

**Cromemco**  
**3102 TERMINAL**  
INSTRUCTION MANUAL  
ADDENDA

CROMEMCO, INC.  
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CROMEMCO  
3102 Terminal  
Instruction Manual  
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## INTRODUCTION

The Cromemco 3102 terminal is a modified version of the Beehive Micro Bee 2. The differences between the 3102 and the Micro Bee 2 are fairly extensive. Unlike the Micro Bee 2, the 3102 is designed primarily for on-line use. Furthermore, the 3102 is designed for on-line use with Cromemco systems. It has many physical and operational characteristics that enhance compatibility with Cromemco hardware and software and that reflect Cromemco's commitment to making products easy to use. The keyboard layouts of the 3102 and Micro Bee 2 differ, and some of the keys that have similar labels have different effects. Unlike the Micro B2, the 3102 does not normally display a status line, though it can display one if asked to do so. The messages displayed on the 3102 status line are not the same as those displayed on the Micro Bee 2 status line. A few of the switches on the back panel have different meanings. Some of the CPU-controlled functions of the 3102 differ from those of the Micro Bee 2. Finally, a few functions have been added.

This document describes aspects of the 3102 that differ from those of the Micro Bee 2. Matters not discussed here should be assumed to be as described in the Beehive Micro Bee 2 Technical Users Manual (supplied with each 3102). Thus, the user can gain a general understanding of the terminal by reading the Beehive manual and can refer to this document for specific information on key functions and other operational characteristics.





## 3102 KEYBOARD

### Keyboard Layout

The Cromemco 3102 keyboard is arranged as depicted in Figure 1. Some of the keys are engraved on the front as well as on the top of the keycap. Some of the keys are labeled in red to indicate that the control key (which is red) must be depressed simultaneously to have the indicated effect. In contrast with the Micro Bee 2:

1. there is no separate <line feed> key,
2. there is no separate <(cursor) home> key,
3. the underline is a <shift-0> ,
4. there is an extra <,> key for use with the number pad (right side of keyboard),
5. the <tab> key is located to be easily accessible from both the alphanumeric keyboard and the number pad,
6. there is no <backspace key> (use <←>),
7. there are two keys for working with forms, <make form> and <use form> ,
8. Page or Line Mode is selected with a single (toggle) key,
9. there is no <aset> (attribute set) key,
10. there is a single <(block) send> key,
11. there is no <mlock> key,
12. there is no (memory) <test> key,
13. there is only one <control> key,
14. the <(cursor) ↑ >, <↓>, <←>, and <→> keys are located so that they will be easily accessible in accordance with observed use patterns,
15. there are twenty unassigned function keys, and
16. there is a <pause key>, a <print> key, and a <help> key.



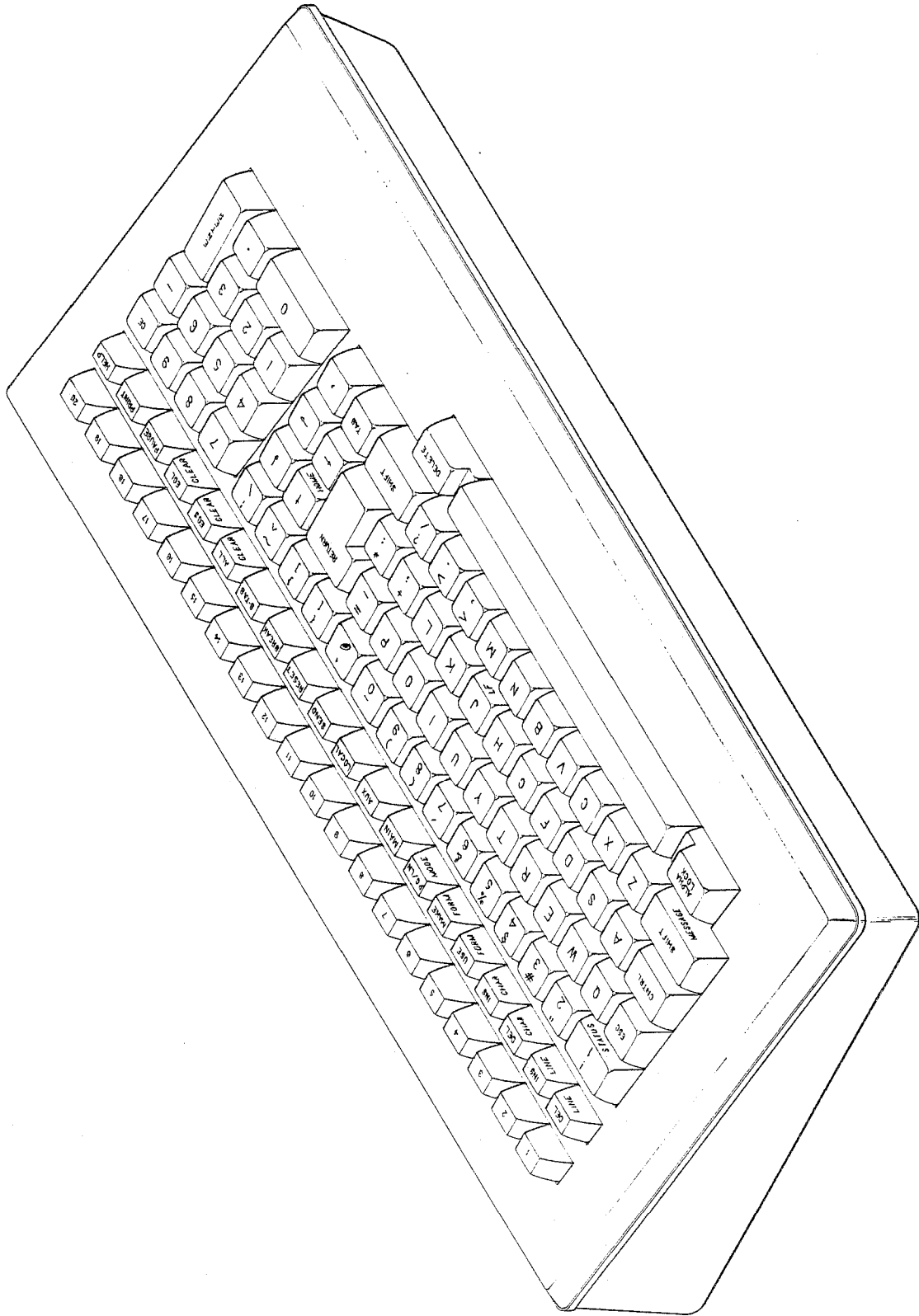


Figure 1



## Keyboard Functions

### Cursor Motion --

The effect of pressing the <(cursor) ↑>, <↓>, <←>, <→> and <control-↑> (home) keys depends on whether the terminal is on-line or off-line and on whether the cursor movement keys are set to transmit characters or act locally (via either the "auto echo" switch on the back panel or the use of the special CPU control sequences ESC . 4 and ESC . 5).

If the terminal is off-line (regardless of the position of the "auto echo" switch) these keys transmit nothing but have the indicated function.

If the terminal is on-line (the normal mode) and cursor movement keys have been set to operate locally, these keys transmit nothing but have the indicated function. If cursor movement keys have been set to transmit, the keys have no local effect, but transmit the following codes:

Cursor <↑>	-- 0B Hexadecimal
Cursor <↓>	-- 0A Hexadecimal
Cursor <←>	-- 08 Hexadecimal
Cursor <→>	-- 0C Hexadecimal
Cursor <home>	-- 19 Hexadecimal

### <return> --

If the 3102 is off-line, pressing the key moves the cursor to the first column of the current line, and, unless the "Auto Line feed" switch (back panel) is off, advances the cursor one line.

If the 3102 is on-line, no local action is taken, but a CR is transmitted.



<enter> --

This key generates the terminator character(s) selected by the rear panel switches. If "CR" or "CR-LF" are selected, the 3102 performs the corresponding functions or transmits the corresponding characters when the <enter> key is depressed. If "EOT" or "ETX" are selected, the terminal transmits those codes but does not alter the display.

<ce> (clear entry) --

This key sends the two character sequence STX-^ if the 3102 is on-line. If the software handshaking protocol is selected, both characters must be echoed by a STX. If function keys are disabled, pressing this key does nothing but sound the bell.

If the 3102 is off-line and in USE FORMS mode, depressing this key moves the cursor to the beginning of the current unprotected field and erases to the end of the field. If the 3102 is off-line and not in USE FORMS mode, pressing this key does nothing but sound the bell.

<tab> --

Depressing this key causes a TAB character to be transmitted if the terminal is on-line.

If the 3102 is off-line, the cursor moves to the next tab stop or to the next unprotected field.

<delete> --

This key causes a DEL character to be transmitted if the 3102 is on-line.

If off-line, this key has no effect unless the 3102 is in MAKE FORMS mode, in which case a delete code (space filler in empty data fields) is written on the screen (see Micro Bee 2 Technical Users Manual). Thus, in MAKE FORMS mode, this key can be used to extend data fields.





<alpha lock> --

Depressing this key once capitalizes all alphabetic characters, but does not affect the number and special character keys. Depressing it a second time allows both upper- and lower-case letters to be typed unless the INHIBIT LOWER CASE switch (back panel) is on.

<shift> --

If pressed without simultaneously pressing the <cntrl> key, this key operates just like a typewriter <shift> key. If used in combination with the <cntrl> key, this key displays the latest special status line message that the 3102 has received.

<ctrl> (control) --

Holding down this (red) key while pressing any alphabetic key causes the corresponding ASCII control code to be transmitted over the selected port. Holding this key down while pressing any key labelled in red causes the indicated action to occur or the indicated character to be transmitted.

<esc> (escape) --

If the 3102 is on-line, pressing this key causes an ESC to be transmitted.

If the 3102 is off-line, pressing this key causes the next key pressed to have the alternate effect indicated in the Micro Bee 2 ASCII Code Chart (Beehive Micro Bee 2 Technical User's Manual).

<del line> (delete line) --

If the 3102 is on-line and function keys are enabled, this key sends the sequence STX-'. If the software handshaking protocol is selected, both characters must be echoed by a STX. If function keys are disabled, pressing this key does nothing but sound the bell.



If the 3102 is off-line, the line containing the cursor is deleted, and all lines below it scroll upward one line (creating a blank line at the bottom of the screen).

If the 3102 is in USE FORMS mode, pressing this key has no effect.

<ins line> (insert line) --

If the 3102 is on-line, this key sends the sequence STX-a. If the software handshaking protocol is selected, both characters must be echoed by a STX. If function keys are disabled, pressing this key does nothing but sound the bell.

If the 3102 is off-line, a blank line is created at the position of the cursor, and all lines below it scroll downward one line (causing the data in the bottom line to be lost).

If the 3102 is in USE FORMS mode, pressing this key has no effect.

<del char> (delete character) --

If the 3102 is on-line, this key sends the sequence STX-b. If the software handshaking protocol is selected, both characters must be echoed by a STX. If function keys are disabled, pressing this key does nothing but sound the bell.

If the 3102 is off-line, the character under the cursor is deleted, and all characters to the right of it up to the end of the line (field, in USE FORM mode) move one space leftward, spaces being inserted at the end of the line. If pressed in conjunction with the <cntrl> key, all characters to the right or below the deleted character move one space to the left (except those in column one, which move to the end of the previous line), spaces being inserted at the end of the screen.



<ins char> (insert character) --

If the 3102 is on-line, this key sends the sequence STX-c. If the software handshaking protocol is selected, both characters must be echoed by a STX. If function keys are disabled, pressing this key does nothing but sound the bell.

If the 3102 is off-line, it enters a mode such that any character typed until <ins char> is pressed again is inserted under the cursor rather than simply replacing what's there. The character which was under the cursor and those to the right of it up to the end of the line (field, in USE FORMS mode) move one space to the right. Any character in column 80 of the line will be lost. If pressed in conjunction with the <cntrl> key, the 3102 enters a mode such that all characters to the right or below the cursor move one space to the right (except those in column 80, which move to the beginning of the next line) whenever a character is typed until <ins char> is pressed again. Any character in column 80 of line 24 will be lost.

<use form> --

If the 3102 is on-line, this key sends the sequence STX-d. If the software handshaking protocol is selected, both characters must be echoed by a STX. If function keys are disabled, pressing this key does nothing but sound the bell.

If the 3102 is off-line it enters a mode such that all previously-defined field attributes take effect. (See FORMS mode in Micro Bee 2 manual.)

<make form> --

If the 3102 is on-line, this key sends the sequence STX-e. If the software handshaking protocol is selected, both characters must be echoed by a STX. If function keys are disabled, pressing this key does nothing but sound the bell.



If the 3102 is off-line, it enters a mode that allows the operator to define fields of various types at selected locations on the screen (i.e., to create forms for later data entry).

<pg/ln mode> (page/line mode) --

Pressing this key changes the 3102 from LINE mode to PAGE mode or vice-versa. Whether the mode is LINE or PAGE at the time the <send> key is pressed determines whether one line of data or the entire page is transmitted. This key operates locally at all times.

<main> --

Pressing this key selects the main I/O port (toggles with <aux> key). This key operates locally at all times.

<aux> --

Pressing this key selects the auxiliary I/O port (toggles with <main> key). This key operates locally at all times.

<local> --

Pressing this key puts the terminal in LOCAL mode. This key operates locally at all times.

<send> --

If block send is enabled, pressing this key initiates transmission of a block of data, the size of which depends on which of PAGE or LINE mode is currently selected. A block transmission is comprised of two STX characters, followed by a line or a page of screen data (see Operational Differences) and terminated by an EOT character. If the software handshaking protocol is selected, 3102 waits for an STX to be echoed after every character before sending any more data. Note that this also applies to the final EOT character. This key operates locally at all times.





If block send is disabled (the default mode), pressing this key does nothing and sounds the bell.

<reset> --

Pressing this key without simultaneously pressing the <control> key does nothing. With the control key depressed, this key resets the 3102 software to the state it assumed when turned on, except that the contents of the screen are unaffected, the cursor movement keys continue to operate as previously set, and block send and function keys remain enabled or disabled as they were before the reset. Note that software handshaking reverts to being selected. This key operates locally at all times.

<break> --

Pressing this key without simultaneously pressing the <control> key does nothing. With the <control> key depressed, this key sends a 100 msec break signal to the selected port.

<bktab> (back tab) --

If the 3102 is on-line, this key sends the sequence STX-i. If the software handshaking protocol is selected, both characters must be echoed by a STX. If function keys are disabled, pressing this key does nothing but sound the bell.

If the 3102 is off-line, pressing this key positions the cursor at the previous tab stop.

<clear all> --

If the 3102 is on-line, this key sends the sequence STX-f. If the software handshaking protocol is selected, both characters must be echoed by a STX. If function keys are disabled, pressing this key does nothing but sound the bell.

If the 3102 is off-line, pressing this key clears all unprotected fields on the screen



and leaves the cursor in the upper left hand corner.

<clear eos> (clear to end of screen) --

If the 3102 is on-line, this key sends the sequence STX-g. If the software handshaking protocol is selected, both characters must be echoed by a STX. If function keys are disabled, pressing this key does nothing but sound the bell.

If the 3102 is off-line, pressing this key clears all unprotected fields to the right of and below the cursor (including visual attributes; see Micro Bee 2 Technical User's Manual).

<clear eol> (clear to end of line) --

If the 3102 is on-line, this key sends the sequence STX-h. If the software handshaking protocol is selected, both characters must be echoed by a STX. If function keys are disabled, pressing this key does nothing but sound the bell.

If the 3102 is off-line, pressing this key clears all unprotected fields on the line to the right of the cursor (including field attributes).

<pause> --

If the 3102 is on-line, pressing this key sends the sequence STX-5FH. If the software handshaking protocol is selected, both characters must be echoed by a STX. If function keys are disabled, pressing this key does nothing but sound the bell.

If the 3102 is off-line, pressing this key does nothing.



<print> --

If the 3102 is on-line, this key sends the sequence STX-j. If the software handshaking protocol is selected, both characters must be echoed by a STX. If function keys are disabled, pressing this key does nothing but sound the bell.

If the 3102 is off-line, pressing this key does nothing.

<help> --

If the 3102 is on-line, this key sends the sequence STX-k. If the software handshaking protocol is selected, both characters must be echoed by a STX. If function keys are disabled, pressing this key does nothing but sound the bell.

If the 3102 is off-line, pressing this key does nothing.

Alphanumeric and Special Character Keys --

If the 3102 is on-line, depressing one of these keys causes the corresponding ASCII character to be transmitted over the selected port.

If the 3102 is off-line, depressing one of these keys causes the keyed character to appear on the screen at the cursor position.

Regardless of whether the 3102 is on- or off-line, pressing the <l> key while holding down the <cntrl> key causes the status line to appear or disappear, depending on whether or not it was already being displayed.

Numbered Function Keys --

If the 3102 is on-line, depressing one of these keys sends a two-character sequence consisting of a STX followed by the code indicated in the following table:



<u>Key #</u>	<u>Code Following STX</u>
1	70Hexadecimal
2	71H
3	72H
4	73H
5	74H
6	75H
7	76H
8	77H
9	78H
10	79H
11	7AH
12	7BH
13	7CH
14	7DH
15	7EH
16	7FH
17	6FH
18	6EH
19	6DH
20	6CH

If function keys are disabled, pressing any of these keys does nothing but sound the bell.

If the 3102 is off-line, pressing any of these keys does nothing.





## 3102/MICRO BEE 2 SPECIAL FUNCTION DIFFERENCES

Special functions of the 3102 are invoked when it receives certain two or three character sequences. These sequences may be received from the host system or, if the 3102 is off line, from the keyboard. All such sequences begin with ESC; the character(s) received immediately thereafter determine the function invoked and satisfy any arguments required.

Most of the code sequences for invoking special functions are the same for the 3102 as they are for the Micro Bee 2 (see Beehive Micro Bee 2 Technical Users Manual ASCII Code Chart). The exceptions are:

<u>Code Sequence</u>	<u>Meaning</u>
ESC (	Select main port and go on-line
ESC )	Select auxiliary port and go on-line
ESC - (minus sign)	toggle the status line display (default is with status line not displayed)
ESC N	Go off-line (remember port)
ESC n	Go on-line to selected port
ESC j	Has no effect (enables aux port on Micro Bee 2)
ESC k	Has no effect (disables aux port on Micro Bee 2)
ESC V	Resets the 3102 (see Keyboard Functions <reset> key)
ESC . 0	Enable software handshaking protocol on main port (default)



ESC . 1	Disable software handshaking protocol on main port
ESC . 2	Enable software handshaking protocol on auxiliary port (default)
ESC . 3	Disable software handshaking protocol on auxiliary port
ESC . 4	Cursor control keys transmit control codes (see Keyboard Functions) and have no local effect (default)
ESC . 5	Cursor control keys operate locally, transmitting nothing
ESC . 6	Disable block transmit (default)
ESC . 7	Enable block transmit
ESC . 8	Disable function keys for ONLINE USE
ESC . 9	Enable function keys for ONLINE USE

Note that in the three character sequences, the final character is the ASCII code for the indicated digit, rather than a byte containing the number itself.

There are, in addition to the functions invoked by "escape" sequences, two 3102 functions that are invoked by single characters: Terminal Identification and Send. If the 3102 receives an ENQ, it transmits the string '3102'. If the 3102 receives an ETB, it sends the contents of the current screen line or page, depending on whether LINE or PAGE mode is selected. Both functions operate according to the software handshaking protocol if it is selected.



## 3102/MICRO BEE 2 OPERATIONAL DIFFERENCES

### Default Mode Settings --

When the 3102 is turned on, it comes up on-line to the main port, with the status line not displayed, with software hankshaking selected, with cursor movement keys set to transmit, and with block transmit and function keys disabled.

### Non-Blinking Block Cursor --

The cursor on the 3102 is a non-blinking block which indicates where the next character (or field attribute) would be written. When the cursor is on top of a character, that character appears in reverse video.

### Automatic Log-on --

When the 3102 is turned on, it waits ten seconds and then begins sending ASCII CR characters at 250 msec intervals until a CR is received. A series of CRs is also invoked, after a one second pause, by the detection of a break of more than 100 msec duration on the main port. These characteristics allow the 3102 to re-establish communication (i.e. synchronize baud rates) with the host after a temporary power failure -- or whenever deemed necessary by the host -- without operator intervention. When the terminal is sending CRs, pressing any key will abort the sequence and have whatever effect the key would normally have.

### Function Keys --

The numbered function keys and those labelled function keys which are not entirely local in their operation (see Keyboard Functions) transmit a sequence of two characters on the 3102 (see Keyboard Functions for exact sequences) if function keys are enabled. If function keys are disabled, pressing any non-local function key sounds the bell. The Micro Bee 2 always transmits a four- or five-



character sequence when these keys are depressed.

#### Block Send --

Whenever a block send is invoked (eg: a control W is received or the <send> key is pressed with block send enabled), the 3102 sends two STX characters followed by the data to be transmitted (either one line or the entire screen, depending on whether the 3102 is in LINE or PAGE mode, respectfully), followed by an EOT character. A block send in PAGE mode includes a carriage-return (and a linefeed unless the line is a full 80 characters in length) after each line. If software handshaking (see below) is enabled, the data stream will be transmitted according to that protocol.

#### Software Handshaking Protocol --

Several operator-invoked or CPU-invoked special functions of the 3102 cause a stream of characters to be sent to the host (e.g.: function keys, block send, terminal status, cursor position, terminal ID). Some host systems may not be able to process characters fast enough to keep up with such transmissions. The 3102 supports an optional software handshaking protocol that holds character-stream output until the host is ready to receive it. If this protocol is selected, any character sent by the 3102 as part of a data stream must be echoed by a STX before the terminal sends any more data. Note that this includes the final character of any sequence. The default setting is with software handshaking selected. The protocol may be deselected (or re-selected) on the main and auxiliary ports independently. When the protocol is deselected, data streams are transmitted by the 3102 at the current baud rate without any pauses.





## Setting Time of Day --

Both the 3102 and the Micro Bee 2 have an internal clock which is displayed on the status line. They differ in that the 3102 allows seconds as well as hours and minutes to be set. Thus, the six characters following and ESC <space> (received over the input port or typed in local mode) are used to set the time.

## I/O Port Configuration --

The Micro Bee 2 can be connected to both I/O ports (main and aux) at once (see Beehive Micro Bee 2 Technical Users Manual). The 3102 can be connected to only one port at a time.

## Start/Stop Transmission (X-ON/X-OFF) Protocol --

The 3102 possesses a simplified form of the Micro Bee 2's ability to stop and restart transmission of data. Upon receipt of an X-OFF (DC3) character, characters-to-be-transmitted will be stored in a 15 character buffer rather than being transmitted immediately. Pressing any key when the buffer is already full will sound the bell and cause the keyed character to be lost. Receipt of an X-ON (DC2) will cause all characters currently in the buffer to be transmitted at once (or until the next X-OFF is received).

While terminal output is being held following receipt of an X-OFF, the host should not request any information from the 3102 (eg: block send, terminal status). Failure to observe this rule may cause the 3102 to become inoperative. In this case, pressing <cntrl-reset> will allow operation to be resumed.

While terminal output is being held following receipt of an X-OFF and software handshaking is selected, hitting a function key will lock the keyboard against further data entry (ringing the bell for each key struck) until an X-ON is received and the STX of the function key sequence has been echoed.

Resetting the 3102 while it is holding output after having received an X-OFF causes it to



revert to immediate transmission of typed characters, however, the data that was being stored is not transmitted, it is lost.



## STATUS LINE

The bottom (25th) line of the screen can display information concerning the status of the 3102 (i.e.: whether it is ON-LINE or OFF-LINE, in LINE mode or PAGE mode, etc.) However, unlike the Micro Bee 2, the 3102 does not normally display the status line. It is displayed automatically whenever anything occurs that would change it. Also, the operator can display the status line or cause it to disappear from the keyboard by simultaneously depressing the <control> key and the <status> key (labelled in red on the front of the <1> key).

A few of the messages displayed on the status line differ from those displayed by the Micro Bee 2:

When the 3102 is awaiting operator input, the message "READY" appears in columns 28-38. This differs from the synonymous message on the Micro Bee 2, which reads "SYSTEM RDY".

Another message that may appear in this field is "SCREEN LOCK". This differs from the "MEMORY LOCK" displayed by the Micro Bee 2.

Because of differences between the 3102 and the Micro bee 2 regarding the relationship of the main and auxiliary ports and the commands that control port use, the messages which may appear in columns 21-26 are "MAIN" and "AUX", rather than those indicated in the Micro Bee 2 manual.

The DSR (Data Set Ready) message that appears on the Micro Bee 2 status line, indicating that the data line to the host or other device is operative, does not appear on the 3102 status line. Since the 3102 comes on with the status line not displayed, but displays it whenever there is a change in terminal status, and since displaying the DSR message would cause the status line to appear whenever the terminal was turned on or reset, the state of the DSR line does not affect the 3102 status line.





