the cuff is wrapped too tightly. Therefore, assure that the cuff is properly applied.

The skin is sometimes fragile (i.e., on pediatrics, geriatrics, etc.) In these cases, a longer timer interval should be considered to decrease the number of cuff inflations over a period of time. In extreme cases, a thin layer of soft roll or webril cotton padding may be applied to the limb in order to cushion the skin when the cuff is inflated. This measure may affect NIBP performance and should be used with caution.

*When using the thigh cuff this product will not comply with AAMI accuracy standards.

**The limb circumferences of the Color Coded Cuffs adhere to the AHA guidelines for size.

2. Attach cuff hose to NIBP Connector (12).

NOTE: The distal edge of the cuff should be placed higher on the patient's arm (away from the elbow) to avoid differential pressure damage to the radial nerve. Refer to section 6.3 in the Operating Instructions, Precautions with Using Automatically Cycled Blood Pressure Cuffs for more information.

3. Place the cuff at the patient's heart level or an error, due to hydrostatic effect, may be introduced into the measurements. To reduce additional errors, the cuff should be fitted snugly, with little or no air present within the cuff. Be sure the cuff lies directly against the patient's skin. No clothing should come between the patient and the cuff.

4. Press the ON/ST'BY switch (14) ON. Wait for a successful self-check routine.

5. Select PATIENT SIZE (10) - either Adult/Child or Neonate. Press key for three seconds to change mode.

6. If necessary, Press CUFF PRESSURE (9) to change the cuff pressure value.

Cuff inflation values depend on the PATIENT SIZE setting. The sequence of cuff inflation is:

PATIENT SIZE Setting	Initial Cuff Inflation Values
Adult/Ped	180, 200, 220, 240, 260, 100, 120, 140, 160, 180...(mmHg)
Neonate	120, 140, 40, 60, 80, 100, 120... (mmHg)

7. Press START (23) to begin an NIBP measurement.

NOTE: Inflate the cuff only after proper application to the patient's limb. Cuff damage can result if the cuff is left unwrapped and then inflated.

The cuff begins to inflate to the selected cuff pressure value. After reaching the selected value the cuff begins to slowly deflate and the Datascope ACCUTORR begins to collect oscillometric pulsations.

If the initial cuff inflation is found to be inadequate, the unit retries with a higher inflation pressure (+50mmHg in the adult mode; +30mmHg in the neonate mode).

Have the patient remain still to avoid the introduction of unnecessary motion artifact. After the cuff pressure drops below the diastolic pressure, the results of the measurement are displayed on the discrete LED readouts. A two tone audible beep indicates the completion of the measurement.

During or after an NIBP measurement, one of several advisory messages may be displayed on the LCD window. Refer to Section 1.3.4.8, LCD Messages, for their explanations.

ELAPSED TIME (7) indicates the amount of time since the completion of the last measurement. Elapsed time is updated each minute until a new measurement is made.

8. If desired, press HOLD (19) to cancel a measurement.

1.3.4.2 Automatic Initiation of NIBP Measurements

1. Press INTERVAL (22) until the desired timed-interval setting is selected.

   The LCD Advisory (24) will display one of the following:

   Off, Contin*, 1-, 2.5-, 5-, 10-, 15-, 20-, 30-, 45-, 60-, or 120-minutes.

2. Press START (23) to begin an automatic, timed measurement sequence.

Automatic Adjustment in the Timer Mode

In the timer mode, the unit adjusts the inflation pressure according to the previous reading of the systolic pressure. After the first measurement in the timer mode, the cuff inflation pressure display reads "AUTO" and the inflation pressure is the previous systolic +50mmHg in the Adult Mode and +30mmHg in the neonate mode.

Suspension of Automatic NIBP Feature

To suspend an automatically timed measurement sequence or to end a measurement cycle already in progress (deflate cuff):

- Press HOLD (19).

To resume a suspended timed measurement sequence:

- Press START (23).

Note: Press HOLD (19) at any time to postpone a scheduled measurement or to terminate a measurement cycle already in progress.

Interval Set Mode

Pressing the INTERVAL key (22) enters the unit into the Interval Mode. When in this mode, INTERVAL is displayed in reverse graphics on the monitor. If the unit is left in the Interval Mode when turned off, when powered up it will still be in this mode, but will not be activated until START (23) is pressed.

CAUTION

Observe Extreme Caution On All Patients (Neonates,Pediatrics, and Adults) When NIBP is set to the Continuous Mode.

Reports have been made of nerve injury occurring during use of automatically cycled blood pressure cuffs. See Appendix in the Operating Instructions P/N 0070-00-0220, "Precautions when Using Automatically Cycled Blood Pressure Cuffs".

---

* A five-minute limit is placed on continuous measurements. After five minutes the ACCUTORR will automatically switch to a five-minute measurement interval cycle, taking one measurement every five minutes.

1.3.4.3 NIBP Pressure Limit Fail Safe

If the cuff pressure is overpressurized, the cuff will automatically vent to atmosphere, the alarm tone is sounded, and the advisory on the LCD reads CUFF OVERPRESSURE.

The unit must be turned off and back on again to reset the overpressure switch before any new measurements are taken.

1.3.4.4 Cuff Inflation Time

If the cuff pressure does not attain 20mmHg within 40 seconds of the start of inflation or if the target pressure is not reached within another 60 seconds, then the cuff is vented and the RETRY or UNABLE TO MEASURE message will appear in the LCD.

1.3.4.5 START and HOLD Functions

The START and HOLD functions have the following effects on the timed measurement sequence.

- INTERVAL is set and you Press START (23):

An unscheduled measurement is made. Taking this unscheduled measurement does not affect the timing of the interval cycle. In other words, the scheduled measurements that follow will be taken as if there were no interruptions . Only one measurement is taken for each measurement cycle - even if the unscheduled measurement coincides with the scheduled measurement.

- INTERVAL is set and you press HOLD (19):

The timed measurement is suspended or the measurement cycle is stopped (cuff deflation).

- INTERVAL is set and you Press HOLD (19) a second time:

The HOLD mode is cancelled, i.e., the cuff remains deflated until another measurement is begun by pressing START, or another measurement is automatically begun by the interval timer's request .

Hold mode affects scheduled measurements. For example, with the interval set to five minutes:

Time	Mode/Timer Interaction	Result
10:00	Not in hold mode	Measurement taken
10:04	Hold mode is entered	Hold message is displayed on LCD
10:05	Timer requests a measurement	Measurement is skipped
10:07	Hold mode is exited	Hold message no longer is displayed on LCD
10:10	Timer requests a measurement	Measurement taken

1.3.4.6 Sequence for Establishing SaO_2

SaO_2 measurements can be obtained from the Datascope ACCUTORR 3 SAT and the ACCUTORR 4 SAT monitors.

1. Select the appropriate sensor for the patient. Base your selection of the sensor on the information included in this section.

Guidelines for the selection of a sensor are provided in the Sensor Selection Chart.

2. Follow the patient application instructions provided in each sensor package.

3. The SaO_2 waveform displays on the LCD.

4. Press PAGE DOWN (17) or PAGE UP (18) to change the size of the waveform displayed. (The selected waveform size is remembered once it has been selected.)

5. Press BEEP VOLUME (6) to set the volume of the SaO_2 beep. There are eight available settings including OFF. If held depressed, the volume will change in increasing levels to maximum then off, etc. If an SaO_2 sensor is not connected, then a beep at the current volume will be generated. If a sensor is connected a beep will not be generated as the volume is increased.

1.3.4.7 Sensors

A wide range of sensors are available for connection to the Datascope ACCUTORR 3/4 SAT. The sensors cover both short-term and long-term monitoring needs on patients ranging from neonates to large adults.

The DIGISENSOR is intended for short-term adult monitoring.

The FLEXISENSOR SD, available in five different sizes, provides both short-term and long-term monitoring for large adults, adults, pediatrics, infants, and neonates. The FLEXISENSOR SD is used when the DIGISENSOR is not convienient or suitable.

The ear sensor is intended for long-term adult monitoring. It is a convienient alternate monitoring site for the anesthesiologist.

A range of disposable bandages are available for use with the FLEXISENSOR SDs. They are available in 2 styles, butterfly (used for large adults, adults, and pediatrics) and coban (used for infants and neonates).

Use of the sensors does not cause any penentration of the skin, nor is there any electrical contact or transfer of excessive heat to the patient.

The sensor is composed of a light emitting diode (emitter) and a photodiode (detector). The emitter discharges two colors (wave lenght) of light into the patient's extremity (finger, toe, ear). The detector receives that amount of light not absorbed by the blood or tissue components. The ACCUTORR then uses the relative absorbtion of the two light wavelengths to compute and display SaO2 and Rate measurements.

The key benefits of the sensors are:

-electrocautery noise (ESU) rejection
-the monitoring of restless patients
-tracking of weak peripheral pulse levels
-rejection of ambient light
-long term patient comfort
-can be resterilized (ETO sterilization - 3 times)
-patient isolation
-ease of application and removal

- Electrocautery Noise (ESU) Rejection

The sensor configuration of both the DIGISENSOR and the FLEXISENSOR SD provide uninterrupted monitoring and absence of false alarms during the use of ESU (ESU can be set at any power level). This design prevents electro-surgical noise entering the monitor, via the sensor, and interfering with unit operation.

- Monitoring Restless Patients

Motion artifact rejection is achieved in several ways.

1. The sensor design used with their recommended bandages assures a snug fit of the sensor to the patient.

2. Light emitting diodes (LEDs) and detectors gather a strong signal from the patient.

3. Software in the ACCUTORR evaluates the shape of each pulse and automatically rejects noisy and unreliable pulses.

4. When in the presence of motion, the software adjusts the "averaging-period", increasing it to a maximum of 15 seconds during motion, and automatically reducing it during quiet periods to obtain a fast response. This combination reduces the number of monitoring interruptions and false alarms from patient motion.

- Tracking of Weak Peripheral Pulse Levels

Many patients suffer poor peripheral perfusion due to hyothermia, hypovolemia, reduced cardiac output, etc. The ACCUTORR is designed to automatically increase its gain to track patients with poor peripheral perfusion.

- Rejection of Ambient Light

Many monitoring situations involve high levels of ambient light, ie., operating room lights, neonatal phototherapy, heat warmers, etc. The ACCUTORR Monitor, sensors, and bandages each contribute to the rejection of ambient light. The monitor automatically measures and corrects for high levels of ambient light. The enclosed design of the DIGISENSOR prohibits the interference of high levels of ambient light on adults with sensor operation. And the opague material used in the composition of the bandages, which are used with the FLEXISENSOR SD, helps keep out ambient light.

- Patient Comfort

The FLEXISENSOR SD line is designed to slip into a disposable bandage of two styles (butterfly and coban) which conform comfortably and safely to the particular patient's anatomy.

A. Sensor Selection and Application

Selection of a specific sensor is based on the patient's age, sex, physical condition, and expected monitoring duration.

General guidelines for the selection of a sensor are provided in the Sensor Selection Chart, which follows.

Instructions for the application of a sensor to a patient are provided in each sensor package.

B. Sensor Connection to the ACCUTORR 3SAT/4SAT

1. Align the cable connector on the sensor assembly with the SaO_2 Patient Connector (13) on the ACCUTORR 3SAT/4SAT.

2. Push the cable connector into the SaO_2 Patient Connector (13). Confirm that the cable connector is securely in place.

TO OBTAIN MAXIMUM CABLE USE, DO NOT TWIST THE CABLE CONNECTOR WHEN ATTACHING TO OR DISCONNECTING FROM THE ACCUTORR 3SAT/4SAT.

C. Sensor Inspection

Before use, always inspect sensors, cables, and connectors for damage, ie., cuts and abrasions. Do not use the sensor, cable or connector if damaged. Replace with a good working sensor.

For long sensor life:

-Do not drop on the floor, or give other sharp shocks to the sensor(s).

Between use, store the sensors in the optional FLEXISENSOR SD Organizer, accessory pouch, or coil the sensor cable and store on the side of the ACCUTORR using the optional cable retainer.

For accessory part number information see Section 5.2, "Optional Accessories".

-Avoid running any cart, bed, or any piece of equipment over the sensor cable.

-Avoid strong pulls on the sensor cable (10 lbs/4kg).

-Watch for cracks in the DIGISENSOR housing.

-Watch for cracks, cuts, rips, fogging, or signs of moisture in the FLEXISENSOR SD.

D. Sensor Performance

For the BEST performance of all Datascope sensors:

-DO NOT PLACE any sensor on an extremity with an arterial catheter or blood pressure cuff in place. Placement of an arterial catheter or blood pressure cuff on an extremity may obstruct normal blood flow. False pulse rate information may result if the FLEXISENSOR SD is placed on that same extremity. Place the sensor on the limb opposite the site of the arterial catheter or blood pressure cuff.

-Encourage the patient to remain still. Patient motion may affect the sensor's performance. If it is not possible for the patient to remain still, replace the sensor bandage on the FLEXISENSOR SD to assure good adhesion, or change the site of the DIGISENSOR.

-Check the sensor site daily on adults and every 4 hours on neonatal patients for indications of skin abrasions, sensor displacement, sensor damage, or circulation impairment. Check the sensor site every 4 hours if the ear clip is used. If necessary, remove and reapply the sensor. If any of the above mentioned indications occur, immediately remove the sensor and find an alternate site.

NOTE: Check the sensor site more frequently on infant and active pateints.

-Placement of the DIGISENSOR may be difficult on patients with long fingernails or artificial nails (over 1/4" long). Incorrect placement can also reduce the acquired sensor signal, and therefore compromise performance. Select an alternate site (toe) or use a FLEXISENSOR SD if the sensor can not be placed on the patient's finger correctly or if the fingernails interfere with the acquisition of a reliable signal.

-Use of the DIGISENSOR is not recommended for long-term monitoring (4-6 hours). Pressure from the spring mechanism on the DIGISENSOR may cause minor skin damage to the finger/toe used. For monitoring situations exceeding 4-6 hours, either reposition the DIGISENSOR every 4-6 hours to a different site (finger/toe) or use a FLEXISENSOR SD with its appropriate bandage.

-Do not over-tighten the sensor bandages. Excessive pressure on the monitoring site can affect SaO_2 readings and may reduce readings below true SaO_2. Excessive pressure can also result in pressure necrosis and other sking damage.

E. ACCUTORR Sensor Selection Chart

Patient Group Sensor Type	Approximate Patient Weight kg/lbs	Where to be used	Long or Short Term Monitoring	ESIS	Re-usable	Bandage Type	Part Numbers** Sensors	Bandages
Large Adult (LA)	> 80kg/ >176 lbs	Fingers, Toes	Long & Short Term	Included	Yes Up to 20 uses	Adhesive, Disposable	0998-00-0076-03	0683-00-0409-01
Adult (A)	30 - 90kg/ 66 - 198 lbs	Fingers, Toes	Long & Short Term	Included	Yes Up tp 20 uses	Adhesive, Disposable	0998-00-0076-02	0683-00-0409-02
Pediatric (P)	10 - 40kg/ 22 - 88 lbs	Fingers, Toes	Long & Short Term	Included	Yes Up to 20 uses	Adhesive, Disposable	0998-00-0076-01	0683-00-0409-03
Infant (I)	4.5 - 10kg/ 10 - 22 lbs	Feet, Palms, Big Toes	Long & Short Term	Included	Yes Up to 20 uses	Non-Adhesive*, Disposable	0998-00-0074-03	0683-00-0415
Neonate (N)	Up to 5kg/ Up to 11 lbs	Feet, Palms, Heel, Calf	Long & Short Term	Included	Yes Up to 20 uses	Non-Adhesive*, Disposable	0998-00-0074-02	0683-00-0440
Adult Ear (AE)	> 40kg/ >88 lbs	Adult Ear	Long & Short Term	Included	Yes Up to 20 uses	N/A	0998-00-0074-01	N/A
DIGISENSOR	40 +kg/ 90 + lbs	Fingers, Toes	Short Term	Included	Yes 6-months	N/A	0998-00-0088-02	N/A

*Non-adhesive bandages are recommended for premature infants to minimize prenatal skin damage.
**See Accessories, Chapter 5, for more detailed information.

1.3.4.8 LCD Messages

The following messages may be displayed on the LCD during a NIBP measurement cycle. The messages are divided into four major categories: NIBP Measurement, Qualifying NIBP Measurement, Monitor Operation, and SaO_2.

A. NIBP Measurement Messages

Message	Reason	Response
RETRY-MOTION ARTIFACT	Too much motion artifact.	Unit begins a retry measurement after venting the cuff for 5 seconds.
RETRY-PUMP HIGHER	Cuff not inflated enough to measure patient's pressure.	Unit begins a retry measurement after venting the cuff for 5 seconds.
CUFF OVERPRESSURE	Cuff pressure exceeds the preset trip point (330mmHg).	Cuff vents and remains vented. Cycle power to reset this condition The alarm tone sounds for 5 seconds.
RETRY	Measurement cycle too long or no pulsations detected.	Unit begins a retry measurement after venting the cuff for 5 seconds.
UNABLE TO MEASURE	Unit cannot successfully complete the NIBP measurement after four attempts.	Alarm tone sounds for five seconds. Correct problem.

B. Monitor Operation Messages

The following messages pertain to the operation of the monitor.

Message	Reason	Response
LOW BATTERY	Battery requires recharging.	Recharge/Replace battery. See Section 4.3 in the Operating Instructions.
INTERNAL TEST IN PROGRESS	Self test is being performed.	Wait for completion of self-test. See Section 1.3.2.
RAM TEST FAILED	Message appears unti unit is turned off. Self test was not successful.	Power cycle unit.
ROM TEST FAILED	Message appears until unit is turned off. Self test was not successful.	Power cycle unit.

CHKSUM FAIL	Message appears until unit is turned off. Self test was not successful.	Power cycle unit.
OFFSET FAIL	Message appears until unit is turned off. Self test was not successful.	Power cycle unit.
PRINTER FAILURE	Message indicates a problem with the recorder mechanism.	Message remains until the situation is corrected.
ERROR ON DSB	Message indicates a collision or data error on the Datascope Serial Bus.	Message remains until a successful transmission.
ERROR ON RS232	Message indicates a collision or data error on the RS232C Bus.	Message remains until a successful transmission.

C. SaO_2 Messages

The following messages pertain to SaO_2 Operation.

Message	Reason	Response
NO SENSOR	Sensor not connected to ACCUTORR.	Connect sensor if desired.
SENSOR OFF	Sensor not connected to patient.	Connect sensor to patient.
INTERFERENCE	Patient motion.	Wait for motion to end.
PULSE SEARCH	ACCUTORR establishing patient pulse level.	Wait or reposition sensor.
WEAK PULSE	Low patient pulse amplitude.	Check patient.
NO PULSE	Patient pulse not detected.	Check patient.
PR UNDER 30	Pulse rate below operating limits.	
PR OVER 250	Pulse rate above operating limits.	
SAO2 UNCAL	SaO_2 value below specified accuracy.	
CHECK SENSOR	Sensor incorrectly applied. Defective sensor.	Check sensor site.
FILTER FAIL	System self test was unsuccessful.	Power cycle unit.

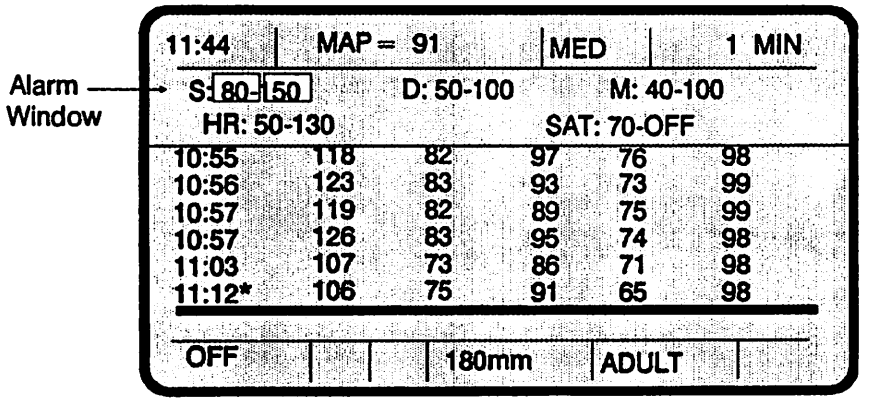
1.3.4.9 Alarms and Indicators

The Datascope ACCUTORR provides high and low alarm limits for systolic pressure, diastolic pressure, mean pressure, heart rate, and SaO_2*.

A. Setting Alarm Limits

1. Press ALARMS SELECT (27) to activate the ALARM SET MODE and to choose a desired alarm parameter. The alarm limits for each parameter are displayed in a window superimposed on the trend display. Continue to press ALARMS SELECT (27) to cycle through the available alarm parameters. Thirty seconds is allowed to begin setting the alarm limits once you are in the ALARM SET MODE.

NOTE: Pressing and holding the ALARMS SELECT key for 3 seconds will cancel all of the alarm limits. All limits will be set to OFF except for SaO_2 Low, which will be set to 85.



2. Press HI (26) until the desired numerical value for the high alarm limit displays. See Section 1.3.4.8, B, Alarm Limits, for the available high alarm limits.

3. Press LO (28) until the desired numerical value for the low alarm limit displays. See Section 1.3.4.8, B, Alarm Limits, for the available low alarm limits.

4. Press VOLUME (25) until the desired alarm tone level for systolic pressure, diastolic pressure, mean pressure, and heart rate is achieved (low, medium, or high).

The OFF selection may be disabled or activated in the User Configuration Mode, see section 1.3.4.12. If the alarm OFF selection is activated, a rectangular marker will appear in the upper left corner of the VOLUME window. If the alarm OFF is disabled, then no marker will appear.

5. If you are using an ACCUTORR 3 SAT or an ACCUTORR 4 SAT, press BEEP VOLUME (6) until the desired alarm tone level for SaO_2 is achieved (low, etc...).

6. If desired, press MUTE (5) to silence the alarm tone for the current NIBP measurement. The SaO_2 alarm tone will be muted for two minutes.

Notes: 1. An NIBP measurement can be taken while setting the alarm limits. 2. You can not set the alarm limits while printing data. 3. All alarms disable while being set.

* if equipped

B. Alarm Limits

The following chart defines the alarm limits for systolic pressure, diastolic pressure, mean pressure, heart rate, and SaO_2.

ALARM PARAMETERS				
	HIGH		LO	
	Adult/Child	Neonate	Adult/Child	Neonate
Systolic (mmHg)	Off, 130-240	Off, 40-130	Off, 40-120	Off, 20-90
Diastolic(mmHg)	Off, 40-130	Off, 30-100	Off, 20-90	Off, 30-100
Mean (mmHg)	Off, 80-140	Off, 30-100	Off, 30-90	Off, 30-100
Rate (BPM)	Off, 100-240	Off,100-250	Off, 30-80	Off, 30-80
SaO_2 (%)	Off, 80-100	Off, 80-100	50-95	50-95

All NIBP settings are in increments of 5mmHg. HI SaO_2 increments in steps of 1%. LO SaO_2 increments in steps of 5% from 50-85%, and in steps of 1% from 86-95%.

C. Alarm Violations

An alarm violation occurs when the systolic pressure, diastolic pressure, mean pressure, heart rate, or SaO_2 values equal or exceed their set limits.

The following occurs with a recognized alarm condition:

- The LEDs of the related parameter(s) begin to flash.
- A steady alarm tone sounds at the currently selected alarm volume level.

The alarm message window appears superimposed over the trend display area on the LCD, with the violated alarm limits flashing in reverse graphics.

The tone continues until:

- The alarm violation no longer exists.
- The Alarm Limits Are Changed (if alarm limit is set outside alarming range).
- The MUTE key (5) is pressed. (Alarms are muted until the next NIBP measurement or for two minutes for SaO_2 alarm violations.) Pressing the MUTE key twice within 3 seconds will mute all alarms for 2 minutes.

Additional SaO_2 Alarms:

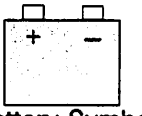
Fifteen seconds after one of these messages appears,

- SENSOR OFF
- NO PULSE
- CHECK SENSOR

An alarm of 3 short beeps will sound for 5 seconds.

D. Battery Indicators

When a battery is installed in the unit a battery symbol will display.



Battery Symbol

When the battery charge is low the following will occur:

- A LOW BATTERY advisory message will appear on the display.
- An audio alarm consisting of a short low tone followed by a long low tone will be sounded once per minute.
- The recorder will be inactive while the pump motor is running.

NOTE: When a battery is installed, the battery symbol and the LOW BATTERY message display even while the unit is running from AC power.

1.3.4.10 Trend

The Datascope ACCUTORR can display and provide a permanent record* of trended NIBP data, heart rate data, and SaO_2* data.

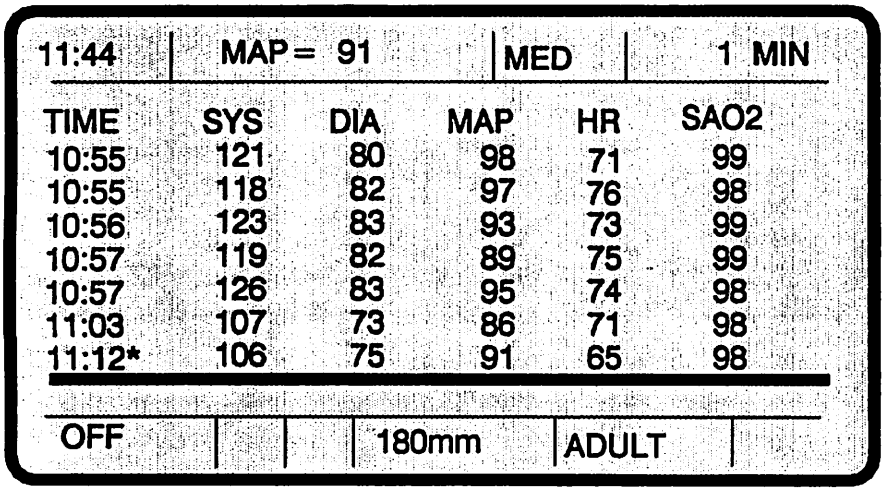
The data can be presented on the LCD in one of three ways: a numerical list of trended NIBP, heart rate, SaO_2* data; a graphic display of trended NIBP and heart rate data; and a graphic display of trended SaO_2 and heart rate data.

With power on, data from each available parameter automatically accumulates. Data is taken once every measurement.

A. Operation of Trend

1. Numerical Trend List

Data trended for NIBP, heart rate, and SaO_2* can be presented in a numerical list. The list consists of the time of each measurement, and values for Systolic, Diastolic, Mean, HR, and SaO_2.



a. Press SELECT (20) until the desired trend screen displays on the LCD.

b. Press PAGE UP (18) to proceed through the display of data (seven lines at a time).

c. Press PAGE DOWN (17) to go back through the display of data (seven lines at a time). The display will automatically return to the "page" that displays the current time when a new measurement is entered.

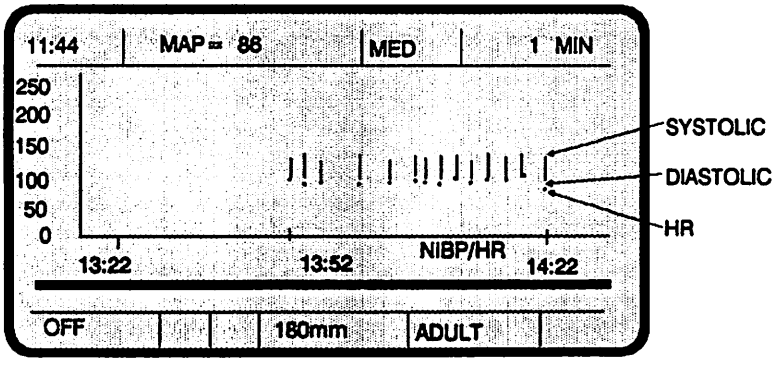
NOTE: An * is placed next to the time of the most recent measurement. Readings that have violated alarm limits are displayed in reverse graphics.

NOTE: Pressing TREND SELECT before a screen has been fully updated will cancel the screen redraw and begin drawing the next trend screen.

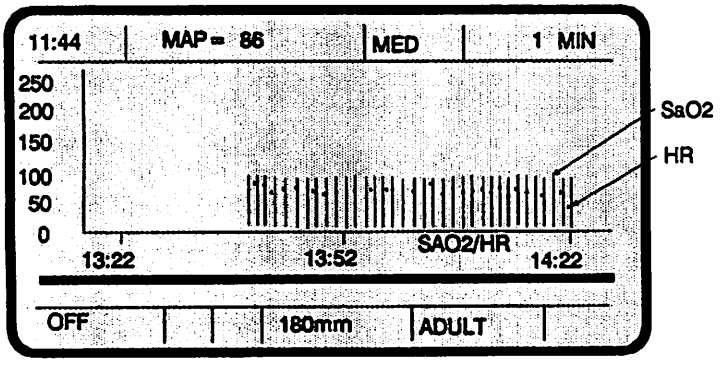
* if equipped

2. Graphic Trend

Data trended for NIBP, heart rate, and SaO_2 can also be presented in graphic form. There are two types of graphic displays - NIPB/Heart Rate and SaO_2/Heart Rate.



NIBP TREND GRAPHIC



SaO2 TREND GRAPHIC

a. Press SELECT (20) until the desired trend screen displays on the LCD.

b. Press DURATION (16) until the desired trend time scale displays. Trended data can be displayed on a 1-, 2-, 4-, 8-, 12-, or 24-hr. time scale.

Note: Between graphic trend updates a line appears to the right of the current time representing the accumulating average.

c. Press PAGE UP (18) or PAGE DOWN (17) to shift the horizontal scale.

Note that Heart Rate is on a scale of 0-250.

Note: If SELECT is set for the Graphics Trend display, pressing RECORD (11) will cause the trend picture to be printed.

In the examples above the trend duration is one hour. The current time is 14:22. Note that new data enters from the right and displaces older data to the left. When the trend duration is changed, the right-hand time is held constant, but depending on the scale setting, data is either displaced to the left or pulled in from the left.

The data update rate varies with the duration that has been selected. (37.5 seconds for the one hour mode and up to 15 minutes for the 24 hour mode.) Each point on the graph represents the average data sample over a period of time as shown below:

Duration	Time Slice (2 pixels wide)
1 hr	37.5 sec
2 hr	1.25 min
4 hr	2.5 min
8 hr	5 min
12 hr	7.5 min
24 hr	15 min

B. Clearing Trend

1. Press and hold DURATION (16) for three seconds.

The LCD advisory message reads, TREND CLEARED. (This message supercedes any other message.) The alarm tone sounds at the high volume for three seconds.

2. The monitor automatically returns to a normal operational state once the trend memory is cleared and the alarm tone stops.

NOTE: Clear trend after each patient.

1.3.4.11 Printer

The DATASCOPE ACCUTORR 3 and the ACCUTORR 3 SAT provide a permanent record of a patient's: systolic pressures, diastolic pressures, mean pressures, heart rates, and SaO_2.*

A. Operation of Printer in the NIBP Trend List Mode.

1. If necessary, press PAPER FEED (15) to advance the paper in the printer.

2. Press RECORD (11) to enter into a continuous list recording mode. The entire trend list is printed. Subsequent measurements are also recorded. The LCD display shows the status of the recorder, CON for continuous and blank for standby.

3. Press RECORD a second time to stop the recording feature.

B. Operation of Printer in the Graphic Trend or SaO_2 Waveform Mode

1. If necessasry, press PAPER FEED (15) to advance the paper in the printer.

2. Press RECORD (11) to produce a permanent record of the graphic display on the LCD trend area. The LCD graphic display is frozen until the recording is completed.

3. Press RECORD at any time during printing to abort the process of printing.

NOTE: When tearing off recording, tear at an angle to avoid pulling out excess paper.

See Section 4.4, in the Operating Instructions, for Paper Replacement instructions.

* if equipped

1.3.4.12 User-Configuration

To enter into the user configuration mode:

1. Press PAGE DOWN (17), or PAGE UP (18), or both while turning the power on.

The unit will display the following menu:

USER CONFIGURATION

CLOCK SET MODE
RESTRICT PATIENT SIZE
RS232C
ALARM ON/OFF
FACTORY SETTINGS
PRESSURE CALIBRATION
EXIT USER CONFIGURATION MODE

One of the menu items will be displayed in reverse graphics. The reverse graphics is known as the "cursor". The cursor may be moved up or down by pressing PAGE UP (18) or PAGE DOWN (17). When the cursor is at the desired menu option, press TREND SELECT (20) to enter into that function. The function of each menu item is described in the following sections.

A. CLOCK SET MODE

When the clock set mode is selected, the current date and time (Eastern Standard Time, 24 hour format) is displayed on the LCD panel. The format of the display is as follows:

CLOCK SET MODE
DATE xx/xx/xx (m/d/y)
TIME xx:xx

The cursor is initially on the month. Pressing the START key moves the cursor to the next parameter, which is the day, then the year, hours, and minutes. Pressing the PAGE UP (18) or PAGE DOWN (17) key changes each parameter to the desired setting. To exit the clock set mode press the TREND SELECT (20) key. Pressing TREND SELECT enters the time that is displayed on the LCD panel. TREND SELECT may be pressed at any time during the clock set mode.

B. RESTRICT PATIENT SIZE

When this menu option is selected the current setting for the patient size will be displayed on the LCD panel. There are three possible settings for the patient size: "adult mode only", "adult or neonate available", or "neonate mode only". Press the START (23) key until the desired setting is displayed. Then press the HOLD (19) key to enter the displayed setting and exit the RESTRICT PATIENT SIZE mode.

C. RS232C

When this menu option is selected the current setting for the RS232C serial channel baud rate will be displayed on the LCD panel. There are seven available settings for the baud rate: 300, 600, 900, 1200, 2400, 4800, and 9600. Press the START key (23) until the desired setting is displayed. Then press the HOLD key (19) to enter the displayed setting and exit the RS232C mode.

D. ALARM ON/OFF

When this menu option is selected the current setting for the ALARM ON/OFF will be displayed on the LCD panel. The two available settings are "allow ALARM OFF MODE", or "eliminate ALARM OFF MODE". When the "eliminate ALARM OFF MODE" is selected, the alarm volume can not be set to off. Press the START key (23) until the desired setting is displayed. Then press the HOLD key (19) to enter the displayed setting and exit the ALARM ON/OFF mode.

E. FACTORY SETTINGS

Selecting this menu option returns the user configuration parameters to their factory settings. The factory settings are displayed for 15 seconds and are as follows:

VIEW ANGLE	OEOh
PATIENT SIZE	adult or neonate available (adult mode selected)
RS232C	9600 baud
ALARM ON/OFF	allow alarm off setting
ALARM VOLUME	medium
ALARM LIMITS	all OFF, except for SaO_2 LO which is set to 85

F. PRESSURE CALIBRATION

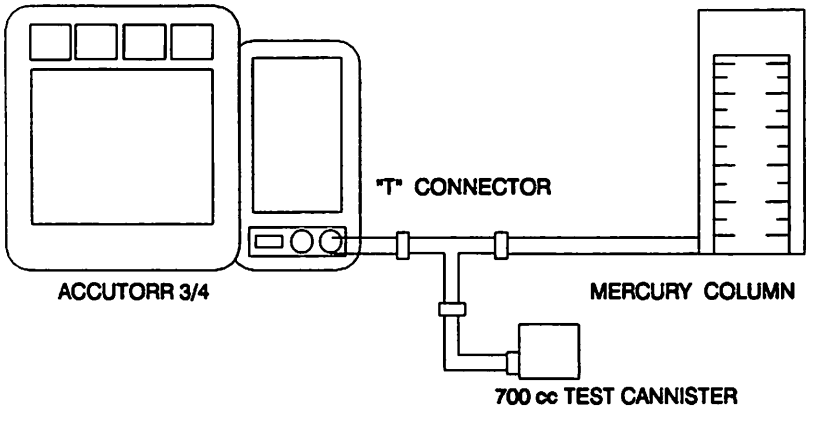
The pressure calibration test mode is entered into for the purpose of adjusting the sensitivity of the transducer circuit for optimal accuracy and for checking the linearity at three separate points.

1. When the PRESSURE CALIBRATION TEST option is selected, the menu for the pressure calibration options will be displayed on the LCD panel as follows:

PRESSURE CALIBRATION MODES

LOW RANGE CALIBRATION MODE
MID RANGE CALIBRATION MODE
HI RANGE CALIBRATION MODE
QUIT

2. Connect the 700cc test chamber and manometer as shown in the figure below. (If a test chamber is not available, an adult cuff wrapped around a towel may be substituted for the Pressure Calibration Test.)



The cursor may be moved by pressing the arrow keys.

When the cursor is at the desired menu option, press TREND SELECT to perform that function. Selecting QUIT exits the pressure calibration mode.

3. Select LOW, MID, or HI range calibration to inflate the cuff (or calibration canister) to approximately 50mmHg (for LOW), 100mmHg (for MID), or 250mmHg (for HI).

During this time the pressure will be displayed in the MEAN window and the message "PRESS HOLD TO VENT CUFF" will display on the LCD panel. After the desired target pressure is reached, the pump will turn off and the pressure will be held until the user presses the HOLD key. Then the pressure will be released and another calibration may be performed after the pressure drops to 0mmHg.

5. Compare the MEAN display on the ACCUTORR with the reading on the manometer. The calibration tolerance as follows:

+/- 3mmHg for LOW RANGE
+/- 3mmHg for MID RANGE
+/- 4mmHg for HI RANGE

NOTE: If the unit is out of calibration, see Calibration Section 4.

G. EXIT USER CONFIGURATION MODE

When this menu option is selected the unit performs the internal power-up tests and returns to the normal operation mode.

1.3.4.13 Interfacing

The ACCUTORR may be connected to other equipment via the Datascope Serial Bus or via an RS232-C port.

A . DATASCOPE INTERFACE CONNECTOR*

This connector is for attachment to the Datascope Serial Bus. Pins 9, 12, 21, and 24 are used as defined below. All other pins are open circuit.

PIN #	Description	Signal Level
9	Transmit/Receive Serial Data Open Collector TTL Compatible	0-5V
12	Cable Shield/Chassis Ground	0V
21	Serial Data Ground (digital Ground)	0V
24	Ground (analog)	0V

NOTE: The maximum non-destructive voltage which may be applied to the Datascope Interface connector is +/-12 volts.

B. RS232 CONNECTOR*

This is an RS232-C port which can be connected to an external, compatible computer. Pins 1, 2, 3, 4, 5, 7, and 25 are connected per standard RS232 definitions as defined below. All other pins are open circuit.

PIN #	Description	Signal Level
1	GND Chassis Ground/Cable Shield	0V
2	TXD Transmit Data	RS232C
3	RXD Receive Data	RS232C
4	RTS Request to Send	RS232C
5	CTS Clear to Send	RS232C
7	SGND Signal Ground	0V
25	AGND Analog Ground	0V

NOTE: The maximum non-destructive voltage which may be applied to the RS232C connector is +/-25 volts.

* Before using the communication connectors, contact authorized service personnel for assistance.

1.4 Theory of Operation

The "Detailed Circuit Description", Section 1.4.2, provides information regarding circuit operation. This text is included to assist service personnel while repairing printed circuit boards to a component level. Refer to the schematic diagrams, in Chapter 2, when reading the "Detailed Circuit Descriptions".

1.4.1 Block Diagram

The Block Diagram indicates the internal organization of the instrument. It depicts several circuit boards, numerous connectors, and a liquid crystal display (LCD). The Block Diagram is used to gain familiarity with the instrument and to locate malfunctioning PC Boards. To avoid clutter, the number of PC Board interconnects is minimized. The interconnects shown represent major or essential signal flow and clock connections. Power Supply connections for each board are also shown.

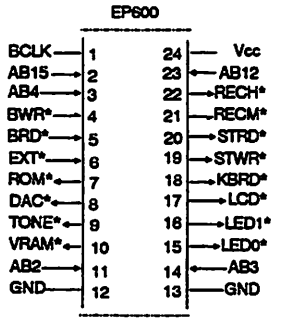
1.4.2 Detailed Circuit Descriptions

This section of the manual described the operation of each circuit board assembly. Refer to the schematic diagrams in Chapter 2.

Included are description for the following circuit board assemblies.

Decoder

U8, a EP600 EPLD, is used to generate all the decoding for the peripherals on the interface board. Processor address bits AB2,3,4,12, and 15, BRD*, BWR*, and the group decoding signal, EXT*, are the inputs. Outputs are the strobes to the LED and LCD controller, the status and control registers, the keyboard register, the recorder registers, the tone register, the quad DAC, the ROM cartridge (Datasette), and the video RAM.



INPUTS

Name	Pin	
BCLK	1	;active high, register clock
AB15	2	;active high, 80C196 processor address bit 15
AB4	3	;active high, 80C196 processor address bit 4
BWR*	4	;active low, 80C196 processor write signal
BRD*	5	;active low, 80C196 processor read signal
EXT*	6	;active low, group decode for peripherals
AB2	11	;active high, 80C196 processor address bit 2
AB3	14	;active high, 80C196 processor address bit 3
AB12	23	;active high, 80C196 processor address bit 12

OUTPUTS

Name	Pin	
ROM*	7	;active high, Datasette enable
DAC*	8	;active high, quad-DAC enable
TONE*	9	;active low, tone generator enable
VRAM*	10	;active low, video RAM enable
LED0*	15	;active low, LED group 0 enable
LED1*	16	;active low, LED group 1 enable
LCD*	17	;active low, LCD enable
KBRD*	18	;active low, keyboard read enable
STWR*	19	;active low, control register write enable
STRD*	20	;active low, status register read enable
RECM*	21	;active low, recorder motor enable
RECH*	22	;active low, recorder head enable

FIGURE 1-1 U8 Interface Board: PERDEC: Peripheral Decoder

LED Controller

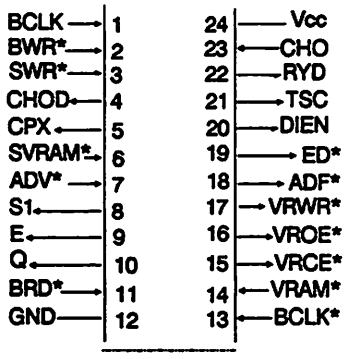
U1 and U2 are two 7218 LED controllers, each capable of controlling eight seven segment LED's. U1 controls group A, which includes the three digit systolic and three digit mean/SaO2 LED's. U2 controls group B, which includes the three digit diastolic and three digit rate LED's. The outputs of U1 and U2 are connected to J18, which goes to the LED's on the LED board directly.

Group A	Digit 8 - Systolic Hundreds	Group B	Digit 8 - Diastolic Hundreds
	Digit 7 - Systolic Tens		Digit 7 - Diastolic Tens
	Digit 6 - Systolic Digits		Digit 6 - Diastolic Digits
	Digit 5 - Mean/SaO2 Hundreds		Digit 5 - Rate Hundreds
	Digit 4 - Mean/SaO2 Tens		Digit 4 - Rate Tens
	Digit 3 - Mean/SaO2 Digits		Digit 3 - Rate Digits

LCD Controller

U14, MSM6255, is a LCD controller that generates all the timing signals for the LCD (128x240 pixels). These include: FR, the frame signal to the LCD that is active once every frame of the display; LO, the line signal to the LCD that is active once every scan line of the display; DF, the alternate frame signal needed to drive the LCD; and CP, the clock to the LCD. It also takes data from the video RAM, U13, and shifts it out to the LCD four bits at a time via UD0, UD1, UD2, and UD3. The video RAM is implemented by a 32K by 8 static RAM as a triple-ported RAM. It is being transparently shared by the main control processor in the NIBP module, a 80C196, the LCD controller itself, and the supplemental SaO2 processor, U16, a 63B09E. Since the LCD screen only requires 4K of RAM. The rest is used by the 68B09E for its program and data storage. Program for the 68B09E is directly loaded by the main control processor. Communication between the main control processor and the SaO2 processor is also done via the triple ported RAM. This architecture allows efficient access between the two processors. It also allows each processor to access the display memory independently and without interference to the display process.

The multiplexing of the addresses between the three possible sources for the triple-ported RAM is done via the LCD controller. The multiplexing of the data buses is done by U15, a 74HCT245, and U12, an EP600 EPLD. U12 is implemented as a bidirectional registered transceiver. The LCD controller timing is generated by U7, another EP600 EPLD.



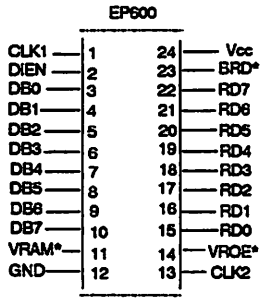
INPUTS

Name	Pin	
BCLK	1	;positive trigger, 5.5296MHz clock from 80196 processor
BWR*	2	;active low, 80196 write signal
SWR*	3	;active low, 6809 write signal
SRAM*	6	;active low, 6809 RAM decode enable
ADV*	7	;active low, 80196 address strobe
BRD*	11	;active low, 80196 read signal
BCLK	13	;positive trigger, inverse of BCLK
VRAM*	14	;active low, 80196 video RAM enable
CHO	23	;active high, character clock strobe from LCD controller

OUTPUTS

Name	Pin	
CHOD	4	;active high, delayed CHOD, not used
CPX	5	;active high, analog clock, not used
S1	8	;active high, clock to LCD controller
E	9	;active high, E clock to 6809
Q	10	;active high, Q clock to 6809
VRCE*	15	;active low, video RAM chip enable
VROE*	16	;active low, video RAM output enable
VRWR*	17	;active low, video RAM write signal
ADF*	18	;active low, address floating to LCD, not used
ED*	19	;active low, E delayed, not used
DIEN	20	;active high, display enable to LCD controller
TSC	21	;active high, tri-state control to 6809
RDY	22	;active high, ready signal to 80196

FIGURE 1-2 U7 Interface Board: LCDCON: LCD Controller



INPUTS

Name	Pin	
CLK1	1	;positive trigger, DB register clock
DIEN	2	;active high, display enable
VRAM*	11	;active low, video RAM chip select
CLK2	13	;positive tirgger, RB register clock
VROE*	14	;active low, video RAM output enable
BRD*	23	;active low, processor read signal

BIDIRECTIONAL INPUT/OUTPUTS

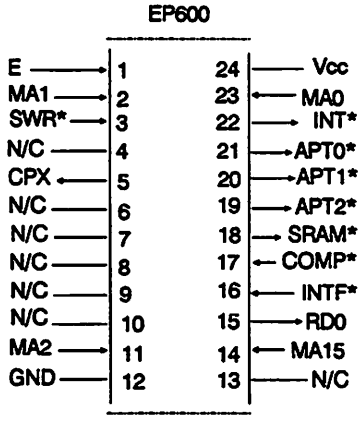
Name	Pin	
DB0	3	;active high, 80C186 processor data bus bit 0
DB1	4	;active high, 80C186 processor data bus bit 1
DB2	5	;active high, 80C186 processor data bus bit 2
DB3	6	;active high, 80C186 processor data bus bit 3
DB4	7	;active high, 80C186 processor data bus bit 4
DB5	8	;active high, 80C186 processor data bus bit 5
DB6	9	;active high, 80C186 processor data bus bit 6
DB7	10	;active high, 80C186 processor data bus bit 7
DB0	15	;active high, video RAM data bus bit 0
DB0	16	;active high, video RAM data bus bit 1
DB0	17	;active high, video RAM data bus bit 2
DB0	18	;active high, video RAM data bus bit 3
DB0	19	;active high, video RAM data bus bit 4
DB0	20	;active high, video RAM data bus bit 5
DB0	21	;active high, video RAM data bus bit 6
DB0	22	;active high, video RAM data bus bit 7

FIGURE 1-3 U12 Interface Board: BUSCON: Bus Controller

SaO2 Processor

The 63B09E, U16, is running at 1.3824MHz. The E and Q clocks to the 63B09E (at 1.382MHz) are generated by dividing by 4 the 5.5296MHz system clock of the 80C196 processor (divide by 2 from the 11.0592MHz crystal). The program and data memory for the 63B09E is the same video memory used by the LCD controller. The memory is shared by using the TSC (tri-state control) signal of the 63B09E. Thus the 63B09E address and data buses are used only half the time for the processor itself, without affecting the operation of the processor.

The decoding for the 63B09E processor is performed by U6, an EP600 EPLD. RAM occupies the top 32K byte (32K-64K) of the address space. The bottom 4K of this 32K bytes of RAM (32K-36K) is allocated as LCD video memory. This 32K RAM is accessed by the main control processor as eight pages of 4K memory. The paging is controlled by the three page bits in the control register, PG0, 1, and 2. For example, PG2,1,0 = 000 accesses the video memory (32K-36K); PG2,1,0 = 111 accesses the highest 4K bytes in the 63B09E address space (60K-64K).



INPUTS

Name	Pin	
E	1	;positive trigger, E clock to be divided down
MA1	2	;active high, 6809 address bus bit 1
SWR*	3	;active low, 6809 write signal
MA2	11	;active high, 6809 address bus bit 2
MA15	14	;active high, 6809 address bus bit 15
INTF*	16	;active low, interference input from analog board
COMP*	17	;active low, comparator input from analog board
MA0	23	;active high, 6809 address but bit 0

OUTPUTS

Name	Pin	
CPX	5	;clock signal to analog board (E divide by 22)
RD0	15	;active high, 6809 data bus bit 0
SRAM*	18	;active low, group decode for 6809 RAM
APT2*	19	;active low, analog board strobe 2
APT1*	20	;active low, analog board strobe 1
APT0*	21	;active low, analog board strobe 0
INT*	22	;active low, interrupt signal to NIBP processor

FIGURE 1-4 U9 Interface Board: SaO_2: SaO_2 Decoder

Three strobes for the SaO2 analog board are generated, APT0, 1, and 2. These three strobes are used to clock data and control signals to the A/D system in the SaO2 analog board. Two input bits from the SaO2 analog board, INTF*, (active low when there is interference from the sensor) and COMP*, (the active low comparator output signal) can also be read via data bus bit 0, RD0. It also generates the 62.84 KHz to the SaO2 analog board by dividing the processor clock, E, by 22.

The 63B09E is interrupted at about a 250Hz rate at the NMI input by the recorder motor strobe signal, RECM*. (Note that the RECM* signal is activated every 250Hz regardless of whether the recorder is being accessed; when the recorder is idle, a zero is written into the recorder motor register). The 63B09E can also interrupt the main control processor by sending a strobe on the external interrupt line, INT*. The 63B09E is also halted whenever the PG3 signal is low, indicating that the main control processor is in the initialization ROM page, when program is to be loaded into the triple-ported RAM. The power-up condition is for the 63B09E to be in the halt condition.

The Status and Control Register

The control register, U4, contains the page selection bits to the triple-ported memory, PG0, 1, and 2; the ROM page selection bits, PG3 and 4; and the keyboard address strobe bits, KB0, 1 and 2. It is reset to zero on power-up. The ROM page is divided into 4 pages of 32K bytes each. PG4,3=00 indicates page 0; PG4,3=01 indicates page 3, etc. (See description of Datasette for allocation of these pages).

Only the lower four bits of the status register, U5, are implemented. This allows the main control processor to detect low battery condition, recorder option, recorder home position, and SaO2 option. The recorder option is activated whenever the recorder cable is connected to the motherboard (by grounding the REC* signal).

Control Register (U4)	Status Register (U5)
Bit 7, Q8 - Page bit 1	Bit 7
Bit 6, Q7 - Display Bit 2	Bit 6
Bit 5, Q6 - Display Bit 1	Bit 5
Bit 4, Q5 - Display Bit 0	Bit 4
Bit 3, Q4 - Page Bit 0	Bit 3
Bit 2, Q3 - Keyboard Scan Line 2	Bit 2 - 0 = Recorder is in Home Position
Bit 1, Q2 - Keyboard Scan Line 1	Bit 1 - 1 = Recorder Installed
Bit 0, Q1 - Keyboard Scan Line 0	Bit 0 - 0 = Low Battery Condition

The Keyboard Register

The keyboard scan matrix is organized as three rows of six keys. Whenever the corresponding keyboard address strobe bit is activated (active low), the state of one row of the keys can be read on the lower order six bits of the keyboard register, U3. The upper two bits of the keyboard register is connected to the four position dip switch, (only two positions are used). They are used to select the SaO_2 option and LCD type.

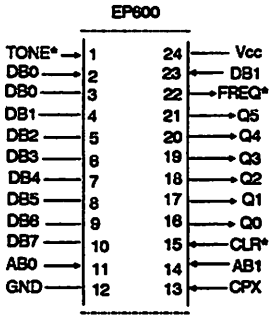
Bit 7 - 1 = SaO2 Installed, 0 = No SaO2
Bit 6 - 1 = LCD 1, 0 = LCD 2

The Recorder Registers

The recorder head and motor registers U8, controls the recorder thermal print head and the paper movement motors in the recorder. They are located on the recorder board (U6 and U5 respectively).

The Tone Register

The tone register, U9, is implemented with a EP600 EPLD. The 124 KHz clock, CPX, is divided down by a constant determined by a five bit constant that is being written into the lower order five bits of the tone register. The output of the frequency divider, FREQ*, is fed to the audio amplifier.



INPUTS

Name	Pin	
TONE*	1	;active low, tone register decode enable
DB0	2	;active high, 80196 data bus bit 0
DB1	23	;active high, 80196 data bus bit 1
AB0	11	;active high, 80196 address bus bit 0
AB1	14	;active high, 80196 address bus bit 1
CLR*	15	;active low, reset signal from 80196
CPX	13	;positive trigger, clock input

OUTPUTS

Name	Pin	
FREQ*	22	;active low, tone frequency output
Q5	21	;active high, divider output bit 5
Q4	20	;active high, divider output bit 4
Q3	19	;active high, divider output bit 3
Q2	18	;active high, divider output bit 2
Q1	17	;active high, divider output bit 1
Q0	16	;active high, divider output bit 0

BIDIRECTIONAL INPUT/OUTPUTS

Name	Pin	
DB0	3	;active high, 80C196 processor data bus bit 0
DB1	4	;active high, 80C196 processor data bus bit 1
DB2	5	;active high, 80C196 processor data bus bit 2
DB3	6	;active high, 80C196 processor data bus bit 3
DB4	7	;active high, 80C196 processor data bus bit 4
DB5	8	;active high, 80C196 processor data bus bit 5
DB6	9	;active high, 80C196 processor data bus bit 6
DB7	10	;active high, 80C196 processor data bus bit 7

FIGURE 1-5 U9 Interface Board: TONE: Tone Generator

The Datasette Connector

The Datasette connector, J12, is used to connect the 1 megabit EPROM on the Datasette to the main control processor. When the NIBP module is connected to the motherboard, the memory decoder in the module automatically disables the on board EPROM and let the external Datasette memory takes control. (This is done by grounding the PIB signal on the 50 pin NIBP cable.) In addition, the wait state generator and the quad dac decoding strobe, DAC*, on the interface board takes precedence over those generated in the module.

The 1 megabit EPROM on the Datasette is organized into four pages of 32K bytes ROM, controlled by the page bits PG3 and PG4. On power-up, page 0 is selected. Page 0 contains initialization and SaO2 code to be downloaded; page 1 contains service diagnostic and configuration code; page 2 and page 3 contains normal operating code the main control processor, the 80C196, operates in.

The LCD View-angle Adjust Circuit

The LCD viewing angle is adjusted by a an analog voltage, the VA signal, from -15V to +5V. This is generated by filtering the PWM0 output from the NIBP module to obtain an analog voltage. The filtering is done by a simple RC circuit, R3 and C18, with a time constant of 47ms. This voltage is then amplified and level shifted by U10A,C, to produce the proper signal levels.

The Audio Amplifier

The volume of the audio output is controlled by one channel of the quad DAC in the NIBP module (AOUT1 from channel D). The output of the quad DAC is chopped by the variable frequency generated by the tone generator via Q5, to produce the audio tone. This is then filtered and amplified by U11, LM386, to drive the speaker directly. A roughly 1KHz tone is generated for key clicks and alarms. Tones of varying frequencies are generated for SaO2 pulse beep (according to formula described in the tone generator).

The Battery Charger

The battery charger is of a switch mode design, which keeps power consumption low even when the input charge voltage fluctuates over a wide range. It takes the rectified and filtered power input from the power supply board, DC+ and generates the proper charging voltage, CHRG, to the battery. Whenever the power is plugged in and the AC power switch is on, the battery charger is in action.

Capacitors C31 and C32 form an input filter for the charger to provide a local high high-frequency source impedance and to attenuate noise which would feedback on the line. U31 provides a regulated +12V to run the battery charger control circuits.

The battery charger operates in the buck-mode with Q4 acting as the modulating switch; CR5 as the steering diode; and L1 and the battery itself as the output filter. Output current is sensed and amplified by R51 and differential amplifier U34.

U33 is the PWM controller IC which drives the FET through isolation transformer T1. U33 contains the error amplifier, the output voltage of which is fed back through variable attenuator R36 to R38. Comparator U32B switches the attenuator for a 15.1V or 14.2V output. The output of the attenuator and thus the input to the error amplifier is clamped by R63 and Cr7 to limit maximum charge current to 370mA.

U32B is initially set to the overcharge voltage level by comparator U32A's sensing of a battery terminal voltage of less than 12.5V. Once current has fallen below 60mA and U32B changes states, U32D is tripped, adding hysterisis to a level of 140mA to avoid oscillations. A 200 KHz timing ramp is created for the PWM controller by R39 and C38. This ramp is buffered by emitter follower Q1 and returned to the PWM controller as a reference ramp for the modulation. It is also an input to U32C, which generates a chop for the charge pump. The charge pump is implemented by Q2, Q3, C41, CR8, CR9, and C37. This charge pump generates a negative supply for U34.

The Recorder Head Register

U6 controls the eight vertical dots of the thermal print head directly through the print head drivers, U1 and U2, UDN2543. The software is responsible for turning the print head on and off at about 250 Hz.

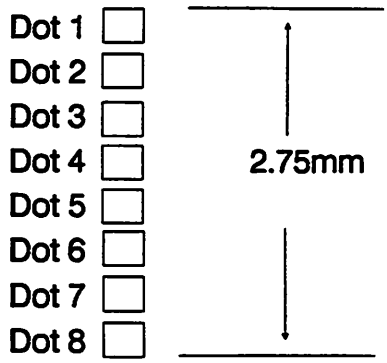


FIGURE 1-6 DOT PLACEMENT AND CHARACTER SIZE

The Recorder Motor Register

The most significant four bits of U5 controls the four control lines to the paper feed step motor in the recorder via motor driver U4, UDN2543. The least significant four bits of U5 controls the four control lines to the head feed step motor in the recorder via motor driver U3, a UDN2543. The four control lines to each motor are pulsed sequentially at about 250Hz to produce the desired stepping of the motors.

The Watchdog Timer

U7, a DS1232, is a watchdog timer that will clear both recorder registers if the recorder head register has not been strobed for about 150 msec. It also resets both registers on power-up. The maximum reset active time is about one second. A jumper JP1 allows the optional removal of the watchdog timer and using the system reset line, CLR*, to clear the recorder head and recorder motor registers. JP1 is normally open.

The Recorder

The recorder mechanism is a Seiko STP211-144 thermal recorder. The horizontal resolution is 144 pixels, which will generate 24 characters per line if a 5x7 character matrix is used. The home position switch will open when the recorder print head is in left most position, causing the HOME* signal to go high, (pull up resistor on interface board). The recorder runs at +5V that is filtered by LC circuit, L1 and C6.

Power Supply Board - 0670-00-0374

The power supply board uses a continuous mode flyback converter to generate +/- 15V, +12V, and +5V from a 10 to 34V input.

The AO 1,2 input is rectified by a bridge rectifier CR1 and filtered by C1, L1, C2, and C3. It is fused by F1 before it is switched by a power on-off switch off board. Power to the converter is selected between this AC source and the battery power by diodes CR2, 3, 13, and 14. CR2 and CR13 are used to select AC power; CR3 and CR14 are used to select battery power. CR13 and CR14 are used to select for the controller power; CR2 and CR3 are used to select for the converter power.

U1, an UC2843 PWM controller, is used to pulse width modulate the drive to a flyback transformer T1 via Q7, a FET. The switching frequency is about 250 KHz. A current transformer (T2) is used for current sense to the PWM controller. Power to run U1 and drive the FET is derived from a low dropout regulator implemented by Q3, a PNP transistor of type 2N6134. A low dropout regulator is necessary to provide power to the PWM controller (U1) under the lowest possible input voltage conditions, while insuring that power to U1 is limited.

Q4, a 2N3906 PNP transistor, is used to implement a saturated switch to gate the power to the PWM controller such that the load is cut off from the battery when the battery is discharged (10,25V +/-3%). On power-up, this pass element is pulsed on via a 0.47UP capacitor and Q5, used for current gain. Thereafter, a comparator U3D holds this pass element on as long as battery voltage is above cut off level. When battery voltage falls below the cutoff level, base current to Q4 is removed, the switch opens and only a 100K load (R21) remains on the battery.

A second comparator, U3C, senses an earlier warning of low battery condition (11.3V +/-3%). This comparator is disabled on line operation by CR16 by biasing its inverting input.

Instantaneous primary current in T1 is sensed by a comparator, U2B which fires a one-shot implemented by U2A, U2B, CR17, CR18, and C37. This in turn gates the PWM controller, which protects against transformer saturation in T1.

A soft start circuit is implemented by C41, R29, CR19, and CR20 to avoid output transients on both power up and recovery from short circuit cutoff.

The +/-15V supply is regulated by three terminal regulators, U5 and U6, to give better regulation on these supplies. The +5V is chosen for the main voltage feedback to give better voltage regulation on the +5V supply.

A filtered +5V by R41 and C43 is used to power the DC-AC inverter to provide better isolation from the regular +5V supply. Q1 and Q2 implements a switch to power an optional fan during line operation only. No fan is installed in the ACCUTORR 3/4. No fan is installed in the ACCUTORR 3/4.

NIBP Module: NIBP Pneumatic Board - 0670-00-0369 and Control Board - 0670-00-0375

OVERVIEW

The NIBP module consists of two boards interconnected by a 20 pin cable: the control board that contains most of the electronic circuitry ; and a pneumatic board that contains all the pneumatic parts.

THE CPU

The electronics are built around a 16 bit microcontroller (80C196). Built into the 80C196, in an 8-channel 10-bit A/D converter, five 8-bit I/O ports, pulse width modulators, high-speed inputs and outputs, an UART, a watchdog timer, and two 16-bit counter/timer

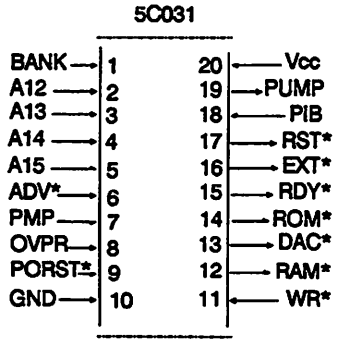
An 11.0592MHz crystal is connected to the on-chip oscillator of the 80C196. This frequency is chosen for accurate generation of standard baud rates (the on-chip UART has an integral baud rate generator). An RC circuit, R1 and C1, resets the 80C196 on power-up. The microcontroller can also be reset from an external, open-collector, active low reset signal from Pin 8 of connecter J28.

The non-maskable interrupt, NMI, of the 80C196 is used to detect the overpressure (OVPR) condition. A low to high transition on the OVPR signal will cause the microcontroller to sense the overpressure condition. The OVPR signal is also connected to the high speed input bit 1 of the microcontroller for it to verify the overpressure condition.

The BUSWIDTH input is tied low since the eight bit data bus mode is used for external memory access. The EA/ pin is tied low since external EPROM and static RAM are used for program and data memory.

ADDRESS DECODER

The 80C196 address decoding is controlled by an EP320 EPLD (U7). Two different decoding is possible, depending on the state of the signal PIB (OPT2). In the module mode, PIB is high. When the NIBP module is plugged into the ACCUTORR 3/4, PIB is pulled low, and a different set of decoding is activated.




```
INPUTS

Name    Pin
BANK*   1     ;active low, bank select (1->ROM;0->shadow RAM)
A12     2     ;active high, 80C196 address bit 12 (not used)
A13     3     ;active high, 80C196 address bit 13
A14     4     ;active high, 80C196 address bit 14
A15     5     ;active high, 80C196 address bit 15
ADV*    6     ;active low, 80C196 address strobe
PMP     7     ;active high, pump control input
OVPR    8     ;active high, overpressure signal
PORST*  9     ;active low, power-on reset
WR*     11    ;active low, 80196 write signal
PIB     18    ;active high, PIB mode (1->module;0->DSBP)

OUTPUTS

Name    Pin

RAM*    12    ;active low, RAM decode enable
DAC*    13    ;active low, DAC decode enable
ROM*    14    ;active low, local ROM decode enable
RDY     15    ;active high, ready signal to 80196
EXT*    16    ;active low, external peripherals decode enable
RST*    17    ;active low, reset signal to 80196
PUMP    19    ;active high, pump control output
```

FIGURE 1-7 U7 NIBP Control Board: DECODE4: Address Decoder

In the module mode, (module mode = DSBP module used in any product other than ACCUTORR 3/4) when the bank bit BANK, (U5 pin 33) is set high, the lower 32K bytes (0-32K) are mapped to the on-board EPROM; the next 8K bytes (32K-40K) are mapped to non-volatile RAM; the next 16K bytes (40K-56K) are not used; and the last 8K bytes (56K-64K) are mapped to I/O, the only I/O available being the quad DAC, U9.

When the bank bit is set low, the lower 8K bytes (0K-8K) are still mapped to the on-board EPROM; but the next 24K (8K-32K) bytes are mapped to non-volatile RAM; the remaining RAM and I/O space remain the same.

In the stand-alone mode, (stand-alone mode is when the DSBP module is used in the ACCUTORR 3/4) when the bank bit BANK is set high, the lower 32K bytes (0K-32K) are mapped to the off-board Datasette; the next 24K bytes (32K-56K) are mapped to non-volatile RAM; the last 8K bytes (56K-64K) are mapped to off-board peripherals.

When the bank bit is set low, the lower 8K bytes (0K-8K) are still mapped to the off-board EPROM; the next 24K bytes (8K-32K) are mapped to non-volatile RAM; the next 8K bytes (32K-40K) remains mapped to non-volatile RAM; the next 16K bytes (40K-56K) are not used; and the last 8K bytes (56K-64K) remains mapped to off-board peripherals.

The address decoder EPLD, U7 also disables the pump when the overpressure condition OVPR is set and buffers the reset signal to the 80C196 microcontroller.

THE PRESSURE AND PULSE CHANNEL AMPLIFIERS

The normal pressure transducer installed is a Sensym BP01. The output of the pressure transducer is amplified by an instrumental amplifier implemented by U13A, C, and D. The gain can be adjusted by trimpot VR1. The output is then buffered, low pass filtered and offset adjusted by U13B and sent to the 80C196 A/D channel 7 at the pressure signal. The offset is automatically corrected by adjusting the voltage level of OFFSET from the output channel 1 of the quad DAC U9. The gain of the amplifier is such that the output at U13 pin 7 is about 68.27mmHg/V.

The pulse channel signal is obtained by AC coupling and amplifying the pressure signal (U13B-7). The pulse channel output can be reset by activating the CLEAR signal. This signal can be activated when there is disturbance at the pulse output during pneumatic switch-overs or severe motion artifacts. There are two gain switches controlled by U8A and U8B, implementing four possible gain settings. The nominal gain settings for the pulse channel are about 28, 56, 111, or 222. The default gain for adult mode is 28 and the default gain for neonate mode is 111. The pulse signal is connected to the 80C196 A/D channel 5.

U11, U21B and U21C are not used at this time.

Reference voltages +5VR and -5VR are generating by amplifying a 2.5V reference generator U12 by a factor of 2 and -2 respectively.

The sampling rate of the 80C196 A/D is about 250 Hz.

PNEUMATIC AND MISCELLANEOUS CONTROL

The five MSB's of I/O port 1 of the 80C196 are used to control the air valves. All the valves are of the normally open type. In case of loss of power, the valves will open VALVE0 is the dump valve, which lets air out of the cuff when the measurement is complete. VALVE1, VALVE2, VALVE3, and an optional VALVE4 controls valves that have different orifice openings. They are used to control the bleed rate of the pressure in the cuff during a measurement. The valve control signals are buffered by U15, an ULN2003. U21D implements an optional linear valve driver that is driven by channel A of U9, the AD7226 quad DAC. It is currently not used.

The pump is controlled by a pulse width modulated output from bit 1 of the high speed out put section of the 80C196 (U5 pin 29). In adult mode, the pump runs at full speed; in neonate mode, the pump is pulse width modulated to moderate the pump speed. The pump signal is active high and the high speed outputs reset to a zero state. On power-up, the pump is turned off.

An overpressure switch will close when the pressure in the cuff is 300mmHg +/- 25mmHg. This will set the latch implemented by U17A and U17B which cause the OVPR signal to go high. This, in turn, will force VALVE 0 to open and the pump to stop. This condition can only be reset by resetting the entire module. This is done by power-cycling the unit.

THE SERIAL INTERFACE

The on-chip UART is used to implement an RS-232 interface. Bit 0 and 1 of port 2 is used as the UART transmitter output and receiver input respectively. Additionally, high speed input bit 3 is used as the CTS input and bit 7 of port 2 is used as the RTS output. The UART has an integral baud rate generator. Different values are written to the baud rate value register to generate different baud rates.

The signals from the UART are buffered by U4, a MAX232 RS-232 driver/ receiver. The nominal output voltage levels of the MAX232 is +/-9V.

THE DSB INTERFACE

The Datascope Bus Interface is implemented by a software UART using the high speed input and output section of the 80C196. High speed input bit 0 is used as the input; and high speed output bit 4 is used as the output. Q4 and associated components implements the proper bidirectional buffering to Pin 9 of the DSB connector J2.

PC Interface For The ACCUTORR

All characters received and sent are in standard ASCII format. There are no packets, checksums, etc. Other details of the RS232 interface are:

standard asynchronous mode
8 data bits
1 start bit
1 stop bit
no parity
baud rate selectable from the User Configuration Menu

At power up the following will be sent:

ACCUTORR PC Interface is ready
>

At this point the ACCUTORR will be available to accept a command. A command is executed by sending the ACCUTORR a single character when the "" prompt is present. There are three valid commands:

Command	Character	Notes
Show alarm limits	"L"	
Show patient information	"P"	
Prompt request	"^C"	Assures prompt available ^C = ASCII code 03

The ACCUTORR will respond to a command (except "^C") by displaying the command character, a colon then a sequence of 3 digit numbers separated by a comma. The last number will be followed by a carriage return and line feed. The number of 3 digit fields and the meaning of each field is dependent on the particular command. If a field is not in use, it will be represented by"--". An example would look exactly like this (all characters are printable):

P:--,85,120, 45, 80,000,010,000, 5

Command Responses:

The following is returned by the "Prompt request" command ("^C")

>

The following is returned by the "Show alarm limits" command ("L")

L:aaa,bbb,ccc,ddd,eee,fff,ggg,hhh,iii,jjj

The fields are as follows:

a: SaO2 high limit
b: SaO2 low limit
c: Pulse rate high limit
d: Pulse rate low limit
e: Systolic high limit
f: Systolic low limit
g: Mean blood pressure high limit
h: Mean blood pressure low limit
i: Diastolic high limit
j: Diastolic low limit

The following is returned by the "Show patient data" command ("P")

P:aaa,bbb,ccc,ddd,eee,fff,ggg,hhh,iii

The fields are as follows:

a: SaO2
b: Pulse rate
c: Systolic blood pressure
d: Mean blood pressure
e: Diastolic blood pressure
f: Status Byte 0 (see next page)
g: Status Byte 1 (see next page)
h: Status Byte 2 (see next page)
i: Elapsed time (minutes) since last NIBP measurement

The three status bytes are a binary sequence of flags. Each byte contains 8 bits numbered as follows: 7 6 5 4 3 2 1 0. The meaning of each bit in the status bytes is as shown below:

Status 0:
- Bit 0: SaO2 indicating NO SENSOR
- Bit 1: SaO2 indicating SENSOR OFF
- Bit 2: SaO2 indicating INTERFERENCE
- Bit 3: SaO2 indicating PULSE SEARCH
- Bit 4: SaO2 indicating PULSE LEVEL WEAK
- Bit 5: SaO2 indicating NO PULSE
- Bit 6: SaO2 indicating CHECK SENSOR SITE
- Bit 7: SaO2 indicating PULSE RATE UNDER 30 BPM

Status 1:
- Bit 0: SaO2 indicating PULSE RATE OVER 250 BPM
- Bit 1: SaO2 UNCALIBRATED
- Bit 2: SaO2 ALARM OVERLAPPED
- Bit 3: SaO2 RAM TEST FAILURE
- Bit 4: SaO2 ROM TEST FAILURE
- Bit 5: SaO2 OFFSET MISMATCH
- Bit 6: SaO2 FILTER MISMATCH
- Bit 7: SaO2 SYSTEM TEST IN PROGRESS

Status 2:
- Bit 0: NIBP indicating CUFF OVERPRESSURE
- Bit 1: NIBP indicating MOTION ARTIFACT
- Bit 2 thru 7: Not used

SaO_2 Analog Board - 0670-00-0327

The SaO2 analog board provides all the patient finger probe excitation and analog signal processing for measuring SaO2.

The operation of the analog board is controlled by the SaO2 microprocessor, U16 on the Interface Board, via input buffers (U15, U16, and U30) and latches (U17, U18, and U19). The signals IR0, IR1, Red 0, Red 1, and Run/Cal determine the operation of the Digital Sequencer Controller comprised of U23, U24, U25, and U26. The outputs of U25, S1 through S6, control the pre-amp (U1A) gain and synchronous demodulation of the detected patient finger probe signal.

The patient finger probe is driven alternatively by Q2 and Q3, which are controlled by the Digital Sequence Controller outputs IRDRV and REDDRV. Q1 provides a clean power supply voltage for the probe LED emitters.

The probe patient signal enters (J9-13, 14) the board as current pulses in the range of 0.25 to 40 uA. U1B provides filtering for noise above 15KHz. U1A acts as a current to voltage converter with gain switchable via U3. U2B is an integrator which maintains the output of U1B at an average DC voltage of zero. U2A acts as a comparator which will detect noise voltages larger than +/-6.5V in amplitude. This information is sent to (J1-32) the SaO2 microprocessor.

The pre-amp output red and infra-red signal is demodulated by U4, U5, U6, and U7. The resultant signals are filtered identically (U8, U9) and are alternately selected for further amplification via the U10 analog switch.

U11A provides voltage amplification of x1, x2, or x4. Its output is amplified by U11B, which uses the microprocessor controlled DAC (U20, U21) voltage to maintain the resultant signal in the amplifier linear region. U11B provides switchable gains of x5, x22, and x100. Its output is sampled by U13 for amplitude digitization via comparator U14, using the DAC voltage for comparison. The signal is sent to the Interface Board (J1-30).

Regulated power for the analog board is provided by U27 and U28. Reference voltages of -8V and +3.35V are generated by U29 and U22.

1.5 Specifications

SaO_2

	# of digits	Accuracy (%) Mean Difference	Measurement Range Adult	Neonate
SaO_2	3	70 to 100% < +/-2% SaO2 60 to 70% < +/-4% SaO2 <60%, unspecified	0 to 100	0 to 100 (%)

NIBP

	# of digits	Measurement Range Adult	Neonate
Systolic Pressure	3	50 to 235	30 to 200 (mmHg)
Diastolic Pressure	3	30 to 200	10 to 150 (mmHg)
Mean Pressure	3	70 to 220	20 to 170 (mmHg)
Heart Rate	3	30 to 220	30 to 250 (bpm)

Accuracy — Meets AAMI standard for automatic sphygmomanometers. (For all available size cuffs except the thigh cuff.)

Measurement Cycle: — Less than 30 seconds average at 72 bpm without motion artifact or arrhythmia. Cycle time is affected by arm size and wrapping technique, which determine cuff capacity.

Initial Cuff Inflation (Auto Mode)
- Adult/Pediatric: 180 +/-15 mmHg
- Neonate: 120 +/-15 mmHg

Cuff Pressure Range
- Adult/Pediatric: 0 to 270 mmHg
- Neonate: 0 to 230 mmHg

Maximum Cuff Pressure: (Adult Mode) — 330 mmHg (will not exceed 10 mmHg for longer than five minutes)

Hose Connections: — LUER-Lock Connecter.

LCD Display

Resolution:	128 vertical dots x 240 horizontal dots

Trend

The graphic trend memory stores up to 24 hours of NIBP and SaO2 data. The list trend memory stores up to 120 NIBP measurement cycles. Can be erased manually or automatically if turned off or left in the stand-by mode for one hour. Trend will also be erased when switching from ADULT to NEONATE or NEONATE to ADULT modes.

Printer

When equipped, provides a permanent record of:
- annotated and trended waveforms of systolic, diastolic, and mean blood pressure values and heart rate values
- annotated saturated oxygen values
- List Trend; Graphic Trend of NIBP/Heart Rate;
- Graphic Trend of SaO2/Heart Rate;
- Graphic display of frozen SaO_2 waveform

Chart Paper -	
Type:	Thermal
Width:	58 mm (2.28 in)
Length:	25 m (82 ft)
Roll Diameter	48 mm (1.89 in)
Printed Data -	
Format:	5 x 7 pixels
Character Size:	1.5 mm x 2.4 mm (.06 x .09 in)

Mechanical

Size:	9 3/4" H x 6 1/4" W x 13 3/4" D (vertical)

Weight:

ACCUTORR 3	13 lbs. 8 ozs. without battery
ACCUTORR 4	12 lbs. 4 ozs. without battery
ACCUTORR 3 SAT	14 lbs. 0 ozs. without battery
ACCUTORR 4 SAT	12 lbs. 12 ozs. without battery
Battery	1 lb 14 ozs.

Power Requirements

Voltage Input:	Models -10, -11, -12, -13; 108 to 132 VAC; 57-63 Hz 30 Watts typical Models -20, -21, -22, -23; 198 to 264 VAC; 47-57 Hz 30 Watts typical, 0.2A maximum

Environmental

Operating Temp:	10 to 40 degrees C
Operating Humidity:	90% max., non-condensing
Storage Temp:	-40 to 70 degrees C
Storage Humidity:	5 to 95%., non-condensing
Operating Altitude:	4000 feet below sea level to 8000 feet above sea level.

Battery

Type:	Sealed, lead-acid, 12V, 1.9Ah
Operating Time:	2 hrs. with timer interval set to 5 minutes; without SaO_2 1 hr. with timer interval set to 5 minutes; with SaO_2
Recharge Time:	16 hrs.

Agency Compliancies

This product is designed to comply with:

UL544 Underwriters Laboratory, Medical and Dental Equipment
Canadian Standards Association C-22.2, # 125-M1984
601.1 IEC, Standards for Safety of Medical Equipment
BS5724 BSI

This product meets or exceeds the accuracy requirements specified in:
Standard for Electronic or Automated Sphygmomanometers, AMMI, February 1987 revision Canadian Standard (proposed) for sphygmomanometers: Medical Device Regulation Amendment, Schedule IX, 5 Sept., 1987.

Fuses

Replace with IEC 127 type fuse rated T0.25; 250V only.

Replacement: Disconnect the line cord from unit. Open input module by placing a screwdriver into the slot and prying open. Remove fuse carriers and replace fuses.

Datascope Corp. maintains a policy of continual product improvement and reserves the right to change materials and specifications without notice.

2. REPAIR INFORMATION

2.1 Introduction

This chapter of the Service Manual provides the necessary technical information to perform repairs to the instrument. The most important prerequisites for effective troubleshooting are a thorough understanding of the instrument functions, as well as an understanding of the theory of operation. Therefore, if necessary, refer to the Operating Instructions (P/N 0070-00-0220) which describes the instrument functions and features, and refer to Chapter 1 of this manual which provides a theory of operation.

2.2 Safety Precautions

In the event that the instrument covers are removed, observe the following warnings and general guidelines.

A. Do not short component leads together.

B. The troubleshooting charts are not intended as a rapid course on how to repair devices of this type. Rather, they are intended as a guide for qualified technical personnel only. The instrument covers must not be removed by other than technically qualified personnel who have received supplementary instructions regarding maintenance of medical electronic equipment or have has equivalent experience in this area.

2.3 Troubleshooting Guidelines

In an instrument as complex as this, it is virtually impossible to list each and every potential problem and appropriate action. Any given problem, however, can be effectively identified through an understanding of the instrument features and the theory of operation. These are prerequisites for repair. If necessary, read the Operating Instructions Manual and study the theory of operation presented in Chapter 1 of this manual. The time spent reading and absorbing this information is generally realized by a reduction in repair time and, ultimately, in the overall experience of service personnel.

General Troubleshooting Guidelines

1. **IDENTIFY THE PROBLEM.** Due to the wide ranges of potential symptoms, certain problems may be more subtle than others. One approach to troubleshooting is to set-up the instrument for testing as described in Chapter 4 and attempt testing. If successful, there is a reasonable assurance that there is no problem. By contrast, the fact that a particular test is not successful is generally indicative of a failure in that specific area.

The cause of the symptom can now be further isolated by referring to Chapter 1. An examination to the Table of Contents (page 1-1) will reveal a listing of specific circuits or areas in the instrument, each of which is dedicated to provide a specific function. Once the operation of that circuit is understood, troubleshooting can be completed by making measurements in that circuit to determine which component(s) is at fault.

2. **AVOID SHORTING COMPONENT LEADS.** During repair procedure it can become tempting to make a series of quick measurements. Always turn off the power before connecting and disconnecting test leads and probes. The accidental shorting of component leads can easily over stress components, resulting in a second unnecessary failure (aside from creating a possible safety risk).

3. **USE THE PROPER EQUIPMENT.** This equipment listed in Section 2.4 is suggested to fulfill a wide range of troubleshooting requirements. Use a soldering iron the appropriate wattage for a given job. For example, use a pencil-type iron (25 watts max.) for repairs to printed wiring boards and a pistol-grip (75 watts) for repairs requiring this much power. Do not use the high powered iron to repair the printed wiring boards as the conductors will lift from the board under the extreme heat, thus ruining it.

4. **CLEAN THE REPAIR AREA.** After soldering operations, clean off the repaired area with alcohol and a stiff hair brush. This will remove residual solder flux, making the repaired area more visible for inspection and returning the instrument to its original, neat appearance. Removal of the flux will also facilitate making electrical measurements in the affected area as the flux itself is not conductive.

EXCHANGE PROGRAM

Datascope offers an exchange program for certain assemblies in the instrument. In many cases, replacement of the complete assembly will result in the most expedient repairs. See section 3.4 for details concerning the exchange program.

2.4 Equipment and Special Tools Required

Description	Specification
DVM	
Standard Mercury Column	0-300mmHg
Dummy Cuff (693)	0138-00-0001-01
Oscilloscope	
Safety Analyzer	Dempsey Model or equivalent
Finger Sensor Probe	ACCUSAT Compatable
Extender Boards:	
Interface Board	0670-00-0398
Power Supply and SaO2 Analog Board	0670-00-0399

2.5 Disassembly Instructions

The ACCUTORR 3/4 design consists of sub-assemblies, individual PC boards and a user-replaceable software cartridge.

The face plate has the ability to be oriented in one of two possible positions. When removing the face plate assembly be sure to note the position of the mounting bracket for later reassembly.

Before disassembling the unit, perform the following:

A. Power down the ACCUTORR and remove the power cable.

B. Disconnect all cables from the rear panel.

C. If the battery option is installed, disconnect and remove the battery.

D. Remove the Datasette cartridge from the back of the unit.

Note: The numbers in parentheses () refer to the isometric drawings.

1. Removal of the Top Cover (1)

a) Remove the two screws (29).

b) Pull the front panel (16) out and up away from the ACCUTORR while carefully removing the ribbon cables (14, 15).

c) Remove the five screws (33).

d) Slowly lift the top cover up and off of the ACCUTORR.

2. Disassembly of the LED Board (8) / LCD Display (5)

a) Disconnect the ribbon cables (14, 15) from the LED Board.

b) Remove the four screws (13) from the LED Board.

c) Disconnect the keypad flex-tape connector from the LED Board.

d) Disconnect the EL backlighting connector, P24, from the LED Board.

e) Carefully separate the LED Board from the LCD assembly by disconnecting J23.

f) Remove the LCD assembly by removing the four standoffs (12).

3. Removal of the Interface Board (18)

a) Disconnect the ribbon cable from the top of the SaO2 Analog Board (17).

b) Remove the NIBP Cuff HOse (98) at the filter (99) just inside the Pneumatics sub-assembly (45). Slide the hose through the plastic holder (55) attached to the battery box.

c) Grasp the Interface Board (18) at each corner and lift the board up and out.

4. Removal of the SaO2 Analog Board (17)

a) After completing the steps to remove the Interface Board (18), grasp the Analog Board at each corner and pull up and out of the unit.

5. Removal of the Power Supply Board (16)

a) Grasp the Power Supply Board at the upper corners and pull the board up and out of the unit.

6. Removal and Disassembly of the Pneumatics Sub-Assembly (45)

a) Disconnect the ribbon cable (112) from the Mother Board at J27.

b) Lift out the Pneumatics Sub-Assembly (45) and remove the ribbon cable (113) from the Mother Board at J4.

c) Once the Pneumatics Sub-Assembly is separated from the ACCUTORR, orient the assembly so the solder side of the NIBP Control Board (100) is facing up. Remove the four screws (102), one located at each corner.

d) To separate the NIBP Control Board (100) from the Pneumatic Assembly, remove the ribbon cable (108) from the NIBP Control Board at J31. Remove the pneumatic hose marked #7 from the Pneumatics Board.

7. Removal of the Pneumatics Board (107)

a) Remove the hose protruding from the pump housing (93) connected to the filter (99).

b) Remove the pump power cable protruding from the pump housing at J29.

c) Remove the two standoffs (106) from the Pneumatics Board.

d) Grab the Pneumatics Board from the open ends of the casing and pull up on the board. Once the board is released, lift the board up and out of the frame.

8. Removal of the Pump (114)

a) Remove the two screws (103) on the bottom of the Pneumatics Assembly frame (109).

b) Remove the two screws (101). Gently remove the pump housing cover (93) while allowing the hose and cable to slide through during removal.

c) Remove the pump assembly itself by removing the two screws (119).

9. Removal of the Battery Box (47)

a) Remove the battery back cover plate (48) from the back of the battery box by removing the two screws (49).

b) Remove the battery by sliding the battery out and disconnecting the positive and negative connectors.

c) Alternately remove the three nuts (56) and the three terminal lugs (35) from the ground lug post located on the front of the battery box nearest (55).

d) Remove the four screws (57) at the base of the battery box.

e) Remove the cable (54) from the Mother Board at J13.

f) Lift the battery box up and find where the three ground wires are connected to the bottom of the battery box. They are attached in the same fashion as step 9c. After the wires are detached, remove the battery from the bottom frame.

10. Removal and Disassembly of the Printer Assembly

a) To remove the printer and Printer Board from the paper holder, unscrew (do not remove) the two screws (79) attaching the metal frame to the paper holder and slide the assembly out and up.

b) Disconnect the ribbon cable (38) from J10 on the Mother Board. Remove the printer assembly from the ACCUTORR.

c) To remove the Printer Board, remove the flex cable attached to the printer head from the Printer Board by lifting up the two ends of the flex connector and pulling the flex cable up and out. Remove the two screws (78) holding the Printer Board to the frame.

d) To remove the printer from the frame, loosen the two black screws (77) towards the rear of the printer (do not remove them). Towards the front of the printer, remove the two screws (77) holding the front plate attached to the printer.

e) To remove the paper holder assembly, remove the four screws (39). Lift the assembly up and out of the ACCUTORR.

11. Removal of the Transformer

a) Remove the transformer cable from J14 on the Mother Board.

b) Remove the four screws (60) holding the transformer down.

c) Remove the five wires from the power supply connection. IMPORTANT - NOTE THEIR POSITIONS FOR REASSEMBLY!

d) Lift up and remove the transformer from the ACCUTORR.

12. Removal of the Mains AC Power Switch and Power Module

a) Remove the four wires from the mains ac power switch (65). *IMPORTANT - NOTE THEIR POSITIONS FOR REASSEMBLY!*

b) Gently pull out the mains ac power switch by depressing the two key locks on the top of the switch with a flat head screwdriver. Push the switch out (to access) then use the screwdriver to pry the switch out.

c) Before removing the power module, first perform steps 11c, 9f, and remove any connections to the ac mains power switch noting their locations for reassembly.

13. Removal of the Speaker (64)

a) Remove the cable from the Mother Board at J7.

b) Remove the two screws (62) from the speaker and gently lift the speaker holder (63) out, then remove the speaker.

14. Removal of the SaO2 Patient Cable

If a straight phillips head screwdriver is being used, the power transformer must be removed (step 11).

If a 90 degrees angular phillips head screwdriver is being used:

a) Remove the two screw (62) attaching the SaO2 patient connector and cable assembly (70) to the front frame and remove the assembly.

15. Removal of the ON/OFF Standby Switch (68)

a) Disconnect the On/Off Standby Switch cable (67) at J37 on the Mother Board.

b) Remove the two screws (69) holding the switch down. Before removing, place the switch in the on position then gently rock the switch out of the cut-out.

NOTE: When putting the switch back in place, make sure it is in the ON position. This will allow the switch to easily slide into the cut-out. Make sure that the switch is then returned to the OFF position.

16. Removal of the Mother Board (19)

a) Make sure all of the cables are disconnected from the Mother Board.

b) Remove the six screws (21) holding the board in place.

c) Lift up on the end opposite to the external cable ports and gently rock the board so that it can come free.

17. Removal of the Bedrail Brackets (27)

a) Make sure that the brackets are fully collapsed before proceeding.

b) Remove the screws (24).

c) Remove the cap locks (25) and the clip tension stops (26).

d) Remove the bedrail brackets.

18. Horizontal to Vertical Configuration, Front Panel

a) Remove the two screws (29).

b) Pull the front panel out and rotate 90 degrees counter-clockwise. Reinsert front panel.

c) Reinstall the two screws (29).

d) Remove the four feet (28) and four receptacle covers (3) and exchange their locations.

2.6 Assembly and Schematic Drawings

Schematic drawings and accompanying assembly drawings of printed circuit boards are provided in the remainder of this chapter.

The following is a list of the drawings and the corresponding drawing number (if available) and the page where it can be found.

Figure No.	Description	Datascope Part Number
26	Clip, Tension Stop	0344-00-0020
27	Bracket, Bedrail	0105-00-0066
28	Foot	0348-00-0136
29	Screw, #4-40 1/2" Pan Head	0212-10-0408
30	Fitting, Luer w/ Washer and Nut	0103-00-0223
31	Lug, Terminal	0210-06-0009
32	Wire, Ground 16 Ga.	0006-02-1654
33	Screw, #6-32 2 3/4" Pan Head	0212-02-0644
34	Post, Binding w/Nut	0124-00-0062
35	Ring, Terminal	0210-00-0113
36	Chassis, Bottom	0380-00-0147
37	Washer, Lock #8 Internal Tooth	0210-09-0008
38	Cable, Ribbon 20 Pin Printer (P10 to P25)	0012-00-0594
44	Screw, PLT-30 4B x 5/16	0213-09-0405
45	NIBP Module w/o Ribbon Cable	0997-00-0213-02
46	Printer w/ Printer Board mounted on plate w/o paper holder, w/items 75, 80, & 81	0997-00-0252
47	Can, Battery	0202-00-0081
48A	Door, Battery	0370-00-0010
48B	Door, Battery, modified for use with VISA	0370-00-0018
N/S	Cable, Telemetry Power, ACCUTORR to VISA	0012-00-0719
49	Screw, PEM PS10-44-40	0217-00-0001
50	Fuse, 5A	0159-22-5000
51	Nut, Hex #4-40	0220-06-0004
52	Clamp, Wire Tie Mount	0343-00-0058
53	Tie, Cable	0125-01-0001
54	Assembly, Battery Cable w/items 50, 52, 53	0012-00-0605
55	Clamp, Cable	0343-05-0002
56	Nut, Hex #8-32 w/Lockwasher	0220-06-0008
57	Screw, #6-32 516 Pan Head	0212-17-0605
58	Battery, 12V, 1.9AH	0997-00-0262
59	Block, Mounting - Battery Can	0391-00-0059
60	Screw, #8-32 2 1/4" Pan Head	0212-04-0836

Figure No.	Description	Datascope Part Number
61	Transformer	0120-00-0122
62	Screw, Pan Head (Black)	0213-09-0404
63	Plate, Mounting - Speaker	0406-00-0442
64	Speaker, w/P7	0012-00-0257-01
65	Switch, Mains	0261-00-0139-02
66	Assembly, Power Entry	0012-00-0543-02
67	Switch, Standby/On-Off w/P37	0012-00-0606
68	Button	0368-00-0075
69	Screw, #2 B 1/4" Pan Head	0213-09-0204
70	Cable Assembly, SaO2 w/P9	0012-00-0431-04
75	Head, Printer	0683-00-0296
76	Panel Dress, Printer	0380-00-0150
77	Screw, #2-56 x 3/16" PH BM Hd	0212-04-0203
78	Screw, #4-40 x 1/4" PH BM Hd	0212-04-0402
79	Screw, #4-40 x 1/4" Pan Head	0212-04-0404
80	Bracket, Printer	0406-00-0375
81	Printer Board	0670-00-0386
82	Bracket, Printer RH	0406-00-0474
83	Bracket, Printer LH	0406-00-0475
84	Chassis, Printer	0441-00-0031
85	Standoff, 1/4" x 2 5/16", Paper Roll	0361-06-0012
87	Ring, Retaining	0354-00-0024
88	Cable Assy, Printer Housing to Battery Case	0012-00-0698
89	Holder, Paper	0352-00-0035
90	Screw, #2-56 x 3/16 Pan Head	0212-04-0203
91	Door, Printer	0370-00-0008
92	Hinge Pin, Printer	0384-00-0013
93	Housing, Pump	0380-00-0139
94	Foam, Top	0349-00-0082-04
95	Foam, Sides	0349-00-0082-05

Figure No.	Description	Datascope Part Number
96	Foam, Rear	0349-00-0113
97	Grommet, Rubber	0348-01-0016
98	Tubing, Tygon, 1/8" I.D., 1/4" O.D.	0008-04-0002
99	Filter, Pneumatic	0378-01-0001
100	Control Board	0670-00-0375
101	Screw, #4-40 x 5/16" Pan SS	0212-12-0405
102	Screw, #4-40 x 1/4" Pan SS	0212-12-0404
103	Screw, #4-40 x 5/16" FLT SS	0212-17-0405
104	Screw, #6-32 x 5/8" Pan SS	0212-12-0610
105	Washer, Flat #6	0221-00-0006
106	Standoff, Hex 2.5 Lg	0361-30-2500
107	Pneumatics Board	0670-00-0369
108	Cable Assembly, Control Bd to Pneumatics Bd	0012-00-0594
109	Chassis, NIBP Module	0441-00-0058
110	Foam, Chassis Side	0349-00-0082-03
111	Foam, Chassis Top	0349-00-0112
112	Cable Assembly, Ribbon 26 Pin, P28 to J8	0012-00-0593-02
113	Cable Assembly, Ribbon 50 Pin, P32 to P4	0012-00-0598
NS	Assembly, Pump ASF, w/items 114 & 115	0997-00-0227-02
114	Pump, ASF 12V DC	0119-00-0114
115	Plate, Pump Mount Adapter	0386-00-0135
116	Screw, #6-10 x 3/8" Pan	0213-09-0606
117	Plate, Pump Mount	0386-00-0134
118	Mount, Shock	0348-08-0001
119	Screw, #6-32 x 5/16" Pan SS	0212-12-0605
120	Tubing, 1/8" O.D., 1/16" I.D.	0008-08-0001
121*	Screw, Slotted Binding Head, Nylon #4-40 x 5/16 Lg.	0212-01-0405
122*	Nut, Hex 4-40, Nylon	0220-00-0037

* To be used when cuff pocket (item #2) is not installed.

Figure No.	Description	Datascope Part Number
NS	PCB Extender Card, Interface Board	0670-00-0398
NS	PCB Extender Card, Power Supply Board	0670-00-0399
NS	Shield, Transformer	0337-00-0058
NS	Shield, Transformer Cover	0337-00-0059
NS	Tape, Double Coated Foam 3/4"	0215-03-0002
NS	Clip, Software	0220-00-0073
NS	Fuse, 1/2A Slow Blow, Mains Power	0159-18-0500
NS	PCB Extender Card, SaO2 Analog Board	0670-00-0334
NS	Label, Recorder Door	0334-00-0800
NS	Label, Front, w/o SaO2	0334-00-0801
NS	Label, Front w/ SaO2	0334-00-0802
NS	Label, Power Input	0334-00-0803
NS	Label, Serial Number	0334-00-0804
NS	Cable Assy, Recorder Housing Gnd	0012-00-0699
NS	Cable Assy, w/o Recorder Gnd	0012-00-0697
NS	Cable Assy, Lver Gnd	0012-00-0700

NS = Not Shown

REF. NO.	DESCRIPTION	DATASCOPE PART NO.
	SaO_2 ANALOG BOARD	0670-00-0327
	EXCHANGE BOARD	0670-00-0327E
C1	CAP, CER, .1uF	0283-04-0104
C3	CAP, CER, 220pF 10%, 200V	0283-05-0221
C4	CAP, CER, 47pF 10%, 200V	0283-05-0470
C5	CAP, CER, 22pF 10%, 200V	0283-05-0220
C6	CAP, CER, 22pF 10%, 200V	0283-05-0220
C7	CAP, CER, .47uF 10%, 50V	0283-04-0474
C8	CAP, CER, .1uF	0283-04-0104
C9	CAP, CER, .1uF	0283-04-0104
C10	CAP, CER, .47uF 10%, 50V	0283-04-0474
C11	CAP, CER, .1uF	0283-04-0104
C12	CAP, CER, .1uF	0283-04-0104
C13	CAP, CER, .01uF 10%, 100V	0283-05-0103
C14	CAP, CER, .1uF	0283-04-0104
C15	CAP, CER, .1uF	0283-04-0104
C16	CAP, CER, .01uF 10%, 100V	0283-05-0103
C17	CAP, TANT, 22uF 10%, 20V	0290-02-1226
C18	CAP, CER, .1uF	0283-04-0104
C19	CAP, CER, .1uF	0283-04-0104
C20	CAP, CER, .1uF 5%, 100V	0283-04-1104
C21	CAP, CER, .1uF 5%, 100V	0283-04-1104
C22	CAP, CER, .022uF 5%, 100V	0283-04-1223
C23	CAP, CER, .022uF 5%, 100V	0283-04-1223
C24	CAP, CER, .1uF 5%, 100V	0283-04-1104
C25	CAP, CER, .1uF 5%, 100V	0283-04-1104
C26	CAP, CER, .022uF 5%, 100V	0283-04-1223
C27	CAP, CER, .1uF	0283-04-0104
C28	CAP, CER, .022uF 5%, 100V	0283-04-1223
C29	CAP, CER, .1uF	0283-04-0104
C30	CAP, CER, .1uF	0283-04-0104
C31	CAP, CER, 22pF 10%, 200V	0283-05-0220
C32	CAP, CER, 470pF 10%, 100V	0283-05-0471
C33	CAP, CER, 100pF 10%, 200V	0283-05-0101
C34	CAP, CER, 22pF 10%, 200V	0283-05-0220
C35	CAP, POLYPRO, .0082uF	0285-08-8201
C36	CAP, CER, .1uF	0283-04-0104
C37	CAP, CER, .1uF	0283-04-0104
C38	CAP, CER, .47uF 10%, 50V	0283-04-0474
C39	CAP, CER, .1uF	0283-04-0104
C40	CAP, TANT, 10uF 20%, 25V	0290-02-2106
C41	CAP, TANT, 10uF 20%, 25V	0290-02-2106
C42	CAP, TANT, 10uF 20%, 25V	0290-02-2106
C43	CAP, CER, .47uF 10%, 50V	0283-04-0474
C44	CAP, TANT, 10uF 20%, 25V	0290-02-2106
C45	CAP, TANT, 10uF 20%, 25V	0290-02-2106
C46	CAP, CER, .47uF 10%, 50V	0283-04-0474
C47	CAP, ALUM ELEC, 22uF 50%, 25V	0290-01-2220
C48	CAP, CER, .1uF	0283-04-0104
C49	CAP, TANT, 10uF 20%, 25V	0290-02-2106
C50	CAP, TANT, 10uF 20%, 25V	0290-02-2106

REF. NO.	DESCRIPTION	DATASCOPE PART NO.
C51	CAP, CER, .1uF	0283-04-0104
C52	CAP, CER, .1uF	0283-04-0104
C53	CAP, CER, .1uF	0283-04-0104
CR1	DIODE, 1N914	0153-00-0014
CR5	DIODE, 1N914	0153-00-0014
CR6	DIODE, 1N914	0153-00-0014
CR7	DIODE, 1N6263	0153-00-0085
CR8	DIODE, 1N5239B, 9.1V	0153-00-0010
CR9	DIODE, 1N914	0153-00-0014
CR10	DIODE 1N6275	0153-00-0091
CR11	DIODE 1N6275	0153-00-0091
CR12	DIODE, 1N914	0153-00-0014
R1	RES, 1K 5%, 1/4W	0315-00-0102
R2	RES, 1K 5%, 1/4W	0315-00-0102
R3	RES, 47K 5%, 1/4W	0315-00-0473
R4	RES, 133K 1%, 1/8W	0309-00-1333
R5	RES, 665K 1%, 1/8W	0309-00-6653
R6	RES, 2M 1%, 1/8W	0309-00-2004
R7	RES, 2M 5%, 1/4W	0315-00-0205
R8	RES, 200K 5%, 1/4W	0315-00-0204
R11	RES, 10K 5%, 1/4W	0315-00-0103
R12	RES, 100K 5%, 1/4W	0315-00-0104
R13	RES, 39K, 5%, 1/4W	0315-00-0393
R14	RES, 10K 5%, 1/4W	0315-00-0103
R15	RES, 10K .1%, 1/8W	0320-00-1002
R16	RES, 10K .1%, 1/8W	0320-00-1002
R17	RES, 100K 1%, 1/8W	0309-00-1003
R18	RES, 392K 1%, 1/8W	0309-00-3923
R19	RES, 475K 1%, 1/8W	0309-00-4753
R20	RES, 16.5K 1%, 1/8W	0309-00-1652
R21	RES, 100K 1%, 1/8W	0309-00-1003
R22	RES, 10K 5%, 1/4W	0315-00-0103
R23	RES, 10K 5%, 1/4W	0315-00-0103
R24	RES, MF, 10 ohm 1%, 1/4W	0310-00-0100
R25	RES, 27 ohm 5%, 1/4W	0315-00-0270
R26	RES, 22 ohm 5%, 1/4W	0315-00-0220
R27	RES, 100K 5%, 1/4W	0315-00-0104
R28	RES, 100K 5%, 1/4W	0315-00-0104
R29	RES, 1K 5%, 1/4W	0315-00-0102
R30	RES, 1K 5%, 1/4W	0315-00-0102
R31	RES, 150K 1%, 1/8W	0309-00-1503
R32	RES, 150K 1%, 1/8W	0309-00-1503
R33	RES, 150K 1%, 1/8W	0309-00-1503
R34	RES, 124K 1%, 1/8W	0309-00-1243
R35	RES, 150K 1%, 1/8W	0309-00-1503
R36	RES, 124K 1%, 1/8W	0309-00-1243
R37	RES, 150K 1%, 1/8W	0309-00-1503
R38	RES, 150K 1%, 1/8W	0309-00-1503
R39	RES, 150K 1%, 1/8W	0309-00-1503
R40	RES, 124K 1%, 1/8W	0309-00-1243

REPLACEMENT PARTS FOR: **SaO_2 ANALOG BOARD** **0670-00-0327**

REF. NO.	DESCRIPTION	DATASCOPE PART NO.
R41	RES, 150K 1%, 1/8W	0309-00-1503
R42	RES, 124K 1%, 1/8W	0309-00-1243
R43	RES, 150K 1%, 1/8W	0309-00-1503
R44	RES, 300K 1%, 1/8W	0309-00-3003
R45	RES, 100K 1%, 1/8W	0309-00-1003
R46	RES, 10K .1%, 1/8W	0320-00-1002
R47	RES, 100K 1%, 1/8W	0309-00-1003
R48	RES, 3.24K 1%, 1/8W	0309-00-3241
R49	RES, 10K .1%, 1/8W	0320-00-1002
R50	RES, 53K .1%, 1/8W	0320-00-5302
R51	RES, 291K .1%, 1/8W	0320-00-2913
R52	RES, 1M .1%, 1/8W	0320-00-1004
R53	RES, 1K 5%, 1/4W	0315-00-0102
R54	RES, 10K .1%, 1/8W	0320-00-1002
R55	RES, 1K 5%, 1/4W	0315-00-0102
R56	RES, 10K 5%, 1/4W	0315-00-0103
R57	RES, 14.7K 1%, 1/8W	0309-00-1472
R58	RES, 47.5K 1%, 1/8W	0309-00-4752
R59	RES, 232 ohm 1%, 1/8W	0309-00-2320
R60	RES, 232 ohm 1%, 1/8W	0309-00-2320
R61	RES, 1.62K 1%, 1/8W	0309-00-1621
R62	RES, 1.62K 1%, 1/8W	0309-00-1621
R63	RES, 392K 1%, 1/8W	0309-00-3923
R64	RES, 10M 5%, 1/4W	0315-00-0106
R65	RES, 10 ohm 5%, 1/4W	0315-00-0100
R66	RES, 5.11K 1%, 1/8W	0309-00-5111
R67	RES, 15K 1%, 1/8W	0309-00-1502
R68	RES, 10 ohm 5%, 1/4W	0315-00-0100
R69	RES, 10 ohm 5%, 1/4W	0315-00-0100
R70	RES, 10K 1%, 1/8W	0309-00-1002
R71	RES, 10K 1%, 1/8W	0309-00-1002
R72	RES, 10K 1%, 1/8W	0309-00-1002
R73	RES, 10K 1%, 1/8W	0309-00-1002
R74	RES, 4.7K 5%, 1/4W	0315-00-0472
R75	RES, 39K, 5%, 1/4W	0315-00-0393
R76	RES, 10K 5%, 1/4W	0315-00-0103
R77	RES, 1K 5%, 1/4W	0315-00-0102
R78	RES, 1K 5%, 1/4W	0315-00-0102
R79	RES, 4.7K 5%, 1/4W	0315-00-0472
RN1	RES SIP, 5.6K	0307-00-0020
RN2	RES SIP, 5.6K	0307-00-0020
J9	HEADER, DBL ROW. RT ANGLE, 16 POS	0136-20-1016
J24	HEADER, DBL ROW. RT ANGLE, 14 POS	0136-20-1014
Q1	TRAN. 2N5308A	0151-00-0086
Q2	TRAN. 2N5308A	0151-00-0086
Q3	TRAN. 2N5308A	0151-00-0086
Q4	TRAN. 2N2222A	0151-00-0061
Q5	TRAN. 2N3645	0151-00-0037

REF. NO.	DESCRIPTION	DATASCOPE PART NO.
U1	I.C., TL082	0155-00-0151
U2	I.C., TL082	0155-00-0151
U3	I.C., DG201CJ	0155-00-0404
U4	I.C., OP-27 GP	0155-00-0392
U5	I.C., DG201CJ	0155-00-0404
U6	I.C., OP-07, LOW OFFSET	0155-00-0159
U7	I.C., OP-07, LOW OFFSET	0155-00-0159
U8	I.C., TL082	0155-00-0151
U9	I.C., TL082	0155-00-0151
U10	I.C., DG201CJ	0155-00-0404
U11	I.C., TL082	0155-00-0151
U12	I.C., DG201CJ	0155-00-0404
U13	I.C., LF398N	0155-00-0394
U14	I.C., LM311N	0155-00-0107
U15	I.C., 74L504N	0155-00-0408
U16	I.C., 74L504N	0155-00-0408
U17	I.C., 74C374, OCTAL D F/F	0155-00-0129
U18	I.C., 74C374, OCTAL D F/F	0155-00-0129
U19	I.C., 74C374, OCTAL D F/F	0155-00-0129
U20	I.C., AD7541AJN	0155-00-0393
U21	I.C., OP-27 GP	0155-00-0392
U22	I.C., TL082	0155-00-0151
U23	I.C., 74HC393	0155-00-0210
U24	ACCUSAT SEQUENCER EPROM ASSEMBLY	0155-90-0061
U25	I.C., 74C374, OCTAL D F/F	0155-00-0129
U26	I.C., CD4011AE	0155-00-0059
U27	I.C., LM317T	0155-00-0194
U28	I.C., LM337T, REG, NEG ADJ	0155-00-0216
U29	I.C., SG3503, VOLTAGE REF	0153-00-0093
U30	I.C., 74L504N	0155-00-0408
XU3	SOCKET, 16 PIN	0136-01-1016
XU5	SOCKET, 16 PIN	0136-01-1016
XU10	SOCKET, 16 PIN	0136-01-1016
XU12	SOCKET, 16 PIN	0136-01-1016
XU17	SOCKET, 20 PIN	0136-01-1020
XU18	SOCKET, 20 PIN	0136-01-1020
XU19	SOCKET, 20 PIN	0136-01-1020
XU20	SOCKET, 18 PIN	0136-01-1018
XU24	SOCKET, 28 PIN	0136-01-1028
XU25	SOCKET, 20 PIN	0136-01-1020
XU29	TRANSISTOR PAD	0432-01-0002
	FOAM TAPE, DOUBLE ADHESIVE	0215-03-0002
	CARD EJECTOR	0367-00-0018

REPLACEMENT PARTS FOR: **PNEUMATIC BOARD** **0670-00-0369**

REF. NO.	DESCRIPTION	DATASCOPE PART NO.
	PNEUMATIC BOARD	0670-00-0369
	EXCHANGE BOARD	0670-00-0369E
C1	CAP, 3300uF 16V	0290-11-0001
J29	HEADER, 3 PIN	0136-50-0003
J30	20 PIN, DOUBLE ROW HEADER	0136-24-1020
J34	20 PIN, DOUBLE ROW HEADER	0136-24-1020
L1	CHOKE, 100UH	0108-08-1000
SW1	PRESSURE SWITCH	0262-00-0003
V1	VALVE, 12V, 2-WAY	0119-00-0073
V2	VALVE, 12V, 2-WAY	0119-00-0073
V3	VALVE, 12V, 2-WAY	0119-00-0073
V4	VALVE, 12V, 2-WAY	0119-00-0073
XL1	WASHER, NYLON	0210-07-0003
	TERMINAL, FEMALE	0210-00-0094
	TEE	0103-00-0298
	6 PORT MANIFOLD	0103-00-0283
	FLOW RESTRICTOR	0103-11-0008
	FLOW RESTRICTOR	0103-11-0011
	FLOW RESTRICTOR	0103-11-0022
	AIR FILTER	0378-01-0002
	FTG, RT. ANGLE, 1/16	0103-12-0001
	TUBING, PVC, 1/8 ID	0008-04-0002
	TUBING, Polyurethane, 1/16 D	0008-08-0001
	TAPE, SINGLE-COATED, FOAM	0215-02-0001
	SCREW, 4-40 X .25LG, PH	0212-12-0404
	SCREW, 4-40 X 1.123 LG, PH	0212-12-0418
	NUT, HEX, 4-40	0223-00-0004
	CABLE TIE	0125-01-0001
	WIRE, STRND, AWG #22, WHT	0006-02-2299
	FILTER, IN-LINE, 43 MICRON	0378-00-0032

REF. NO.	DESCRIPTION	DATASCOPE PART NO.

REPLACEMENT PARTS FOR: POWER SUPPLY BOARD 0670-00-0374

REF. NO.	DESCRIPTION	DATASCOPE PART NO.
	POWER SUPPLY BOARD	0670-00-0374
C1	CAP ELECTRO., 2200uF, 35V	0290-00-0101
C2	CAP, 4.7uF 20%, 50V	0285-12-5475
C3	CAP, 4.7uF 20%, 50V	0285-12-5475
C4	CAP, 220uF LOW ESR, 25V	0290-12-0002
C5	CAP, 220uF LOW ESR, 25V	0290-12-0002
C6	CAP, 470pF 10%, 200V	0283-05-0471
C8	CAP, .47uF 10%, 50V	0283-04-0474
C9	CAP, 2.2uF 20%, 50V	0285-12-5225
C10	CAP, .47uF 10%, 50V	0283-04-0474
C11	CAP, 4.7uF 20%, 50V	0285-12-5475
C12	CAP, 470uF TYPE F, 25V	0290-00-0112
C13	CAP, 470uF, 16V	0290-08-4733
C14	CAP, 4.7uF 20%, 50V	0285-12-5475
C15	CAP, .015uF 10%, 100V	0283-04-0153
C16	CAP, .15uF 10%, 50V	0283-04-0154
C17	CAP, 2.2uF,20%, 50V	0285-12-5225
C18	CAP, .001uF, 20%, 50V	0283-00-0043
C19	CAP, 560pF 10%, 200V	0283-05-0561
C20	CAP, .47uF 10%, 50V	0283-04-0474
C21	CAP, .47uF 10%, 50V	0283-04-0474
C22	CAP, .33uF 10%, 50V	0283-04-0334
C23	CAP, .33uF 10%, 50V	0283-04-0334
C24	CAP, .1uF 10%, 100V	0283-04-0104
C25	CAP, .47uF 10%, 50V	0283-04-0474
C26	CAP, TANT, 47uF 20%, 20V	0290-02-1476
C27	CAP, 47pF 10%, 200V	0283-05-0470
C28	CAP, .001uF 10%, 200V	0283-05-0102
C29	CAP, TANT, 1uF 20%, 35V	0290-02-3105
C30	CAP, 470uF, 16V	0290-08-4733
C33	CAP, .1uF 10%, 100V	0283-04-0104
C37	CAP, TANT, 2.2uF 20%, 35V	0290-02-3225
C39	CAP, .001uF 10%, 200V	0283-05-0102
C40	CAP, 10pF 10%, 200V	0283-05-0100
C41	CAP, .22uF	0283-04-0224
C43	CAP, 470uF, 16V	0290-08-4733
C44	CAP, .47uF 10%, 50V	0283-04-0474
C45	CAP, 2.2uF 20%, 50V	0285-12-5225
CR1	DIODE BRIDGE, MDA970-A2	0153-00-0088
CR2	DIODE, USD945	0153-08-0004
CR3	DIODE, USD945	0153-08-0004
CR4	DIODE, UES1103	0153-00-0086
CR5	DIODE, UES1103	0153-00-0086
CR6	DIODE, UHVP208	0153-00-0152
CR7	DIODE, UHVP208	0153-00-0152
CR8	DIODE, USD945	0153-08-0004
CR9	DIODE, 1N914	0153-00-0014
CR10	DIODE, UES1103	0153-00-0086

REF. NO.	DESCRIPTION	DATASCOPE PART NO.
CR11	DIODE, UES1103	0153-00-0086
CR12	DIODE, 1N6275	0153-00-0091
CR13	DIODE, 1N4003	0153-00-0001
CR14	DIODE, 1N5819	0153-00-0127
CR15	DIODE, 1N914	0153-00-0014
CR16	DIODE, 1N914	0153-00-0014
CR17	DIODE, 1N914	0153-00-0014
CR18	DIODE, 1N914	0153-00-0014
CR19	DIODE, 1N914	0153-00-0014
CR20	DIODE, 1N914	0153-00-0014
CR21	DIODE, 1N4003	0153-00-0001
CR22	DIODE, 1N4003	0153-00-0001
CR23	DIODE, 1N6294A	0153-07-0091
CR24	DIODE, 1N6263	0153-00-0085
CR25	DIODE, 1N914	0153-00-0014
CR26	DIODE, 1N914	0153-00-0014
R1	RES, 8.2K 5%, 1/4W	0315-00-0822
R2	RES, 12 ohm 5%, 1/4W	0315-00-0120
R3	RES, 470K 5%, 1/4W	0315-00-0474
R4	RES, 12 ohm 5%, 1/4W	0315-00-0120
R5	RES, 200K 1%, 1/8W	0309-00-2003
R6	RES, 10K 0.1%, 1/8W	0320-00-1002
R7	RES, 10K 0.1%, 1/8W	0320-00-1002
R8	RES, 6.49K 1%, 1/8W	0309-00-6491
R9	RES, 10K 5%, 1/4W	0315-00-0103
R10	RES, 1K, 5%, 1/4W	0315-00-0102
R11	RES, 240 ohm 5%, 1/4W	0315-00-0241
R12	RES, 10K 5%, 1/4W	0315-00-0103
R13	RES, 12K 5%, 1/4W	0315-00-0123
R14	RES, 2.2K 5%, 1/4W	0315-00-0222
R15	RES, 100K 5%, 1/4W	0315-00-0104
R16	RES, 4.7K 5%, 1/4W	0315-00-0472
R17	RES, 10K 5%, 1/4W	0315-00-0103
R18	RES, 15K 5%, 1/4W	0315-00-0153
R19	RES, 100K 5%, 1/4W	0315-00-0104
R20	RES, 100K 5%, 1/4W	0315-00-0104
R21	RES, 100K 5%, 1/4W	0315-00-0104
R22	RES, 15K 5%, 1/4W	0315-00-0153
R23	RES, 8.87K 1%, 1/8W	0309-00-8871
R24	RES, 1K 1%, 1/8W	0309-00-1001
R25	RES, 4.99K 1%, 1/8W	0309-00-4991
R26	RES, 510K 5%, 1/4W	0315-00-0514
R27	RES, 10K 5%, 1/4W	0315-00-0103
R28	RES, 10K 5%, 1/4W	0315-00-0103
R29	RES, 11.8K 1%, 1/8W	0309-00-1182
R30	RES, 30.9K 1%, 1/8W	0309-00-3092
R31	RES, 8.06K 1%, 1/8W	0309-00-8061
R32	RES, 470K 5%, 1/4W	0315-00-0474
R33	RES, 232 ohm 1%, 1/8W	0309-00-2320
R34	RES, 10K 1%, 1/8W	0309-00-1002
R35	RES, 1K 5%, 1/4W	0315-00-0102

REPLACEMENT PARTS FOR: **POWER SUPPLY BOARD** **0670-00-0374**

REF. NO.	DESCRIPTION	DATASCOPE PART NO.
R36	RES, 232 ohm 1%, 1/8W	0309-00-2320
R37	RES, 4.7K 5%, 1/4W	0315-00-0472
R38	RES, 2.55K 1%, 1/8W	0309-00-2551
R39	RES, 2.55K 1%, 1/8W	0309-00-2551
R40	RES, 4.7K 5%, 1/4W	0315-00-0472
R41	RES, 10 ohm 5%, 1/4W	0315-00-0100
R42	RES, 470 ohm 5%, 1/4W	0315-00-0471
R43	RES, 100 ohm 5%, 1/2W	0301-00-0101
R44	RES, 20K 5%, 1/4W	0315-00-0203
R45	RES, 22 ohm 5%, 1/4W	0315-00-0220
R46	RES, 2K 5%, 1/4W	0315-00-0202
R47	RES, 470K 5%, 1/4W	0315-00-0474
F1	FUSE, 2A	0159-09-0013
L1	CHOKE, 3mH	0108-00-0034
L2	FERRITE BEAD	0108-00-0014
L6	FERRITE BEAD	0108-00-0014
L7	FERRITE BEAD	0108-00-0014
L8	FERRITE BEAD	0108-00-0014
L9	FERRITE BEAD	0108-00-0014
L10	FERRITE BEAD	0108-00-0014
L11	FERRITE BEAD	0108-00-0014
L12	FERRITE BEAD	0108-00-0014
L13	FERRITE BEAD	0108-00-0014
L14	FERRITE BEAD	0108-00-0014
L15	FERRITE BEAD	0108-00-0014
Q1	XSTR, 2N6134	0151-00-0053
Q2	XSTR, 2N2222A	0151-00-0061
Q3	XSTR, 2N6134	0151-00-0053
Q4	2N3906	0151-00-0013
Q5	2N3906	0151-00-0013
Q6	XSTR, 2N2222A	0151-00-0061
Q7	XSTR, IRF540 OR SMP30N10	0151-00-0101
T1	XFMR, FLYBACK	0120-00-0121
T2	XFMR, CURRENT SENSE, 100T	0108-00-0031
TP1	DIGI-KLIP	0124-00-0064
TP4	DIGI-KLIP	0124-00-0064
TP5	DIGI-KLIP	0124-00-0064
TP6	DIGI-KLIP	0124-00-0064
TP7	DIGI-KLIP	0124-00-0064
TP8	DIGI-KLIP	0124-00-0064
TP9	DIGI-KLIP	0124-00-0064
TP10	DIGI-KLIP	0124-00-0064
TP11	DIGI-KLIP	0124-00-0064
TP12	DIGI-KLIP	0124-00-0064
TP13	DIGI-KLIP	0124-00-0064

REF. NO.	DESCRIPTION	DATASCOPE PART NO.
U1	IC, UC2843	0155-00-0395
U2	LM393	0155-00-0098
U3	LM339	0155-00-0073
U4	78L05AP	0151-00-0072
U5	LM317	0155-00-0194
U6	IC, LM337	0155-00-0216
XF1	FUSE CLIP	0352-00-0026
XQ7	HEAT SINK	0373-00-0032
XQ7	INSULATOR, XSTR	0349-00-0056
XQ7	WASHER, SHOULDER, NYLON	0214-00-0155
XQ7	SCREW, 4-40 x .25LG	0212-12-0404
XQ7	NUT, 4-40	0223-00-0004
	INSULATOR BEAD	0214-00-0074
	WIRE, BUS, AWG22	0007-02-0022
	WIRE, SOLID, AWG22, BLK	0006-04-2200

REPLACEMENT PARTS FOR: NIBP BOARD 0670-00-0375

REF. NO.	DESCRIPTION	DATASCOPE PART NO.
	NIBP BOARD	0670-00-0375
	EXCHANGE BOARD	0670-00-0375E
C1	CAP TANT, 22uF 20%, 20V	0290-02-1226
C2	CAP, 33pF 10%, 200V	0283-05-0330
C3	CAP, 33pF 10%, 200V	0283-05-0330
C4	CAP, .01uF 10%, 100V	0283-05-0103
C5	CAP TANT, 22uF 20%, 20V	0290-02-1226
C6	CAP TANT, 22uF 20%, 20V	0290-02-1226
C7	CAP TANT, 22uF 20%, 20V	0290-02-1226
C8	CAP, .01uF 10%, 100V	0283-05-0103
C9	CAP TANT, 22uF 20%, 20V	0290-02-1226
C10	CAP, .1uF 10%, 100V	0283-04-0104
C11	CAP, .1uF 10%, 100V	0283-04-0104
C12	CAP, .1uF 10%, 100V	0283-04-0104
C13	CAP, .22uF 10%, 100V	0283-04-0224
C14	CAP, .01uF 10%, 100V	0283-05-0103
C15	CAP, .01uF 10%, 100V	0283-05-0103
C16	CAP, 4.7uF TANT.	0283-04-0104
C17	CAP, .01uF 10%, 100V	0283-05-0103
C18	CAP, .01uF 10%, 100V	0283-05-0103
C19	CAP, .1uF 10%, 100V	0283-04-0104
C20	CAP, .01uF 10%, 100V	0283-05-0103
C21	CAP, .01uF 10%, 100V	0283-05-0103
C22	CAP, .0047uF 10%, 100V	0283-05-0472
C24	CAP POLY, .47uF	0285-00-0055
C25	CAP POLY, .47uF	0285-00-0055
C26	CAP POLY, .47uF	0285-00-0055
C27	CAP, .01uF 10%, 100V	0283-05-0103
C28	CAP, .01uF 10%, 100V	0283-05-0103
C29	CAP, .01uF 10%, 100V	0283-05-0103
C30	CAP, .01uF 10%, 100V	0283-05-0103
C90	CAP TANT, 22uF 20%, 20V	0290-02-1226
C91	CAP TANT, 22uF 20%, 20V	0290-02-1226
C92	CAP TANT, 22uF 20%, 20V	0290-02-1226
C93	CAP TANT, 22uF 20%, 20V	0290-02-1226
C95	CAP, .0033uF 10%, 100V	0283-05-0332
C100	CAP, .047uF 10%, 100V	0283-04-0473
C101	CAP, .1uF 10%, 100V	0283-04-0104
C102	CAP, .01uF 10%, 100V	0283-05-0103
C103	CAP, .1uF 10%, 100V	0283-04-0104
C104	CAP, .01uF 10%, 100V	0283-05-0103
C105	CAP, .01uF 10%, 100V	0283-05-0103
C106	CAP TANT, 4.7uF 20%, 50V	0290-00-0110
C107	CAP TANT, 4.7uF 20%, 50V	0290-00-0110
C108	CAP, .1uF 10%, 100V	0283-04-0104
C109	CAP, .1uF 10%, 100V	0283-04-0104
C110	CAP, .1uF 10%, 100V	0283-04-0104
C111	CAP TANT, 4.7uF 20%, 50V	0290-00-0110
C112	CAP TANT, 4.7uF 20%, 50V	0290-00-0110
C114	CAP TANT, 22uF, 20%, 50V	0290-02-1226
C119	CAP, .1uF, 10%, 100V	0283-04-0104
C120	CAP, .1uF, 10%, 100V	0283-04-0104
C121	CAP, 100pF, 10%, 200V	0283-05-0101
C122	CAP, .01uF, 10%, 100V	0283-05-0103
C123	CAP, .01uF, 10%, 100V	0283-05-0103
C124	CAP, .1uF, 10%, 100V	0283-04-0104

REF. NO.	DESCRIPTION	DATASCOPE PART NO.
CR1	DIODE, 1N6263	0153-00-0085
CR2	DIODE, 1N6263	0153-00-0085
CR3	DIODE, 1N6263	0153-00-0085
CR4	DIODE, 1N6263	0153-00-0085
CR5	DIODE, 1N6263	0153-00-0085
CR6	DIODE, 1N6263	0153-00-0085
CR7	DIODE, 1N6263	0153-00-0085
CR8	DIODE, 1N6263	0153-00-0085
CR9	DIODE, 1N914	0153-00-0014
CR10	DIODE, 1N4004	0153-00-0098
CR18	DIODE, 1N914	0153-00-0014
CR19	DIODE, 1N914	0153-00-0014
CR20	DIODE, 1N6263	0153-00-0085
CR21	DIODE, 1N6263	0153-00-0085
CR22	DIODE, 1N6263	0153-00-0085
CR23	DIODE, 1N914	0153-00-0014
CR24	DIODE, 1N914	0153-00-0014
CR25	Diode, IN5817	0153-00-0069
R1	RES, 33K 5%, 1/4W	0315-00-0333
R3	RES, 2.2K 5%, 1/4W	0315-00-0222
R4	RES, 2.2K 5%, 1/4W	0315-00-0222
R5	RES, 1K 5%, 1/4W	0315-00-0102
R6	RES, 2K 5%, 1/4W	0315-00-0202
R7	RES, 30K 5%, 1/4W	0315-00-0303
R8	RES, 1K 1%, 1/8W	0309-00-1001
R9	RES, 1.21M 1%, 1/8W	0309-00-1214
R10	RES, 590K 1%, 1/8W	0309-00-5903
R11	RES, 1K 5%, 1/4W	0315-00-0102
R12	RES, 1K 5%, 1/4W	0315-00-0102
R13	RES, 10K 5%, 1/4W	0315-00-0103
R14	RES, 10K 5%, 1/4W	0315-00-0103
R15	RES, 10K 5%, 1/4W	0315-00-0103
R16	RES, 1K 5%, 1/4W	0315-00-0102
R17	RES, 4.7K 5%, 1/4W	0315-00-0472
R19	RES, 110K 1%, 1/8W	0309-00-1103
R20	RES, 35.7K 1%, 1/8W	0309-00-3572
R21	RES, 22.1K 1%, 1/8W	0309-00-2212
R22	RES, 121K 1%, 1/8W	0309-00-1213
R23	RES, 2.43K 1%, 1/8W	0309-00-2431
R24	RES, 280K 1%, 1/8W	0309-00-2803
R26	RES, 49.9K 1%, 1/8W	0309-00-4992
R27	RES, 10K 5%, 1/4W	0315-00-0103
R28	RES, 10K 5%, 1/4W	0315-00-0103
R34	RES, 4.7K 5%, 1/4W	0315-00-0472
R37	RES, 100K 5%, 1/4W	0315-00-0104
R41	RES, 1K 1%, 1/8W	0309-00-1001
R43	RES, 4.7K 5%, 1/4W	0315-00-0472
R44	RES, 47K 5%, 1/4W	0315-00-0473

REPLACEMENT PARTS FOR: **NIBP BOARD** **0670-00-0375**

REF. NO.	DESCRIPTION	DATASCOPE PART NO.
R100	RES, 47K 5%, 1/4W	0315-00-0473
R101	RES, 22K 5%, 1/4W	0315-00-0223
R102	RES, 47K 5%, 1/4W	0315-00-0473
R103	RES, 10K 5%, 1/4W	0315-00-0103
R104	RES, 24.9K 1%, 1/8W	0309-00-2492
R105	RES, 150 ohm 5%, 1/4W	0315-00-0151
R110	RES, 29.4K 1%, 1/8W	0309-00-2942
R111	RES, 150K 1%, 1/8W	0309-00-1503
R112	RES, 76.8K 1%, 1/8W	0309-00-7682
R113	RES, 274K 1%, 1/8W	0309-00-2743
R114	RES, 10K 5%, 1/4W	0315-00-0103
R115	RES, 1K 5%, 1/4W	0315-00-0102
R116	RES, 4.7K 5%, 1/4W	0315-00-0472
R117	RES, 100K 5%, 1/4W	0315-00-0104
R118	RES, 10K 1%, 1/8W	0309-00-1002
R119	RES, 10K 5%, 1/4W	0315-00-0103
R120	RES, 100 ohm, 5%, 1/4W	0315-00-0101
R121	RES, 100 ohm, 5%, 1/4W	0315-00-0101
RP1	RES NET, 10K, 10 PIN SIP	0307-06-2103
RP2	RES NET, 10K, 10 PIN SIP	0307-06-2103
RP3	RES NET, 10K 14 PIN DIP	0307-00-0029
RP4	RES NET, 10K 14 PIN DIP	0307-00-0029
RP5	RES NET, 5.6K, 10 PIN SIP	0307-00-0020
J28	HEADER, DUAL 13, 26 PIN	0136-24-1026
J31	HEADER, DUAL 10, 20 PIN	0136-24-1020
J32	HEADER, DUAL 25, 50 PIN	0136-24-1050
J33	HEADER, DUAL 10, 20 PIN	0136-24-1020
PT1	SENSOR BLOOD PRESSURE	0682-00-0059
Q1	XSTR, 1RD110 HEX FET	0151-01-0010
Q4	XSTR 2N4401	0151-00-0052
U1	IC, DS1242 SMART WATCH W/32K x 8 RAM	0155-00-0440
U2	IC, 74HCT573 OCTAL "D" LATCH	0155-00-0439
U3	IC, 74LS244 OCTAL BUFFER	0155-00-0426
U4	IC, MAX232 DUAL CHNL RS232	0155-00-0400
U5	IC, 80C196KB uCNTLR	0155-00-0442
U6	IC, NIBP U6 EPROM	0155-90-0111
U7	IC, NIBP U7 EPLD	0155-90-0112
U8	IC, DG201 ANALOG SW	0155-00-0404
U9	IC, AD7226 QUAD 8-BIT DAC	0155-00-0424
U10	IC, 79L05 -5V REG	0151-00-0068
U11	IC, LM324 LO PWR OP-AMP	0155-00-0053
U12	IC, SG3503 VOLTAGE REF	0153-00-0093
U13	IC, LT1014 QUAD OP-AMP	0155-00-0443
U14	IC, LT1014 QUAD OP-AMP	0155-00-0443
U15	IC, ULN2003 XSTR ARRAY	0151-00-0100
U17	IC, 74HC00 QUAD 2 IN NAND	0155-00-0213
U18	IC, 74HCT244 OCTAL BUFFER	0155-00-0426
U19	IC, 74HCT245 OCTAL BUS XCVR	0155-00-0438
U21	IC, LM324 LO PWR OP-AMP	0155-00-0053

REF. NO.	DESCRIPTION	DATASCOPE PART NO.
VR1	RES ADJ, 5K 10% S.T.	0311-01-2502
XU5	SOCKET, IC, PLCC 68 PIN	0136-57-0068
XU6	SOCKET, IC, 28 PIN	0136-01-1028
XU7	SOCKET, IC, 20 PIN	0136-01-1020
XU9	SOCKET, IC, 20 PIN	0136-01-1020
XU12	MOUNTING PAD	0432-01-0002
XU18	SOCKET, IC, 20 PIN	0136-01-1020
XU19	SOCKET, IC, 20 PIN	0136-01-1020
XPT1		
XPT1		
XPT1		
XPTI		
XY1	INSULATOR BEAD	0214-00-0074
Y1	CRYSTAL 11.0592M Hz	0158-01-0024
	Cable Tie Wrap	0215-01-0001

REPLACEMENT PARTS FOR: **MOTHER BOARD** **0670-00-0383**

REF. NO.	DESCRIPTION	DATASCOPE PART NO.
	MOTHER BOARD	0670-00-0383
J1	CONN., PC CARD EDGE, 50 PINS	0131-21-0025
J2	CONN., 24 PIN IEEE488, FEMALE	0131-00-0165
J3	CONN., RS232 FEMALE	0131-00-0142
J4	CONN., DOUBLE ROW, 50 PINS	0136-24-1050
J5	CONN., PC CARD EDGE, 50 PINS	0131-21-0025
J6	CONN., PC CARD EDGE, 36 PINS	0131-21-0018
J7	CONN., 2 PINS, .1"	0136-22-0002
J8	CONN., PC CARD EDGE, 50 PINS	0131-21-0025
J10	CONN., DOUBLE ROW, 20 PINS	0136-24-1020
J13	CONN., HIGH CURRENT, 2 PINS	0131-28-0002
J14	CONN., LOCKING, 3 PINS	0131-01-0003
J27	CONN., DOUBLE ROW, 26 PINS	0136-24-102E
J37	CONN., 5 PINS, .125"	0136-17-0005
JP1	CONN., DOUBLE ROW, 6 PINS	0136-24-1006
JP2	CONN., DOUBLE ROW, 6 PINS	0136-24-1006
JP3	CONN., DOUBLE ROW, 6 PINS	0136-24-1006
10	WASHER, LK. INT. TOOTH	0210-09-0010
	KIT, JACKPOST MTG. (24 PIN RECEPTACLE)	0132-00-0063
	SCREW, P.H. 4-40 x 3/8 LG.	0212-12-0406
	NUT, PLAIN HEX SMALL PATTERN	0223-02-0004
	NUT, SHAKEPROOF, #4-40	0220-06-0004
	WASHER, LOCK INT. TOOTH, #4	0210-09-0004
	CABLE, FLAT BRAID #14 AWG	0337-01-0187
	TERMINAL RING, #8	0210-19-0006
	TERMINAL RING, #4	0210-19-0003
	TUBING HEAT SHRINK 3/16 GRN/YEL	0008-01-5415
	TERMINAL, SLIP ON	0210-00-0102
	WIRE, STRAINED, #18 AWG-GRN	0006-02-1855

REF. NO.	DESCRIPTION	DATASCOPE PART NO.

REPLACEMENT PARTS FOR: **LED BOARD** **0670-00-0384**

REF. NO.	DESCRIPTION	DATASCOPE PART NO.
	LED BOARD	0670-00-0384
CR1	LED, GREEN HLMP-1585	0153-05-0033
J20	CONN., SINGLE ROW, 12 PINS	0136-21-0012
J21	CONN., DOUBLE ROW, 26 PINS	0136-24-1026
J22	CONN., DOUBLE ROW, 40 PINS	0136-24-1040
J23	TERMINAL STRIP, 12 PINS	0124-31-1012
J24	HEADER, SGL ROW, 5 PINS	0136-21-0005
T1	DC-AC INVERTER	0014-00-0025
U1	DIODE LED, 7.6mm, 7 SEG COMMON ANODE DISPLAY	0153-00-0128
U2	DIODE LED, 7.6mm, 7 SEG COMMON ANODE DISPLAY	0153-00-0128
U3	DIODE LED, 7.6mm, 7 SEG COMMON ANODE DISPLAY	0153-00-0128
U4	DIODE LED, 7.6mm, 7 SEG COMMON ANODE DISPLAY	0153-00-0128
U5	DIODE LED, 7.6mm, 7 SEG COMMON ANODE DISPLAY	0153-00-0128
U6	DIODE LED, 7.6mm, 7 SEG COMMON ANODE DISPLAY	0153-00-0128
U7	DIODE LED, 7.6mm, 7 SEG COMMON ANODE DISPLAY	0153-00-0128
U8	DIODE LED, 7.6mm, 7 SEG COMMON ANODE DISPLAY	0153-00-0128
U9	DIODE LED, 7.6mm, 7 SEG COMMON ANODE DISPLAY	0153-00-0128
U10	DIODE LED, 7.6mm, 7 SEG COMMON ANODE DISPLAY	0153-00-0128
U11	DIODE LED, 7.6mm, 7 SEG COMMON ANODE DISPLAY	0153-00-0128
U12	DIODE LED, 7.6mm, 7 SEG COMMON ANODE DISPLAY	0153-00-0128
XU1	CONN., P.C. PIN GRID ARRAY	0136-09-0005
XU2	CONN., P.C. PIN GRID ARRAY	0136-09-0005
XU3	CONN., P.C. PIN GRID ARRAY	0136-09-0005
XU4	CONN., P.C. PIN GRID ARRAY	0136-09-0005
XU5	CONN., P.C. PIN GRID ARRAY	0136-09-0005
XU6	CONN., P.C. PIN GRID ARRAY	0136-09-0005
XU7	CONN., P.C. PIN GRID ARRAY	0136-09-0005
XU8	CONN., P.C. PIN GRID ARRAY	0136-09-0005
XU9	CONN., P.C. PIN GRID ARRAY	0136-09-0005
XU10	CONN., P.C. PIN GRID ARRAY	0136-09-0005
XU11	CONN., P.C. PIN GRID ARRAY	0136-09-0005
XU12	CONN., P.C. PIN GRID ARRAY	0136-09-0005
	SPACER, NYLON, .1870D x .375 LG	0361-34-0004
	CABLE TIE	0125-01-0004

REF. NO.	DESCRIPTION	DATASCOPE PART NO.

REF. NO.	DESCRIPTION	DATASCOPE PART NO.
	INTERFACE BOARD	0670-00-0385
	EXCHANGE BOARD	0670-00-0385E
C1	CAP., 22uF TANT 20V 20%	0290-02-1226
C2	CAP , 22uF TANT 20V 20%	0290-02-1226
C3	CAP., .1uF 100V 10%	0283-04-0104
C4	CAP., .1uF 100V 10%	0283-04-0104
C5	CAP., .1uF 100V 10%	0283-04-0104
C6	CAP., .1uF 100V 10%	0283-04-0104
C7	CAP., .1uF 100V 10%	0283-04-0104
C8	CAP., 22uF TANT 20V 20%	0290-02-1226
C9	CAP., 22uF TANT 20V 20%	0290-02-1226
C10	CAP., 22uF TANT 20V 20%	0290-02-1226
C12	CAP., .01uF 100V 10%	0283-05-0103
C13	CAP., 4.7uF TANT 35V 20%	0290-02-3475
C14	CAP., 4.7uF TANT 35V 20%	0290-02-3475
C15	CAP., .1uF 100V 10%	0283-04-0104
C16	CAP., .01uF 100V 10%	0283-05-0103
C17	CAP., .01uF 100V 10%	0283-05-0103
C18	CAP., 4.7uF TANT 35V 20%	0290-02-3475
C20	CAP., .1uF 100V 10%	0283-04-0104
C21	CAP., .1uF 100V 10%	0283-04-0104
C22	CAP., .1uF 100V 10%	0283-04-0104
C23	CAP., .1uF 100V 10%	0283-04-0104
C24	CAP., .1uF 100V 10%	0283-04-0104
C25	CAP., .01uF 100V 10%	0283-05-0103
C26	CAP., 22uF TANT 20V 20%	0290-02-1226
C31	CAP., 4.7uF, 20%, 50V	0285-12-5475
C32	CAP., 4.7uF, 20%, 50V	0285-12-5475
C33	CAP., 4.7uF, TANT 35V 20%	0290-02-3475
C34	CAP., 1uF 100V 10%	0233-04-0104
C35	CAP., 1uF 100V 10%	0283-04-0104
C36	CAP., .1uF 100V 10%	0283-04-0104
C37	CAP., .1uF 100V 10%	0283-04-0104
C38	.001uF 1% CAP	0283-00-0043
C39	CAP., .1uF 100V 10%	0283-04-0104
C40	CAP., .1uF 100V 10%	0283-04-0104
C41	CAP., .01uF 100V 10%	0283-05-0103
C42	CAP., .47uF 50V 10%	0283-04-0474
C43	CAP., .0027uF 100V 10%	0285-05-0272
CR1	1N4003	0153-00-0001
CR2	1N6275 15V	0153-00-0091
CR3	UES1103	0153-00-0086
CR4	UES1103	0153-00-0086
CR5	VSK140	0153-00-0146
CR6	VSK140	0153-00-0146
CR7	1N914	0153-00-0014
CR8	1N914	0153-00-0014
CR9	1N914	0153-00-0014

REF. NO.	DESCRIPTION	DATASCOPE PART NO.
R1	RESISTOR, 10K 5% 1/4W	0315-00-0103
R2	RESISTOR, 2.7K 5% 1/4W	0315-00-0272
R3	RESISTOR, 10K 5% 1/4W	0315-00-0103
R4	RESISTOR, 10K 5% 1/4W	0315-00-0103
R5	RESISTOR, 120K 5% 1/4W	0315-00-0124
R6	RESISTOR, 39K 5% 1/4W	0315-00-0393
R7	RESISTOR, 10K 5% 1/4W	0315-00-0103
R9	RESISTOR, 10 OHM 5% 1/4W	0315-00-0100
R10	RESISTOR, 10 OHM 5% 1/4W	0315-00-0100
R11	RESISTOR, 10K 5% 1/4W	0315-00-0103
R12	RESISTOR, 10K 5% 1/4W	0315-00-0103
R13	RESISTOR, 10K 5% 1/4W	0315-00-0103
R14	RESISTOR, 10 OHM 5% 1/4W	0315-00-0100
R15	RESISTOR, 10K 5% 1/4W	0315-00-0103
R16	RESISTOR, 10K 5% 1/4W	0315-00-0103
R31	30.1K, 1%, 1/8W	0309-00-3012
R32	30.1K, 1%, 1/8W	0309-00-3012
R33	20.0K, 1%, 1/8W	0309-00-2002
R34	100.0K, 1%, 1/8W	0309-00-1003
R35	16.2K, 1%, 1/8W	0309-00-1622
R36	16.2K, 1%, 1/8W	0309-00-1622
R37	76.8K, 1%, 1/8W	0309-00-7682
R38	187.0K, 1%, 1/8W	0309-00-1873
R39	8.06K, 1%, 1/8W	0309-00-8061
R40	3.61K, 1%, 1/8W	0320-00-3611
R41	3.61K, 1%, 1/8W	0320-00-3611
R42	30.0K, .1%, 1/8W	0320-00-3002
R43	30.0K, .1%, 1/8W	0320-00-3002
R44	RESISTOR, 10 OHM 5% 1/4W	0315-00-0100
R45	22K, 5%, 1/4W	0315-00-0223
R46	22K, 5%, 1/4W	0315-00-0223
R47	22K, 5%, 1/4W	0315-00-0223
R48	2.2K, 5%, 1/4W	0315-00-0222
R49	RESISTOR, 10K 5% 1/4W	0315-00-0103
R50	RESISTOR, 10K 5% 1/4W	0315-00-0103
R51	1 OHM, 5%, 1/4W	0315-00-010x
R52	1K, 5%, 1/4W	0315-00-0102
R53	1K, 5%, 1/4W	0315-00-0102
R54	2.2K, 5%, 1/4W	0315-00-0222
R55	1 OHM, 5%, 1/4W	0315-00-010x
RP1	RES. NET, 10 PIN SIP 10K	0307-06-2103
RP2	RES. NET, 10 PIN SIP 10K	0307-06-2103
J12	CONN., CARD EDGE, 34 PINS	0131-00-0209
J18	CONN., RT. ANGLE, 40 PINS	0136-20-1040
J19	CONN., RT. ANGLE, 26 PINS	0136-20-1026
L1	680 UH, .4A INDUCTOR	0108-00-0055

REPLACEMENT PARTS FOR: **INTERFACE BOARD** **0670-00-0385**

REF. NO.	DESCRIPTION	DATASCOPE PART NO.
Q1	2N2222A	0151-00-0061
Q2	2N2222A	0151-00-0061
Q3	2N2907A	0151-00-0073
Q4	IRFD110	0151-01-0010
Q5	TRANSISTOR, 2N7000	0151-00-0115
U1	IC, 7218, 8 DIGIT LED DRIVER	0155-00-0401
U2	IC, 7218, 8 DIGIT LED DRIVER	0155-00-0401
U3	IC, 74HCT244	0155-00-0426
U4	IC, 74HCT273	0155-00-0453
U5	IC, 74ACT240	0155-00-0239
U6	IC, EPLD, U6	0155-90-0125-1
U7	IC, EPLD, U7	0155-90-0124-1
U8	IC, EPLD, U8	0155-90-0127-1
U9	IC, EPLD, U9	0155-90-0126-1
U10	IC, LM324 QUAD OP AMP	0155-00-0053
U11	IC, LM386 POWER AMP	0155-00-0078
U12	IC, EPLD, U12	0155-90-0128-1
U13	IC, 32k x 8 BIT STATIC RAM	0155-00-0590-01
U14	OKI MSM6255	0155-00-0454
U15	IC, 74HCT 245	0155-00-0438
U16	IC, 68B09E	0155-00-0399
U31	VOLTAGE REG., 78L12	0155-00-0457
U32	LM339 QUAD COMPARATOR	0155-00-0073
U33	UC2843 SWITCHING REG.	0155-00-0395
U34	OP-07	0155-00-0159
U35	IC, DS1232, 32Kx8	0155-00-0425
T1	TRANSFORMER, FET DRIVE	0120-00-0081
TP1	HEADER, 7 PIN RT. ANG.	0136-21-0007
TP2	HEADER, 7 PIN RT. ANG.	0136-21-0007
TP3	HEADER, 7 PIN RT. ANG.	0136-21-0007
TP4	HEADER, 7 PIN RT. ANG.	0136-21-0007
TP5	HEADER, 7 PIN RT. ANG.	0136-21-0007
TP6	HEADER, 7 PIN RT. ANG.	0136-21-0007
TP7	HEADER, 9 PIN RT. ANG.	0136-21-0009
TP8	HEADER, 9 PIN RT. ANG.	0136-21-0009
TP9	HEADER, 9 PIN RT. ANG.	0136-21-0009
TP10	HEADER, 9 PIN RT. ANG.	0136-21-0009
TP11	HEADER, 9 PIN RT. ANG.	0136-21-0009
TP12	HEADER, 9 PIN RT. ANG.	0136-21-0009
TP13	HEADER, 9 PIN RT. ANG.	0136-21-0009
TP14	HEADER, 9 PIN RT. ANG.	0136-21-0009
TP15	HEADER, 9 PIN RT. ANG.	0136-21-0009
TP16	HEADER, 7 PIN RT. ANG.	0136-21-0007

REF. NO.	DESCRIPTION	DATASCOPE PART NO.
XU1	SOCKET, 28 PINS	0136-01-1028
XU2	SOCKET, 28 PINS	0136-01-1028
XU3	SOCKET, 20 PINS	0136-01-1020
XU4	SOCKET, 20 PINS	0136-01-1020
XU5	SOCKET, 20 PINS	0136-01-1020
XU6	SOCKET, DIP LOW PROFILE 24P	0136-01-2024
XU7	SOCKET, DIP LOW PROFILE 24P	0136-01-2024
XU8	SOCKET, DIP LOW PROFILE 24P	0136-01-2024
XU9	SOCKET, DIP LOW PROFILE 24P	0136-01-2024
XU12	SOCKET, DIP LOW PROFILE 24P	0136-01-2024
XU13	SOCKET, 28 PINS	0136-01-1028
XU15	SOCKET, 20 PINS	0136-01-1020
XU16	SOCKET, 40 PINS	0136-01-1040
	WIRE, HOOK-UP, SOLID, 22 AWG	0006-04-2200
	SHIELD, MUMETAL	0337-00-0064
	INSULATOR, MYLAR BOTTOM	0349-00-0127
	INSULATOR, MYLAR TOP	0349-00-0128
	STAND OFF, HEX M=F NYLON #4-40	0361-32-0375
	SCREW PAN HD. #4-40 NYLON	0212-01-0404
	NUT HEX #4-40 NYLON	0220-00-0037
	WIRE #22GA	0006-02-2255

REPLACEMENT PARTS FOR: **RECORDER BOARD** **0670-00-0386**

REF. NO.	DESCRIPTION	DATASCOPE PART NO.
	RECORDER BOARD	0670-00-0386
C1	CAP., .1uF	0283-04-0104
C2	CAP., .1uF	0283-04-0104
C3	CAP., .1uF	0283-04-0104
C4	CAP., .1uF	0283-04-0104
C5	CAP., .1uF	0283-04-0104
C6	CAP., 3300uF 16V	0290-17-0332
C7	CAP., .022uF	0283-04-0223
R1	RESISTOR, 470 ohms	0315-00-0471
R2	RESISTOR, 10K 5%, 1/4W	0315-00-0103
J25	CONN., DOUBLE ROW, 20 PINS	0136-24-1020
J26	FLEX CKT., 23 PINS	0131-00-0143
L1	CHOKE, 100UH	0108-08-1000
L1 MOUNT	SCREW, 4-40 x 1.123 LG, PH	0212-12-0418
L1 MOUNT	NUT, HEX, 4-40	0223-00-0004
TP1	DIGI-CLIP	0124-00-0064
TP2	DIGI-CLIP	0124-00-0064
U1	SPRAGUE UDN2543	0155-00-0455
U2	SPRAGUE UDN2543	0155-00-0455
U3	SPRAGUE UDN2543	0155-00-0455
U4	SPRAGUE UDN2543	0155-00-0455
U5	IC 74HCT273	0155-00-0453
U6	IC 74HCT273	0155-00-0453
U7	DS1232	0155-00-0425
XU5	SOCKET IC 20 PIN	0136-01-1020
XU6	SOCKET IC 20 PIN	0136-01-1020

REF. NO.	DESCRIPTION	DATASCOPE PART NO.

REPLACEMENT PARTS FOR: **PMM BOARD** **0670-00-0396**

REF. NO.	DESCRIPTION	DATASCOPE PART NO.
	PMM BOARD	0670-00-0396
C1	CAP, 0.1uF 10%, 100V	0283-04-0104
RN1	RES NET, 100K 10 PIN	0307-06-2104
RN2	RES NET, 100K 8 PIN	0307-06-1104
RN3	RES NET, 100K 8 PIN	0307-06-1104
RN4	RES NET, 100K 8 PIN	0307-06-1104
U1	IC, EPROM 27010, IMBIT	0155-00-0428
	PCB	0388-00-0282
	HANDLE, PMM MODULE	0380-00-0153
	SCREW, 4-40 x .31 LG PHILLIPS PAN HD	0212-12-0405
	LABEL, DATA-SETTE	0334-00-0806
	LABEL, EPROM	0334-00-0446
	SOFTWARE, DSBP DATA-SETT	SR 0155-90-0135-1
	SCREW, CAPTIVE FASTENER	0217-00-0002
	RETAINER, RING	0354-00-0025

REF. NO.	DESCRIPTION	DATASCOPE PART NO.

4. CALIBRATION

4.1 Introduction

This chapter of the Service Manual provides detailed information required to properly test and calibrate the instrument. Calibration consists of making mechanical and electrical adjustments in conjunction with the proper test equipment. The instrument should be tested and calibrated after repairs have been completed or at regular intervals as part of a preventive maintenance procedure.

4.2 Warnings and General Guidelines

In the event that the instrument covers are removed, observe these following warnings and general guidelines.

- Once the instrument covers have been removed, an electric shock hazard may exist. Therefore, calibration should only be performed by qualified service personnel who proceed with care and follow proper servicing techniques.
- Do not short component leads together.
- Use extreme care when reaching inside the opened instrument. Do not contact exposed metal parts which may become live.
- Do not attempt to calibrate the instrument without the TEST EQUIPMENT AND SPECIAL TOOLS REQUIRED. These are listed in Section 4.3.
- Throughly understand each step of the procedure before performing the procedure. Perform all steps in the order given. Do not skip any steps.

4.3 Test Equipment and Special Tools Required

Description	Specification
DVM	
Standard Mercury Column	0-300mmHg
Dummy Cuff (693)/Test Chamber	0138-00-0001-01
Oscilloscope	
Safety Analyzer	Dempsey Model or equivalent
Finger Sensor Probe	ACCUSAT Compatable
Extender Boards:	
Interface Board	0670-00-0398
Power Supply and SaO_2 Analog Board	0670-00-0399

4.4 Diagnostic & Calibration Procedure

To enter the Service Diagnostic Mode:

A. Turn power off.

B. Press and hold the HOLD key.

C. Turn the power on.

D. When the Service Diagnostic Menu appears, release the HOLD key.

One of the menu items will be displayed in reverse graphics. The reverse graphics shall be known as the "cursor". The cursor may be moved up or down by pressing the arrow keys.

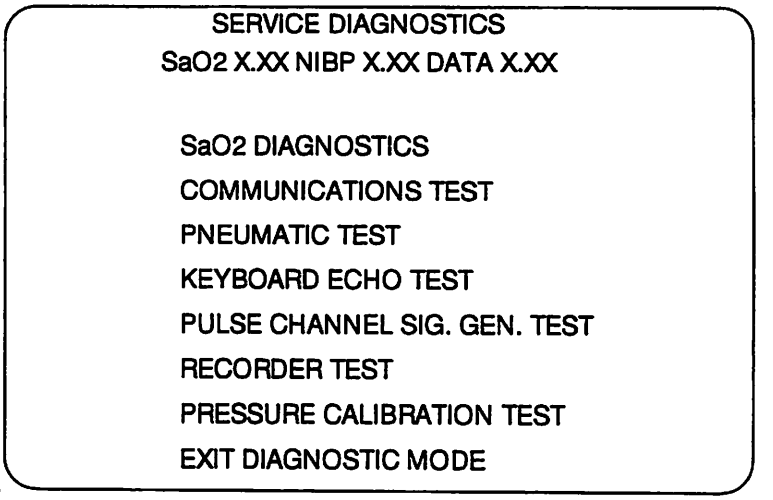


FIGURE 4-1
DIAGNOSTIC MENU

E. When the cursor is at the desired menu option, press TREND SELECT to perform that function.

The function of each menu item is described in the following sections. Also, note that the X.XX's represent the version numbers for the SaO_2 code, the NIBP code, and the Datasette.

NOTE: The tests available and their specifications may vary depending on the Datasette Revision Level. After entering the Service Diagnostic Mode, note the Datasette Revision for reference of the correct specifications and test results.

4.4.1 SaO_2 Diagnostics

NOTE: If the unit being tested is not equipped with the SaO_2 option, then the main diagnostics menu is displayed whenever a user selects the SaO_2 DIAGNOSTICS.

The SaO_2 Diagnostics consist of three separate tests which may be run to verify the sub-systems of the SaO_2 module as well as the accuracy and status of the selected SaO_2 sensor. When this menu option is selected the SaO_2 Diagnostics Menu is displayed on the LCD panel as shown in figure 4-2.

The cursor may be moved up or down by pressing the arrow keys. When the cursor is at the desired menu option, press TREND SELECT to perform that function. Selecting EXIT ends SaO_2 Diagnostic mode. The functions of each SaO_2 Diagnostic Test is described in the following sections.

NOTE: If the unit being tested is not equipped with the SaO2 option, then the main diagnostics menu is displayed whenever a user selects the SaO2 DIAGNOSTICS.

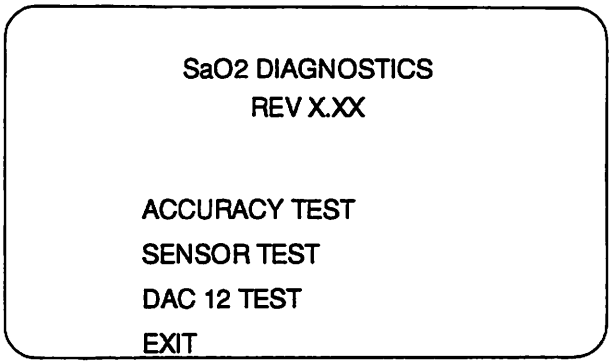


FIGURE 4-2
SaO_2 DIAGNOSTICS

A. ACCURACY TEST

The purpose of this test is to verify that the SaO_2 plug-in boards (PIB) perform accurately with any selected SaO_2 sensor. The test routine sends the infrared light output signal through both the red and infrared channels. This produces a 1:1 red to infrared ratio which corresponds to an SaO_2 value of 85%. The successful completion of this test signifies that the SaO_2 module can transmit and receive light through the monitored sight, the red and infrared channels are matched, and that the processing unit can successfully display the parameters. Since the SaO_2 module is empirically calibrated during the design phase (calibration values in software, no trim pots to calibrate), a display of 85% means that the SaO_2 module can accurately display SaO_2 over the entire monitoring range.

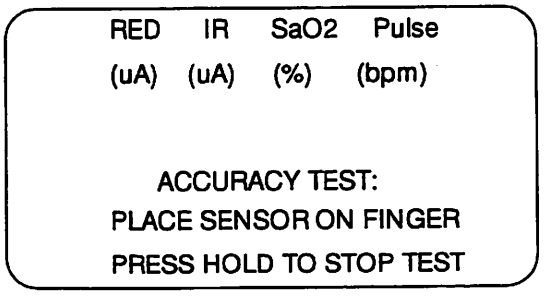


FIGURE 4-3
ACCURACY TEST

1. Select ACCURACY TEST from the SaO_2 Diagnostics Menu. A set of instructions is displayed on the LCD panel as shown in figure 4-3.

2. Place an SaO_2 sensor on your finger.

Shortly after the sensor is placed on a finger the SaO_2 value is displayed on the LED's along with the pulse rate. The LED's are updated as the values change.

3. Press the HOLD key to end the test. The SaO_2 Diagnostic Menu will display on the LCD panel.

B. SENSOR TEST

The purpose of this test is to verify that the Digisensor in use will work with the entire range of patients it was designed for. During this test both the red and infrared LED's are analyzed. The true LED currents are measured by the light detector which provides for the evaluation of the LED output levels. The number corresponding to the weakest sensor that works with the total patient population is 70uA.

1. Select SENSOR TEST from the SaO_2 Diagnostic Menu. A set of instructions is displayed on the LCD panel as shown in figure 4-4.

2. If the sensor is on your finger, remove it.

3. Face the emitter to the detector.

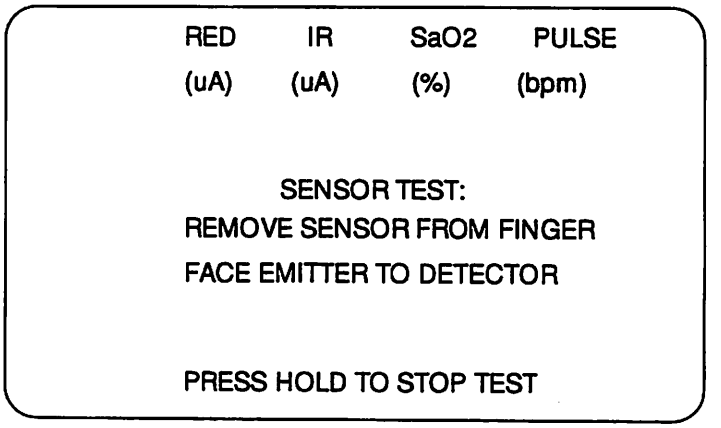


FIGURE 4-4
SENSOR TEST

Shortly after the test is started the red and infrared readings are displayed on the LED's. These values are continuously updated whenever they change. These values should be equal to or exceed 70uA.

4. Press the HOLD key to end the test. The SaO_2 Diagnostic Menu will display on the LCD panel.

C. DAC 12 TEST

The purpose of this test is to verify the performance of the Analog Board DAC. An oscilloscope is used to measure this waveform at J24, Pin 5, GND on Pin 6. The output waveform should be observed for linearity and lack of hysteresis

1. Select DAC 12 TEST from the SaO_2 Diagnostic Menu. A set of instructions is displayed on the LCD panel as shown in figure 4-5.

2. Attach a scope to Pin 5 of the Analog Board test connector.

Shortly after the test is started the waveform may be observed.

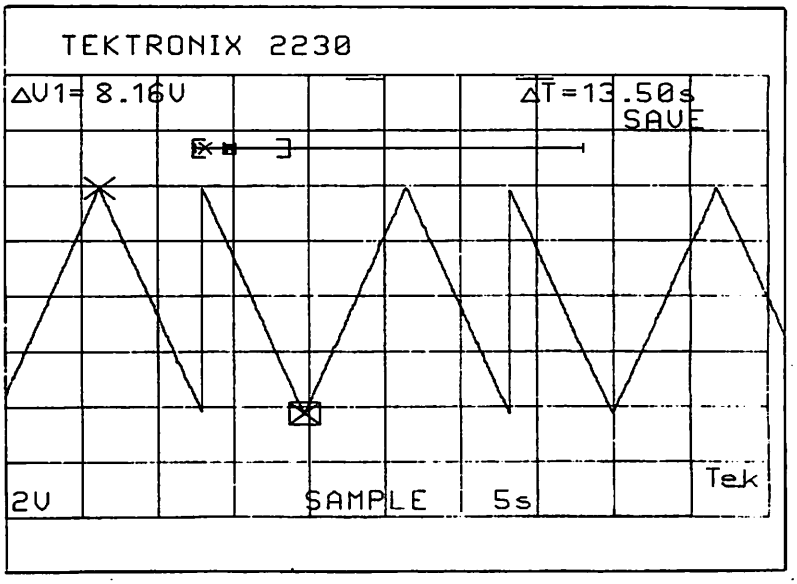
DAC TEST
ATTACH A SCOPE TO PIN 5 OF
ANALOG BOARD TEST CONNECTOR

PRESS HOLD TO STOP TEST

FIGURE 4-5
DAC TEST

TEST WAVEFORM

A



TEST WAVEFORM

EXPANDED

B

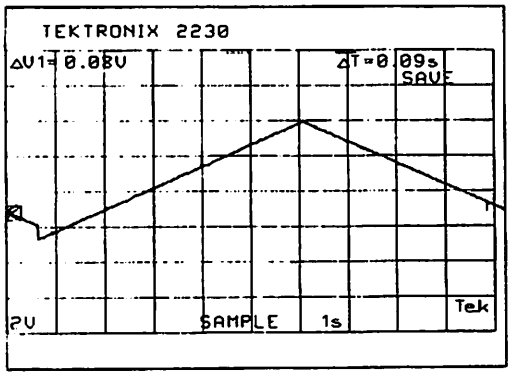


FIGURE 4-6 A & B

4. Press the HOLD key to end the test. The SaO_2 Diagnostic Menu will display on the LCD panel.

4.4.2 COMMUNICATIONS TEST

The purpose of this test is to verify the integrity of the Datascope Bus and the RS232 Channel. The user will be instructed to jumper the transmit and receive pins together on the RS232 connector, and to disconnect any Datascope Bus cables. This will allow both serial communication channels to transmit data and receive back the data that is sent.

1. Select COMMUNICATIONS TEST from the Diagnostic Menu.

A set of instructions will be display on the LCD panel as shown in figure 4-7.

2. Disconnect the Datascope bus cable.

3. Jump the transmit and receive pins (pins 2 & 3), on the RS232 connector, together.

4. Press the START key to run the communications test.

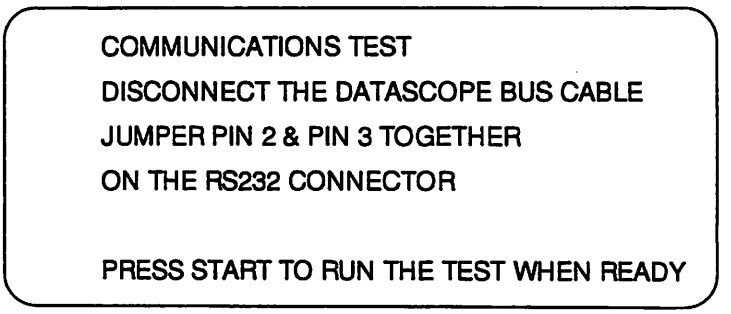


FIGURE 4-7
COMMUNICATIONS TEST

The Datascope bus test involves transmitting values from 0 to 0FFh, then reading back the received data to verify that all data was correctly received.

The RS232 test involves transmitting the ASCII characters from space to lower case z, then verifying that the received data is the same as what was transmitted.

In both tests, if the data is received incorrectly or if not enough data is received the test will fail. The RS232 test will fail if the transmit and receive pins are not jumped together.

The test results will be displayed on the LCD panel as shown in figure 4-8.

5. If the START key is pressed again, the tests are performed again. If the HOLD key is pressed, the test ends and the main Diagnostic Menu displays on the LCD panel.

6. FOR REV "F" AND ABOVE SOFTWARE: Press the RECORD Key to obtain a printout of the test results.

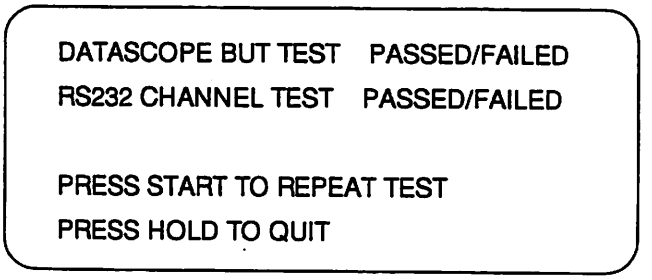


FIGURE 4-8
COMMUNICATIONS TEST RESULTS

4.4.3 PNEUMATIC TEST

The pneumatic test consists of four separate tests which may be run to check the pneumatic components of the unit. When this menu option is selected the Pneumatic Test Menu is displayed on the LCD panel as shown in figure 4-9.

The cursor may be moved up or down by pressing the arrow keys.

When the cursor is at the desired menu option, press TREND SELECT to perform that function. Selecting QUIT exits the pneumatic test mode. The function of each Pneumatic Test is described in the following sections.

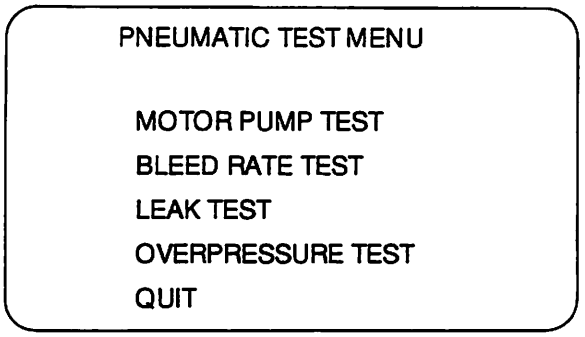


FIGURE 4-9
PNEUMATIC TEST MENU

NOTES: The pneumatic tests are to be run with a 700cc chamber connected.

If the HOLD key is pressed during any pneumatic test, the test will be aborted and the valve will be opened to release the pressure in the chamber.

A. MOTOR PUMP TEST

- REV "E" DATASETTE

The purpose of this test is to determine if the output of the pump is adequate.

1. Select the Motor Pump Test option. Selecting this option causes the LCD panel to display a menu listing the pressure selections for the test as shown in figure 4-10a.

2. Connect the 700cc test chamber. **NOTE:** A 700cc chamber must be used for this test, otherwise the results are invalid.

3. Use the arrow keys to move the cursor, and press TREND SELECT to choose a particular test. When QUIT is selected, the motor pump test is ended and the main Pneumatic Test Menu reappears.

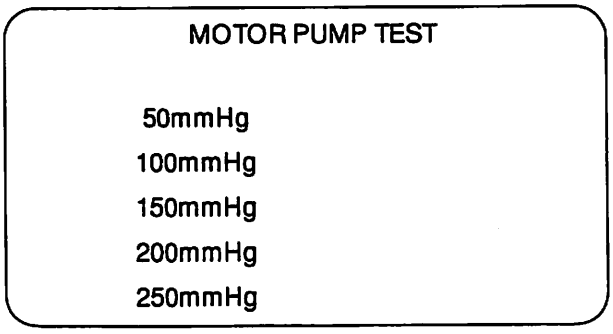


FIGURE 4-10a
MOTOR PUMP TEST
REV E DATASETT

When any of the pressure options are selected, the unit pumps to the selected pressure and then releases the pressure. The current pressure is displayed on the LED's. The time required to reach the target pressure will be displayed in units of xx.x seconds.

SPECIFICATIONS FOR REV E DATASETTE

50mmHg < 3.0 sec
100mmHg < 5.0 sec
150mmHg < 8.0 sec
200mmHg < 10.0 sec
250mmHg < 16.0 sec

This test may be repeated for any particular pressure and will result in overwriting the old test results with the new ones.

- REV "F" AND ABOVE DATASETTE

The purpose of this test is to determine if the output of the pump is adequate.

1. Connect the 700cc test chamber.

NOTE: The 700cc test chamber must be used for this test, otherwise the results are invalid.

2. Select the Motor Pump Test option by pressing the TREND SELECT Key.

The LCD panel will display the following message:

The pump will inflate the chamber to 250mmHg, then release the pressure. During the inflation/deflation cycle the current pressure is displayed in the MEAN or SaO_2 LED window. The time required to reach the target pressure will be displayed on the LCD panel in units of xx.x seconds.

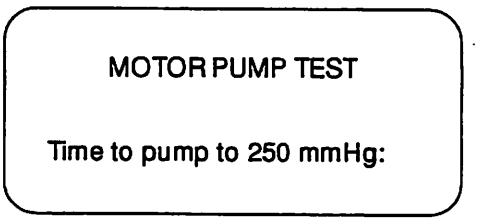


FIGURE 4-10b
MOTOR PUMP TEST
REV F DATASETTE

SPECIFICATIONS

250mmHg < 16.0 sec

3. Press the START key to repeat the Motor Pump Test, or press the HOLD key to quit the test and return to the main Pneumatic Test menu.

4. Press the RECORD key to obtain a print out of the test results.

B. BLEED RATE TEST

The purpose of this test is to determine if the solenoids and orifices are performing properly. **NOTE:** The 700cc test chamber must be used for this test, otherwise the results are invalid.

1. Select BLEED RATE TEST option.

Selecting this option causes the pump motor to inflate the chamber to 170mmHg. The largest orifice is then opened. The time required for the pressure to drop from 150mmHg to 130mmHg is counted. After the pressure drops to 130mmHg, the unit again inflates the chamber to 170mmHg. The middle sized orifice is opened and the time required for the pressure to drop from 150mmHg to 130mmHg is counted. After the pressure drops to 130mmHg, the chamber is again inflated to 170mmHg. This time the smallest orifice is opened. The time required for the pressure to drop from 150mmHg to 130mmHg is counted.

FOR REV 'E" DATASETTE: The chamber is reinflated to 170mmHg. This time the dump valve is opened, and the time required for the pressure to drop from 150mmHg to 130mmHg is counted.

FOR REV 'F" AND ABOVE DATASETTE: The chamber is then inflated to 250mmHg. This time the dump valve is opened and the time required for the pressure to drop from 250mmHg to 20mmHg is counted.

Then the pressure is released and the bleed rate for each of the orifices is displayed on the LCD panel in units of xxx.x mmHg/sec. The current pressure is displayed on the LED's during the entire test. The format for displaying the test results is as shown in figure 4-11.

		SPECIFICATIONS	
		REV E SOFTWARE*	**REV F AND ABOVE SOFTWARE**
Orifice # 1	xxx.x mmHg/sec	5.6 - 11 mmHg/sec	5.6 - 11 mmHg/sec
Orifice # 2	xxx.x mmHg/sec	1.0 - 1.9 mmHg/sec	1.0 - 1.9 mmHg/sec
Orifice # 3	xxx.x mmHg/sec	0.5 - 0.9 mmHg/sec	0.5 - 0.9 mmHg/sec
Orifice # 4	xxx.x mmHg/sec	200 mmHg/sec or greater	50 mmHg/sec or greater

FIGURE 4-11
BLEED RATE TEST
RESULTS

3. Press the START key to repeat the bleed rate test, or press the HOLD key to quit the test and return to the main Pneumatic Test Menu.

4. FOR REV 'F" AND ABOVE DATASETTE: Press the RECORD Key to obtain a printout of the test results.

*For Rev E Software, the specifications for orifice # 4 is 50mmHg/sec or greater when the blue 43um cuff filter is installed.

C. LEAK TEST

The purpose of this test is to check the leak rate of all the pneumatic components which comprise the cuff system.

1. Connect the 700cc test chamber. **NOTE**: The 700cc test chamber must be used for this test, otherwise the results are invalid.

2. Select the LEAK TEST option.

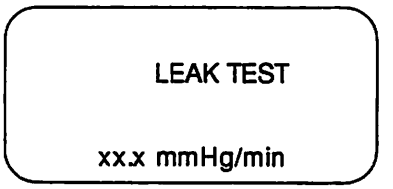


FIGURE 4-12
LEAK TEST

When this option is selected, the chamber is inflated to about 200mmHg. After waiting 5 seconds for the pressure to settle, the pressure is noted. Then the pressure is held for a period of 1 minute. The ending pressure is noted, then the pressure is released. The current pressure is displayed on the LED's during the entire test. The total pressure drop during the 1 minute holding period is displayed on the LCD panel as the leak rate as shown in figure 4-12. The leak results should not exceed 5.0mmHg/min.

3. Press the START key to repeat the leak test, or press the HOLD key to quit the test and return to the main Pneumatic Test Menu.

4. FOR REV "F" AND ABOVE DATASETTE: Press the RECORD Key to obtain a printout of the test results.

D. OVERPRESSURE TEST

- Perform this test on units with Dattasette Rev K or below. (For Rev L and above proceed to Step 6)

The purpose of this test is to determine whether the overpressure sensor is operating properly and will prevent overpressure in the event that the normal pressure sensing circuit fails.

1. Connect the 700cc test chamber.

WARNING: If there is an external mercury column connected, this mode may exceed the pressure rating of the mercury column.

2. Select OVERPRESSURE TEST option.

When this option is selected, the pump is started in an attempt to pump up to a pressure of 330mmHg. The overpressure sensor should be tripped before the target pressure is reached. The peak pressure is displayed on the LCD panel when the overpressure sensor is tripped, but if the pressure in the chamber reaches the target pressure of 330mmHg without tripping the sensor a message is displayed on the LCD panel stating that the target pressure of 330mmHg was reached without tripping the sensor. The current pressure is displayed on the LED's while the unit is pumping up.

Specification: Trip point > 293mmHg < 330mmHg.

3. Turn the set screw, located on the side of the grey pressure switch, counter-clockwise to increase the trip point. (Nominal Set Value = 315mmHg)

4. Press the START key to repeat the overpressure test, or press the HOLD key to quit the test and return to the main Pneumatic Test Menu.

5. **FOR REV "F" AND ABOVE DATASETTE:** Press the RECORD Key to obtain a printout of the test results.

- Perform this test on units with Dattasette Rev L or above.

6. Connect the 700cc test chamber.

WARNING: If there is an external mercury column connected, this mode may exceed the pressure rating of the mercury column.

7. Select OVERPRESSURE TEST option.

When this option is selected, the pump is started in an attempt to pump up to a pressure of 395mmHg. The overpressure sensor should be tripped before the target pressure is reached. The peak pressure is displayed on the LCD panel when the overpressure sensor is tripped, but if the pressure in the chamber reaches the target pressure of 395mmHg without tripping the sensor a message is displayed on the LCD panel stating that the target pressure of 395mmHg was reached without tripping the sensor. The current pressure is displayed on the LED's while the unit is pumping up.

Specification: pressure switch trip point > 293mmHg < 395mmHg

8. Turn the set screw, located on the side of the grey pressure switch, counter-clockwise to increase the trip point. (Nominal Set Value = 375mmHg)

9. Press the START key to repeat the overpressure test, or press the HOLD key to quit the test and return to the main Pneumatic Test Menu.

10. Press the RECORD Key to obtain a printout of the test results.

4.4.4 KEYBOARD ECHO TEST

1. Select KEYBOARD ECHO TEST from the Service Diagnostic Menu.

When this menu option is selected the unit performs a test on the front panel touch switches (keys) by displaying, on the LCD panel, the name of the key which was pressed.

2. Press each front panel key.

3. To end the test, do not press any keys for 10 seconds

4.4.5 PULSE CHANNEL SIGNAL GENERATOR TEST

NOTE: Not availabe with REV "E" DATASETTE.

REV "F" AND ABOVE DATASETTE

The pulse channel test consists of three separate tests. When this menu option is selected the pulse channel test menu is displayed on the LCD panel as follows:

The cursor may be moved up or down by pressing the arrow keys. When the cursor is at the desired menu option, press TREND SELECT to perform that function. Selecting QUIT exits the pulse channel test mode. The functions of the other pulse channel test options are described in the following sections.

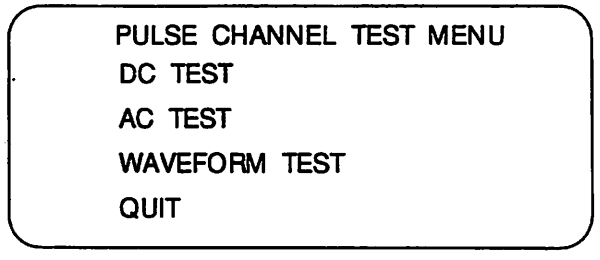


FIGURE 4-13
PULSE CHANNEL TEST MENU

A. DC TEST

The purpose of the DC test is to measure the DC offset and average noise in the pulse channel for each of the three possible gain settings. During this test the cuff connector should be open.

1. Select DC TEST option.

At the conclusion of the test, results are displayed on the LCD panel as shown in figure 4-14.

OFFSET	NOISE
GAIN 1: xx.xxV	xxxmV
GAIN 2: xx.xxV	xxxmV
GAIN 3: xx.xxV	xxxmV

FIGURE 4-14
DC TEST RESULTS

	SPECIFICATIONS	
	OFFSET	NOISE
GAIN 1:	1.5 - 1.83V	< 25mV
GAIN 2:	1.5 - 1.83V	< 50mV
GAIN 3:	1.5 - 1.83V	< 75mV

2. Press the RECORD Key to obtain a printout of the test results.

3. The test may be repeated by pressing START, or may be exited by pressing HOLD.

B. AC TEST

The purpose of the AC test is to graphically show the AC response of the pulse channel on the LCD panel.

1. Select AC TEST option.

The AC TEST MENU displays as shown in figure 4-15.

2. Connect a 700cc test chamber to the cuff connector.

3. Select a gain setting from the AC Test Menu and press TREND SELECT. The test chamber is inflated to 150mmHg.

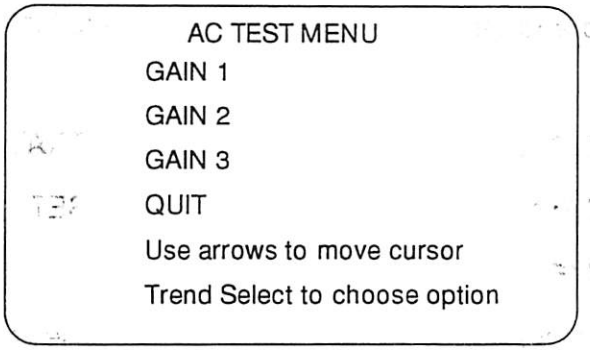


FIGURE 4-15
AC TEST MENU

The pulse channel waveform is displayed on the LCD. The pressure bleeds down slowly as the valve is opened and closed. The pulse channel should respond to these minor pressure changes. See figure 4-16. The waveform remains on the display until the pressure reaches zero. Then the AC Test menu displays again.

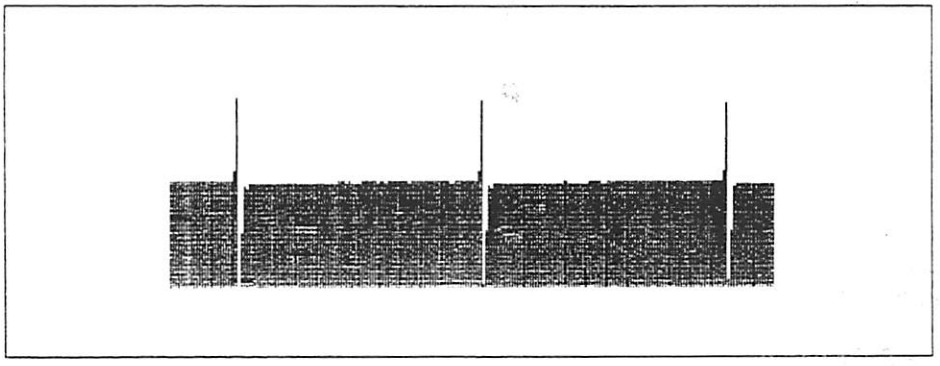


FIGURE 4-16
TYPICAL WAVEFORM AT GAIN 1

The test may be repeated with any of the three gain settings. A relative change in pulse amplitude can be observed between gain settings.

4. To obtain a printout of the waveform, press the RECORD Key. Pressing the RECORD Key will also freeze the waveform.

Examples of how the AC Test may be used:

1. As you run the test using higher gain settings (gain #1 is the lowest, 3 is the highest) the pulses on the LCD display should increase in size. If not the gain selection circuity may be faulty in the Pulse Channel.

2. If no pulses are observed on the LCD display, the pulse channel may be completely inoperative. In the extreme case the unit would pump up to the target pressure but never display any readings.

NOTE: The test may be aborted at any time by pressing the HOLD Key.

C. WAVEFORM TEST

This test is not implemented. If selected, press the HOLD Key to return to the main Pulse Channel Test menu.

4.4.6 RECORDER TEST

1. Select RECORDER TEST from the Service Diagnostics Menu.

When this menu option is selected the unit performs a test on the (optional) recorder unit. During the recorder test, the LCD display contains the message "RECORDER TEST". The test pattern which is printed out tests each dot and every available character in the printer font. See figure 4-17.

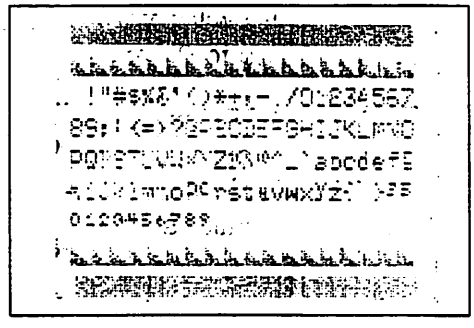


FIGURE 4-17
EXAMPLE OF RECORDER OUTPUT

2. After the printer stops, the Main Pneumatic Test menu is displayed.

NOTE: If the unit being tested is not equipped with a recorder, then the Main Diagnostics Menu is displayed whenever a user selects the recorder test.

4.4.7 PRESSURE CALIBRATION TEST

The purpose of this test is to adjust the sensitivity of the transducer circuit for optimal accuracy and for checking the linearity at three separate points.

1. Select PRESSURE CALIBRATION TEST from the Service Diagnostics Menu.

When the PRESSURE CALIBRATION TEST option is selected, the menu for the pressure calibration options will be displayed on the LCD panel as shown in figure 4-18.

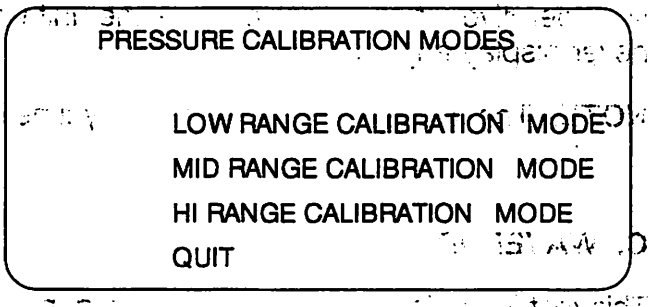


FIGURE 4-18
PRESSURE CALIBRATION MENU

2. Connect the 700cc test chamber and manometer as shown in figure 4-18. (If a test chamber is not available, an adult cuff wrapped around a towel may be substituted for the Pressure Calibration Test.)

The cursor may be moved up or down by pressing the arrow keys.

When the cursor is at the desired menu option, press TREND SELECT to perform that function. Selecting QUIT exits the pressure calibration mode.

3. Select LOW, MID, or HI range calibration to inflate the cuff (or calibration canister) to approximately 50mmHg (for LOW), 100mmHg (for MID), or 250mmHg (for HI).

During this time the pressure will be displayed in the MEAN window and the message "PRESS HOLD TO VENT CUFF" will be displayed on the LCD panel. After the desired target pressure is reached, the pump will turn off and the pressure will be held until the user presses the HOLD key. Then the pressure will be released and another calibration may be performed after the pressure drops to 0mmHg.

4. Compare the MEAN display on the ACCUTORR with the reading on the manometer. If the readings do not match, adjust VR1 on the NIBP Control Board. Adjust the calibration tolerance as listed in the specifications.

SPECIFICATIONS

+ /- 3mmHg for Mid Range
+ /- 3mmHg for Low Range
+ /- 4mmHg for Hi Range

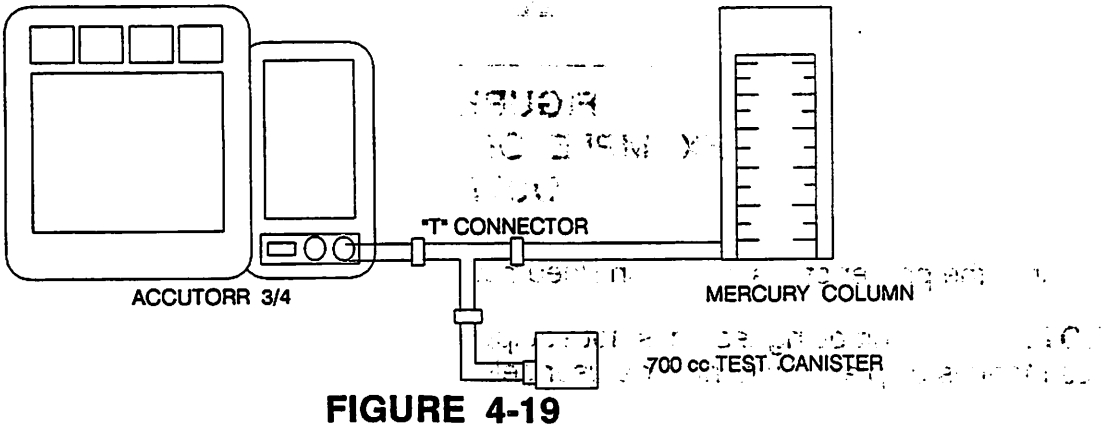


FIGURE 4-19
SET-UP FOR PRESSURE CALIBRATION TEST

4.4.8 EXIT DIAGNOSTIC MODE

When this menu option is selected, the unit goes into normal operation mode.

Datascope Corp.● 580 Winters Avenue, P.O. Box 5●Paramus, N.J. 07653-0005, U.S.A.● Tel. (201) 265-8800● TWX #710-990-6630●Telex 7109906630

Datascope B.V.●Drs. W. van Royenstraat 8●3871 AN Hoevelaken●P.O. Box 26●3870 CA Hoevelaken●The Netherlands● Telephone 31-3495-44911●Fax 31-3495-34280

Printed in U.S.A. 0070-00-0221 REV O