

# Blood Component Detector

## Interface Reference Manual

105-0002



**CAUTION:**  
DESCRIBES TESTS TO PARTS AND  
ASSEMBLIES SUSCEPTIBLE TO DAMAGE BY  
ELECTROSTATIC DISCHARGE (ESD).

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# Blood Component Detector

## Interface Reference Manual

The Blood Component Detector is available in several configurations. These configurations support different interfaces and are considerations based on the intent or type of design integration. The configurations are as follows:

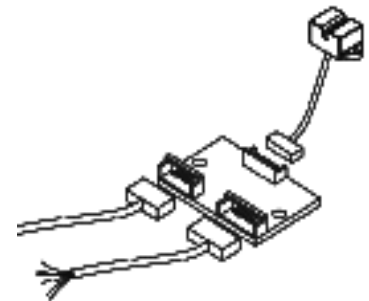
- 1) **Terminal Mode** – Primarily for test and evaluation. A desktop computer interface provides monitoring and set-point control. This configuration gives good visibility and flexibility to the functionality of the detector. A detector head, PCB and an RS-232 cable is supplied with this configuration.
- 2) **Standard Electrical Interface** – Suitable for test and evaluation or OEM applications. A detector head is supplied with an external PCB and is operated using point-to-point wiring and electrical logic interface. See page 8
- 3) **Chip Level Integration** – An integration package is available from Introtek. This integration package defines the electrical schematic and bill-of-materials. This configuration allows electrical components to be consolidated to your main system PCB. This represents the most space efficient and cost effective OEM solution.

Consult your Introtek Sales Representative for more information related to this configuration.

The Terminal Mode interface provides RS-232 communication to control and operate the blood component detector. This is a development tool to aid in the test and evaluation of the detector. A user friendly command set is provided on the following page. This command set provides the standard input and output feature necessary to operate the blood component detector using RS-232. (A separate command set is available for embedded applications)

An RS-232 interface cable is supplied by Introtek that is exclusively for this application. This cable allows personal computer connectivity, Mac is not supported.

Microsoft HyperTerminal application is recommend for this interface. HyperTerminal is provided on PC platforms that have Windows 2000 or XP operating systems installed. If Windows 7 or Vista is used Hyper Terminal must be installed.



Sensor Head, PCB, Electrical Interface Cable and RS-232 Cable Shown

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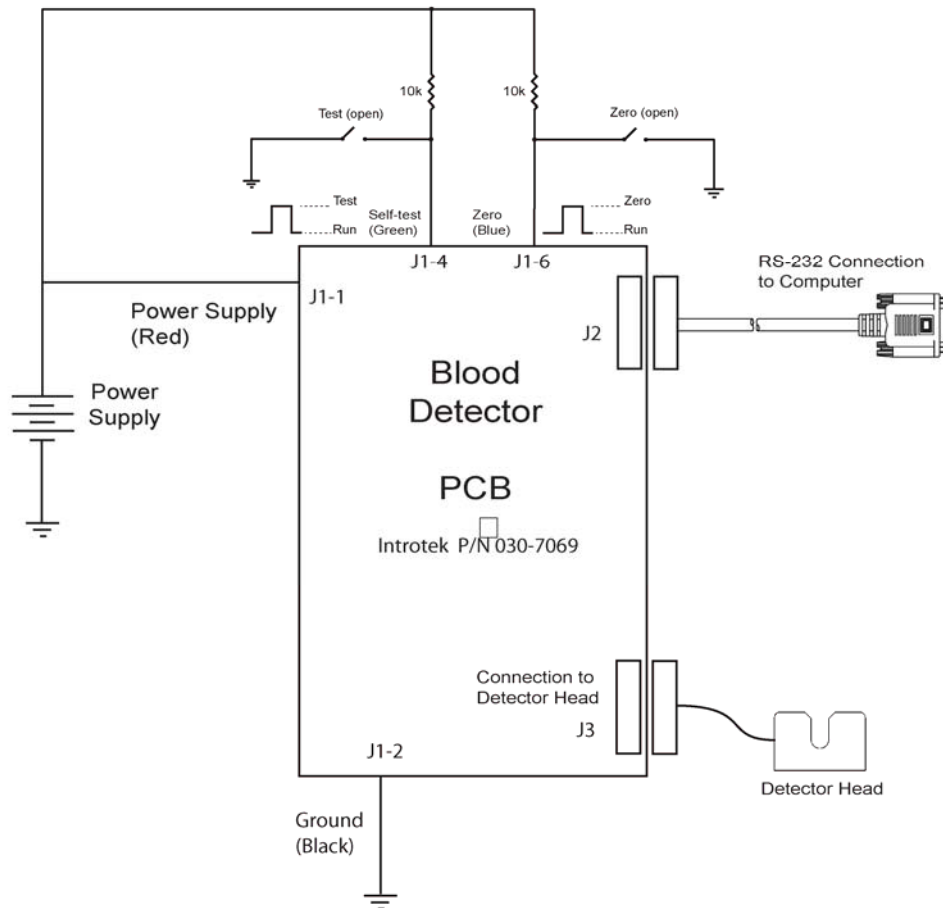
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# Blood Component Detector

## Terminal Mode



The above wiring diagram shows the electrical configuration for terminal mode communication. The Inrotek control board (part number 030-7069 programmed with 104-1013 firmware) is required for these purposes.

Connect the circuit as shown. Set power supply to the correct voltage before it is applied. Load and configure Hyper Terminal. The Hyper Terminal configuration settings are covered in this document.

Note: All input and output connections must be made as shown to insure proper operation.

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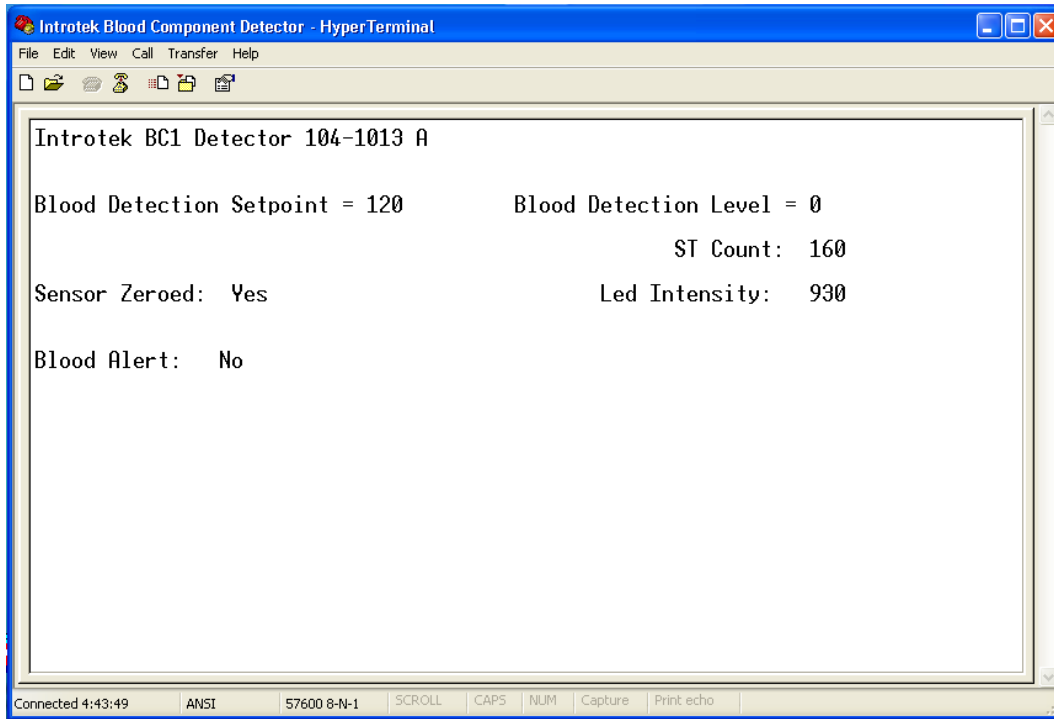
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# Blood Component Detector

## Terminal Mode



To begin in terminal mode communication press [ctrl] [U].

To Zero the detector you first insert a segment of clear tubing into the detector head. Then load the tubing with clear liquid (saline or water works fine).

Press [Z] to zero.

It will be necessary to zero the detector periodically or for each new tube insertion.

Without removing the tube replace the clear liquid in the tube with dilute blood content.

The dilute blood content should contain the concentration of blood that represents the desired threshold level. Below this concentration no response will occur.

Press [C] to calibrate the detector threshold to the blood component level in the tube.

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# Blood Component Detector

## Terminal Mode

The data refresh rate in Terminal Mode is approximately once every 0.5 seconds. This is slower than when in the Standard UART configuration for on-screen viewing purposes.

The standard UART refresh rate is once every 100ms.

### Terminal Mode User Commands:

Ctrl U = Used to initiate communication between computer terminal and Blood Component Detector.

Z = ZERO - This will normalize the detector to zero for a given tube insertion. Tubing with clear fluid must be present during this operation.

C = CALIBRATE - Allows you to program the detector to a current blood condition. Tubing with your blood threshold should be present for this operation. Note: The detector must be zeroed prior to this operation.

S = SETPOINT - Allows you to manually enter and save a numeric value threshold set point via the keyboard. The detector will save this value. The format is SXXX. Where XXX is the desired value from 0 to 870 (leading zeros not required) followed by (Enter). When the set point is changed a G command must be issued to derive and store the new required LED drive current.

T = SELF-TEST - Asserting a self-test will result in the output reporting a blood condition. Note: the detector must be zeroed prior to performing self-test.

G = GET SELF-TEST DRIVE - Sets and saves the led drive current such that the attenuation achieved during a self-test will be limited to approximately 40 counts above the set point. This must be reset every time the set point is changed.

Note: Either lower or upper case characters may be sent.

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# Blood Component Detector

## Terminal Mode

The following section describes how to configure HyperTerminal for your use.

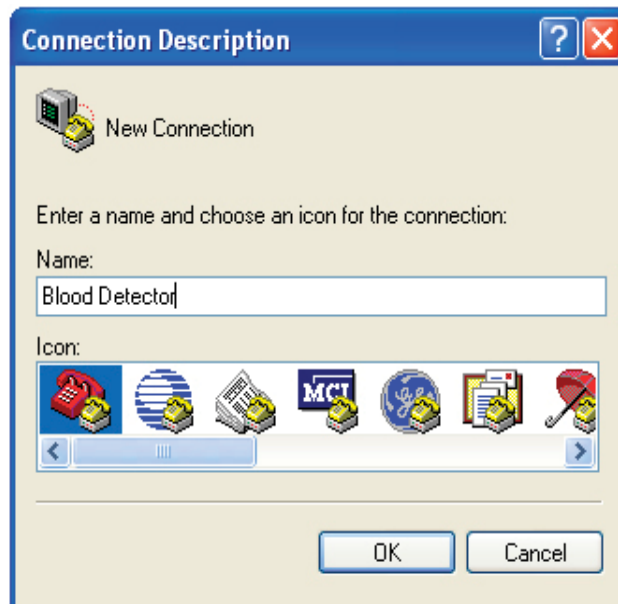
Open the HyperTerminal program.

For example on Windows XP:

Click Start->All Programs->Accessories->Communications->HyperTerminal

A dialog box will ask if you want to make HyperTerminal your default telnet program, we recommend you click Yes.

The "Connection Description" window will open. Enter a connection name and choose an icon for your connection. The only restriction here is it cannot be a device name e.g. "COM1" click OK.



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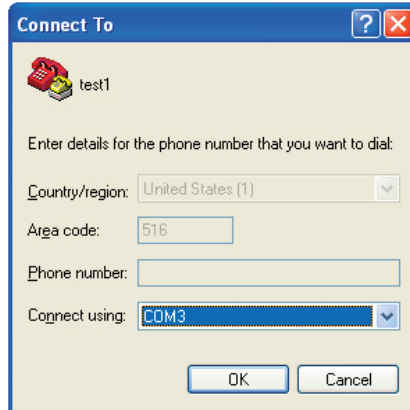
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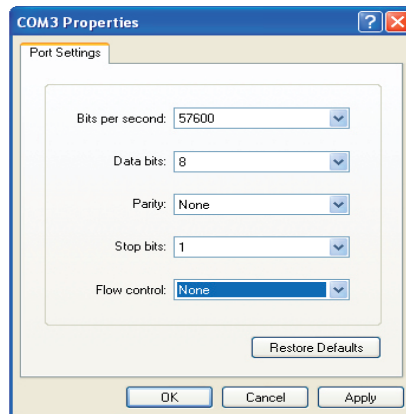
# Blood Component Detector

## Terminal Mode

At the bottom of the “Connect To” window is a pull down menu list. Select the appropriate communications port for your connection. Click OK.



On the Properties screen there will be several pull down menus. Configure them as show below. And then click OK



Click -> SAVE to save your changes.

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# Blood Component Detector

## Standard Electrical Interface

### Power Supply:

5.0 VDC @ <50mA for standard configurations. Damage may occur when applying an over voltage condition.

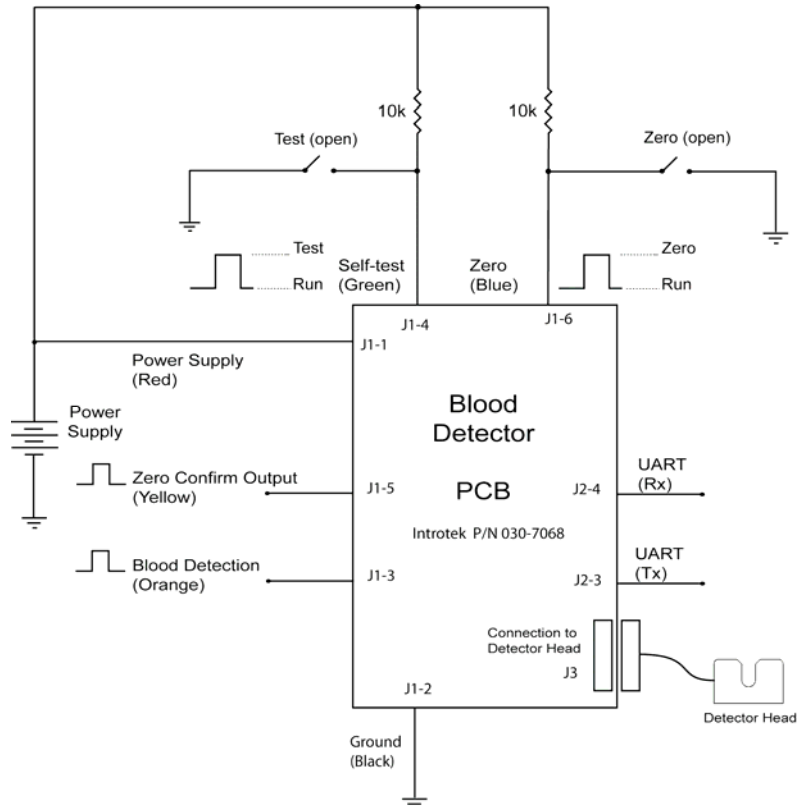
### Zero:

Zero is to be performed with a tube inserted with clear liquid. Asserting a logic high will normalize the detector for each unique tube insertion. A 10K pull-up resistor is recommended.

### Self-Test:

Self-Test is to be performed with a tube inserted with clear liquid. Asserting the self-test signal high will simulate a blood condition forcing the Blood Detect output high. A 10K pull-up resistor is recommended.

Note: All input and output connections must be made as shown to insure proper operation.



### Pin Configuration

**J1-1 - Power Supply**  
**J1-2 - Ground**  
**J1-3 - Blood Detect Logic Output**  
**J1-4 - Self Test**  
**J1-5 - Zero Confirm Output**  
**J1-6 - Zero**

**J2-1 - Power Supply**  
**J2-2 - Ground**  
**J2-3 - UART TX**  
**J2-4 - UART RX**

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# Blood Component Detector

## Standard Electrical Interface

In this mode the BC1 can operate as a slave device to a host computer via the two wire serial connection or by the standard logic interface.

The command characters sent to the UART by the host may be either upper or lower case characters. The command characters sent to the BCD will be echoed back in uppercase as verification that the request has been received. Immediately following this echoed character the requested data is sent.

All data consists of four numerals including leading zeros.

The data refresh rate is approximately 100ms.

In the Standard Electrical Interface mode the blood alarm signal will go to logic high as soon as the blood concentration criterion is exceeded. In the serial two wire mode the BC1 should be continually queried. The returned value can then be compared to the stored set point value by the host to determine if the blood threshold level has been reached or exceeded.

### Standard UART Interface User Commands:

Ctrl <S> (or initial power up) will put the BCD into its default Embedded System Mode.

S = Enter and save the Blood Detection Set Point

The Format is SXXX. Where XXX is the desired value and it is followed by 'r' (Enter).

When the set point is changed a G command must be issued to derive and store the new required LED drive current.

The range for XXX is 0 to 870. Leading zeros are not required.

A received 'X' indicates a time out has occurred and no changes were made. A time out will return an 'X' in approximately 3 - 4 seconds.

A valid value acceptance will return the value in a 4 digit format 'XXXX'.

A failed attempt will return an 'F'.

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## Standard Electrical Interface

T = Self Test returns 'P' for Pass or 'F' for Fail (no changes made).

Note: If the sensor has not been zeroed it will always return 'F' for Fail.

G = GET SELF-TEST DRIVE – Sets and saves the led drive current such that the attenuation achieved during a self-test will be limited to approximately 40 counts above the set point.

This must be reset every time the set point is changed.

The letter 'G' will be sent repetitively by the detector until the correct led drive has been obtained. The attenuation value obtained will be sent upon completion of the process.

I = INTENSITY – Returns the raw reading of the detector. When zeroed the value will be approximately 930. As the led intensity increases and decreases so will the number that is returned.

V = Blood Detection Level, Returns 'VXXXX'

Z = Zero Sensor

Repetitive 'Z' characters are sent from the BC1 to the host as it converges to zero. 'Y' character is returned when calibration has completed.

Q = ZERO CONFIRM - The ZERO CONFIRM polling shall be performed only immediately after the ZERO command. Returns "P" for Pass and "F" for Fail

D = Display Blood Detection Set Point, Returns 'DXXXX'

C = Calibrate, This will adjust Set Point to the physical blood concentration present in the tube. If the concentration level is >10 the detector will return string 'CXXX'.

If the value was not accepted an 'F' will be returned indicating a failed operation.

If the unit is reset an "R" will be sent to the host computer.

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