OPERATING MANUAL

COMP-U-DIFF

MODEL 10-329

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COMP-U-DIFF MODEL 10-329

GENERAL INFORMATION

COMP-U-DIFF (model 10-329) is a differential cell counter and morphology data entry workstation that provides efficient, direct computer entry of differential counts, RBC morphology, comment, specimen and technical identification. COMP-U-DIFF guides the operator through the data entry procedures via a series of English-text prompts displayed on a large bright backlit LCD. The model 10-329 outputs its information to a laboratory computer and/or ticket printer. With it's 127 location batch memory, COMP-U-DIFF may be used in a stand-alone, or autonomous, operation should the Laboratory computer be busy or inoperative.

FEATURES

LCD display — **All channels are displayed simultaneously with large digits on bright backlit LCD display**

Specimen Memory **COMP-U-DIFF has sufficient memory to store information from up to 127 specimens.**

Search Function — **High speed search facilitates quick access of information**

Hemogram Recall — **This b-directional feature enables the user to view associated hemogram data on the COMP-U-DIFF screen. A query to the lab computer results in data being downloaded from the computer to the COMP-U-DIFF screen.**

Comp/Printer Ports **Two separate ports allow for easy interfacing to both the lab computer and standard ticket printer.**

Status Screen — **To view internal function settings.**

Count Correction — **Permits the operator to decrement counts.**

Non-total channels — **Provides for optional counting of NRBC or other abnormal cells independent of the differential count.**

Output Data Format **The data format is a serial string of characters provided for easy programming.**

PHYSICAL LAYOUT

FUNCTION KEYS

Six function keys are located directly above the keypad area as shown in the diagram below. Three of these keys access multiple screens where each key depression advances to the next screen.
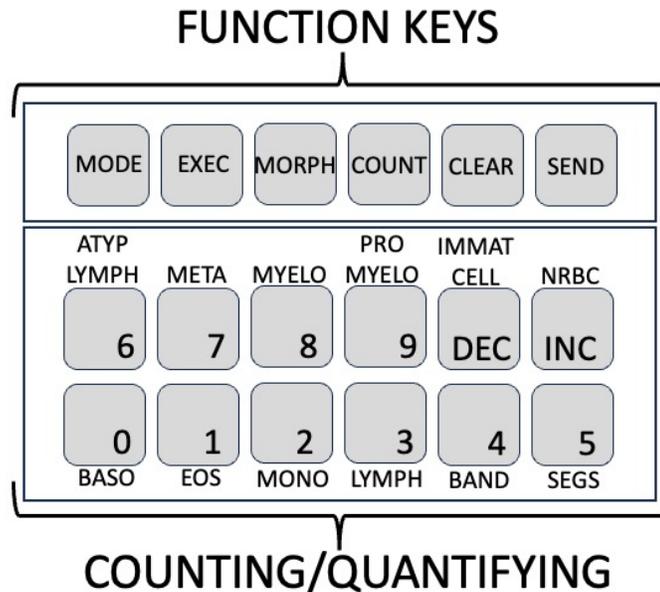
The function keys operate in the following manner each time one is depressed.

[MODE]	STORE → RECALL → BATCH
[MORPH/COMMENT]	RBC1 → RBC2 → RBC3 RBC4 → CMMT.....etc.
[COUNT]	COUNT → PERCENT COUNT ....etc.
[EXEC]	In STORE Mode. Writes report to batch memory. In RECALL Mode. Rewrites updated report to batch memory.
[CLEAR].	In STORE Mode. Clears local memory. In RECALL Mode. Clears selected report from batch memory. In BATCH Mode. Clears ALL reports in batch memory.
[SEND]	In STORE Mode. Transmits current results to laboratory computer. In RECALL Mode. Sends selected results to laboratory computer from batch memory . In BATCH Mode. Sends ALL results stored in batch memory to computer.
[CLEAR] + [MORPH]	Status Screen (user selectable programs.)

* NOTE: [ ] DENOTES A KEY

DATA ENTRY KEYS

The data entry keys provide two different operations.

1) The twelve keys add counts to different cell channels in COUNT mode; or,

2) Enable the entry of specific numeric values [0-9] for identification numbers, quantifiers, etc.

The [INC] and [DEC] keys provide two functions:

1) Screen cursor controls; or,

2) Pointer to memory locations for accessing data stored within the batch memory.

COMP-U-DIFF QUICK DEMO

Note: This demonstration is intended as a quick introduction of the COMPUDIFF.

STEP 1. **Plug the power to the wall socket. The screen default will appear as shown below. Note that the Unit is in the STORE mode.**

```
ID #       0000000000      STORE
DATE       00/00/0000
```

STEP 2. **Enter Specimen ID Number (up to ten digits).**
STEP 3. **At this step the user could _optionally_ press the [SEND] key transmitting the specimen number to the Lab. Computer requesting Hemogram data to be displayed on the screen. [see discussion on Hemogram lookup]; or,**

STEP4. **Press [COUNT] function key. The screen will display the twelve counting channels and the three digit total count as shown below:**

```
00    00    00    00    00    00     TOTAL
00    00    00    00    00    00     000
```

STEP 5. **Depress the counting key as required. Each key depression will add a count to the appropriate channel and add a count to the total count (except to the upper right key if it has been designated as a non-totalizing channel for counting NRBCs).**
When the user has completed counting cells, he/she may then optionally save the specimen count results by pressing [EXEC] key, send the results to the laboratory computer by pressing the [SEND] key; or if there is morphology or comments to be entered proceed to the next step.

STEP 6. **Press [MORPH] Key. Note that the cursor will be located on the ACANthocytes field. Enter a quantifier (one of the lower sic keys) for the selected Morphology. To enter additional morphologies on the same page, press the [INC] or [DEC] keys to select the desired morphology. Note that the morphologies are presented in alphabetical order. To select other pages depress the [MORPH] key through the four pages.**

```
┌─────────────────────────────────────────┐
│  ACAN 1+__    ANIS 2+__    BASO___       │
│  BURR ____    CABT____     CREN__        │
└─────────────────────────────────────────┘
```

Press **[MORPH]** key

```
┌─────────────────────────────────────────┐
│  H-JB_____   HINZ____     HYPO___       │
│  MACR____     MAP_____     MICR___       │
└─────────────────────────────────────────┘
```

Press **[MORPH]** key

```
┌─────────────────────────────────────────┐
│  OVAL____     PAPP___      PLAT___       │
│  POIK____     POLY___      SCHS___       │
└─────────────────────────────────────────┘
```

Press **[MORPH]** key

```
┌─────────────────────────────────────────┐
│  SECL_____    SIDR_____    SPHR_____     │
│  STOM___      TARG___      TEAR____      │
└─────────────────────────────────────────┘
```

The user may optionally save all the results entered thus far by pressing **[EXEC]** key, send the results to the computer by pressing **[SEND]**; or alternatively, proceed to the next step for entering comments.

Press **[MORPH]** key to access the computer page. Enter a 3-digit number from the comment dictionary. The user has the option of entering up to four comments. As in the case of the morphology, these can be obtained by pressing the **[INC]** or **[DEC]** keys.

```
┌─────────────────────────────────────────┐
│  COMMT1 000      COMMT2 000              │
│  COMMT3 000      COMMT4 000              │
└─────────────────────────────────────────┘
```

Upon completion of the comments the user may send the results to the laboratory computer/printer by pressing the **[SEND]** key, or simply save the work for later transmission by pressing the **[EXEC]** key. Upon sending or saving the results, the screen will display an acknowledgement, i.e., a momentary message, and then return to the initial screen form ready to accept the next specimen.

OPERATION

TO APPLY POWER

1. Plug power adapter connector into the associated socket located on the rear panel of the COMP-U-DIFF.
2. Insert the power adapter plug into the wall outlet.
3. The screen will display the specimen entry form.

TO ENTER SPECIMEN ID AND COLLECTION DATE

1. The screen displays the word STORE and a flashing cursor will be noted over the first digit of the Specimen number.
2. Enter the ten (10) digit Specimen number using [0-9] keys. [Note that data entry is right justified].
3. Use the [INC] key to move cursor to the Date field. Enter the eight digit Data using the [0-9] keys and the ddmmyyyy format.

TO ENTER DIFFERENTIAL COUNTS

The 12-channel keyboard for entering differential counts is shown below. While the default key assignment layout is indicated. Alternate assignments can be programmed in the laboratory computer to accommodate key assignment matched to the tech identification code.
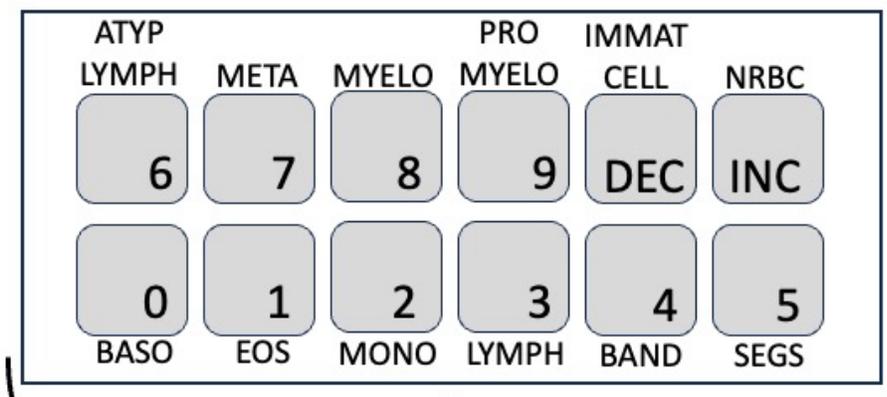
COUNTING/QUANTIFYING
KEYPAD LAYOUT

TO ENTER DIFFERENTIAL COUNTS (CONTINUED)

1. Press the [COUNT] key until the word TOTAL is displayed on the screen.
2. Enter differential counts by depressing the appropriate key for each category (i.e. SEGS, BANDS, MONOS, etc.).
3. Each time a count is entered, both the corresponding channel count and the total count are increased by one and, an audible click will be heard (except for non-totalizing channel where the count is deposited only in associated channel, but not in the total count).

ADDITIONAL CELL CATEGORIES

To expand the COMP-U-DIFF Cell counting capabilities to accommodate more then 12 categories the user may redefine channels 9 and 10. The default for these channels is:

Channel 9	Promyelocyte
Channel 10	Immature Cells

The comment codes 801-807 are reserved for assigning cell types to channel 9 and codes 901-907 are reserved for channel 10 (see exhibit 3). To assign cells to these channels follow the steps described below (see comment entry).

1. Press [MORPH] key repeatedly until the comment screen is reached.
2. Press [INC] and [DEC] keys to access the required comment field.
3. Enter a valid cell category change comment.
4. Press [EXEC] key to save the comment.
5. The selected cell category is automatically inserted at the correct print location on the ticket.

TO CONVERT COUNTS TO PERCENTAGE OF TOTAL

1. Press the [COUNT] key until the -%- is displayed.
2. Each channel is now calculated and displayed as percent of total; i.e., a two digit number.
3. If the NRBC is designated for the non-total channel, the non-totalized value will be normalized to the number of NRBCs per 100 WBCs.

TO SUBTRACT COUNTS (DECREMENT)

1. Press the [COUNT] key twice and hold down on the second press.
2. Press the cell category keys that you desire to subtract while holding down the [COUNT] key. The screen will display –[DECR]- while in this mode.
3. Release the [COUNT] key to continue counting.

LOCKOUT FEATURE

1. At 100, 200, 300, etc. total cells counted. The keypad locks out any additional entries.
2. To resume counting press the [COUNT] key and continue data entry.

NON-TOTAL KEY (OPTIONAL FEATURE)

1. Press the upper right hand counting key. The channel count increases by one but the TOTAL does not. The NRBCs per 100 white cells displayed on the -%- screen.

Note: This capability is factory preset. But maybe disabled by setting the appropriate jumper plug.

CELL CATEGORY COUNTS EXCEEDING 99

A count exceeding 99 on any cell category will be indicated by an arrow to the left of the pointing at the channel, which has overflowed. Each channel can tally up to 999 counts in memory. However, only the two least significant digits are displayed due to restrictions on screen spaces.

ENTRY OF MORPHOLOGY SELECTIONS

COMP-U-DIFF allows for the entry of 24 morphology selections arranged in alphabetical order on four screens of six selections each.

1. Press the MORPH key the required number of times to select any one of the four morphology screens.
2. A blinking cursor is positioned over the first morphology entry of the screen.
3. Use the INC and DEC keys to select other morphologies on the screen.
4. To enter a morphology quantifier press one of the numeric keys within the range of 1-5. To erase a quantifier press key 0.
5. The selected quantifier will be displayed at the cursor position.

   RBC   Quantifiers
   Key 0 = No Result
   Key 1 = 1+
   Key 2 = 2+, etc.

6. The platelet selection has special quantifier meaning for keys 0-2 only.

   Platelet Quantifiers
   Key 0 = Adequate
   Key 1= Decrease
   Key 2 = Increase

Note: The ticket printer output format contains the full names of the selected morphologies.

ENTRY OF GENERAL COMMENTS

Up to four general comments may be entered for each specimen. Maintain a comment dictionary for reference by your microscope. The specific numbers can then access a comment dictionary which is stored in the user LIS.

1. Press MORPH key until the COMMENT screen is reached.
2. A blinking cursor is positioned over the entry for COMMT1.
3. The INC and DEC keys may be used to access the required comment field.
4. Look up the desired comment from your dictionary and enter the three-digit number at the cursor position.
5. The COMP-U-DIFF counter has a preprogrammed set of comment expansion codes for use with the ticket printer output. These are shown in greater detail in Exhibit 3.

OPERATING MODES

STORE MODE

The STORE mode primarily allows the user to gather results (i.e., enter Specimen identification, diff counts, morphology and comment data) and store these in the batch memory.

1. After entering results, press the [EXEC] key to store these in the next available location of the batch memory.
2. A message will be displayed momentarily giving the batch memory storage location followed by a return to the Specimen entry screen.
3. The process may now be repeated for the next specimen; or, alternatively,
4. After entering results, press the [SEND] key to transmit the patient results directly to the host computer.

The batch memory can hold data of up to 127 specimens. If an attempt is made to enter more than this number in STORE mode, COMP-U-DIFF will display a message to indicate that memory is full. At this point no more specimens can be entered and the stored results should be transmitted or cleared.

RECALL MODE

1. Press the [MODE] key to access the RECALL screen. The first specimen number in memory will be displayed.
2. Press the [INC] key to step up through the stored data. When reaching the end memory location, the unit will produce a beep.
3. Conversely, the [DEC] key allows the operator to step back down through the memory locations to the beginning location.
4. Once results are retrieved, they can then be transmitted to the computer by pressing the [SEND] key, or updated and restored by pressing the [EXEC] key.

Data Search

This capability provides for quick access to specific results instead of sequentially searching through the batch memory. To execute a quick find:
1. Press the [MODE] key to the RECALL mode.
2. Enter the Specimen number for the desired report then press [INC] key.
3. The COMP-U-DIFF will scan each memory location searching for a match of Specimen Identification. If a match is found the search will terminate at the desired specimen location. If a match is not found, the unit will beep and display LAST record.

Data Update

1. Press the [MODE] key to access the RECALL mode and select the desired Specimen number.
2. Over write the desired count, MORPH or comment values. Note: DATE and TECH# cannot be updated in the RECALL mode.
3. Press the [EXEC] key to store all data changes for the selected specimen.

BATCH MODE   See SEND and CLEAR operations

CLEAR OPERATIONS

CLEARING SELECTIVE DATA FROM MEMORY

1. Press the [MODE] key to access the RECALL mode.
2. Select the desired record to be erased.
3. Press the [CLEAR] key.
   All data associated with the specimen will be set to zero and
   the COMP-U-DIFF will advance and display the next specimen record.

Note that a cleared memory location will be automatically reused during the next specimen **STORE** *operation.*

CLEARING ALL RECORD FROM MEMORY

1. Press the [MODE] key to access the BATCH mode.
2. Press the [CLEAR] key.

Preparatory to clearing memory, the unit will display the following message:

Press [CLEAR] to erase
Press [MODE] to EXIT

3. Press the [CLEAR] key a second time (a fail-safe procedure to avoid erroneous purging of the memory.) The memory will clear and the unit will return to the Specimen entry form in the STORE mode.

TO SEND DATA

SENDING A SINGLE REPORT DIRECTLY ON-LINE

> While in the STORE mode you may enter your differential and morphology data as previously described. Once entered you may then send the report directly to the host computer without storing the report by simply pressing the [SEND] key; i.e., instead of the [EXEC] key which commits the data to the memory.

SENDING A SINGLE REPORT FROM MEMORY

a). Results transmission – operating with bi-directional Mode off.

1. Set MODE to RECALL
2. Press [INC] and [DEC] keys or go to FIND mode to select the desired specimen.
3. Press [SEND] key to initiate transmission.
4. The formatted data will be sent to the Laboratory computer and the screen will return to the next specimen report. The data is also formatted (vertically) and sent to the printer port (see ticket printer format for more details.)

b). Results transmission – operating with bi-directional Mode on.

1. Set MODE to RECALL
2. Press [INC] and [DEC] keys or go to FIND mode to select the desired specimen.
3. Press [SEND] key to initiate transmission.

The laboratory computer will return either:

<ctrl> U   Signals a NOT ACKNOWLDGE TO the COMP-U-DIFF where it then resends the previous report, or

<ctrl> F   Will indicate COMPUTER ACKNOWLEDGE on the screen. The screen will indicate the next specimen to be processed. This will also cause an output of results to the printer port where the data will be vertically formatted for ticket printout.

SENDING ALL STORED REPORTS

a). Results transmission – operating with bi-directional mode off.

1. **Set MODE to BATCH**
2. **Press the [SEND] key**

The specimen number for each report will be displayed as each report is transmitted to the host computer. After transmission is completed, the screen will return to the Specimen screen in STORE mode.
Note: the operator may desire to clear the Batch memory before continuing with a new batch – see Batch Clear operation.

b). Results transmission – operating with bi-directional mode on.

1. **Set MODE to BATCH**
2. **Press the [SEND] key**

The specimen number for each report will be displayed as each report is transmitted to the host computer. The host computer will return either:

<ctrl U>   **Not Acknowledge. This causes the unit to retransmit the report.**
<ctrl F>   **Acknowledge. This causes the unit to transmit the next report stored in the batch memory.**

After all report transmissions are completed, the screen will return to the Specimen screen in STORE mode. (Notes: 1). The unit will not send data out the printer port in this mode; 2). The operator may desire to clear the Batch memory before entering a new batch of results – see batch Clear operation).

BI-DIRECTIONAL OPERATION – TIME-OUT

When operating in the bi-directional mode, the COMP-U-DIFF has a built in time-out capability to avert the possibility of a lockup. After the unit transmits to the host computer is awaits an acknowledgement reply. If this should not take place because of a computer outage, or other problem, the COMP-U-DIFF will wait for 5 seconds, whereupon it will actuate an alert and issue a warning on the screen:

No Computer Response Press any COUNT key

After pressing any of the COUNT keys the screen will then prompt the user to press the [EXEC] key to re-initialize operation.

HEMOGRAM RECALL

The COMP-U-DIFF has the capability to query the host computer for a patients Hemogram data. The dialog to recall hemogram data requires that the operator send only the requested specimen number with no cell counts. The host computer will then recognize this unique data format as a request for information whereupon it sends the Hemogram data to the COMP-U-DIFF to be displayed as one or more pages (screens). The required setup for querying the Hemogram data includes:

1. **Set the COMP-U-DIFF to the STORE mode.**
2. **Set all counts to zero by pressing the [CLEAR] key.**
3. **Enter Specimen number for desired Hemogram query.**
4. **Press [SEND] key.**
   Note: The recall capability requires that operation be in the Bi-directional mode. To enable bi-directional operation set, <PJ1>location #3 = Jumper ON.

The COMP-U-DIFF is capable of receiving and displaying four lines data. Since each line can accommodate up to 22 characters, the unit can display up to two screens. While the host computer can be programmed to present any format constrained to 88 characters, the following screen layout is shown as one possible example.

Page 1:

```
WBC   RBC   HGB   HCT
12.1  3.34  10.5  22.9
```

Page 2:

```
MCV   MCH   MCHC  PLT
95.7  33.7  34.6  159
```

While only one of the pages will be shown on the screen at any time, the user may scroll up or down between pages by pressing the [INC] or [DEC] key. *Note: It may be more desirous for the system to display a 3 or 5 part diff, Unclassified Cells, etc.*

To resume with preparation of the data for the selected patient, Press any of the counting keys to erase the Hemogram data and initialize for the counting operations. Note that the Specimen Identification number entered during the query will be maintained and therefore does not have to be re-entered.

Programming Considerations

For the query example described above, the host LIS computer interface should create the following data format:

Page 1:				
	<STX> WBC	RBC	HGB	HCT
	<ETB> 12.1	3.34	10.5	22.9

Page 2:				
	<STX> MCV	MCH	MCHC	PLT
	<ETB> 95.7	33.7	34.6	159
	<ETX>			

Upon receipt of the query data, the COMP-U-DIFF will then return an Acknowledge control character <CTRL F> to the host computer. It should be noted that the COMP-U-DIFF ignores the CR and LF characters if sent along with the above data strings.

The computer dialog utilizes the following ASCII characters:

<STX> = Ctrl B
<ETB> = Ctrl W
<ETX> = Ctrl C
<ACK> = Ctrl F
<NACK> = Ctrl U

INSTALLATION

A number of options are provided as user selectable Jumper plug settings. These options include:

> **Communications**
> **Baud rate**
> **Parity**
> **Word length**
> **Bi-directional protocol**
> **Computer/Printer selection**
> **Non-total key**

The socket strip where the selections are made is located on the main logic board adjacent to the contrast control. To access the jumper strip <PJ1>, remove power to the unit and turn it over. Remove the four retaining screws and carefully lift the case top. It will be observed that there is a ribbon cable running between the display and main logic board. The user may wish to disconnect this cable, which is easily removed from its socket. Remember to replace this connector after you have completed your changes.

FACTORY SETTINGS

The internal settings can be displayed on the screen. To assess the status of settings:
> **1). Set the unit to the STORE mode**
> **2). Pressing the [CLEAR] and [MORPH] keys simultaneously.**

The screen will display the factory settings as shown below:

BAUD 9600	**BITS 7**	**COMP**
PARITY off	**BDR off**	**NT1**

> **3). Press the [CLEAR] key to exit the status screen.**

The user will also observe that jumper strip PJ1 is set-up as follows:
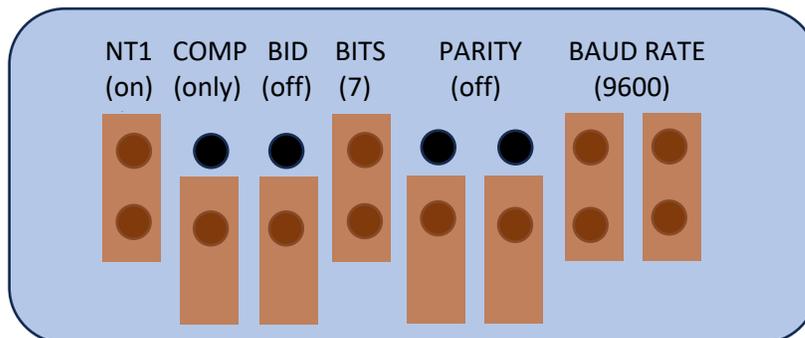
JUMPERS COVER PINS 1, 4, 7, 8
JUMPERS OFFSET PINS 2, 3, 5, 6

USER CHANGEABLE SETTINGS

<PJ1> LOCATION #1 - -   NON-TOTAL KEY (NT1)
        Jumper on = Upper right key <non-total>
        ### Jumper off = All count keys add into grand total

<PJ1> LOCATION #2 - - COMPUTER OR PRINTER OUTPUT SELECTION
        Jumper on = Data output to both Printer and Computer ports.
        Jumper off = Data output to Computer port only.

<PJ1> LOCATION #3 - - COMPUTER PORT PROTOCOL TYPE (BID)
        Jumper On = Bi-directional data control utilizing ACK/NACK protocol.
        Jumper Off = Unidirectional data flow to computer.

<PJ1> LOCATION #4 - - ASCII DATA WORD LENGTH
        Jumper On = Word length set to 7 bits.
        Jumper Off = Word length set to 8 bits.

<PJ1> LOCATION #5 - - PARITY STATUS
        Jumper On = Parity Enabled.
        Jumper Off = Parity Disabled.

<PJ1> LOCATION #6 - - PARITY TYPE (provided Parity has been enabled)
        Jumper On = Even Parity.
        Jumper Off = Odd Parity.

<PJ1> LOCATION #7/8 - - BAUD RATE SELECTION (Computer Port)

BAUD RATE	LOCATION #7	LOCATION #8
1200	Jumper Off	Jumper Off
2400	Jumper Off	Jumper On
4800	Jumper On	Jumper Off
9600	Jumper On	Jumper On

Note: Printer Port set in software to 1200 band – 8 data bits – No Parity.

COMPUTER INTERFACE

The COMP-U-DIFF workstation may be connected directly to a lab computer system by means of the supplied communications interface cable. The port is EIA and RS-232 compatible with pins configured as shown below:

PIN #	SIGNAL NAME
2	RECEIVE (used in bi-directional mode only)
3	TRASMIT
4	REQUEST TO SEND (RTS)
5	CLEAR TO SEND (CTS)
7	SIGNAL GROUND
20	DATA TERMINAL READY (factory set option)

RTS/CTS jumper <JMP3>

This jumper is located immediately behind the three-port interface jack J2 and between components U3 and U4.

> **Jumper On = Stand-alone operation.**
> **Jumper Off = Allows flow control when used with MDS Multiplexer type MD 204.**
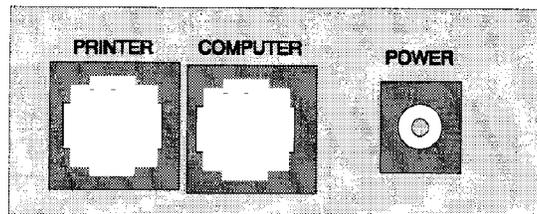
PRINTER PORT

This RS232 compatible port is specifically formatted to allow the direct connection of a Ticket Printer to the COMP-U-DIFF.

PIN#	SIGNAL NAME
2	RECEIVE
3	TRANSMIT
7	SIGNAL GROUND

Note: RTS/CTS and DTR protocol are not supported on this port!

PHYSICAL LAYOUT OF WORKSTATION SERIAL PORTS

THE WORKSTATION HAS TWO [2] RS232 SERIAL PORTS, WHICH ARE PHYSICALLY LOCATED AT THE REAR OF THE INSTRUMENT ADJACENT TO THE POWER ADAPTER REVEPTACLE.

THE DIAGRAM SHOWS THE PORT LAYOUT DETAIL (SEEN FROM REAR APRON)

PRINTER PORT

DATA OUTPUT IN ENGLISH TEXT FORMATTED (VERTICALLY) FOR USE WITH A TICKET PRINTER.

COMPUTER PORT

DATA IS OUTPUT IN AN [ASCII] STRING FORMAT; i.e., HORIZONTAL FORMAT. Refer to exhibit 1 for specific details.

HELPFUL HINTS

FREE STANDING COUNTER OPERATON (no computer necessary)

1. COMP-U-DIFF can always function as a stand-alone differentia tally counter.
2. Follow Section on Differential count entry.
3. On completion of count, transcribe data by hand.
4. Push CLEAR to zero unit and start next differential.

KEY ASSIGNEMENT OVERLAYS

A versatile key assignment overlay is furnished with each new COMP-U-DIFF. The overlay allows operator to pencil in a preferred key arrangement. Additional overlays may be ordered for use when several operators share the same instrument. Where several operators each prefer different key layout arrangements, laboratory computer programs can be written to translate differing key layouts to a common format. Translation tables can be selected by the Tech ID number.

ABSOLUTE COUNTS

To express each channel in terms of absolute WBC, the program should be designed to search and find the hemogram data for the same specimen number. The WBC value can then be extracted and the appropriate percent applied to each channel. The user can also correct WBC by first applying the NRBC counts to the absolute total white blood cell counts.

COMMENT DICTIONARY – USER DEFINED

Get CREATIVE! All of those special diagnostic descriptions, favorite nomenclatures, messages to physicians, etc., can all be accessed through the comments dictionary. Remember the table for the comments is stored in the host computer. You can write up to 396 of your own comments.

EXHIBIT 1

COMPUTER DATA FORMAT
COMP-U-DIFF 10-329

CHARACTER POSITION	PARAMETER NAME	CHARACTER POSITION	PARAMETER NAME
1-10	**Specimen Ident. Number**	70	Microangiopath
11-13	Channel 1/Raw Count	71	Heinz Bodies
14-16	Channel 2/Raw Count	72	/
17-19	Channel 3/Raw Count	73	Teardrop RBC
20-22	Channel 4/Raw Count	74	Schistocyte
23-25	Channel 5/Raw Count	75	Crenated RBC
26-28	Channel 6/Raw Count	76	Burr Cells
29-31	Channel 7/Raw Count	77	Pappenheimer Bodies
32-34	Channel 8/Raw Count	78	Stomatocyte
35-37	Channel 9/Raw Count	79	/
38-40	Channel 10/Raw Count	80-82	Comment Code 1
41-43	Channel 11/Raw Count	83-85	Comment Code 2
44-46	Channel 12/Raw Count	86-88	Comment Code 3
47-49	Total Cell Count	89-91	Comment Code 4
50-51	/	92	/
52	Poikilocytosis	93-94	Channel 1 Percent (%)
53	Polychromasia	95-96	Channel 2 Percent (%)
54	Hypochromasia	97-98	Channel 3 Percent (%)
55	Anisocytosis	99-100	Channel 4 Percent (%)
56	Microcytosis	101-102	Channel 5 Percent (%)
57	Platelet Sufficiency	103-104	Channel 6 Percent (%)
58	/	105-106	Channel 7 Percent (%)
59	Target Cells	107-108	Channel 8 Percent (%)
60	Ovalocyte	109-110	Channel 9 Percent (%)
61	Spherocyte	111-112	Channel 10 Percent (%)
62	Acanthacyte	113-114	Channel 11 Percent (%)
63	Macrocytosis	115-116	Channel 12* Percent (%)
64	Howell-Jolly Bodies	117	/
65	/	**118-125**	**Date Field mmddyyyy**
66	Cabot Rings	**126**	**Indicators <*> Recall inq.**
67	Sickle Cell		**</> All Others**
68	Basophilic Stippling	**127**	**Carriage Return**
69	Siderocyte	**128**	**Line Feed**

Notes:

* Channel 12 is an optional 'non total' channel. If 'non total' is chosen the counts on this channel will not   tally into the grand total. They are, however, normalized for number of nucleated red cells (NRBC) per 100 WBC's.

Calculated percent of total (chars 93-116) are rounded to 2 digits. If the user desires 3 digit accuracy use the raw counts (chars 11-46) and perform calculations using total cell count (47-49)

xxx bold italics defines altered data format to accommodate Y2K compliance and 10 digit Specimen Identification Number.

EXHIBIT 2

SUGGESTIONS FOR THE USER-DEFINED COMMENTS TABLE

It is recognized that each laboratory may have its own list of comments to implement on the laboratory system.
The COMP-U-DIFF provides for up to 396 user-defined comments each defined by 3-digit code.
The following list is included only as a guide used by other laboratories.

010	RED BLOOD CELLS NORMAL	26X	MAY-HEGGLIN BODIES
020	PLATELETS NORMAL	27X	CHEDIAK-HIGASHI ANOMALY
030	HEMOLYZED SPECIMEN	28X	ALDER'S ANOMALY
040	ICTERIC SPECIMEN	29X	GIANT NEUTROPHILS
050	LIPEMIC SPECIMEN	30X	MYELOBLASTS
060	SLIDE REFFERED TO PATHOLOGIST	31X	HAIRY CELLS
070	SEE SEPARATE REPORT	32X	EOSINOPHILIC BANDS
08X	CLUMPED PLATELETS	33X	EOSINOPHILIC METAMYELOCYTE
09X	GIANT PLATELETES	34X	EOSINOPHILIC MYELOCYTE
10X	MEGAKARYIOCYTES	35X	BASOPHILIC BANDS
11X	PLASMOCYTES	36X	BASOPHILIC METAMYELOCYTE
12X	ELLIPTOCYTOSIS	37X	BASOPHILIC MYELOCYTE
13X	NO MALARIAL PARASITES	801	MYELOBLAST CHANNEL 9
14X	ERYTHROPHAGOCYTOSIS	802	PROLYMPHOCYTES CHANNEL 9
15X	ROULEAUX	803	PLASMA CELLS CHANNEL 9
16X	SUGGEST HEMOGLOBIN ELECTROPHORESIS	804	PROGRANULOCYTES CHANNEL 9
17X	HEMOGLOBIN 'C' CRYSTALS	805	PROMONOCYTES CHANNEL 9
18X	REACTIVE LYMPHOCYTES	806	PRORUBRICYTE CHANNEL 9
19X	SMUDGE CELLS	807	METARUBRICYTE CHANNEL 9
20X	TOXIC GRANULATION	901	MYELOBLAST CHANNEL 10
21X	VACUOLATED NEUTROPHILS	902	PROLYMPHOCYTES CHANNEL 10
22X	HYPERSEGMENTED NEUTROPHILS	903	PLASMA CELLS CHANNEL 10
23X	PELGER HUET ANOMALY	904	PROGRANULOCYTES CHANNEL 10
24X	AUER RODS	905	PROMONOCYTES CHANNEL 10
25X	DOHLE-AMATO BODIES	906	PRORUBRICYTE CHANNEL 10
		907	METARUBRICYTE CHANNEL 10

TABLE OF QUANTIFIERS

KEY	QUANTIFIER
0	NO QUANTIFIER
1	1+
2	2+
3	3+
4	4+
5	SLIGHT
6	OCCASIONAL
7	FEW
8	MODERATE
9	MARKED

EXAMPLES OF QUANTIFIED COMMENT CODES

159	**ROULEAUX, MARKED**
196	**SMUDGE CELLS, OCCASIONAL**
247	**AUER RODS, FEW**

EXHIBIT 3

TICKET PRINTER COMMENT CODES

The comment code function permits entry of three digits. The first two digits selects the comment and the third digit (x) quantifies. (See table of quantifiers).

CODE	MORPHOLOGY/PLATELETS	CODE	CHANNEL DESIGNATION	
010	RED BLOOD CELLS NORMAL	801	MYELOBLASTS	CHANNEL 9
020	HEMOLYZED SPECIMEN	802	PROLYMPHOCYTES	CHANNEL 9
030	REFERRED TO PATHOLOGIST	803	PLASMA CELLS	CHANNEL 9
04X	ROULEAUX	804	PROGRANULOCYTES	CHANNEL 9
05X	PLATELETS CLUMPED	805	PROMONOCYTES	CHANNEL 9
06X	GIANT PLATELETS	806	PRORUBRICYTES	CHANNEL 9
07X	MEGAKARYOBLASTS	807	METARUBUBRICYTE	CHANNEL 9
08X	TOXIC GRANULATION	901	MYELOBLAST	CHANNEL 10
09X	HYPRSEGMENTED NEUTROPHILS	902	PROLYMPHOCYTE	CHANNEL 10
10X	VACUOLATED NEUTROPHILS	903	PLASMA CELLS	CHANNEL 10
11X	MYELOBLASTS	904	PROGRANULOCYTES	CHANNEL 10
12X	SMUDGE CELLS	905	PROMONOCYTES	CHANNEL 10
13X	PLASMA CELLS	906	PRORUBRICYTE	CHANNEL 10
20X	REACTIVE LYMPHS	907	METARUBRICYTE	CHANNEL 10
21X	PROLYMPHOCYTES			
22X	LYMPHOCYTES			
23X	PROMONOCYTES			
24X	MONOBLASTS			
25X	EOS BANDS			
26X	EOS METAMYELOCYTE			
27X	EOS MYELOCYTES			
28X	BASO BANDS			
29X	BASO METAMYELOCYTE			
30X	BASO MYELOCYTES			
31X	PRORUBRICYTE			
32X	RUBRICYTE			
33X	METARUBRICYTE			

TABLE OF QUANTIFIERS

KEY	QUANTIFIER
0	NO QUANTIFIER
1	1+
2	2+
3	3+
4	4+
5	SLIGHT
6	OCCASIONAL
7	FEW
8	MODERATE
9	MARKED

Examples Of Quantified Comments

045 - Rouleaux, slight
089 - Toxic Granulation, marked
066 - Giant Platelets, Occasional

WARRANTY POLICY

Modulus Data Systems, Inc. warrants, for a period of twelve (12) months from date of receipt by the user, the COMP-U-DIFF differential cell counter/workstation against all defects in workmanship and materials. The unit will be repaired or replaced without charge provided it has received normal usage according to the directions accompanying the instrument.

This warranty is void if the unit is operated at voltage levels other than specified on the instrumental label attached to the outer case. Further, this warranty is void if the unit is tampered or serviced by personnel unauthorized by Modulus Data Systems, Inc.

REPAIR SERVICE IN THE UNITED STATES

1) Send a valid purchase order with all units to be repaired. Units in warranty will be repaired and returned at no charge to the address on the purchase order. Out-of-warranty service is billed at a ship rate plus return shipping costs.

2) Describe the problem very specifically (in terms of what was visually evident at the time the user recommended repair), and note that description on the repair purchase order. Many problems are intermittent and the unit cannot be repaired without very specific information.

3) Package securely, ship prepaid and insure for the replacement cost (amount varies depending on the model number). We are not responsible for units lost or damaged in the mail.

SHIP TO: MODULUS DATA SYSTEMS, INC.
386 MAIN STREET SUITE B
REDWOOD CITY, CA 94063
ATTN. REPAIR DEPARTMENT

REPAIR SERVICE IN FOREIGN COUNTRIES

1) Contact your distributor for specific information on receiving repair service for your instrument.

2) Do not ship the unit directly to the factory. Lack of proper documentation can result in high customs charges, and possible loss of the unit.