DLM400

Users Guide & Reference

Benedict Computer
DLM400
Serial Communication
Exerciser & Analyzer
(C)2010

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DLM400 TUTORIAL

In a hurry? Just follow the instructions in the left column and watch the DLM.
Please note: All characters in brackets ([ ]) are keys on the DLM keyboard.

If you find that the DLM is configured in a manner that will not perform as documented, you may return the DLM to default settings by hitting the [POWER OFF] button and then the letter "D" (for default).

STARTING THE DLM400

Slide the front slide switch to the left.	Turns on the MAIN power to the DLM. This switch is only provided if the firmware becomes disabled. This switch should NOT be used in normal operation. The DLM should be powered down by pushing the [POWER OFF] button and then the [START/STOP] button to confirm shutdown
Push the [POWER ON] button on lower right.	Sends power to the DLM400 computer which , in turn, will turn on internal power relay. A graphic display will start, push [RETURN] to skip intro. The unit should start. If not, try powering the DLM with the external transformer. If this works, then replace the battery.

STOPPING THE DLM400

Push the [POWER OFF] button and then the [START/STOP] button	The DLM should be powered down by pushing the [POWER OFF] button and then the [START/STOP] button to confirm shutdown. This procedure is required for the DLM to save the configuration and Capture buffer before it powers itself off.

CAPTURING DATA

Push [O] ("O" on keyboard).	Shows Output prompt page with PATTERN choice flashing. Hit [→] or [←] to select the pattern which will be transmitted. ASCII Set is the default.
Hit [START/STOP] to begin.	Attaches USART transmitter to pin 2 and transmits selected pattern. DLM400 will continue to transmit until [START/STOP] is pushed or specified number of passes is completed. The DLM400 will simultaneously capture the data

	that it transmitted and the returned data.
[START/STOP] to end.	Stops transmission and returns to VIEW mode.
	The DLM capture buffer now contains data which can be viewed in a variety of ways.

PERUSING THE CAPTURED DATA.

Push [PAGE UP]	The DLM display will back up one screen and stop all scrolling.
Push [HOME], [END], [PAGE DOWN], [⇨], [⇦], [⇧], or [⇩]	The cursor will move respectively to the top left corner, the bottom right corner, down one screen, one character to the left, one character to the right, one line up, or one line down.
Hit [HOME] 2 times.	The cursor will move to the beginning of the capture buffer.
Hit [RETURN].	The cursor will slowly scroll through the buffer. If you hit [⇨] the cursor will increase scrolling speed and [⇦] will decrease scrolling speed.
Hit [.] .	DLM will prompt to GOTO a specific buffer location.
Enter "123+[RETURN]".	DLM will place the cursor on location 123. The current location will be reflected on status line 8 starting in column 1.
Hit [RETURN] 2 times.	DLM will scroll to the end of the capture buffer.

LOOKING AT HEX DATA

Hit [H] to show HEX. Hit [H]	Displays capture buffer in HEX. Cursor is placed on character that it was on when [H] was pressed. Exits HEX and returns to default code (ASCII, EBCDIC, etc.)

PRODUCTION CAPTURE OF DATA

Connect the DLM400 to a source of data.	Using the included Ribbon Cable, attach one end to either of the connectors on the right side of the DLM400. **INSERT** the two connectors at the other end of the cable between two connectors in the circuit to be monitored.
Transmit data through the circuit you wish to monitor.	If the baud rate, word size and parity are correct, the DLM will automatically start collecting and scrolling data as it passes through the circuit. If framing errors occur then push [A] (autoconfigure TD line) or [W] (autoconfigure RD line). The DLM400 will tell you which line to autoconfigure. The DLM400 can determine asynchronous line speed in as little as 8 characters.

ADVANCED FEATURES-THE STATUS KEY

Normally STATUS is set to show: CURSOR LOCATION, NUMBER OF CHARACTERS CAPTURED, ERRORS and the value of the character that the cursor is over in DECIMAL and HEX.	
Hit [STATUS].	Now the STATUS display will show the real time(current) state of six modem interface signals.
Hit [STATUS].	Now the STATUS display will show the HISTORICAL value of the modem interface signals when the character, which the cursor is over, was received.
Hit [STATUS] again	The status display is turned off and eight full lines of data are shown.
Hit [STATUS] again.	Returns to the default status display.

TRANSMITTING A CUSTOM PATTERN

Hit [E] to edit a string.	
Type in the string you want to transmit (e.g., "xyz").	The Edit screen shows the available commands on the first three lines of the display.
Hit [START/STOP] key.	Exits the Edit string function.
Hit [O].	Shows the Output prompt screen.
Hit [RETURN] until "STRING1" shows in the in the PATTERN box.	Sets the output pattern to String1, the string just created with the EDIT STRING function.
Hit [START/STOP]	The letters "xyz" will now be transmitted. Other capabilities include the capability to load string1 from a specific location in the capture buffer or enter String1 in HEX.
Hit [START/STOP].	Terminates the OUTPUT function.

TERMINAL EMULATION

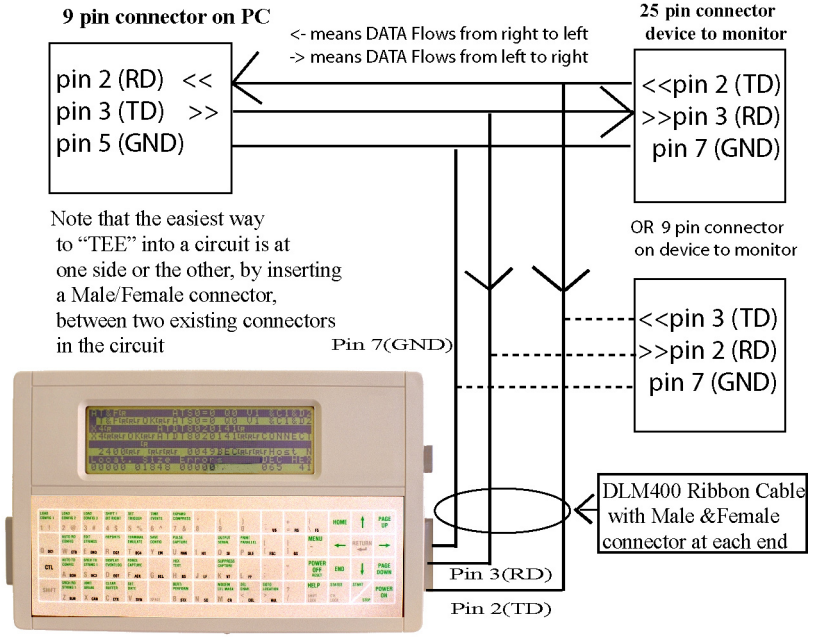
Attach DLM400 to a PC serial port.	Attach one of the right side DLM400 connectors to a PC serial port using null modem or included break out box with signals on pin 2 and pin 3 swapped. **The DLM400 transmits on pin 2 in terminal and output modes.**
Hit [T].	Enter the TERMINAL EMULATION function on the DLM400.
	Everything you type on the DLM400 will be transmitted to the PC and, everything that you send from the PC will be shown on

	the DLM400. You can use [PAGEUP] and [PAGEDOWN] to look at the data without leaving terminal emulation. If you hit [PAGEUP] OR [PAGEDOWN] screen scrolling will stop (so it does not fly by while you are looking at it). To restart scrolling from the end of the buffer, hit [END] twice).
Hit [START/STOP]	Exit the Terminal Emulation and return to VIEW MODE

COMMAND KEY REFERENCE

OVERVIEW

1. The following diagram shows several ways you can use the DLM400.
2. Troubleshoot serial printers.
3. Eliminate handshaking problems.
4. Determine transmission quality of a leased line.
5. Remotely operate the DLM400 from any PC using DLMVIEW Software.
6. Flag cables with broken wires.
7. Troubleshoot terminals.
8. Isolate faults by monitoring data transmission.

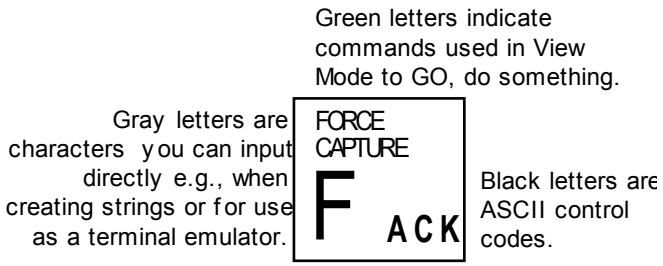


Note: when monitoring all lines on the line monitor are receive (IN lines) it is passive and only captures data from both of the lines.

USING THIS GUIDE

This guide gives detailed information about all of the commands and submenus available in the View Mode, and also describes all values allowed in the Configure Menu.

There are three different colors of ink used on the labels on the keys of the DLM400 each key can serve 3 functions:



	Green Ink	**Gray Ink**	**Black Ink**
Function	*Commands*	*Direct input*	*Control Codes*
Description	Think of green as meaning "Go! Do something"	Input a letter or number directly from keyboard	Nonprintable ASCII codes (0-31)
Uses	Used in the View Mode (i.e. when data is showing on the screen)	For Terminal Emulation and inputting strings.	For Terminal Emulation and inputting strings.
Exceptions to Description		CTL, SHIFT and RETURN as their name implies.	DEL (127) is delete.

Brackets [ ]

In order to conserve space on screen, instead of identifying a command key by its full name (for example PULSE CAPTURE) the screen will just use the (gray) letter of the alphabet that appears on the key and place it in brackets [U]. This lets you know the reference is to its command characteristics and not to the letter of the alphabet.

CHAPTER ONE VIEW MODE

You are in the View Mode when you first turn on the DLM400. From the View Mode you can:

- Wait for transmitted data to appear.
- Stop the DLM400 (Press SHUTDOWN then STOP)
- Press HELP to get more information (see HELP in this chapter or press HELP to find out more about this user-friendly option).
- Execute any command. (e.g. Auto configure TD, Status)
- Switch to the Configure Menu to set communications parameters.

The first three items listed above don't need much more of an explanation. The rest of this chapter, Chapter One, will cover the fourth item—the commands. Chapter Two will cover the Configure Menu. Chapter Three shows you how to operate the DLM400 from a remote terminal.

The DLM400 has over 35 command keys. The command keys have green labels identifying their respective command functions. Push HELP while in the View Mode to see all of the command keys listed. They are also listed alphabetically starting on 2nd page.

THE COMMAND KEYS

The command keys are described below. The keys have been listed alphabetically to make them easy to find.

Setting Options & Values

Several of the command keys drop you into a submenu with options followed by values. Setting these values, and scrolling through the options are done primarily by using the arrow keys, PAGE UP, PAGE DOWN, HOME, END and RETURN as indicated on the following page.

When you are in an options menu, one of the option's values will be shown in reverse video, i.e. highlighted, that means it is selected. To increment the value of that option, press RETURN or →. To highlight a different option's value use the keys as illustrated on the following page.

Entering Integers or Hex Values Directly

Some values call for an integer or a hex value. Here are some hints for entering values directly from the keyboard:

- Enter 923, for example, by pressing the keys 9-2-3.
- Or you can increase the value one integer at a time by pressing RETURN. For example if 919 were showing, press RETURN four times to show 923.
- Press ← to delete the low order character. If you want to change `923` to `943` for example:

  1 press ← to see `_92`

  2 then press ← to see `__9`.

  3 finally, press 4 and 3 to see 943.

Execution of all commands, stopping execution, and exiting most submenus can be accomplished by using START/STOP.

ANSWERBACK [L]

The ANSWERBACK command is not printed on the DLM400 keyboard. To enter ANSWERBACK, hit the "L" button. This mode functions the same as TERMINAL except that if the DLM sees the occurrence of the STRING1 (Created in EDIT) in the incoming data stream on the RD line, it will automatically transmit STRING2 (Also created in EDIT). In ANSWERBACK, all the normal keys (QWERTY) will be transmitted as well. Special functions available are [→] which will transmit a 250 millisecond break or [PAGE DOWN] which will transmit STRING2.

AUTO TD CONFIG [A]

If you do not know the transmission settings of the device you are attempting to monitor, press AUTO TD CONFIGURE and the DLM400 will analyze the TD (signal on pin 3 of the interface**)** signal and automatically set itself to match the parameters it finds. Please note that to properly determine ODD or EVEN parity, the DLM must see more than one character. There must be some characters with the Parity bit on and some with the parity bit off. The reason for this, is that for example, a 7 bit EVEN parity capital "A" looks the same to the DLM as a 8 bit NONE parity "A". However a capital "B" will look differently to the DLM.

AUTO RD CONFIG [W]

If you do not know the transmission settings of the device you are attempting to monitor, press AUTO RD CONFIGURE and the DLM400 will analyze the RD (signal on pin 3 of the interface**)** signal and automatically set itself to match the parameters it finds.

BERT/PERFORM [B]

Bit Error Rate Testing (BERT) is used to transmit a test pattern to a DCE, the DCE then re-transmits the same pattern back to the DLM400 and, finally, the DLM400 compares the incoming data to the original string, counts and reports errors.

When you first press BERT/PERFORM, you will see this screen:

```
Pattern                    Timeout
Flow Control               Handshake
Passes(0=cont.)
LEFT/RIGHT ARROWS to set flashing values
UP/DOWN ARROWS to change selection. PAGE
UP/DN for next page. [START] to continue
```

Pattern

The pattern you would like to output for the test:

All Bits	Fox2	TD buffer
Spaces (HEX 00)	Start String	ASCII set
Mark (HEX FF)	Stop String	511 Bert Pattern
Fox	RD buffer	

Flow Control Yes, No

Would you or would you not like flow control? (Note, if you choose a pattern which transmits XONs and XOFFs (e.g. All Bits or 511 Bert) you must turn Flow Control off.)

Passes Enter any integer up to 255

How many times, total would you like to send the string?

Timeout Enter any integer up to 255

How many .250 second intervals would you like the DLM400 to wait for an answer before reporting a timeout error. When a timeout occurs, the words "timeout error" appear on the report.

Flow Control XON/XOFF, RTS/CTS, Off

The form of flow control on any transmit option that you want. This options inhibits transmission from the DLM if: A)an XON state does not exist, B)CTS interface signal is not asserted, respectively.

After you press STOP to stop the test, a report will display. It will look something like this:

```
Chars sent       999 Block Errors      9
Chars recv         9 Bit Errors        9
Rec in sync        9 Blocksize
Elap  second       7 Error Free Sec    %
BERT:             *% BLERT:            %
Average trip time per block (ms)
                    TEST COMPLETED
Press STOP to end test.
```

Interpret the results as follows:

Chars sent

The total number of characters sent up to 999,999,999.

Chars recv

The total number of characters received up to 999,999,999

Recv in sync

The total number of characters received the same as sent.

Elap second

Total elapsed time, in seconds, the test took to complete.

BERT

Percent of bit errors to total bits transmitted.

Average trip time per block (ms):

An average of the amount of time in milliseconds, it took for one block to make the loop.

Block Errors
Number of blocks received that contained at least one error.

Bit Errors
Total number of bits received in error.

Blocksize
Each of the patterns you choose from the previous screen (FOX, FOX2, ASCII…) is a different length. Blocksize is the number of bytes in the pattern (also known as a "block") you chose.

Error Free Sec
Percentage of the total time (100%) that the transmission had no errors.

BLERT
Percentage of block errors to total received.

CLEAR BUFFER [C]

Permanently deletes all data in the buffers.

CTL LOCK

A toggle switch that locks the control switch (CTL) on. Press CTL LOCK again to disengage.

DISPLAY EVENTLOG [D]

The DLM400 can be set (See "Log Events;" in the Configure Menu chapter) to keep a log; containing buffer location; location; Channel, Date and Time for any/all of the following:

Start Trigger	*Stop Trigger*
Framing error	*CRC Error*
Parity error	

When you press [D], if Log Events is on in the Configure Menu, the following screen will appear:

```
Locat. Event Chan.  Time     Date
nnnn


[CLEAR], [PG], [ARROW], [STOP]
```

The highlighted location is selected. Read across to find the event, channel, time and date of that event. Use the ↑ and ↓ to scroll through location/events. Once you have highlighted a location/event you would like to examine, press STOP and you will be viewing that precise location in the capture buffer.

To see more events PAGE DOWN or PAGE UP.

EDIT STRINGS [E]

Drops you into a line editor. From this line editor you can create one or two 80-byte ASCII strings (string1 and string2) by typing in bytes from the keyboard. When your string is finished, press Start/Stop to exit the line editor.

You may also enter non-printing ASCII characters (see names in black ink on keypad for example DC1, ETB…) by holding down the CTL key or pressing CTL LOCK and then pressing the keys. Refer to the black ink on the keys to see the non-printing codes.

Note that the key between V and B enters a space.

```
UPARROW  =del    PAGEUP=Clear
DOWNARROW=ASC/HEX
PAGEDOWN =STRING1/STRING2
SIZE: 0 LOC: 0 DEC:  0 HEX: 0
----------------------------
----------------------------
----------------------------
```

The Edit Strings screen works as follows:

↑	deletes the byte above the cursor. If you hold it down for one second or more it will delete one byte after another from the right side of the cursor, until all of those bytes are gone, then it will begin deleting to the left of the cursor until all of those bytes are gone.
Page Up	clears, *deletes*, the entire string
↓	toggles the editor between Hex and current "Code" as set in Configure Menu (e.g. ASCII).
Page Down	toggles between string1, string2 , string3, and string4 (The Start Up Screen String). The current string is highlighted—when string1 is highlighted, it means you are creating string1.

Strings are used in the DLM400 as follows:

- As triggers. When you set a Start Trigger, the DLM can be set to wait until it sees this trigger in incoming data before it begins collection—or set to stop collection with a Stop Trigger.
- As straight output. In addition to the factory-set strings the DLM400 provides for output. You can create your own string to output for the OUTPUT, BERT or PRINT functions.

When your string is finished, press Start/Stop to exit the line editor.

END (See shut off)

Moves the cursor to the end of the screen when in View Mode. Push it again to move to the end of the buffer (i.e. the end of the last screen of data).

When a menu is showing, moves the cursor to the last option on the menu.

END ,END (Hit END two times in a row)

Moves the cursor to the current END OF BUFFER and places the DLM into real time scroll mode.

EXPAND COMPRESS [7]

Displays data in View Mode at 30 characters per line in EXPAND mode and 40 in COMPRESS mode. Note, graphical characters (e.g. HEX) won't display in COMPRESS mode.

FORCE CAPTURE [F]

Forcing data capture, forces the DLM400 to begin capturing all data. This is applicable in any synchronous mode when the synchronous character is unknown or if it is not known if a clock signal is present on pins 15 or 17. 1 bit will be captured for each clock tick on TD Clock(pin 15) or RD clock(pin 17). All bits will be captured without regard to byte boundaries. For more information, see EXAMPLE #2, Sync Character Decoding.

GOTO LOCATION [>]

When in View Mode, press [>] and you will see the following screen:

```
Enter capture address<     >
```

Type the location in the buffer you would like to see. For example, type 6 followed by a RETURN if you would like the cursor to be placed on the sixth character in the TD buffer. Once there, press ↓ to get to the sixth character of the RD buffer.

HELP

The DLM400 has complete on board documentation plus features recently implemented not in the manual. Help offers assistance on a variety of topics.

After you press HELP, you will be offered a list of help topics. You may scroll through these topics using PAGE UP and PAGE DOWN.

To find out more about any of the topics, press the first letter of the topic. For example Q for Questions. If there is more than one topic that begins with that letter (for example several of the topics start with “S”) keep pressing that letter and all of the topics beginning with that letter will scroll by.

To exit the HELP menu or any more detailed HELP explanations, press STOP.

You may print the onboard help text using the Output [O], Prints [P], or Report [R] option.

HOME

- Moves the cursor to the beginning of the current screen (position 0) when in View Mode. Press HOME again to move to the beginning of the buffer (position 0 screen 1)
- When a menu is showing, HOME moves the cursor to the first option in the menu.
- From within the HELP menu HOME displays the first HELP screen.

HOME-HOME(HOME TWICE)

Moves the cursor to the beginning of the CAPTURE BUFFER, location 0.

HEX TEXT [H]

Press [H] to toggle between displaying data in the current mode (ASCII, BAUDOT etc) and hex code. To see characters in binary or decimal, place the cursor on the character and press STATUS.

LOAD CONFIG 1 [1], CONFIG 2 [2], CONFIG 3 [3]

The DLM400 allows you to save up to three sets of system communication parameters. See SAVE CONFIG for more information on saving.

To recall configurations push 1, 2, or 3, from within the View Menu, press [1], [2], or [3] respectively. The DLM will set itself to the chosen configuration.

Press [RESET] then [D] to set the DLM to the default configuration (i.e. the communication values set at the factory).

MENU [`]

MENU enters the Configuration mode where such things as Baud Rate, protocol, word size, parity and numerous other options.

MODEM CTL MASK [M]

The modem control signal masks—a mask or template created to match a particular set of modem control signals—can be used to start/stop a timer or begin/end data capture. When the DLM400 senses modem control signals identical to the masks you set up, it will start or stop the timer. See SET TRIGGER and TIME EVENTS command descriptions for more information on the use of the masks.

To create or edit a modem control signal mask, from the View Mode press [M].

```
EDIT MASKS-arrow keys to move, [return]
to toggle values,[STOP] to end

     START MASK          STOP MASK
RS CS DS DC DT RI    RS CS DS CD DT RI
lo lo lo lo lo lo    hi hi hi hi hi hi
```

The highlighted value is selected. To select the value of a different modem control signal, press → or ←. Set the values by pressing RETURN, values may be:

- **hi** matches a high signal
- **lo** matches a low signal
- **??** wildcard—matches, is true, on any signal

Once the mask is set, press STOP to return to the View Menu. At this point you can use your masks by pressing [5] for SET TRIGGER or [6] for TIME EVENTS and scrolling to the appropriate values.

OUTPUT SERIAL [O]

Pressing [O] drops you down into the Output Submenu.

```
Pattern              Handshake
Passes(o=cont.)      Max Pattern Size


LEFT/RIGHT ARROWS to set flashing values
UP/DOWN ARROWS to change selection. PAGE
UP/DN for next page. [START] to continue
```

It is from this screen that you can transmit data—out pin two on either right 25 pin SUB-D connector.

Pattern

The pattern you would like to output for the test.

HEX 00-FF	String1	RD Buffer
Spaces (00)	String2	TD buffer
Mark (FF)	Hex Rpt	ASCII set
Fox	HEX Rpt+Signl	511 Bert
Fox2	Help Rpt	

Note, the hex report and the help report are formatted reports. The hex report outputs the entire contents of the data buffer in hex notation and in ASCII (or text). The help report prints the entire online help system

Passes Enter any integer up to 255

How many times, total, would you like to send the pattern?

[Start/Stop]

Press the key labeled START/STOP to begin or end execution.

← →

Left and right arrows stop and start output.

[STOP]

Press STOP to end output.

PAGE UP

- In Edit Strings mode, PAGE UP clears, *deletes*, the entire string.
- In View Mode, PAGE UP scrolls up one page (a page is one display full of data).
- In screens showing multiple menus, PAGE UP displays the previous menu.

PAGE DOWN

- In Edit Strings mode, PAGE DOWN toggles between string1 and string2.
- In View Mode, it scrolls down one page (a page is one display full of data).
- In screens showing multiple menus, it displays the next menu.

POWER ON

This key turns the DLM400 on. Please hold for at least 1 second to start. To turn it off, press SHUTDOWN then STOP.

PRINT PARALLEL [P]

Sends the selected pattern out the left port of the DLM. This is a parallel port and can therefore be easily hooked up with the one-foot cable included with your DLM400 to a printer or other parallel device. This cable has pin 14 cut. For a description of the various patterns you can print, see OUTPUT SERIAL [O].

CAUTION *The port on the left side of the DLM400 is a parallel output port. Attaching an RS-232 circuit without the special remote connector to a parallel port might destroy the circuit.*

PULSE CAPTURE [U]

Pressing [U] from the View Mode will cause the DLM400 to collect all changes to any of the modem control signals. The pulse changes are marked as hex FF characters in the RD buffer. If you want to store only pulse data and no serial data use suppress [K] to disable both serial ports. To see these transitions, press STATUS three times—view the third status screen (See STATUS).

[POWER OFF]

To shut the DLM down, first hit [power off], then hit [START/STOP]. Please note that if you shut the unit down with only the manual switch, it is possible that your captured data will be corrupted and the battery will slowly discharge.

REPORTS [R]

Press [R] to see the reports submenu.

```
Available reports are:

1)All captured data in TEXT and HEX
2)Same as 1 plus Modem Interface History
3)Printout of HELP text

Hit  [1] [2] or [3]
```

[1]

Outputs all data from the buffer in your choice of notation.

[2]

Outputs all data from the buffer in your choice of notation and includes the changes in line signals.

[3]

Outputs all of the text from the DLM400 help facility.

After you press [1], [2], or [3] you will receive a prompt asking which port you would like to send the report from.

```
Report can be directed to left parallel
port, or either serial port on the right

Hit [O] for serial or [P] for parallel
```

[O]

Will output through 9 pin connector on the right side of the DLM400 using baud rate setting for DLMVIEW option

[P]

Will output through the parallel port on the left side of the DLM400.

After you press [O] or [P] the DLM will output your report as requested.

RESET SHUTDOWN

Returns to View Mode from anywhere

It is used to turn the DLM400 off. After pressing RESET, you will see:

```
Hit STOP to confirm shut down.
```

To turn the DLM400 off, press STOP. Note that from this prompt you may hit "V" to see the current firmware version or "D" to return the DLM to all of its factory settings.

SAVE CONFIG [Y]

The DLM400 allows you to save up to three sets of system parameters, and, by pressing the RESET key then [D], you may reset the parameters to the factory settings. Here is how to save and recall communication settings on the DLM400

1. Set the parameters you would like to save.
3. Press START/STOP to leave the Configure Menu and go to the View Menu.
3. Press SAVE CONFIG [Y] and see the following message on the prompt line

```
Enter configuration number to save
1-3=user defined

hit [RETURN] when done
```

4. Press a number from 1-3.
5. Press RETURN.
6. The configuration is saved.

See LOAD CONFIG for more information.

SET DATE [V]

Pressing [V] allows you to set the internal clock on the DLM400. You must enter two digits each for hours/minutes/seconds and day/month/year.

SET TRIGGER [5]

After you have created an edit string or a modem control mask it can act as a trigger to begin data collection, pressing SET TRIGGER puts the DLM400 into the following screen.

```
Start Trigger    OFF Stop Trigger    Off


Hit [START/STOP](F2) to continue
```

`Start Trigger` `Off, String1-TD, String1-RD, Modem Ctl Mask1`

When you set the value to anything besides Off, the DLM400 will actively search all incoming data for that value. When it finds a match, it will begin collecting data.

`String1-TD`
DLM400 will look for string1 on the TD line.

`String1-RD`
DLM400 will look for string1 on the RD line.

`Modem Ctl Mask1`
DLM400 will look for the high or low states of the RS, CS, DS, CD, DT, and RI lines. When they match the state you have set using [M], the DLM400 will begin capturing data.

SHIFT 1 BIT RIGHT [4]

Shifts all data in the capture buffer one bit to the right. This option is useful in conjunction with FORCE CAPTURE.

SHIFT LOCK

A toggle switch that locks the shift switch (SHIFT) on. Press SHIFT LOCK again to disengage.

SHUTDOWN

Press SHUTDOWN and then STOP to turn the DLM400 off. *Note: The DLM can be set to turn itself off automatically. See Auto Off in the Configure Menu.*

SRCH RD STRING 1 [Z]

Immediately searches contents of the RD capture buffer, looking for a match of string1 and places the cursor on that character. Press status to view the location found.

SRCH TD STRING 1 [S]

Immediately searches contents of the TD capture buffer, looking for a match of string1 and places the cursor on that character. Press status to view the location found.

START STOP

Use this button to begin and end many activities on the DLM400 including:

Press START STOP while…	and the DLM400 will…
in the help menu or in a detail help screen	Exit the current screen and return to VIEW Mode
performing a BERT test	end the test.
in the Configure Menu	return to View Mode.
in the Output Menu	begin outputting
in Timer Menu	begins/ends timer function.
in terminal emulation	return to View Mode.
printing	stop printing.

STATUS

There are three separate status screens that provide information about the data in the buffer. Note that while you are in the status screens, you may change the location of the cursor at anytime using PAGE UP, PAGE DOWN, SEARCH, and the arrow keys.

Ordinarily your screen, as it captures data, simply shows the data on the five reverse-video lines of the liquid crystal display (lcd). However, if you press the STATUS key once, the last two lines of the lcd will become status lines giving a variety of dynamic information:

```
Locat. Size     ERRORS  DEC  HEX
05966  05967        01  083  053
```

The first time you press STATUS, you will see the above two status lines appear. They tell you the location of the cursor in the buffer—in this example the cursor is located at the fifty-first character—and the total size, in bytes—here 103 bytes of data in the buffer. It also displays the current byte (the one the cursor is on) in binary 101001, decimal 83 and hexadecimal 53 codes.

```
Locat. Signal    RS CS DS CD DT RI
05966     Now    lo lo lo hi lo lo
```

Pressing STATUS a second time also shows the current location of the cursor in the buffer, the size of data in the buffer, and shows the current state of six modem control signals, “hi” being high and “lo” being low.

```
Locat. Signal  RS CS DS CD DT RI
05966  Stored  lo lo lo hi lo lo
```

Pressing STATUS a third time shows you into historical mode. It shows you what the stored signals are. When in this mode, you are no longer capturing new data. It is showing data already captured. Once again you see the current location of the cursor in the buffer, the size of data in the buffer and the state of six modem control signals, “hi” being high and “lo” being low when that particular byte was captured.

If you press STATUS again, once again you will see only the data with no status lines at the bottom.

SUPPRESS CAPTURE [K]

Press SUPPRESS CAPTURE and the DLM400 will display the following screen:

```
Hit[T] or [R] to suppress TD or RD
capture or [B] to suppress BOTH
hit [O](off) to re-enable all capture
```

Press…	to KILL capture data on…
[T]	the TD line;
[R]	the RD line;
[B]	both lines.

Pressing [0] will capture data on both lines.

TERMINAL EMULATE [T]

The DLM400 can be made to function just like a terminal. Press [T] and from that point on, the DLM400 will output each letter you type as you type it. It will transmit on pin two of either right connector. Transmitted and received characters will be stored in the buffer. If the DLM400 is set to RS485, then after you press a RETURN, then the DLM400 will remove the transmitter from the output pin and go into receive mode. It will reattach the transmitter when you press another key.

TIME EVENTS [6]

Press TIMER to drop down into the Timer Submenu.

```
Start Clock          OR StopClock
StopClock
Timer Func


LEFT/RIGHT ARROWS to set flashing values
UP/DOWN ARROWS to change selection. PAGE
UP/DN for next page. [START] to continue
```

After you have created your Start Trigger and Stop Trigger using EDIT STRINGS and SET TRIGGER, this option allows you to specify the lines the DLM400 should monitor (looking for the appropriate string) to start then stop the timer. The timer will time, to the thousandth (.000) of a second, the interval between the Start and Stop Trigger.

Start Clock

You may tell the clock to start when it senses any of the following events.

String1-TD

Begins timing on the TD line when the DLM400 receives a string identical to the contents of string1.

String1-RD

Begins timing on the RD line when the DLM400 receives a string identical to the contents of string2.

`ModemStrt Mask`

Begins timing when the modem control signals match the modem control signal mask, see [M].

`Any data TD`

Begins timing on the TD line when the DLM400 receives its first character

`Any data RD`

Begins timing on the RD line when the DLM400 receives its first character.

`OR StopClock, Stop Clock`

You may tell the clock to stop when it senses any of the following events.

`String1-TD`

Stops timing on the TD line when the DLM400 receives a string identical to the contents of string1.

`String1-RD`

Stops timing on the RD line when the DLM400 receives a string identical to the contents of string2.

`ModemStrt Mask`

Stops timing when the modem control signals match the modem control signal mask, see [M].

`Any data TD`

Stops timing on the TD line when the DLM400 receives its first character.

`Any data RD`

Begins timing on the RD line when the DLM400 receives its first character.

`Timer Func Once, Continuous`

Times events once, or over and over again as they happen. Note, the timing of many events will present a statistical average of all of the events.

UN-CLEAR BUFFER[-]

This command resets the DLM capture buffer size pointer to its maximum size. Beware, if you have old data at the end of the buffer, it will re-appear. See Zero buffer to destroy.

XMIT BREAK [X]

Transmits a break sequence (250µs of all bits on). The same effect can be achieved by hitting RIGHT ARROW in Terminal emulation [T]

ZERO CAPTURE BUFFER [0]

Clears the entire capture buffer by writing either HEX 00,55, or FF over any data in the buffer. This command is intended for when the DLM is transported from a secure area

[↑]

All of the arrow keys are programmed to serve different functions depending on what screen or menu is on the display.

- When in the Edit String mode, the ↑ key deletes the byte with the cursor under it, the current byte.
- When in the View Mode, ↑ moves the cursor up one complete line.
- When in any menu ↑ highlights, selects, the previous option on the menu.

[↓]

- In Edit Strings mode, ↓ toggles the editor between hexadecimal and current “Code” as set in Configure Menu (e.g. ASCII).
- In View Mode, ↓ moves the cursor down one line.
- In screens showing multiple menus, ↓ displays the next menu.

CHAPTER TWO CONFIGURE MENU

The Configure Menu is used to set the communications and other parameters of the DLM400. In general, scroll through the parameters by using the ↑ and ↓ keys. To get to the next set of parameters (there are 4 screens) press PAGE DOWN.
To change the value of a parameter, press RETURN.

Baud The various speeds or baud rates the DLM400 can be set to accept.

64000 Sync	230,400	115,000
57,600	38,400	14,400
9,600	4,800	2,400
2,000	1,800	CUSTOM (Selectable rate)
1200	600	300
150	110	75

Stop Bits 1, 1.5, 2

The number of stop bits the DLM400 can be set to read in asynchronous mode.

Data Bits8, 7, 5, 6

The number of data bits the DLM400 can be set to read.

Parity Odd, Even, None, Ignore

The parity your DLM400 can be set to read. Choosing Odd or Even assumes an extra bit at the end of the data bit. If parity is wrong, View Mode displays parity error message. Ignore will not flag parity errors but expects a 9th(parity bit) to be present.

RS Interface 232/422/423/485

Sets the electrical interface which applies to the lower right 25 pin Sub D Connector. RS422 pin out is similar to RS530. See appendix G for specific pin out.

Mode Async, Mono Sync, BSC (bisync)
SDLC, Isochronous

The various modes the DLM400 can recognize:

Async is for asynchronous transmissions.

Monosync and **BSC** modes are byte-oriented synchronous protocols. Monosynchronous uses an 8-bit synchronous character, while BSC uses two 8-bit synchronous characters.

SDLC is a bit-oriented synchronous protocol that uses an 8-bit flag (hexadecimal 7E) to mark the beginning and end of message envelopes.

Isochronous is a clocked asynchronous mode that allows asynchronous data to be sent over synchronous circuits.

Code **ASCII, EBCDIC, IPARS, BAUDOT**

The way you would like to view your data.

Sync Char 1 **(*hex value*)**

In monosync mode this byte is used as a pad character on all transmission—output, loop, and answerback options. To learn how to enter hex values, see "Entering Integers and Hex Values" on page 5.

Sync Char 2 **(hex value)**

Refers to the second synchronous character in BSC mode or the receive synchronous character in Monosync mode. To learn how to enter hex values, see "Entering Integers and Hex Values" on page 5.

Sync character one and two are loaded automatically in SDLC mode.

Data Encoding **NRZ, NRZI, FM0, FM1**

These are the four data encoding methods.

NRZ is used in both synchronous and asynchronous applications.

NRZI, FM0 (biphase space) and **FM1** (biphase mark) are all used in various synchronous applications.

Ig Mul Syn Char **Yes, No**

(Ignore multiple synchronous characters)

Yes tells the DLM400 not to capture synchronous characters. This is useful when the sending device sends more than one synchronous character and you have no need of saving the extra characters.

No tells the DLM400 to capture all synchronous characters.

Drop Sync RTS/CD **Yes, No**

Yes drops synchronization when it detects Ready To Send or Carrier Detect.

Resync Char **None, (*hex value*)**

None has no effect on synchronization.

Setting an **(*hex value*)** means synchronization is dropped when this character is received. To learn how to enter hex values, see "Entering Integers and Hex Values" page 5.

Resync On Char **On, Off**

On drops synchronization when the Resync char is received.

Log Events **No, 1Fill, Cont.**

The DLM400 can be set to keep a log of certain events. See "TIME EVENTS" in Chapter One to learn how to view the log.

Setting **No** means you do not want to keep a log.

Setting **1Fill** means you want to fill the log buffer once. That is, when the log buffer is full, stop collecting logs.

Continuous means you want to continue capturing logs, and when the buffer is full, to clear logs to make room for newer logs.

Status

Normal, Long, None, Short

The DLM400 will notify you of certain events when **normal** is selected e.g. END OF BUFFER.

If you find the Status Messages annoying you can turn them off (**None**) or view them briefly (**Short**). To let them linger on the screen, choose **Long**.

Idle Display **On, Off**

On mode displays "Waiting for data" message on power up, **Off** doesn't.

Error

Fatal, Warn, None, Autoconfigure

Note: When the DLM400 is turned on, it will always pass data through itself, even if it cannot recognize speed or other configuration parameters.

If you choose **Fatal**, the DLM400 will stop receiving at certain hardware errors such as a change in line speed. Press any button and it will begin receiving again. You may also enter the Configure Menu and change a parameter before returning to View Mode.

If you choose **Warn**, a message will appear at certain hardware errors, but receiving will continue.

If you find the Error Messages annoying, say for example when watching a line that changes speed in normal operation, you may suppress them by selecting **None**.

Auto Off (min) **(*value)***

Setting a value means the DLM400 will turn itself off after it has been idle for **(*value*)** number of minutes. The default is 0 minutes which is Auto Off Disabled.

Display Mode **Compressed** **Expanded**

In **Compressed** mode, each data line character is displayed one after another.

In **Expanded** mode, each data line character is followed by a blank to facilitate reading at high speeds—l i k e s o.

Buffer **One fill, Continuous**

If **One Fill** is chosen, the DLM400 will stop collecting data when the buffer is full. If **Continuous** is chosen, the DLM400 will continue to fill the buffer and discard the oldest data on a first in first out basis.

Exclude **Off, Control Data, Text Data**

Off has no effect on capture.

If you choose **Control Data,** then the control data, all data except that between the start of text character (STX) and the end of text character (ETX), will be excluded—not captured.

If you choose **Text Data,** then the text data, the data between the start of text character (STX) and the end of text character (ETX), will be excluded—not captured.

Start Txt Char **(*value*)**

See “Exclude” above. Specify the character you want to use as the STX.

End Txt Char **(*value*)**

See “Exclude” above. Specify the character you want to use as the ETX.

DLMVIEW **Off, On**

Set your DLM400 in an RS-232 circuit (See Chapter Three Remote Control) then turn remote on here to take control of your DLM400 From A PC with DLMVIEW software.

This option is extremely useful for loopback tests when you don't have an assistant in the remote location.

Remote Baud **115200, 19200**

The baud rate at which you want to communicate remotely with DLMVIEW from the DLM400.

Invert Rec. Bits **Yes, No**

Yes inverts the sense of all incoming bits.

SDLC Status **Yes, No**

Yes displays the status of SDLC and **No** doesn't.

CRC Preset **Zeros, Ones**

Ones presets the value of CRCs to ones and **Zeros** presets it to zeroes.

SDLC Search Node **All, Node number (*hex value*)**

Choosing All (0) captures all nodes.

Setting a specific **Node number** allows you to specify one SDLC node in a loop or polled circuit. To learn how to enter hex values, see "Entering Integers and Hex Values" page 5.

SDLC Search **Disable, Enable**

Choose enable to go ahead and search for the node specified above in SDLC Search Node

.

CHAPTER THREE REMOTE VIEWING AND CONTROL

The DLM400 can be controlled by a PC either locally or remotely using DLMVIEW. Using DLMVIEW you can collect as much capture data as your hard disk will allow. Connect the top 9 pin sub-D connector with a straight through cable to a serial port on a PC. Contact support@benedictcommunication.com for more information or visit http://www.benedictcommunication.com/techtips.htm

APPENDIX A
NONPRINTING ASCII CODES

	Key	Abrv.	Name	Description
0	.	NUL	Null	Filler, often used while waiting carriage return on slow printers.
1	A	SOH	Start of Heading	First character of a heading in information transmission.
2	B	STX	Start of Text	Terminates heading and signals start of the text.
3	C	ETX	End of Text	Signals end of text often used to ask for ACK from sending device.
4	D	EOT	End of Trans	When time-sharing logs terminal off.
5	E	ENQ	Enquiry	Asks remote station for identification.
6	F	ACK	Acknowledge	Used by remote to answer affirmative to host. Opposite of NAK.
7	G	BEL	Bell	Sounds a bell.
8	H	BS	Backspace	Moves cursor back one space without erasing.
9	I	HT	Horizontal Tab	Sets print position to preset horizontal tab.
10	J	LF	Line Feed	Moves print position down one line.
11	K	VT	Vertical Tab	Sets print position to preset vertical tab.
12	L	FF	Form Feed	Advances to next page or screen.
13	M	CR	Carriage Return	Moves print head, or cursor, to left margin.
14	N	SO	Shift Out	Shifts into an alternate character set.
15	O	SI	Shift In	Used after Shift Out to return to standard ASCII character set.
16	P	DLE	Data Link Escape	Shifts into a different set of control codes.
17	Q	DC1	Device Control 1	A variable.
18	R	DC2	Device Control 2	A variable.
19	S	DC3	Device Control 3	A variable.
20	T	DC4	Device Control 4	A variable.
21	U	NAK	Negative ACK	Used by remote to answer negative to host. Opposite of ACK.
22	V	SYN	Synchronous Idle	Used as a “pad” in certain types of synch serial transmissions.
23	W	ETB	End Trans. Block	Signals end of block sent by host.
24	X	CAN	Cancel	Disregard last line of data; return to mutually agreed restart point.
25	Y	EM	End of Medium	Signals last character on this medium.
26	Z	SUB	Substitute	Sometimes used as a fill character in fixed-length fields; also used to indicate garbled data.
27	[	ESC	Escape	Used to break transmission or to introduce special sequences of control characters.
28	\	FS	File Separator	Allows files to be sorted by character lower than “space” in collating sequence.
29	]	GS	Group Separator	Similar to FS.
30	=	RS	Record Separator	Similar to FS.
31	-	US	Unit Separator	Similar to FS. Lowest order of separators not counting SP.

APPENDIX B
TABLE OF CODES

Screen	A	B	C	D	E	F	G	H	I	J	K	L	M
ASCII	41	42	43	44	45	46	47	48	49	4A	4B	4C	4D
EBCDIC	C1	C2	C3	C4	C5	C6	C7	C8	C9	D1	D2	D3	D4
IPARS	31	32	33	34	35	36	37	38	39	21	22	23	24
BAUDOT *	03	19	0E	09	01	0D	1A	14	06	0B	0F	12	1C

Screen	**N**	**O**	**P**	**Q**	**R**	**S**	**T**	**U**	**V**	**W**	**X**	**Y**	**Z**
ASCII	4E	4F	50	51	52	53	54	55	56	57	58	59	5A
EBCDIC	D5	D6	D7	D8	D9	E2	E3	E4	E5	E6	E7	E8	E9
IPARS	25	26	27	28	29	12	13	14	15	16	17	18	19
BAUDOT *	0C	18	0E	0F	0A	05	10	14	1E	13	10	15	11

Screen	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**	**l**	**m**
ASCII	61	62	63	64	65	66	67	68	69	6A	6B	6C	6D
EBCDIC	81	82	83	84	85	86	87	88	89	91	92	93	94
IPARS	--	--	--	--	--	--	--	--	--	--	--	--	--
BAUDOT	--	--	--	--	--	--	--	--	--	--	--	--	--

Screen	**n**	**o**	**p**	**q**	**r**	**s**	**t**	**u**	**v**	**w**	**x**	**y**	**z**
ASCII	6E	6F	70	71	72	73	74	75	75	77	78	79	7A
EBCDIC	95	96	97	98	99	A2	A3	A4	A5	A6	A7	A8	A9
IPARS	--	--	--	--	--	--	--	--	--	--	--	--	--
BAUDOT	--	--	--	--	--	--	--	--	--	--	--	--	--

Screen	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**#**	**%**	**$**
ASCII	30	31	32	33	34	35	36	37	38	39	23	25	24
EBCDIC	F0	F1	F2	F3	F4	F5	F6	F7	F8	F9	7B	7D	5B
IPARS	0A	01	02	03	04	05	06	07	08	1B	3C	30	--
BAUDOT **	16	17	13	01	0A	10	15	07	06	18	14		O9

Screen	**.**	**,**	**:**	**;**	**?**	**<**	**>**	**(**	**)**	**[**	**]**	**{**	**}**
ASCII	2E	2C	3A	3B	3F	3C	3E	28	29	5B	5D	7B	7D
EBCDIC	4B	6B	7A	5E	6F	4C	6E	4D	5D	AD	BD	8A	9B
IPARS	--	--	--	--	--	--	--	--	--	--	--	--	--
BAUDOT **	1C	0C	0E	1E	19	--	--	0F	12	--	--	--	--

Screen	**=**	**&**	**!**	*****	**+**	**/**	**@**	**-**	**`**	**|**	**"**
ASCII	3D	24	21	2A	2B	2F	40	5F	60	7C	22
EBCDIC	7E	50	5A	5C	4E	61	7C	60	--	4F	7F
IPARS	0E	--	--	--	2C	11	20	1A	--	--	--
BAUDOT **	0F	1A	--	--	--	--	--	03	--	--	11

Screen	**Space**	**‹**	**fi**	**_**	**^**	**'**	**CR**	**LF**
ASCII	20	7E	7F	--	5E	27	OD	OA
EBCDIC	40	--	--	6D	--	--	OD	25
IPARS	1C	--	--	--	--	--	OC	--
BAUDOT **	04	--	--	--	--	--	08	02

BAUDOT * After an SI (1F) character

BAUDOT ** After an SO (1B) character..

APPENDIX C
SAMPLE ASCII HEX PRINTOUT

X at far right indicates changes in signals.

```
Page number:01   code: ASCII
       00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15
0000Td
    Rd 54 68 69 73 20 69 73 20 52 44 20 64 61 74 61 20 This is RD data
    DS HI HI HI HI HI HI HI HI HI HI HI HI HI HI HI HI
    DT LO LO LO LO LO LO LO LO LO LO LO LO LO LO LO LO
    CD LO LO LO LO LO LO LO LO LO LO LO LO LO LO LO LO
    CS HI HI HI HI HI HI HI HI HI HI HI HI HI HI HI HI
    RS LO LO LO LO LO LO LO LO LO LO LO LO LO LO LO LO
    RI LO LO LO LO LO LO LO LO LO LO LO LO LO LO LO LO
16Td
    Rd 77 69 74 68 20 43 54 53 20 61 6E 64 20 44 53 52 with CTS and DSR
    DS HI HI HI HI HI HI HI HI HI HI HI HI HI HI HI HI
    DT LO LO LO LO LO LO LO LO LO LO LO LO LO LO LO LO
    CD LO LO LO LO LO LO LO LO LO LO LO LO LO LO LO LO
    CS HI HI HI HI HI HI HI HI HI HI HI HI HI HI HI HI
    RS LO LO LO LO LO LO LO LO LO LO LO LO LO LO LO LO
    RI LO LO LO LO LO LO LO LO LO LO LO LO LO LO LO LO
32Td             61 6E 64 20 74 68 69 73 20 69 73 20     and this is
    Rd 20 68 69 20                                      hi
    DS HI HI HI HI LO LO LO LO LO LO LO LO LO LO LO LO     X
    DT LO LO LO LO HI HI HI HI HI HI HI HI HI HI HI HI     X
    CD LO LO LO LO LO LO LO LO LO LO LO LO LO LO LO LO
    CS HI HI HI HI LO LO LO LO LO LO LO LO LO LO LO LO     X
    RS LO LO LO LO HI HI HI HI HI HI HI HI HI HI HI HI     X
    RI LO LO LO LO LO LO LO LO LO LO LO LO LO LO LO LO
48Td 54 44 20 64 61 74 61 20 77 69 74 68 20 44 54 52 TD data with DTR
    Rd
    DS LO LO LO LO LO LO LO LO LO LO LO LO LO LO LO LO
    DT HI HI HI HI HI HI HI HI HI HI HI HI HI HI HI HI
    CD LO LO LO LO LO LO LO LO LO LO LO LO LO LO LO LO
    CS LO LO LO LO LO LO LO LO LO LO LO LO LO LO LO LO
    RS HI HI HI HI HI HI HI HI HI HI HI HI HI HI HI HI
    RI LO LO LO LO LO LO LO LO LO LO LO LO LO LO LO LO
64Td 20 61 6E 64 20 52 54 53 20 68 69 21              and RTS hi!
    Rd
    DS LO LO LO LO LO LO LO LO LO LO LO LO
    DT HI HI HI HI HI HI HI HI HI HI HI HI
    CD LO LO LO LO LO LO LO LO LO LO LO LO
    CS LO LO LO LO LO LO LO LO LO LO LO LO
    RS HI HI HI HI HI HI HI HI HI HI HI HI
    RI LO LO LO LO LO LO LO LO LO LO LO LO
```

APPENDIX D
BATTERIES

Your DLM400 has 2 batteries in it. The primary battery is a 9-volt alkaline. We have found that alkaline batteries provide the longest and most reliable service. Should you decide to use a rechargeable Nicad battery instead, we recommend you carry a charged spare as a Nicad can only deliver about 40% of the capacity of a fresh alkaline. When your battery is running low you will receive a BATTERY LOW warning on your screen and you must then change your battery or plug in the AC adapter. You may plug in the DLM400's external power supply even while the DLM400 is in use.

The second battery in the DLM400 is a lithium cell which is used to preserve memory and menu configuration. Should you notice that your unit "forgets" either of these, it is time to replace your lithium cell.

Replacing the Lithium Cell

Lay the DLM400 face down on a soft cloth and remove the five screws. Remove the back cover. Carefully remove the circular lithium cell from its holder using the tip of a small screw driver to lift the battery up and out. Replace it with a BR-2450 or equivalent type lithium battery. Any 3 volt battery that fits in the holder will suffice.
.

APPENDIX E RS422 DOCUMENTATION

When the Menu RS interface is set to RS422/RS485 then the right hand 25 pin male connector pin out is RS530 as follows:

PIN	NAME
1	CHASSIS GROUND
2	XMIT DATA A MINUS (-)
3	REC DATA A MINUS (-)
4	RTS
5	CTS
6	DSR
7	SIGNAL GROUND
8	RLSD
9	REC CLK B (+)
12	XMIT CLK B (+)
14	XMIT DATA B (+)
15	XMIT CLK A (-)
16	REC DATA B (+)
17	REC CLK A (-)
20	DTR
22	RI

EXAMPLE 1 TERMINAL TESTING

If you do not know the speed and bit configuration of a terminal, the following method will help you quickly get the parameters set.

1) Turn on the DLM400 and attach the single male connector on the included ribbon cable to the DLM400. Attach the other end, Male or Female to the terminal. Now the terminal is only attached to the DLM400. Type an "A" on the terminal. The DLM400 will tell you the line on which it is receiving data. For example "Framing error on TD(2)".

2) The DLM400 will tell you whether to hit "W" or "A" to autoconfigure. Hit the key it says. The DLM400 will now say, “waiting for Data.”

3) Now on the terminal you are testing, press alternating "a" and "c". Within 20 characters the DLM400 will tell you speed and bit configuration and begin capturing data. If you did not see the speed, simply hit the MENU key on the DLM400 and you will see the correct settings.

Exercising Serial Terminals

To send data to a serial terminal:

1) Using a NULL MODEM connector (or using the included break out box to swap pins 2 and 3) between the DLM400 and the terminal, after you have set your speed correctly (above), just hit "O". This will put you into the output screen with all defaults set. Now just hit the START/STOP button and the DLM400 will attach its transmitter to pin 2, the null modem will swap the output to pin 3 and the data will go to the terminal and you will see the alphabet on the screen.

EXAMPLE 2 SYNCHRONOUS PROTOCOL DECODING

The Force Capture Command can capture all the sync and special characters that are normally hidden from you by the hardware and SEE every single bit that passes through the line. To do this:

1) Press the MENU button and set the DLM400 to BYSINC. Press MENU to exit menu. Then push [F] for FORCE CAPTURE. The DLM400 will now capture a bit with each transition of the clock on pins 15 and 17. What appears in the buffer may look like garbage, but that is OK. With analysis you can figure out exactly what the synchronous protocol is being used.

2)Switch the display to hex by hitting [H]. As you page through the buffer you should see repetitive groups of hex characters that are the same. This is the key to determining the SYNC/ IDLE. They may not look like any sync character because they are shifted one or more bits from a proper byte boundary, depending on when you hit [F] to force sync. Also the TD and RD line may show different patterns.

3) If the contents of the capture buffer are not recognizable, push [4] (shift 1 bit right) which will shift the entire capture buffer 1 bit to the right. This may take a few seconds. Since there are 8 bits in a byte, by repeating the shift command, within 8 pushes you should make your groups of characters look like normal sync characters. Possible sync characters are usually a HEX 96 or 16 or 32 or b2. If the characters are 7E you have SDLC or HDLC and not bysinc. If the sync characters are anything other than a 7E the protocol is BISYNC and your should set the SYNC char 1 and 2 in MENU page 2 to the character you find. If the sync char is a 7E it is a FLAG and the MODE on page 2 of MENU should be set to SDLC/HDLC.

Using this method, you can predict odd or even parity. For example, a 96 is the same as a 16 but with EVEN parity.

EXAMPLE 3 SYNCHRONOUS CIRCUIT TESTING

Determining Transmission Quality of a Point-to-Point Synchronous Line with a Benedict Computer DLM400

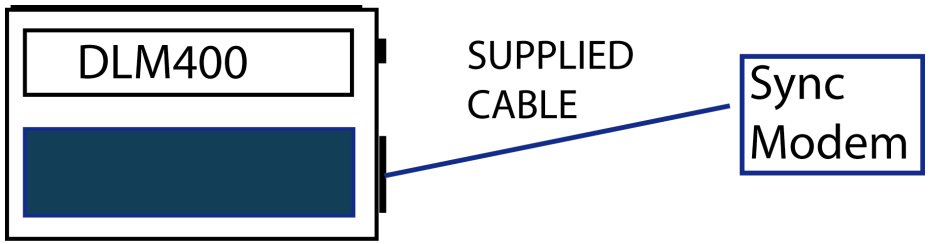
Purpose To determine the quality of a communications circuit. This information can be used to quantify the suitability of a communications line for carrying production data.

Method Attach DLM400 directly to the local DCE, then perform a Loop Test with the Pattern of your choice. This test will show not only the number of bit and block errors but also the average round trip time which is equivilant to throughtput/performance.

Conclusion The bit and block errors represent data loss or corrupted data. Run this test at different times of the day to note any correlation between time of day and errors. In general, less than 95% error free seconds is going to adversely affect performance.

Procedure Setting up a loop test and sending a pattern to detect and count bit errors, block errors, characters received and the average round trip time in milliseconds.

Action	Purpose
Disconnect the Data Teminal Equipment from the MODEM/DSU and plug the right side of the DLM400 into the Modem/Digital Service Unit as illustrated below	*Disconnects the local data terminal equipment and replaces it with the DLM400*



Action
Press [MENU] The following screen will appear

BAUD	**9.6k**	**Auto Off**	**6**
Stop Bits	**1**	**Status Mess**	**Normal**
Data Bits	**8**	**Error Mess**	**Fatal**
Parity	**None**	**Bit Sense**	**LSB**

LEFT/RIGHT ARROWS to set flashing values
UP/DOWN ARROWS to change Selection. PAGE UP/DN for next page. [START] to continue

Action	Purpose
Press [PAGE DOWN]	*Goes to MENU page 2*
Press [RETURN] until mode is set to BSC or SDLC/HDLC	*Sets Synchronous protocol*
Press [MENU]	*Exits the Menu*
Press [B]	*Starts Bert / Loop Performance test*
The following screen will appear	

Pattern	**ASCII**	**Timeout**	**6**
Char delay(ms)	**0**	**Handshake**	**Off**
Passes(0=cont.)	**6**		

LEFT/RIGHT ARROWS to set flashing values
UP/DOWN ARROWS to change Selection. PAGE UP/DN for next page. [START] to continue

Action	Purpose
Press [RETURN] or [Right Arrow] until the pattern you choose is showing.	*Select the pattern to transmit. It may be reasonable to select a pattern that approximates your actual production data (e.g. a string you create in edit[E] or an entire capture buffer,*

[TD buffer] or [RD buffer]).

Press [END],

Go to last entry on current menu screen.

Press [RETURN] until HANDSHAKE is set to OFF.

Handshake is used in the performance BERT test, to control the FLOW of data when intelligent devices need to control transmission with X-On/X-Off or interface signal.

Press [Start/STOP].

Starts the test.

Press [X].

Select eXternl Clock. The DLM will look for timing in pin 15 and pin 17 of the external interface. If there is no signal on these pins, the DLM will issue a TIMEOUT error. If you use internal, the DLM400 will use the BAUD rate set in the MENU and also transmit that clock signal on pin 15 of the interface.

Start of test

Chars Sent	**0**	**Block Error**	**0**
Chars Recv	**0**	**Bit Errors**	**0**
Rec in Syn	**0**	**Blocksize**	**511**
Elap second	**0**	**Error Free Sec**	**%**
BERT:	**%**	**BLERT:**	**%**
Average trip time per block(ms):			**0**
			[C] clears counters
STOP ends test.		**Return injects errors**	

Action

Test may be terminated at any time by pushing the [Start/Stop] button

Completed Test Screen

Chars Sent	**3048**	**Block Error**	**0**
Chars Recv	**3048**	**Bit Errors**	**0**
Rec in Syn	**3048**	**Blocksize**	**510**
Elap second	**1**	**Error Free Sec**	**100%**
BERT:	**0%**	**BLERT:**	**0%**
Average trip time per block(ms):			**236**

TEST COMPLETED-Hit [STOP] to exit

Action

When results have been recorded pushing the [Start/Stop] button will return you to VIEW mode.

Technical Discussion

On a direct land line circuit the TRIP TIME should approximate the block size divided by the result of the computation of the bits-per-second rate divided by the word size in bits. This number should be multiplied by 1000 to get the number in milliseconds.

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TRIP TIME    =     Block size/(bits-per-sec/number of data
bits)
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For example, if you were running this test at 9600 baud and you had 8 bits per byte and your block size is 512 bytes, then the TRIP TIME should be 9600/8 which is the number of bytes per second divided into the block size (in this case 512) multiplied by 1000 to get milliseconds. The result of this computation should be (512 / (9600/8)) * 1000 or 426. If you are using a satellite then the figure would be much larger owing to the time it takes the signal to go from the earth (1/2 second) to the satellite and back (another 1/2 second) to earth. Please note that there is timing overhead in the process of starting and stopping block transmission and waiting for the full block to return, therefore the actual number, even on a perfect circuit may be larger than the actual mathematical computation. The number will be consistent for each type of pattern on the same circuit if there are no BERT or BLOCK errors.

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